

*Dedicated
to the Memory of
Steven G. Lapointe*

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Editors' Preface

We are pleased to present the papers from the 25th reunion celebration of the Linguistics Department at the University of Massachusetts, Amherst, held in September of 1998. Inside this volume, you will find papers written by past and present professors and students covering a wide range of fields: Jennifer Smith and Pius Tamanji on phonology, Toni Borowsky and Paul de Lacy on the phonology-morphology interface, Steven Lapointe on morphology, Noriko Kawasaki, Yoshi Kitagawa, and Peggy Speas on syntax, Barbara H. Partee and Vladimir Borshev on semantics, William Philip on language acquisition, and Katy Carlson, Eva Juarros-Daussà, Anita Nowak, and Elisabeth Villalta on sentence processing. The wide array of topics presented in this collection attest to the diversity of thought and expertise engendered at UMass.

Two other prefaces immediately follow this one. The first is by Elisabeth Selkirk, our current Head of Department. The second is a comprehensive history of the linguistics department at UMass, written by one of our longest-serving professors, Barbara H. Partee. We are certain that these prefaces will give a sense of why the UMass Linguistics Department enjoys the high reputation it has today.

We would like to thank everyone who helped to make the poster session happen, most notably Peggy Speas and Kyle Johnson. We are also grateful to Pius Tamanji, the present GLSA manager, for his editorial advice. Finally, we would like to thank the participants, without whom this volume would not have been possible.

Paul de Lacy
Anita Nowak

1999

Head of Department's Preface

by Lisa Selkirk

This UMOP volume is part of the celebration of the UMass Linguistics Department's 25th Anniversary and Reunion. The volume will serve as a lasting souvenir for those who were able to attend the events in Amherst in September 1998, as a meaningful window on the celebration for those who couldn't be there, and as a collection of fine scholarly work from the extended UMass community.

The anniversary-cum-reunion events brought together a large number of us — there were more than 120 people at the celebratory dinner in Memorial Hall. Among the people present was Steve Lapointe. I was fortunate to have a good long conversation with him, and found him better than I had ever seen him — he was happy with his intellectual life, with his departmental life (he was head of the UC Davis Linguistics Department), with his family. It was a shock to all of us that he was struck down by liver cancer so soon after, and died in January 1999. In his memory and in his honor this volume is dedicated to him.

To celebrate the 25th anniversary of the Department (albeit a bit late — see details in Barbara's historical preface that follows), we wanted to have a reunion where the people who came would have a lot of opportunity to talk with each other and where those who chose to would also have the chance to present their scholarly work. The reunion began with an informal lunch on Saturday. It was followed by a leisurely poster session in the Student Union Ballroom which lasted for much of the afternoon. The atmosphere was warm, relaxed and congenial, as people moved slowly from one poster to the next. Everyone seemed to relish this opportunity to talk about current work in linguistics and memories from the past at UMass.

The sitdown dinner Saturday evening in Memorial Hall was a first for the Linguistics Department, where department parties have always been potluck and totally informal. But how else were we to welcome, feed and celebrate the presence there of more than 120 people — former students and families, current students, former faculty, current faculty, associated faculty from other departments at UMass, visitors to the department. It seemed to be the sort of event that everyone was looking for.

On Sunday morning a bagel brunch on the picnic grounds of Groff Park in South Amherst was followed by a steamy soccer game. The players were mostly current students, who do this sort of thing regularly, though the finale was probably unique.

Many players ended up cooling off in the adjacent Fort River, an event which is recorded for posterity (along with the earlier events of the weekend) by the camera of Yasuaki Abe, who has posted the pictures for all to see on his Web site.

This report, then, puts a little bit into context the papers that follow in this volume. The meals, the socializing and the presentation of work at the poster session were all of a piece. It was a memorable reunion, and I extend my thanks on the behalf of everyone to all of those who were able to attend, and who contributed to this volume.

The editors of this volume have asked me — as the current head of the department — to say something about the state of the department now and about where we are headed in the future. These are not things that are quickly said, and I was a bit daunted by having to write about these issues for the preface until I recalled that all of this was already said, and relatively concisely, in a document produced last fall, a couple of months after the reunion. In consultation with the rest of the faculty I put together a document whose purpose was to describe the department and where it was going to nonlinguists (in particular, administrators) within UMass and beyond. I think this document will be of interest to the readers of this volume, and so I have decided to include it as an appendix of sorts to this preface.

I have to warn you that this document is already out of date. When it was written we did not yet know who the new junior faculty appointments in semantics and phonology would be. I am very happy to report now that, starting in Fall 1999, Lisa Matthewson (Ph.D, University of British Columbia), will be our new semanticist and Joe Pater (Ph.D., McGill University) our new phonologist. Besides their excellence in the formal theoretical realm, they bring really new additional strengths — Lisa is interested in crosslinguistic semantics, especially of little-described languages, and in particular of Salish; Joe is interested both in the acquisition of phonology and in second language acquisition.

There is another important respect in which the appended document is out of date. The document makes a strong appeal for increase in the funding for graduate students in the UMass Ph.D program. I am happy to report that we have made some real progress on this front in the last year. Starting this Fall we are able to offer an 11-month stipend of \$13,500 to incoming students, and we anticipate as well being able to increase somewhat the number of students in our incoming class. So the graduate program is indeed doing well. We urge you to continue sending us excellent students, and we look forward to reunions in the future with as distinguished an array of new former students as we have today.

Amherst, July 1999

DESCRIBING UMASS LINGUISTICS

Key Themes & Messages

Current efforts to communicate the special strengths of UMass to a larger audience organize the presentation of UMass under five key themes. These five key themes are well-suited to describing the special strengths of the UMass Linguistics Department as well, and will provide a framework with which to inform both the University community and a broader audience about the current state of the Linguistics Department and about what we are planning for the future. The first three themes-- Delivering Access to an Excellent Education, Boasting a Distinguished Faculty, Offering Exceptional Opportunity-- have been central to our mission from the outset. We strive for excellence in teaching and research in the core areas of linguistics as well as in a wide range of interdisciplinary endeavors, and are committed to offering the diverse students of this university educational opportunity that exceeds in its quality that which is offered in the most distinguished universities in the land. The fourth theme-- Partnering to Solve Societal Problems-- describes activity that a significant number of our faculty have been engaged in and in which we see growing opportunities to expand. The fifth theme-- Fueling the Economy-- is perhaps least salient in the Department's perception of itself and in the perception of the wider audience, but present activity, as well as activity we propose to embark on, clearly does also fall under this theme.

Theme #1:

Delivering Access to an Excellent Education

A. Graduate Education

- The hallmark of a UMass graduate education is considered to be the excellent training that students receive in all the core areas of linguistics-- syntax, semantics and phonology-- as well as in the experimental subfields of psycholinguistics, child language acquisition and phonetics, and the traditional fields of historical linguistics and language typology. The training is provided in state-of-the-art courses and research seminars and in close relations of apprenticeship and mentoring between faculty and students. The outstanding quality of the graduate level training in linguistics available at UMass has been recognized for some time. In the early 80's the Ph.D program ranked second in the nation; MIT was first. In the recent National Research Council rankings, UMass Linguistics was ranked as the #1 graduate linguistics program in the country. The excellence of the program is a reflection of the quality of the teaching and research engaged in by faculty members. But it is also a reflection of the extraordinary quality of the graduate students we have been able to attract to the program. As an example, last year the only National Science

Foundation Fellowships in linguistics were awarded to three UMass Ph.D. students, and to a UMass undergraduate student majoring in linguistics.

- In the future we seek to maintain our status as the #1 graduate program in linguistics. We wish to urge on the broader audience recognition of the significant effort that will be required to maintain this preeminence. We must be able to continue to attract the best graduate students, and in sufficient numbers to maintain the ‘critical mass’ necessary for a viable program. To do this we require increased support from the University. **What we need to recruit competitively is an annual stipend of \$13,500. What we need to maintain a program of viable size is a restoration of the seven TA positions we have lost since 1989.** *[Afternote: Recall from the preface that, since the writing of this document, we have been making good progress towards this goal. --eos, 7/23/99]*

A survey conducted by our department last year showed that the University provides less money to fund graduate students in linguistics than any of our peer organizations (where “money from the University” includes TA-ships and fellowships). Indeed the level of UMass support relative to other institutions is shockingly low. The amount of graduate student funding we receive is out of line with the quality of our department as measured in the recent NRC evaluation. At the same time, federal grants to our faculty made up a larger share of graduate student funding than at any of our peer institutions. We have done more than any linguistics department in the country to get outside grants that will fund our students. The university has not matched this effort, but rather has dramatically decreased its support since 1989, and this is largely responsible for the significant decrease in graduate enrollment we have experienced in recent years.

We are of course aware of the level funding situation in the College of Humanities and Fine Arts, and so are considering the possibility of putting together a ‘major initiative’ for graduate support to take to the provost and or the Chancellor. We are also beginning to develop some ideas for possible fund raising. (This is in preliminary stages, and in any case, as with any development project, would not bear fruit for some years.) But we are also asking for a reallocation of resources within CFHA to contribute support that is commensurate with the quality of the program and the special contribution it makes to excellence at UMass.

B. Undergraduate Education

Our faculty has been devoted to undergraduate teaching. In recent years two of the faculty were Lilly fellows and two were awarded Distinguished Teaching awards. We have collectively been engaged in developing new ways to deliver better access on the part of undergraduates to the excellent education in linguistics that we have to offer. Some of these we are now implementing and some we plan for the future.

- **Majors and Minors**

For many years we have offered joint majors with other departments: Linguistics and Anthropology, Linguistics and Philosophy, Linguistics and Psychology, Linguistics

and German, Linguistics and Japanese, Linguistics and Chinese, Linguistics and Russian. The joint majors reflect the interdisciplinary reach of the study of language.

Last year, a regular major in Linguistics was instituted. This major will better support students interested in pursuing a career in linguistics in the academy or industry. The hiring of two new faculty in semantics and phonology this year will permit us to allocate resources to the new major without sacrificing the Ph.D. program.

To further enhance interdisciplinary study in linguistics, we plan to work to develop new joint majors with language departments (e.g. Classics, Spanish), Computer Science and Communication Disorders, complementing the joint majors we already have.

Moreover, to respond to the needs of a broader range of students in other departments, we are considering developing several linguistics minors, centered around particular themes like “Language, Meaning and Discourse” (for literature, pre-law, or philosophy students), “Background for Speech Technology” (for computer science or electrical engineering students), “Language and Diversity”, “Language and Education”. Developing a set of thematic minors will require further curriculum development at the undergraduate level, and may well require additional resources beyond those currently available.

- General Education

Two of our introductory course, Ling 101 “People and their Language” and Ling 113 “Language and Diversity in the U.S.” focus on topical issues that will be central in the lives of students as they become citizens of the Commonwealth, such as methods of language arts education, bilingualism, language and multiculturalism and issues of dialect. Our other introductory course, Linguistics 201 “Introduction to Linguistics” is designed to introduce students to analytic reasoning and argumentation, using the exploration into the structure of language as subject matter .

To increase student access to General Education courses in linguistics, we have begun to teach Ling 101 in the more efficient lecture and discussion format. Adequate access to our other principal General Education offering, Ling 201, taught largely by TAs, depends crucially on restoring the TA positions we have lost over the years.

Theme #2:

Boasting a Distinguished Faculty

- The excellence of the UMass Linguistics faculty is reflected in a variety of ways: in the NRC ranking of the faculty itself as #4 in the country, in the prestigious awards given to faculty members (National Academy of Science, American Academy of Arts and Sciences, Guggenheim, Fulbright), in the outstanding record in obtaining federal grant support (Graph 3), in the editorships of prestigious journals, and in the influence of the faculty’s publications.
- Our goal is to move from 4th position to 1st in the NRC ranking of faculty in linguistics. We believe that the new positions for which we are hiring this year will make an important contribution towards achieving that number one status. The new positions are in semantics and phonology. These are areas in which UMass already holds a preeminent position, and the new hires will bring even greater collective excellence. **We also believe that we need to make a new hiring in the area of syntax.**

Syntax lies at the center of the discipline. The Chomskyan revolution in linguistics grew out of the study of syntactic structure in language, and it is standard to introduce students to the leading ideas of linguistic theory and cognitive science from the standpoint of syntax. In our department we do this in a 6-credit introductory syntax course for first year graduate students. From its central position, the theory of syntax continues to profoundly influence phonology and semantics, which are typically construed as interpreting syntactic structures in the realms of sound and meaning. In recent years, though, developments in the theory of the interface between syntax and semantics and the interface between syntax and phonology (areas in which UMass is again preeminent) have begun to influence the theory of syntax itself. We feel it is essential to make a new junior hire in syntax in order to properly represent important new developments in the realm of syntax and to feed into existing teaching and research on the interfaces with syntax in the department.

A new hire in syntax will also help answer to important curricular needs. For example, we are planning to develop an undergraduate course on the structure of the English language which we believe will be of great use to future teachers in the Commonwealth. We feel syntacticians in the Linguistics Department are ideally suited to providing students with an understanding of the structures of the English language along with an understanding of how language functions as a system. Such a course would also have an appeal for computer science students who are interested in language and speech technology grounded in the linguistic analysis of English. We are also developing a 3-credit graduate-level introduction to linguistics for student outside the Linguistics Department who seek an initial encounter with the core ideas in linguistics before entertaining enrolling in our other graduate courses. We anticipate enrollment in this course by graduate students from Communication Disorders, Education, Afro-American Studies, Computer Science, and Philosophy among others.

- The symbiosis between quality of faculty research, quality of teaching and quality of graduate students cannot be emphasized enough. Interaction with outstanding graduate students provides exceptional challenges for teaching, and inevitably leads to continued innovation in research. Achieving #1 status in the NRC ranking of linguistics faculty will require that we remain truly competitive in recruiting the finest graduate students and that the size of the program be restored to earlier levels. To repeat: **What we need to recruit competitively is an annual stipend of \$13,500. What we need to maintain a program of viable size is a restoration of the seven TA positions we have lost since 1989.**

Theme #3:

Offering Exceptional Opportunity

The Linguistics Department offers exceptional opportunities not only to its graduate students but also to undergraduates at UMass and to graduate students from other departments.

- The experience of education in linguistics at UMass is one characterized by small class size, considerable personal attention from faculty and rich possibilities for engaging in research. Many undergraduates have undertaken serious research projects under close supervision from faculty members.
- Given the inherent interdisciplinarity of linguistics and the institutions we have set in place to facilitate interdisciplinary work, students with a wide variety of interests and career goals are able find a base in the Linguistics Department from which to pursue diverse courses of study relating to language. Our existing joint majors, and ones we plan to develop in the future, provide an institutional framework in which to pursue interdisciplinary studies. In addition to this, there are thematic areas of research and teaching which provide a context in which students can carry out interdisciplinary work. These areas include “Issues of Dialect” (with existing collaborations with Communication Disorders, Education, and Afro-American Studies and possible further collaborations with Communication, Anthropology and English), “Cognitive Science” (with existing collaboration with Psychology, Communication Disorders and Philosophy, and possible further collaboration with Computer Science), “Native American Languages” (with existing collaboration with Anthropology and Native American Studies). Undergraduate students and graduate students from outside the department have undertaken programs of research and study in these areas under close supervision by faculty. A future thematic area of interdisciplinary collaboration we plan to explore is with Computer Science; such a collaboration would offer exceptional, unique advantages to students in linguistics and in computer science.

Theme #4:

Partnering to Solve Societal Problems

This 4th key theme has not been as central to the defined mission of the department as themes #1 through #3, but it has been very central to the mission of a number of our faculty, is integrated into the department in a variety of ways, and is expected to have an even greater place in the future.

- Collaborative research on the study of the acquisition of African American English (AAE) by children has been carried out for some time on grants held by Linguistics and Communication Disorders, with Co-PI's in both departments, and with four additional Linguistics faculty serving as active consultants. This acquisition research feeds directly into a recently awarded federal contract to support the development of tools for the assessment of language disorder in children that will avoid having normal AAE-speaking children erroneously diagnosed as having a language disorder. A recent Special Opportunities appointment has brought into our department an expert on African American English who also has a commitment to using research and teaching to solve societal problems.
- Prejudice based on language or dialect difference is endemic in our society, often the overt expression of underlying race and class prejudice. Two introductory-level undergraduate course in linguistics--Ling 101 “People and their Language” and Ling 113 “Language and Diversity in the U.S.” have as central themes education around issues of language and dialect difference and language prejudice associated with these differences. Scientific arguments are presented demonstrating that no language or dialect is better than another, and the mechanisms of language prejudice are explored.

- We hope that ties between the Linguistics Department and the School of Education will be strengthened and enriched in the future. Faculty in the department have participated in the recent debate around the teaching of reading in the state's elementary schools, and have consulted with educators developing state-wide standards for the language arts curriculum. We plan to develop an undergraduate course on the Structure of English where students will learn the distinction between prescriptive grammar and describing language, where students will learn that writing well and writing in the standard language are not to be equated, and where students will see that studying grammar involves the training of the mind. There is also potential for collaboration between Linguistics and the School of Education around issues of bilingualism, bilingual education, and second language acquisition.
- Native American tribes are putting increasing emphasis on reviving, recording and describing the remaining Native American languages, most of which are on the verge of extinction. The Pequot tribe of Connecticut and the Wampanoag (Massachusetts) tribe are currently supporting work by linguists on their languages, with a mind to eventually having the language taught and fostering cultural identity and pride. We plan to explore the possibility of making UMass the site of a central depository for materials on the languages of the original inhabitants of New England, and a center for research on these materials that could involve undergraduate and graduate students. Currently two faculty members are engaged in work on other Algonquian languages of New England. One is working with one of the last remaining speakers of Western Abenaki, originally spoken in Northern New England, including northern Massachusetts in an effort to better record and describe the language. Another faculty member is supervising undergraduate research on Stockbridge Mahican based on an 18th century dictionary.

Theme #5: Fueling the Economy

With one foot in the Humanities and the other in the interdisciplinary realm of the applied, linguistics can see its potential contributions to society both in the intellectual, cultural and moral terms of the humanist and in the concrete economic terms of the industrialist. Clearly our strength has been in the former arena, but we see some possibilities for future development in the latter.

- With the rest of the Humanities, we argue that our teaching and research “provides benefits” to the larger society, albeit ones that may not be readily quantifiable. The need for a citizenry with a humanistic education should be clear, and the intellectual, cultural and moral products of our research and creative endeavors enrich the life of the Commonwealth. (As an example of the perhaps indirect economic consequences of higher education in the humanities, one could cite the cultural and economic boom in Northampton, which is clearly related to the presence of the Five Colleges, their students and faculty.)
- Linguistics is in a position to make somewhat more direct contributions to economic development, in that products involving language that are based on linguistic research and expertise have considerable market value. For example, research on language acquisition and African American English have led to the direct involvement of Laureate Learning, Inc. and of Psych Corp., which together with the federal

government is underwriting the UMass contract to produce a dialect-neutral instrument for the assessment of language disorders in children. Another realm for making a connection between linguistics and the economy lies in the relation between linguistics and computer science. Already, a number of UMass Ph.D's are employed in the computer industry, where with their linguistic expertise they make important contributions to developing software applications involving language. In the coming years we plan to explore possibilities for collaborating with Computer Science in providing further training to interested graduate and undergraduate students that will allow them to readily enter the fields of language and speech technology. We are moreover in contact with alumni in the computer industry, and plan to explore possibilities of financial support for graduate students interested in careers in the computational world.

To conclude, the coming years hold exciting prospects for enriching the offerings of UMass Linguistics in the areas of the Five Key Themes. We hope to find the support from the University that will enable us to make these prospects a reality.

Respectfully submitted,

Elisabeth Selkirk
Head, Department of Linguistics

A History of the UMass Linguistics Department to 1999

Barbara H. Partee
August, 1999

0 Personal preamble.

I was happy to be asked to write a "historical preface" for the UMOP volume of papers from the department's "25th anniversary" conference of September 1998. I would like to dedicate this preface to Don Freeman, who with vision and energy brought the department into existence and set the direction for its spectacularly rapid rise from almost nothing to one of the finest departments in the world. At the 25th anniversary celebration last fall, Don expressed how happy he was that his hopes and dreams for this department had been so fully realized, and his wishes that we go on for another 25 years and more of continued growth, collegiality, and achievement.

Everyone who has spent any time here could write an interesting historical memoir, and there would doubtless be as many different perspectives as there are participants in this story. I suppose I get to write my version because I've been here longer than anybody else. I will mostly stick to facts, but let me in this personal preamble summarize what I think has been so wonderful about this department, and why I am so glad to have chosen it as the place to spend most of my academic life.

One of the lessons that emerged from the formation and growth of this department is that it is easier to build a first-rate department from scratch than to try to turn a middling department into a top one. Overcoming the status quo is never easy; but when there is no status quo to overcome, then if you can get a good bunch of people together and give them the support they need to get going, and if everything clicks, then there's no limit to what you can do. And some of the early decisions in how to proceed helped make things "click". Don and Dick Demers were here first, and Don then recruited some outstanding junior people to help get things up and running: foremost among the new young faculty were Adrian Akmajian and Frank Heny, who put enormous amounts of effort into developing both the undergraduate and the graduate curriculum. They accomplished a great deal very quickly; and that made it easier for them to convince their "senior" recruits that this hitherto unknown place, "in the shadow of MIT", really did have the potential to become a top department.

When I was being recruited in 1971, my colleagues at UCLA were quite surprised that I should imagine that this place had a chance of becoming anything. "Ask Don", they said, "how he expects to build a top department so close to MIT." I asked Don, and his

reply was "Look up and down the whole East Coast, and tell me whether there shouldn't be room for two great departments in the East." And it was true; since the Ivy League schools had had the strongest linguistics department in the pre-Chomsky years, they were the ones slowest to convert to generative grammar, and were clearly suffering a kind of stagnation in the late 60's and into the 70's. The emergence of a good number of very strong departments in the East did not come until a decade or two later, after the anti-Chomskian leadership had mainly retired, or in other newer departments in state universities like Maryland and Rutgers.

And there were other reasons that UMass could be seen as complementing and not competing with MIT. MIT, as a private institution, has very high tuition, and the number of students and their financial support always had to be very tightly capped. UMass has always had relatively low tuition, plus a very important policy of waiving tuition for any graduate student with inside or outside financial support of a certain amount. So we could be considerably more flexible, and in the early years when we couldn't assure full support for all admitted students, it was not absolutely impossible for students to come here on a bit of a financial gamble. And besides, both MIT and UMass admitted very small entering classes of Ph.D. students - the two combined admitted considerably fewer graduate students than UCLA (which had an M.A.-Ph.D. program) then did. A further advantage was and is the potential for cooperation; faculty and students can travel between the two institutions, and have often done so, whether to attend Chomsky's classes, conduct joint workshops, or jointly author papers or edit journals. The danger, of course, was the potential for seeing UMass as a satellite of MIT, or a "farm team", and some of our own faculty did seem to see it that way, but mostly we just shrugged that idea off and did our own thing, which was generally no more and no less independent of MIT than most of the rest of mainstream American linguistics was.

Another part of the winning strategy that really surprised me became apparent when I was first approached about coming here. It was a very small department, but they already had two syntacticians in Adrian and Frank (I was a syntactician then, just beginning to get seriously into "semantics and ____"). (We didn't have the word "interface".) I asked how they could possibly hire another syntactician into such a small department when they already had two. The reply was that they weren't trying to "cover everything", they were instead trying to get a group of people together who would talk to each other, sometimes team teach, and work together with students. They were trying to build a stimulating and productive environment for exciting research to happen, and for students to be part of that research from early in their careers. At the beginning it was just syntax, phonology, and historical, then some semantics, then language acquisition; that was it until the later addition of language processing and much later phonetics. (There was always morphology, too, but it never had a distinct "slot" in the curriculum.)

All of these features of the department were in place when I arrived in 1972, and all have remained great strengths. The department is its people, and there have always been great people here, and a remarkable degree of collegiality which is palpable even to visitors, who often remark on it. Good and dedicated faculty attract good graduate

students, and good graduate students attract good faculty. And a well-functioning department can attract and keep wonderful secretaries who then make possible a well-functioning department. We have been fortunate to be locked into a "virtuous circle" of strength leading to strength, which has continued to build on itself as we have evolved. Not everyone is comfortable with the metaphor of a "happy family", so I try to tone down my manifestations of feeling that way about the department; but it probably isn't a secret.

Now on to the history itself. It happens that I had written historical sketches at the times of two different program reviews, conveniently spaced about a decade apart. So now I am presenting the history in three parts, and with three correspondingly different "present tense" perspectives.

Part I, Prehistory and Early Years, 1967 - 1978, is something I wrote (as "A Brief History of the Department of Linguistics") for a Graduate Program Review of the department in Spring 1978. It itself was divided into three phases: (i) the prehistory of the department the late 1960s; (ii) the establishment of the department in 1971 and its rapid growth and development in the early 1970s; and (iii) the emergence of a more or less stable 'steady state' as a highly regarded and successful program by the second half of the 1970's. I present that part verbatim as I wrote it from the perspective of 1978, and I don't see anything that would need to be changed now.

Part II, The Middle Years, 1978 - 1988, is not a separate "period" in departmental history - indeed, developments have been more or less smoothly continuous ever since the mid-1970s - but there also happens to have been a departmental review in 1988 for which a departmental self-review was prepared. This time there wasn't a separate "history" piece, but Lynne Ballard has helped me collect the historical bits scattered through the document. Partly this is a present-tense snapshot of the department and the graduate program in 1988, and partly it describes the changes over the previous ten years. In this section I have done some editing to omit irrelevant parts and then smooth out the holes, and I have added a number of notes from the perspective of 1999, clearly marked.

Part III, Recent History, 1988 - 1999, is new for this occasion. It is more informal in style because it was written for "us", rather than for an outside review team. And it is also a bit vaguer in terms of specific dates for specific changes, because I am writing it in Leipzig where I don't have drawers full of administrative folders to consult. I'm getting Lynne to help me fill in the most important specifics, and otherwise leaving it slightly vague.

These three main sections are followed by two supplementary sections. Section 4 is a brief history of space and facilities in the department, and Section 5 is a personal reflection on some of the inevitably painful aspects of the transition the department went through in the first few years of its existence.

There is also an Appendix prepared with the help of Lynne Ballard with a list of all regular and visiting faculty in Linguistics from 1970 to the present, and of Department Heads and (with Kathy Adamczyk's help) of Graduate Program Directors. For lists of alumni and current students, see the departmental web page, www.umass.edu/linguist/, and please help us to keep that list updated!

Of course the credits and caveats that need to go with an endeavor of this sort are too many to itemize. And since I know that this document is likely to have some inaccuracies and certainly has various lacunae, let me invite feedback so that the next version 10 years from now can be better. This is mostly a rather "dry" history (except for section 5), not a memoir, because of the "program review" style set by the first two parts and largely maintained in the third. There are of course many stories between the lines, which we could all sit and tell each other long into the night.

The biggest omission from this document is mention of individual students and their roles in the history of the department. As we were reminded at the reunion, there have been different "cohorts" with different vivid "characters" at different times, groups that got involved in particular lines of research together, or in putting on a NELS (Peter Sells and Charlie Jones really knew how to make a NELS party happen, and there were two other great NELSES here as well) or a workshop. Groups that gave a real boost to GLSA, and the cohort that sponsored a series of GLSA auctions (of everything from autographed manuscripts to breakfast in bed) that were hilarious as well as fund-raising. And there have been different department sports. In the very beginning, Dick Demers used to lead departmental cross-country skiing days in the Pelham hills, ending with pizza in his living room in Echo Hill. When Mike Flynn was here we played some football and a lot of softball, usually against Philosophy. There have been periods of basketball, and for many years there was always volleyball at department picnics if they were at 50 Hobart Lane, and there still sometimes is. Soccer has been the sport of choice for so long now that the current students were surprised to see the softball pictures from the 70's at the reunion. But these are just tips of some icebergs; I realized that I couldn't tell about individual students or groups of students without making this into a book. But I also haven't tried to talk about individual faculty, except with respect to recruitment or certain historical events. What I have tried to do, just to provide memory-triggers and landmarks, is to fill in snapshots of what faculty were here at various points and of who the entering classes of students were at the same points. Just looking at the names will probably call up all kinds of memories for those who were here in the various periods, and be a story in itself for anyone who didn't already know how many of the wonderful linguists (or ex-linguists) in the world today were students here or have been part of our faculty at one time or another. (Our undergraduate students are unfortunately not discussed or listed here at all; that omission needs to be corrected in future histories.)

It did not occur to me to put "acknowledgements footnotes" into the earlier program review documents, and it is too late now to try to reconstruct all the help I had. But let me at least take this as a moment of special thanks and appreciation to the wonderful departmental secretaries this department has been blessed with from the

beginning. Without Marty, then Sally, then Lynne, then Lynne and Kathy, no department head, no Personnel Committee chair, no Graduate Program director, no departmental committee, and no one preparing for a departmental program review could have begun to do such a good job as we have all managed to accomplish over all these years. And because the program reviews weren't designed for reminiscing and thanking and patting each other on the back, I don't think the secretaries got as much credit in those historical sketches as they deserve. (Somewhere in some files there are documents that various of us wrote when working to get raises or classification upgrades or service awards for our secretaries, and many, many documents written before we managed to get the second secretarial position approved; those would be the places to look to find some proper words of appreciation.)

As far as my memory goes back (to 1972 first-hand, and a little farther via conversations with Don Freeman, Frank Heny, Adrian Akmajian, and Dick Demers), the first secretary was Marty Bowers, assisted by the graduate student and secretarial helper Jeanine Langdoc. Those two carried the bulk of the administrative assistance work for the establishment of the department, of the Ph.D. program and the joint undergraduate majors, and of the proposal for and preparations for the 1974 Linguistics Institute. Jeanine then left and moved to the Netherlands with her by-then husband Frank Heny. I think Marty also left just after the 74 Institute, and became a graduate student in history at the University of Iowa. Marty overlapped with Sally Hollens (I remember that they both took my "Math for Linguists" course one year, and both surprised themselves by doing very well in it), who was here from 1973 (I think) to 1976, when she left to begin a degree in Accounting at UMass (after realizing she could do math!). Sally and Marty both did a wonderful job in the growth period.

Lynne Ballard came on board in August 1976, and had had a year of experience by the time Jay Keyser left and Emmon was asked to take over the Headship. Emmon had been away on leave in 76-77 and had to return straight from leave into the Headship; Emmon and Lynne had not been acquainted before the fall of 77, and Jay was gone when Emmon got back, but the transition went beautifully, for which Emmon gave Lynne a great deal of the credit, and Lynne has been proving her indispensability in countless ways since.

Kathy Adamczyk started as a part-time Cognitive Science secretary in 1980, funded by the interdepartmental Sloan Grant in Cognitive Science. Kathy was "housed" in Linguistics, because the other participating departments, initially just COINS [now Computer Science, then Computer and Information Science] and then COINS and Psychology, recognized how badly Linguistics needed a second secretary and how difficult it is in the Humanities to get one, since we generally have far too little soft money and our Dean also never has enough resources to meet all the recognized needs. Kathy remained on "soft money" as long as the Sloan Grants lasted, then had additional appointments funded in part by the three cooperating Deans for the Cognitive Science Program and in part by grants which Lyn Frazier and I had in the 1980's. Finally after a great deal of effort a regular position was given to the department for her, and she became a state funded

employee in July 88.

So Lynne has been here now for more than 20 years and Kathy close to 20; the large majority of the faculty, students, and visitors to the department don't remember the time before we had them, and by now none of us can imagine the department without them. I won't embarrass them by turning this into a mushy preface, but I'm sure I speak for everyone who is actually or in spirit represented in this anniversary volume in saying that even though we often act as if we take them for granted, we are collectively conscious of an immense debt of gratitude to them (and to their predecessors) for making everything else the department has accomplished possible, and for their very large share in giving the department the reputation of being a friendly and welcoming one.

1. Part I. Prehistory and Early Years, 1967 - 1978

Source: "A Brief History of the Department of Linguistics", written by Partee (with assistance from Lynne Ballard and others for a Graduate Program Review in 1978.) The review team was Morris Halle, Janet Fodor, and Ed Klima. The favorable review helped pave the way for the subsequent growth in faculty size and financial aid support from the administration.

Those pages are reproduced verbatim below. I will only add to them a series of "faculty snapshots", illustrating the high turnover that parts of our faculty went through during those years, and lists of the entering classes during those years. I append those to the end of this section.

A Brief History of the Department of Linguistics

The history of the Department of Linguistics at the University of Massachusetts can be divided into three phases. As in many institutions, the department grew out of a non-departmental program established under the impetus of individuals in various departments who were interested in linguistics; this phase culminated in the establishment of an independent department. In the second stage, the nature and special aims of the department were clarified. During this period there was rapid growth but also a considerable amount of instability due to turnover in the faculty and student body. The third period represents a certain stabilization marked by more continuity and by the awarding of degrees to the first "class" (as opposed to isolated individuals).

In 1967, Peter Salus (Department of Germanic Languages and Literature) requested approval for the establishment of a Committee on Linguistics, whose task was to establish a Program in Linguistics. The program was to be a semi-autonomous unit without departmental status but with the understanding that two faculty members would be appointed with primary responsibilities in linguistics (see Appendix I). In the academic year 1968-69, the first courses were offered, Richard Demers (German) and Don Freeman

(English) having been appointed. In 1969, Salus resigned and Freeman was appointed Acting Chairman of this semi-autonomous program. During 1969-70, Freeman suggested a number of changes in the Salus proposal, most of which were aimed at reducing the number of 'survey' courses and focusing more on research seminars and in-depth courses. It was during this time that the aim of the program to concentrate on the central aspects of linguistic theory began to be evident. The program was approved under Dean Seymour Shapiro. From the outset it was decided that there would be no undergraduate major in linguistics as such, although it was hoped that a number of joint majors would be developed, (see section on joint majors). From Freeman's correspondence it can be seen that the goal was to develop a first-rate graduate program with 8-10 full-time members. This period culminated in the proposal by Freeman to revise the M.A. and Ph.D. programs and make the change to departmental status (see Appendix II). In December 1971, the Board of Trustees approved the establishment of a Department of Linguistics.

A number of additional appointments had been made during his initial period: Adrian Akmajian (1970), Frank Heny (1970), David Vetter (1970). The first Ph.D. was completed in September 1970, by Gary Bevington, who was appointed on a one-year basis.

The second phase began with departmental status and a commitment from the administration to support the development of the department. (It was also at this time that Freeman secured approval and backing for hosting the 1974 Linguistics Institute of the Linguistic Society of America here, see below). The plan was to continue to rely heavily on junior appointments but to begin a search for one or two senior faculty members. Two Assistant Professors, Jim Heringer and Tom Peterson, were appointed in 1971. This search for senior additions culminated in two appointments: Barbara Hall Partee and Samuel Jay Keyser, who joined the department in 1972, the former with a joint appointment in Philosophy and Linguistics, the latter agreeing to take over the headship, Freeman having agreed to serve as Associate Dean of the School of Humanities and Fine Arts under Jeremiah Allen. (In 1976 he was made Adjunct Professor of Linguistics.) The appointment of Partee coincided with the appointment of Terence Parsons in the Department of Philosophy. Largely because of the efforts of Heny, who played a major role in shaping the department, strong connections had been established with Philosophy (as well as other departments). The appointment of Partee and Parsons continued this direction. A number of candidates for the Ph.D. had joined the program in 1971, but 1972 was the first year in which the present rate of admissions was reached (i.e. six or seven admissions per year, special students excluded).

During the transitional period, which was marked by a strong recruiting effort both for faculty and students on the part of Heny and Freeman, there was considerable turnover in faculty (Vetter, Heringer, and Peterson left the department) and students. The end of the period saw a dramatic increase in the number and quality of applicants and a sharp decrease in the number of students dropping out of the program.

The Department hosted the 1972 North Eastern Linguistic Society conference in the fall. During this year additional recruitment went on for faculty. In 1973 Joan Bresnan and Thomas Roeper (who had been appointed a year earlier) joined the faculty, and Emmon Bach was a Visiting Professor (half-time, with a half-time appointment at Hampshire College, both appointments subsequently made regular). In 1974 Lisa Selkirk joined the department, and during the year 1974-75 Akmajian and Demers accepted appointments at the University of Arizona, and Bresnan at M.I.T., and Heny accepted an appointment at the University of Groningen.

During the summer of 1974, the Department and the University hosted the Golden Anniversary Linguistic Institute of the Linguistic Society of America, with Keyser and Freeman as Co-directors and Bach as Associate Director. The Institute was, in our opinion, one of the most successful of recent years. About 600 students and scholars from all over the world participated. Among the activities were a series of Golden Anniversary lectures by internationally known scholars held in connection with the summer meeting of the LSA.

In 1975, Bach (having resigned his Hampshire position) took on full-time duties in the department and two new appointments were made: Alan Prince and Edwin Williams. At this point, although a number of changes occurred, the basic present personnel of the department was established. During the academic year 1976-77, Bach and Partee were on leave at the Center for Advanced Studies in the Behavioral Sciences (Stanford) and two visitors (Roger Higgins and Robin Cooper) took their place. During this year, Keyser accepted an appointment at M.I.T., and Bach agreed to take on the headship on his return. During this year also two appointments were made (to start in 1978): Richard Kayne and Jean-Roger Vergnaud and two visiting appointments were made for the current year: Daniel Kahn and Wendy Wilkins. The Department is currently engaged in a search for a person either to fill the gaps in diachronic studies which arose when first Demers and then Keyser left the department, or to enhance the psycholinguistic part of the program, which has grown considerably under the leadership of Roeper.

Throughout the history of the department a major influence has been provided by the students (see separate sections on the Graduate Student Linguistic Association). Students take part in the governance of the department in all matters except the granting of financial aid to particular students. In the current year the students organized and hosted another highly successful NELS meeting.

A number of visiting scholars have elected to spend time here. Many come from abroad. They have included Marcelo Dascal (Israel/Brazil), Jurgen Meisel (Germany), Olga Tomic (Yugoslavia), Frank Vlach (Australia). In addition, a number of graduate students from other institutions have come as visitors for a year, either as 'official' students or under formal arrangements with the department. Several have stayed on to work toward a degree here.

The Department has maintained fruitful contacts with individuals in other departments, especially Philosophy, Psychology, and most recently Computer and Information Sciences, as well as other sibling institutions in the Five Colleges, especially Hampshire College.

During Keyser's stay, the Department was the home for Linguistic Inquiry under Keyser's editorship. Partee was editor of the 'squibs' section for two years, at present Prince and Williams are doing this job. Students have been active in putting together the 'semi-publication' University of Massachusetts Occasional Papers, of which the twenty third issue is about to appear.

A number of grants have been given to individuals in the department: Partee and Parsons, Keyser, Prince and Roeper. During the 1974 Institute, Partee organized and conducted an MSSB workshop on problems of non-extensional languages and during the past summer Williams organized and conducted a workshop on discourse grammar.

Faculty snapshots: In 1970-71, the regular faculty were (to the best of my knowledge) Akmajian, Demers, Freeman, Heny, Vetter.

In 1972-73: Akmajian, Demers, Freeman, Heny, Heringer, Keyser, Partee, Peterson.

In 1974-75: Bach, Bresnan, Demers, Freeman, Heny, Keyser, Partee, Roeper, Selkirk.

In 1976-77: Bach, Keyser, Partee, Prince, Roeper, Selkirk, Williams.

Student entering classes: 1969: Gary Bevington, Linda Thomas

1971: Robin Cooper, George Horn, Cathy Lee, Jeannine Langdoc

1972: Ellen Broselow, Mary Clark, Elan Dresher, Muffy Siegel, Joe Sullivan, Barbara Stack, Douglas Sutherland, Charlotte Tsoucalas

1973: Cynthia Allen, Tim Austin, Nancy Chinchor, Jane Grimshaw, Nikki Keach, Michael Rochemont, Richard Schmierer, Justine Stillings, Susan Tavakolian

1974: Janet Bing, Greg Carlson, Helen Goodluck, Paul Hirschbuhler, Renate Krug von Nidda, Jean Lowenstamm, Ed Matthei, Satoru Nakai, Debbie Nanni, Angela Pereira, Larry Solan

1975: Tah Asongwed, Michael Flynn, Ken Hinomizu, Steve Lapointe, Anke de Rooij, Ken Ross, Rick Saenz

1976: Wynn Chao, Panit Chotibut, Paloma Garcia-Bellido, Marianne Phinney, Janet Randall, Mark Stein, Deirdre Wheeler

1977: Lisa Crawford, Elisabet Engdahl, Irene Heim, Jonathan Mitchell, Mary Sparkes, Lori Taft, Martha Young (Martha Wright)

2. Part II. The Middle Years, 1978 - 1988

The regular faculty at the start of the 1978-79 year were: Bach, Frazier (in her first year), Kayne (his first and last year, by his choice, since he wanted to be able to spend half of each year in Paris and the department was too small for that; we needed everyone to be available for full-year advising of students), Partee, Prince, Roeper, Selkirk, Williams, Vergnaud. We were without a historical linguist, but got permission for a search and persuaded Roger Higgins to come back permanently starting in 1979 (he had been a visitor in 1976-77.) In fact, if we look at the list of regular faculty at the start of 1979-80, when Higgins had arrived and Kayne had left, we can see even more clearly that we were indeed into a period of relative stability, as claimed in the 1978 report: Bach, Frazier, Higgins, Partee, Prince, Roeper, Selkirk, Williams, Vergnaud. Of the 9 regular faculty at that time, 6 are still here (I'm counting Emmon, who is now Emeritus but still active and will be co-teaching a Structure of Algonquian course with Roger Higgins in Fall 1999.)

By the 1987-88, the number of regular faculty had grown from 9 to 10 with the addition of Angelika Kratzer in a new semantics position, and the regular faculty that year were Bach, Frazier, Higgins, Kratzer, McCarthy, Partee, Pesetsky, Roeper, Selkirk, Williams. The overlap between 1979-80 and 1987-88 is 7 of the 9/10. Major changes: Prince left in 1984, McCarthy came in 1985. Vergnaud was on the faculty from 1978 to 1982; Pesetsky was hired in 1983, and stayed until 1989.

Entering classes 1978-88: 1978: Yasuaki Abe, Toni Borowsky, Davida Charney, Shinsho Miyara, Mats Rooth

1979: Mieko Abe, Victoria Burke, Gennaro Chierchia, Dan Finer, James Pustejovsky, Betty Schlermann, Marcia Walter (Marcia Carlson)

1980: Mark Cobler, Charlie Jones, Taisuke Nishigauchi, Carolyn Quintero, Craig Roberts, Peter Sells

1981: Nina Dabek, Alison Huettner, Junko Ito, Nirit Kadmon, David Lebeaux, Ralf-Armin Mester, Scott Myers

1982: Jae-Woong Choe, Yoshi Kitagawa, Kiyoshi Kurata, Masanobu Ueda, Alessandro Zucchi

1983: Stephen Berman, T. Daniel Seely, Gautam Sengupta, Tong Shen, Karina Wilkinson

1984: John Boyd, Joyce McDonough, Bozena Rozwadowska, Xiaoping Teng, Michiko Terada, Anne Vainikka, Gert Webelhuth, Alessandro Zucchi

1985: Virginia Brennan, Molly Diesing, Elaine Dunlap, Maire NiChiosain, Jaye Padgett, Bernadette Plunkett, Koichi Tateishi, Changsheng Xi

1986: James Blevins, Ilan Hazout, Gregory Lamontagne, Victoria Liptak, Linda Lombardi, Yutaka Ohno, Roger Schwarzschild, Mari Takahashi, Alison Taub

1987: Juli Carter, Rose-Marie Dechaine, Jingqi Fu, Lisa Green, Noriko Kawasaki, William Philip, Paul Portner, Sylvie Robidoux, Timothy Sherer

What follows is drawn principally from the materials we prepared for the 1988 Departmental Program Review. The reviewing team that time was Morris Halle, Vicki Fromkin, and C.L. (Lee) Baker. "Our main agenda" for that review was our felt need for a new position in phonetics, and a phonetics lab to go with it, and a need for an additional position in syntax. The review committee supported our assessment of that need, and we were able to hire Peggy Speas in 1989 and John Kingston in 1990. Another item for discussion in the 1988 review was the possibility of adding a "straight" linguistics undergraduate major to supplement our 7 joint majors, since the long-discussed possibility of a 5-College linguistics B.A. program had clearly died by then. But on that item there was less consensus about whether we could do it with our faculty size without cutting into the quality of our Ph.D. program, something we would not want to risk. So that change did not come about until ten years later.

Note: in what follows, the present tense refers to 1988. I have inserted some 1999 notes, marked as such.

2.1. GLSA.

The Graduate Linguistic Student Association, GLSA, is an organization whose members are all the registered graduate students in the Linguistics Department. It was established in the early 1970's, soon after the founding of the department, and under the enterprising leadership of Timothy Austin in the mid-1970's it was incorporated as a registered non-profit tax-exempt organization.

Elections are held at the beginning of the fall semester for president, secretary, and treasurer, and again at the beginning of the spring semester for president and secretary. Those students elected to these two positions also serve as student representatives at all faculty meetings, providing student input and taking part in all departmental decisions except those concerning financial aid to particular students.

[Note added 1999: Although we did not publicize it in official documents, the two student representatives had full voting rights on the Personnel Committee as well as in department meeting. That continued until the university expressly and explicitly prohibited it on the advice of University Counsel (for fear of lawsuits by faculty denied tenure or promotion, given the wording of official personnel policy.) Students continued thereafter to participate in Personnel Committee but as non-voting members. Also note that the present paid "GLSA Manager" position was in 1988 still an unpaid "treasurer" position.]

In addition to providing a forum for discussion of graduate student concerns, the GLSA sponsors colloquia, which generally meet on a weekly basis and feature speakers from both within the department (both students and faculty) and from outside. [1999 note: the number of student volunteers for colloquium presentations had already dwindled greatly by 1988, and the ratio of outside to inside speakers had climbed close to its present

very high level. Colloquia remained weekly until just a few years ago.]

The GLSA also elects one of its members to manage the "Node", which contains the Departmental reading room and its library holdings. [1999 note: The Node has moved several times over its history, from the tiny cubicle under the tower stairs, to Room 319, the present Computer Room, to the more spacious "Ballroom" on the ground floor, (Room 126) which Lisa Selkirk managed to get converted into Node plus meeting-room some years after the 1988 report.]

Among the primary activities of the GLSA are its Publications series, which provide an important service to the field and have a wide national and international market. There are three different regular series:

(i) The University of Massachusetts Occasional Papers in Linguistics (UMOP), which have been published since UMOP I in 1974 and are now [1988] up to UMOP 12.

(ii) The Theses service: since 1977 all doctoral dissertations written in the department (including those completed before 1977) have been duplicated and bound by the GLSA and made available to the linguistic community. Orders were first taken at the November 1977 NELS meeting and thousands of copies of theses have been purchased since. All the theses ever written in the department are available through the GLSA.

(iii) NELS volumes: for the first several years of the existence of NELS (North Eastern Linguistics Society), whichever institution hosted the annual fall NELS meeting was also responsible for publishing the proceedings. In 1980 the UMass GLSA was invited to take over the production and sale of all subsequent NELS volumes, which it has done ever since.

The GLSA may be the most active and successful departmental graduate student of its kind; its nearest rivals, which have existed longer, are CLS at the University of Chicago, BLS at Berkeley, and the IULC at Indiana. [1999 note: IULC for a great many years played an extremely important service role in making unpublished works, ranging from unpublished papers to bibliographies to dissertations, available through a xeroxing and distribution service. That was where I offered my first "bibliography of works in linguistics and logic", which was subsequently updated twice by IULC volunteers; that was where we "semi-published" the Bennett and Partee paper when we realized we were never going to get it revised for publication but we did want to make it publicly available. They continue to have an active publications program, and continue to offer a diverse array of 'publications' ranging from short papers for \$1 to real books, but are no longer so highly visible and indispensable as they once were.] It is certainly an organization which reflects well the commitment, energy, independence, and professional maturity of our graduate students.

2.2. The Graduate Program 1978-1988.

The objectives of our graduate program, primarily a Ph.D. program, have not changed substantially since inception, although our offerings have become richer. From its inception the objectives of the program have been defined in terms of developing quality and depth of research rather than breadth of coverage. Most of our Ph.D.'s go on to university careers, but the possibilities for non-university careers are increasing. We aim to help our students develop theoretical foundations and research skills of broad relevance while allowing them to choose and develop their own more specialized directions. [1999 note: This language, like the language found in the graduate program brochure, did not change much from 1972 to 1999. Frank Heny was the author of much of the original 'vision statement', particularly of much of the language which survived over the decades, and in recent years John McCarthy has been doing the most to upgrade and update our brochure (and our web pages) while preserving the continuity of expression of our core values.]

During the last years, our Ph.D. program has undergone a number of changes. The Ph.D. program used to be a four-year program. We now consider it a five-year program. The change seemed desirable for several reasons:

- (i) the rapid increase of "standard knowledge" in all subdisciplines of linguistics,
- (ii) the desirability of encouraging our students to enrich their training with related work in other departments where appropriate, e.g. in Philosophy for work in semantics, in Psychology for work in psycholinguistics; and
- (iii) the fact that four years had already become the exception rather than the norm for completing the Ph.D. coupled with the fact that TA-ships and other resources had become sufficient to allow a normal expectation of five years of support for Ph.D. candidates in good standing.

Similar considerations led to a restructured and very intensive first-year program and to the introduction of "proseminars" for the second year. The new first-year program could only be realized with the help of new assistantships for all first-year students. These special assistantships [1999: For many years now, these have been referred to as First Year Fellowships. They were still quite new in 1988. Emmon had persuaded Dean Murray Schwartz to institute them some time after we learned that Philosophy had persuaded Provost Puryear to institute a few of what are still called Puryear Fellowships for (one or two selected) first-year philosophy Ph.D. students.] free first-year students from time-consuming teaching obligations. The new broadly conceived first-year program, with 13 credits of coursework in the fall and 12 in the spring, led naturally to a change in our

generals paper policy as well. Rather than having to write one generals paper in syntax or semantics and one in phonology or historical linguistics, students can now choose their paper topics from all five core areas offered in the department (plus field work).

The First Year curriculum in 1988 (normally expected of all students):

Fall:

LING 601, Intensive Intro to Generative Grammar (6 credits)

LING 603, Generative Phonology (3 credits)

LING 610, Semantics and Generative Grammar (3 credits)

LING 414, Phonetics (1 credit)

Spring:

LING 604, Syntactic Theory (3 credits)

LING 606, Phonological Theory (3 credits)

LING 611, Psychological Background to Linguistic Theory (3 credits)

LING 620, Formal Semantics (3 credits)

The first-year curriculum gives priority to syntactic theory (9 credits). This acknowledges the special place of syntax within generative linguistics. Out of the five core areas represented in our department, four are introduced to students in their first year: syntax, phonology/phonetics, semantics, psycholinguistics. An introduction to diachronic linguistics and typology is normally taken in the first semester of the second year. Introducing all five core areas of the department early on in the program makes it possible for students to choose any one of those areas as an area of specialization even if they initially lack some necessary additional skills (e.g. statistics, experimental methods, logic, philosophy of language, Old English, field methods, etc.)

The Second Year in 1988:

A normal course load in the second year (and thereafter) is 9 credits per semester. Students are expected to take LING 605, Language Change and Language Typology, in the fall. Apart from that, students may choose any suitable courses offered in the department or in other departments. We offer three courses that are especially geared toward second-year students:

LING 720, Proseminar in Semantic Theory

LING 730, Proseminar in Phonological Theory

LING 791A, Second Year Seminar.

[1999: This system of proseminars and the second and third year seminars still continues, as do the generals papers requirements as described in the 1988 document. The curricular revisions described in the 1988 document occurred shortly after our faculty

grew with the 1985 addition of Angelika Kratzer and concomitant increased strength in semantics. A new round of curricular revision, particularly affecting phonetics and the "menu" of required breadth courses in the first two years, took place after the addition of John Kingston to the faculty in 1990.]

Our Ph.D. program is in the midst of a modest growth period right now, from a nominally 4-year program with an entering class size average of 7 (30-35 students in residence at a time) to a nominally 5-year Ph.D. program with an average entering class of 8 (anticipating about 40 students in residence at a time.) No further growth in the program is presently contemplated, though once we succeed in making the two new faculty appointments we need, we may feel ready for slight further growth. But financial aid demands and the narrow job market for Ph.D.'s are more of a limiting factor than the number of faculty, so no major changes in size are foreseen or desired.

2.3. The undergraduate program 1978 - 1988.

At the undergraduate level, we have several objectives, and several kinds of courses. On the one hand, we have two different introductory-level courses that can serve two different roles in a good liberal education for any student. Our two large multiple-section introductory courses, 101 and 201, fulfill two different General Education requirements - one in "social and behavioral sciences" and the other in "analytical reasoning" - and both are oversubscribed every semester, apparently no matter how many sections we add. The fact that these two quite different introductory courses fulfill two quite different General Education requirements reflects our conviction, largely shared across the field of linguistics, that linguistics occupies a uniquely pivotal role in its relation to the Humanities, Social Sciences, and Mathematics and Natural Science, and similarly bridges several of the classifications in the University's new General Education requirements.

[1999 note: Linguistics 201 has always been taught in multiple autonomous sections. In the 1970s one of the sections was usually taught by a faculty member who also served as T.A. advisor for the student-taught sections. Later it became common for all of the sections to be taught by students, with a single faculty advisor for TAs of 101 and 201, though this still varies somewhat from year to year. In fact, students very often get much of their TA advising from more senior students. The less technical introduction, 101, started as a large lecture course with TAs taking once-a-week discussion sections. At the beginning the reasons for that form of teaching were that there were not enough well-qualified post-first-year Ph.D. students who could autonomously teach all the sections that would be required, and that the conducting of discussion sections was one of the sources of support for first-year students. And there were some very successful teachers of large lecture 101 classes in the early years, including Don Freeman, Frank Heny, and especially Jay Keyser. Later when Freeman, Heny, Akmajian, and Keyser had all left, and none of the faculty felt very comfortable with the large lecture format, Emmon Bach as Head instituted the change of 101 from large lecture to autonomous sections (like

201). That format continued successfully until a few years ago, when a few ambitious faculty members, starting with Peggy Speas, volunteered to start up the large-lecture practice again. Peggy was followed by John Kingston and John McCarthy; all 101s are now done in the large-lecture format. Peggy Speas is now experimenting with the development of web-based materials to enrich 101.]

Beyond 101 and 201 we have a range of more advanced undergraduate courses that have roles to play both as service courses for other majors and in our own broad selection of joint majors. We don't have a straight undergraduate linguistics major, for the historical reason that in the early 1970's when the program was being designed, a majority of us felt that linguistics was still an inherently interdisciplinary field, and that it was a mistake to encourage students to specialize in it too soon. A majority of us would now defend the value of permitting such an option, and there has been under development for several years a proposal for a 5-College B.A. Program in Linguistics, designed to be accessible to students in any of the 5 colleges in the area (Amherst College, Hampshire College, Mt. Holyoke College, Smith College, and the University of Massachusetts). It might be desirable to develop a straight Linguistics major at the University.

Our more advanced undergraduate offerings not only prepare our majors and contribute to related majors, but have turned out to be one of the vehicles by which undergraduates in this very large university can have an experience which is more common at the best smaller schools, namely small classes with exceptionally talented fellow students, challenging material, and a dedicated teacher. Our advanced undergraduate courses have the reputation of being very hard but very good, and we certainly find that the students who sign up for them are almost without exception extremely bright, hard-working, and highly motivated, while very diverse in their backgrounds and other interests. We have thus come to see the upper end of our undergraduate program as fulfilling a mission akin to that of the University Honors program, a mission quite different from the broad service and general education mission of our introductory courses, and one for which small classes are part of the attraction and not a sign of underenrollment. [1999 note: That's what we tried to convince ourselves and the administration of, at least. But the next paragraph was later in the same report.]

Our undergraduate program is still not fulfilling its full potential at the upper division level. Our graduates have very positive things to say about their courses, the faculty, and the quality of their fellow students, but they note the small numbers and the relative lack of attention put into the undergraduate majors. Earlier plans to institute a Five-College B.A. in Linguistics were intended to address that issue, but it is not obvious that those plans will ever come to fruition.

A more likely change would be the addition of a straight Linguistics B.A. program here at the University. That will require additional faculty resources and additional secretarial resources as well. The objectives of such a program would be much like those of our current joint majors but with a richer range of upper division offerings in Linguistics

than we can now provide. The two additional faculty positions that we need anyway could serve these needs as well if sufficient secretarial support is also added.

2.4. Five-College cooperation in the 1980's.

The School of Communications and Cognitive Science (formerly School of Language and Communication) at Hampshire College is very strong in undergraduate linguistics. Smith College is strong in psycholinguistics and philosophy of language. We have strong ties with both these institutions, somewhat weaker ones with Amherst College and Mount Holyoke College. The Five College Linguistics Group as an entity has become quite inactive except for publishing an annual listing of Linguistics courses available at the five colleges. Individual ties and communication remain good, and undergraduate students cross-register with some frequency. Plans for a Five College major in Linguistics have made no visible progress in over eight years.

[1999 note: 5-college cooperation was stronger in the 1970s and early 1980s than it was later, for several reasons. Elizabeth Bruss at Amherst College was an active advocate of 5-College cooperation and helped work with Five Colleges, Inc., to make things happen - 5-college colloquia, discussions of plans for a major, occasional conferences, and other activities. There were a number of energetic and outreach-oriented linguists at Hampshire College, and Murray Kitely in Philosophy at Smith College was always ready to be involved. The cooperation with Smith College became even stronger when Jill and Peter de Villiers moved there. Mt. Holyoke was only marginally involved but friendly. But the plans for the 5-College major moved very slowly. Alan Prince and Liz Bruss were in charge, and plans reached the stage of several serious drafts. But one drag was the knowledge that a major roadblock loomed ahead: Amherst College has always been extremely reluctant to approve any major for its students which is dependent on a critical mass of courses taught outside Amherst College, particularly at the University. (And this major would certainly require a substantial number of courses to be taken at UMass.) Then Liz Bruss died suddenly, very young, and after that the proposed major was clearly doomed, because without a committed, energetic, and forceful advocate at Amherst, it was known to be a hopeless cause. And the hole left by Liz's loss, plus the increasing growth and self-sufficiency of our department, gradually led to the replacement of general 5-College linguistics activity by specific loci of cooperation, such as cooperation between Roeper and de Villiers, and considerable involvement of Hampshire College faculty in the Cognitive Science projects funded by Sloan Foundation grants in the late 1970's and early 80's and continued in various lower-key forms since then. The Five College environment continues to be a great advantage for all the institutions, and there are vital specific cooperative activities and numerous specific cases of cross-institutional shared advising of students.]

2.5. Some indications of success as of 1988.

The department was ranked as clearly among the top 5 Ph.D. programs in the country in the 1982 Assessment of Research Doctorate Programs in the United States, perhaps higher. (The rankings were not unambiguously linear.) Assessments solicited at the time of our 1980 Long Range Planning Status Report ranged from "among the top two" to "among the top five".

Our Ph.D.'s have an excellent record of placement in leading universities in the U.S. and abroad as well as in research and technology industries, and our undergraduates have generally gone on to success in graduate school and/or careers.

Department faculty have received a variety of research and training grants from a variety of sources. Recent grants include:

(i) NIH Research grant to Frazier and Clifton (Psychology) 1986-89, Comprehending Sentences with Long-Distance Dependencies.

(ii) SDF Research grant to Partee, 1984-88, Formal Foundations of Semantics.

(iii) NSF Research grant to Selkirk and McCarthy, 1987-89, Domains of Sentence Phonology.

(iv) NIMH Training Grant to Frazier, Roeper, Rayner, Clifton, Mervis, (all UMass) and J. and P. de Villiers (Smith College), 1987-92, Training in Psycholinguistics.

Less recent but very important were two major interdisciplinary Sloan grants for the development of Cognitive Science. First was a Sloan Foundation grant on Language and Information Processing to a team from Linguistics and Computer Science, 1978-80. That was followed by a Sloan Foundation Grant in Cognitive Science to an expanded team from Linguistics, Computer Science, and Psychology, 1980-85.

It was the Sloan Grant that first supported the new secretarial position filled by Kathy Adamczyk as a Cognitive Science secretary, housed in Linguistics but serving the interdisciplinary grant activities. After the ending of the Sloan grants, Kathy was supported in Linguistics in part by Partee's SDF grant and in part by Lyn Frazier's psycholinguistics grants; and after that, we went through several nervous years in which we had to persuade three Deans to jointly continue to support Kathy's position, until finally we were able to get approval to make the position permanent.

3. Part III, Recent History, 1988 - 1999

3.1. Faculty.

In syntax, we lost David Pesetsky to MIT in 1989 and Edwin Williams to Princeton in 1992. We hired Hagit Borer in 1990, Ellen Woolford in 1992 and Kyle Johnson in 1993. Hagit left in 1997, and a syntax search has finally been approved for next year. In semantics, Emmon retired in 1992 and since then it has been virtually impossible to have any team-taught seminars or other "extra" offerings in semantics or across its various interfaces. Partee began a de facto permanent arrangement of spending one semester per year in Moscow starting in 1996-97. Semantics visitors Orin Percus in 1997-98 and Yael Sharvit in 1998-99 helped to fill the gap, and Lisa Matthewson will join the department as a regular faculty member in semantics, with strength in field linguistics, in the fall of 1999.

Perhaps the biggest change in the last ten years was the addition of John Kingston in phonetics and the phonetics-phonology interface in 1990. Along with the new phonetics lab, research grants, and the integration of phonetics into the Psycholinguistics Training Grant, the addition of Kingston also led to the reworking of the curriculum to make phonetics an integral part of training in phonology and to recognize phonology-related phonetics as a new specialty of the department on a par with the five previously recognized. Further strengthening of phonology is coming with our recruitment of Joe Pater to start in the fall of 1999; his areas are phonological theory and first and second language acquisition.

We also added Lisa Green to the faculty in 1997 in syntax and African-American English, but lost her to the University of Texas in 1999.

At the beginning of the fall of 1999, the regular faculty will be Frazier, Higgins, Johnson, Kingston, Kratzer, Matthewson, McCarthy, Partee, Pater, Roeper, Selkirk, Speas, Woolford, for a total of 13, and with plans to recruit for a 14th position in syntax next year.

3.2. The Graduate Program 1988 - 1999.

The growth foreseen in the report written in 1988 was overoptimistic. Tight financial aid and a tight job market have kept our incoming classes down to an average of 6 in the last decade. On the other hand, it has become normal for students to be able to petition to be approved for a six-year program if their specialty demands it, so that for instance a psycholinguistics student may have an additional year of normal priority for financial support in order to take a full year of statistics and related courses in psychology.

When Kingston arrived and phonetics was added to the program, the first year course plan was revised to put in more of a "menu". In place of a fixed set of four courses in the second semester and one obligatory "foundation" course in the fall of the second year, students now have a "three out of four" choice in the period including the second semester of the first year and all of the second year. Comparing to the program in effect at the end of the Middle Years, the first semester is unchanged, but in the second semester only phonology and syntax are "normally expected of everyone". The "three out of four" choice concerns the following four:

LING 605 Language Change and Language Typology

LING 611 Psychological Background to Linguistic Theory

LING 620 Formal Semantics

LING 614 Introduction to Phonetic Theory

The Generals paper policy did not need to be changed to accommodate phonetics, since it had already been changed to "any two distinct fields". It just needed to be agreed that phonetics was henceforth to be counted as a distinct field, which was indeed agreed.

One "constant" throughout the history of the program has been a certain degree of discontent with the generals paper procedures, and a problem with getting generals papers done by the announced deadlines. We have always been faced with a certain number of petitions for extensions of deadlines at every Graduate Student Progress Review meeting, and there are usually a few petition problems that occupy the majority of the time at those meetings. Every four or five years, with a new set of students, there seems to be a Town Meeting to discuss possible changes to the generals paper policy or to some of the timing involved. And every four or five years some change is introduced which seems to help somehow, at least for a year or two.

Our graduate students seem to be increasingly active in presenting papers at major regional and national conferences, as well as at organizing workshops and conferences themselves. One highly successful recent tradition is the annual "RUMJCLAM" (Rutgers-University of Massachusetts, Amherst Joint Class Meeting) conference/class jointly organized by Rutgers and UMass in Phonology. And just last year, in the fall of 1998, a new semantics MIT-UConn-UMASS workshop was launched, organized mainly by graduate students; it was held at UConn the first year, will be held at MIT in fall 1999, and at UMass in 2000.

3.3. The Undergraduate Program 1988 -- 1999.

After an unsuccessful attempt by Partee as Head to persuade the department to institute a straight (non-joint) linguistics major in approximately 1991, the subject was reintroduced in the late 1990's. This time there was agreement, and a proposal for the new major was submitted in the fall of 1997 and approved in the spring of 1998. Additions to

the curriculum are being gradually introduced, and undergraduate "topics" seminars are also beginning to be offered, both with and without prerequisites. For the fall of 1999, for instance, there is a no-prerequisites Special Topics course in Discourse Analysis being offered in our department by Bob Rothstein (formerly of the recently abolished Slavic Department, now of Comparative Literature), and a mixed undergraduate-graduate course on Algonquian languages offered by Roger Higgins and Emmon Bach.

3.4. Budgetary ups and downs.

The earlier documents did not say much of anything about some of the extreme budgetary ups and downs this university, and with it the department, have been through. Lyn Frazier was hired just in time to encounter a three-year salary freeze, part of the extreme budgetary cuts of the 1970s imposed by the Dukakis administration. Those cuts brought to a screeching halt the remarkable growth spurt of the university that had started in the late 1960's and which Don Freeman and his "team" of young faculty had capitalized on in persuading the administration to commit itself to building up a linguistics department. Our department, like several others, was built or greatly transformed during that great growth period, when Massachusetts was out of synch with many other states and therefore able to attract top young people to a not yet proven but seemingly up-and-coming university. But the cuts of the second half of the 70's put at great risk the university's ambitions to become a first-rate research institution.

Even as early as the 1974 Linguistic Institute, the administration had become very nervous about putting up risk capital to hire the faculty needed for the Institute courses before the amount of tuition income needed to cover those costs could be guaranteed. The "senior" team of Freeman, Keyser, Bach, and Partee went to Provost Gluckstern offering to risk our own summer salaries to help guarantee the salaries of visiting faculty. Luckily, the administration decided to take the risk on itself then, and in the end the income to the Institute was indeed sufficient anyway.

One of the hardest things about the budgetarily lean years in the late 70s was the uncertainty of financial support for our students. In those years we could not yet 'de facto' guarantee financial support for the full four years of the Ph.D., and students often had fractional TA or RAships. During the worst budget years, our students organized themselves on the model of the Economics students and took an active hand in collectively formulating policies for sharing scarce financial aid. The most poignant moment came when the continuing students voted to tell the department to offer the two or three TAs that we had "in the hand" to incoming students, trusting to our ability to come up with additional sources of aid for the continuing students before fall. But Parsons and Partee's 1973-75 NSF grant was not renewed for 1976, and Muffy Siegel, who should have had an RAship for her dissertation year, instead spent that year commuting to Hartford, Connecticut to teach linguistics in the Hartford School for training teachers of the deaf.

When Emmon obtained the First-Year Fellowships for incoming students from the Dean soon after the beginning of the financial upswing in the early 80's, it marked a major turning point in the stability of the department. That freed up a great deal of faculty and student time for more constructive purposes that had previously been spent in an annual spring scramble to scrape together enough resources to support our students for one more year. And as noted in the description of the graduate program in 1988, that had a cascading effect in making possible a five-year program and an enriched first-year curriculum, something that could not happen in a program as egalitarian as ours if any of the first-year students had to teach.

That first major downturn in the mid 1970's came as a shock, and the inability of our administration to persuade the legislature to restore our budgets was one of the main reasons for the success of the faculty unionization drive at that time. Many of us voted for unionization in the belief that only the clout of a major union could give the university an effective voice in the Massachusetts legislature. (Counterfactual arguments about whether that was so and whether the university has thrived under unionization better than it would have without it have continued ever since.)

But there was a financial upturn after the downturn, and faculty salaries were relatively well restored and the financial support situation for students improved to the point that our students almost completely stopped having TAs in the Rhetoric Program (predecessor of today's Writing Program), long a staple source of support but with heavy teaching loads and not in linguistics. Our growth from 8 to 10 faculty happened from 1978 to 1985, the first helped by the Sloan Grant which seeded Lyn Frazier's position.

Another major downturn came in the late 1980's with the collapse of the "Massachusetts miracle" so loudly trumpeted during Dukakis's failed presidential bid. I was department chair then, and a large part of the job was working to keep up morale among graduate students and younger faculty, to persuade them that linguistics would be protected from feeling the effects of the worst of the cuts. And it was; by then the administration for the most part seemed to appreciate that we were something it could point to with pride and that it really didn't cost too much to maintain us so that we could keep trying to do our job with excellence. It was a period when we could not hope for growth, but at least we did not have the kinds of catastrophes experienced with the drying up of student financial support in Muffy Siegel's generation of the mid-70s. The number of incoming students was once or twice reduced as low as 5, and the norm began to be 6 or 7 rather than the buoyant 8 or 9 we had briefly experienced during the Sloan grant years. The graduate students unionized during that second financial downturn; that was the beginning of GEO. During the worst year of that period, the administration forced the departments to give back money out of budgets that had already been approved and allocated, several times during one year, and faculty and staff had to absorb some actual non-payment of salary days (eventually won back again after lengthy court fights led by the union.)

But times improved again, merit raises reappeared, graduate student stipends gradually began to improve, and our faculty grew again, although modestly: the administration was determined to reduce the overall size of the faculty, and it has done so.

Then came another downturn, and for those who had weathered the first two, it finally became really difficult to see downturns as aberrations, as temporary dips in a steady upward climb. Instead it felt as though we were doomed to constant cycles of good years and lean years. (Perhaps I was just allowing myself to feel pessimistic because I was no longer head and no longer had the responsibility for keeping up everyone's morale.)

But it was followed by a general upturn in the economy which we are in the midst of (or perhaps near the end of?) right now, and although the university budget has not recovered at a pace comparable to that of the state and of the general economy, Lisa has recently secured for us some major increases in student support that will enable us to increase the student stipends to a more competitive level and also for the first time to begin to have regular departmental student stipends for summer projects.

And the regular department faculty at the beginning of fall 1999 will include two new positions, one in phonology and one in semantics, bringing the current total to 13.

3.5. Some indications of success as of 1999.

In the latest national rankings, which I think came out in 1994, the UMass Linguistics Department was ranked #4 nationally in quality of faculty and #1 nationally in quality of the training of graduate students. This has made us proud, (and we appreciate the sympathy of our students who concluded that we must be hard-working overachievers.)

We have continued to do well in research grants, teaching awards, fellowships and awards of various kinds to both students and faculty, excellent placement of our graduate students and good graduate school admissions results for our undergraduates, as can be seen by a perusal of the department's web pages. The new semantics journal *Natural Language Semantics* is co-edited by our faculty member Angelika Kratzer and our alumna Irene Heim. Our earlier Ph.D.'s are now in leadership positions around the country and around the globe. Interesting visitors continue to come to the department and enrich our environment. Partee and Bach both served terms as President of the Linguistic Society of America (1986 and 1995 respectively). I believe that our department must have set some records both within the university and within the field of linguistics for the number of NSF Fellowships our students have received over the years; I don't know exactly what statistics to look for, but that would be a nice project to work on sometime.

4. A Brief History of Space and Facilities.

When the program first became a department, its first location was in Thompson Hall. In 1972, the department moved into South College. Initially, we had just the offices on the second floor. In 1972-73, Adrian Akmajian and Frank Heny shared what is now Lynne Ballard's office (233), Jay Keyser was in 224, which Emmon moved into when Jay left and which is now John McCarthy's, I was in my office (222), Dick Demers was in Lisa Selkirk's office (231), and both the regular secretary Marty Bowers and the graduate student/ secretarial assistant Jeannine Langdoc had their desks in the main space in between, similar to where Kathy Adamczyk's desk and our work-study student's desk are now. There was a much-used ditto machine near the main office door – I think it was even electric. No such luxury as a xerox machine then. (I can't remember whether they had been invented yet; probably, but probably too expensive.) I think we also had, or soon thereafter acquired, a thermal master-maker: you could feed in a printed or typed page and it would make a ditto master from that. That was a great luxury.

It's harder for me to remember who was in which office of the four offices out by the "Lounge" (218, 220, 225, 227); collectively they must have been occupied by Jim Heringer, Tom Peterson, and Don Freeman (who also had an office in the Dean's office, where he was serving as Associate Dean). Maybe I'm wrong and Jim Heringer was in Lisa's office and Dick Demers didn't move into that office until a little later. Maybe there was student space in one of those offices; I can't reconstruct why it was necessary for some faculty to double up in offices, which it definitely was, unless possibly we didn't even "own" all four of the offices off the "Lounge" then. The "Lounge" was not yet a lounge then; we had not yet inherited our first round of secondhand furniture from the Dean, and there was no refrigerator, and I think we didn't get our first coffee machine until several years later. I think the Lounge began to be a Lounge while Emmon was Head and Debbi Nanni was a student; Debbi organized the painting of the lounge walls a creamy buff color with a nice orange stripe, which together with the Dean's donated furniture made a very noticeable difference in the "livability" of the department space.

The "Node" already existed in 1972, I believe, but it was a relatively small (but vital!) collection of books and journals in the tiny dark office under the stairs to the tower. We didn't have any offices on any other floors, I don't believe. The Node later expanded partly into room 319 (next paragraph), and several years ago moved down into the Ballroom (126), where it is now.

Lynne has filled me in with the following data about additions and changes in the subsequent years. She thinks, and this sounds right, that we got our T.A. offices on the 5th floor (in the tower) in 1976, and what's now the computer room, 319, at the same time. 319 has had many different uses over the years: it was an extension of the Node and a GLSA office for a long time, then a departmental meeting room and journal room, then partly a computer room and partly a place for language acquisition research, now entirely a computer room. We acquired the various small 3rd floor offices near that room at

various times since then, including 317 (used these days for visiting faculty) in 1985.

In 1985, we got 317 and two rooms down under the Dean's offices, 103 and 105. In 1986 we gave back 103 and 105 but got all the former Debate Club space underneath the main office (the "Ballroom", 126, and the four offices surrounding it, 122, 124, 131, 133.) We also got the GLSA vault in the basement of South College in 1986. I don't know when we first got the Mobile Units out in back of South College near Dickinson Hall, but I remember when Lisa Selkirk organized a clean-up, paint-up, haul-things-to-the-dump day just before the start of school in 1990. I'm pretty sure that's the right year because I think John Kingston, who had just arrived, painted the little office, 321, that he was about to move into as his South College Space (to supplement his lab space in Bartlett 6). That work day, a Saturday, included a lot of work on the 5th floor offices and on the Mobile Units, which Lisa correctly figured might be used more if they were a bit more hospitable and comfortable. We lost the Mobile Units in 1993.

We got the phonetics lab in Bartlett and its initial furnishings in 1990, as part of the negotiated package that came with hiring John Kingston. We got room 08 (I've never seen it!), now used for visitors, in 1994, John McCarthy's research space in 104 in 1996, the Language Acquisition Center in Herter 440 in 1997, and room 401 in 1998.

Every time there has been a review of our space and our space needs, the administration has agreed that our space situation is terrible, both in quantity and quality. And as the list above demonstrates, we keep getting little bits of additions; but the whole University suffers terrible space problems and new buildings tend to go to groups like Polymer Science and engineering that have ways of raising serious money. Lisa Selkirk has been the most persistent at working on space issues, both in terms of finding ways to improve the space we have and in working on finding ways of acquiring more. For every Head, space has been a problem. We constantly feel embarrassed at not being able to provide better space for students and for visitors, not to mention the poor first impression the physical condition of South College makes. Even I have long since lost my appreciation for the quaintness of the building (I think that happened when a piece of my ceiling almost fell on my head about 18 years ago), having seen other buildings at other universities (like the one Linguistics occupies at Ohio State) which are as "charming" as South College on the outside but have been renovated into modern functional buildings on the inside with proper electrical wiring, a reasonable heating and cooling system, good infrastructure for labs and computer facilities, and toilets that don't need posted instruction sheets or "Head's Head Memos" to stop them from running perpetually. (I hope Emmon's Head's Head memo is preserved somewhere for posterity.)

5. A postscript about the early transition years.

To supplement the factual description of the early period of the department, I want to add a few words about some of the unavoidably painful aspects of that early transition.

As I mentioned in the opening paragraphs, it is much easier to build an excellent new department from scratch than it is to turn a second-rate department into a first-rate one, for many human reasons. But building an excellent new department from scratch is not simple either. How do you recruit the best students and faculty to a department which is not yet fully established and whose future is therefore not at all assured? Don's strategy was to start by recruiting some outstanding junior faculty, get the administration to help provide some funds for attracting some outstanding graduate students, then bring in a couple of senior faculty members, all the time keeping the standards very high and 'working like hell' to make the dreamed-for future become the present reality as quickly as possible. And basically that was how it happened, and it worked, with the 1974 Linguistic Institute ideally timed, it turned out, to "show off" to the world what a great department we already had here by then. Starting even before 1974 we had a superb applicant pool for every entering class of Ph.D. students and outstanding applicants for every faculty position.

One factor that had helped Don's early strategy, and helped many other units at UMass in the University's big growth spurt in the late 60's and beginning of the 70's was the accidental fact that the Massachusetts State Legislature had been persuaded to invest in the development of UMass as a major research university just at a time when the national economy was in a slowdown and the academic job market was much worse than it had been during the early and middle 60's. That made top-notch new Ph.D.s like Demers, Akmajian and Heny more willing to risk the important early years of their academic futures on this institution.

But of course, the quality of faculty and students was not uniformly high instantly; one can never move instantly from zero to a full-blown top-notch department. And as a result, there were difficult decisions that had to be made in the very first few years. There was not enough assistantship money to support everyone, and some students received only partial funding. There were a number of M.A. students in the program who went through its transition from a small "Linguistics Program" to an aspiring department; M.A. students mostly did not receive any financial aid, if I remember correctly. So when there were student review sessions and meetings to discuss and decide the distribution of financial aid, and decisions to be made concerning M.A. students who wanted to go on to the Ph.D., the meetings were often protracted and "heavy". (For many years now financial aid has been left in the hands of the Head; that began to be possible only after we reached the point where we had enough sources of financial aid so that the decisions concerned who would get what assignment rather than who would get full, partial, or no funding. That change occurred during Emmon's Headship.) On the one hand, it seemed unfair to raise the standards in the middle of some student's program, in effect pulling the rug out from under them. On the other hand, it would seem unfair to be judging, say, second-year and third-year students by different standards at the same time. And yet without one or both of those things occurring, standards could never go up.

One striking and traumatic case concerned a Ph.D. student who took what he intended to be a year's leave of absence in 1972-73 after one or two years in the program,

but failed to file for “Program Fee” to hold his place in the program, and therefore had to be considered for (re-) Admission for Fall 1973. That happened to be my first year here, when I was Graduate Program Director and therefore automatically Admissions Director. We considered his application together with other applications for Fall 1973, and his was not judged one of the best, given the rapidly rising strength of our applicant pools in those first years. So after a long and searching discussion, he was not admitted. He then sued us, alleging that there was some non-academic reason involved (I can deny that), and claiming that his academic record was clearly strong (that was more problematic for us; it was after that experience that we realized it was dangerous to give only A’s and Incompletes as grades.) That court case went on for several years “without a finding” (meaning his petition was never granted, but neither were we ever totally exonerated.) It was unpleasant both as an experience and in some of the associated newspaper publicity (since only the student’s side was willing to talk to the newspapers). Even without the lawsuit, it was a very unhappy experience, as was every instance when some student who had been judged to meet the prevailing standards in 1970 or 1971 was judged not to be making sufficiently strong progress to receive financial support in 1972 or 1973 or 1974. We had to constantly remind ourselves that such decisions were necessary if we were to attain our goal of excellence, and we had to keep convincing ourselves that achieving such a goal would do more good in the long run than being fair (that’s what the alternative felt like, really) to the students who were caught in the transition.

There were some very difficult decisions involving junior faculty as well. Fritz Newmeyer’s book about the first 25 years of transformational grammar documents one of our firings (technically a non-renewal of contract), with remarks about it that represent the reaction of quite a few linguists around the country at the time. Since it’s in that book, I won’t repress the name. Jim Heringer came up for renewal of his contract in 1972-73, my first year, when I was also Personnel Committee Chair. Heringer was well liked by all and had made some important contributions in the framework of generative semantics. But after a painstakingly thorough review, and with a Personnel Committee that at that time included the two student representatives as voting members, it was decided that the Department could not recommend renewal of Heringer’s contract. There was a whole series of appeals and grievance hearings, but the decision was upheld at all levels. Tom Peterson, whose renewal decision was due to be made at a meeting a week or so after Heringer’s, resigned preemptively before the meeting was held. As Newmeyer’s book reports, many linguists around the country interpreted our action as a signal that we were choosing sides in the generative semantics/ interpretive semantics controversy. I can vouch that that had nothing to do with the decision, but of course there was no way to make a public response to an opinion that was circulating in the non-public conversations of individual linguists. It was painful to know that some people could have such an opinion of our department’s integrity in decision-making.

But I would say that we got through the painful parts of those early years in a principled and honorable manner, and I believe that there is no part of the record that we ever were or ever needed to be ashamed of or embarrassed by. It was not pleasant to make the hard decisions, but it was necessary, and I developed the very highest admiration for the wisdom, character, and humaneness of our core junior faculty in the year of the

hardest decisions (1972-73), Adrian Akmajian, Dick Demers, and Frank Heny, as well as for the first two Heads, Don Freeman and Jay Keyser.

In the case of the students, by about 1973 or 1974 we had achieved the standards for meriting continuing financial support that we have stayed with ever since, standards that were set with the classes that entered in 1971 and 1972. (Gary Bevington and Linda Thomas were the two students who entered before 1971 who obtained Ph.D.s in the department. A substantial number of students from before 1972 did receive MAs but did not go on to the Ph.D.)

And in the case of faculty, we have never had to make a single negative reappointment or tenure decision since the one (potentially two) in 1972-73. One silver lining to the cloud of having to make those first negative decisions was that the reputation we got then for being able to make tough decisions was extremely valuable in giving credibility to our subsequent string of uniformly positive decisions. And it may well be the case – I hope so -- that the pain that we subjected ourselves and our students and colleagues to in the first few years was like an inoculation and helped (together with good hiring and admissions decisions) to make it unnecessary to experience that kind of pain in the more than 25 years since.

APPENDIX: Faculty, Department Heads, Graduate Program Directors 1970-1999.

Faculty

Akmajian, Adrian	70-74	Ito, Junko	93-94 (Vis.)
Aoun, Joseph	81-82 (Vis.)	Johnson, Kyle	93-present
Bach, Emmon	73-present	Kahn, Daniel	77-79 (Vis.)
Beck, Sigrid	96-97 (Vis.)	Kayne, Richard	78-79 (Vis.)
Bevington, Gary	70-71	Keer, Edward	98-99 (Vis.)
Borer, Hagit	90-97	Kempson, Ruth	82-83 (Vis.)
Bresnan, Joan	73-75	Kenstowicz, Michael	84-85 (Vis.)
Chierchia, Gennaro	86-87 (Vis.)	Keyser, Samuel J.	72-77
Cooper, Robin	76-77 (Vis.)	Kingston, John	90-present
Dell, François	88-89 (Vis.)	Kratzer, Angelika	85-present
Demers, Richard	68-75	Lamontagne, Gregory	96-97 (Vis.)
Deprez, Viviane	92-93 (Vis.)	Matthewson, Lisa	99-present
Frazier, Lyn	78-present	McCarthy, John J.	81-82, 85-present
Freeman, Donald C.	68-76	McDaniel, Dana	89-90 (Vis.)
Gafos, Diamandis	96-97 (Vis.)	Muysken, Pieter	82-83 (Vis.)
Green, Lisa	97-present	Partee, Barbara H.	72-present
Heim, Irene	94-95 (Vis.)	Pater, Joseph	99-present
Heny, Frank	70-75	Percus, Orin	97-98 (Vis.)
Heringer, James	71-73	Pesetsky, David	83-89
Higgins, F. Roger	76-77 (Vis.), 79-present	Peterson, Thomas	71-73
		Prince, Alan	75-84

Richards, Norvin	97-98 (Vis.)	Uriagereka, Juan	88-89 (Vis.)
Rizzi, Luigi	81-82 (Vis.)	Williams, Edwin	75-92
Roeper, Thomas	73-present	Vergnaud, Jean-Roger	78-82
Selkirk, Lisa	74-present	Wilkins, Wendy	77-78 (Vis.)
Sharvit, Yael	98-99 (Vis.)	Woolford, Ellen	92-present
Speas, Margaret	89-present	Vetter, David	70-72
Stowell, Tim	82-83 (Vis.)	Zimmermann, T.E.	89-90

Department Heads.

Don Freeman, Acting Chair of Linguistics Program 1969-70; Chair of Linguistics Program 1970-71; Head, Linguistics Department, 1971-72.

Samuel J. Keyser, Head, 1972-77

Emmon Bach, Head, 1977-85 [Selkirk Acting Head 1982-83]

Lisa Selkirk, Head, 1985-87

Barbara Partee, Head, 1987-93 [Selkirk Acting Head 1989-90]

John McCarthy, Head, 1993-96

Ellen Woolford, Head, 1996-98

Lisa Selkirk, Head, 1998-present.

Graduate Program Directors 1971 – present.

[Note: we are not completely sure of all the starting and ending dates; corrections welcome.]

Frank Heny 71-72

Barbara Partee 72-75

Edwin Williams 75-81

Roger Higgins 81-85

Lyn Frazier 85-86

Angelika Kratzer 86-87

Emmon Bach, Acting GPD 88

Roger Higgins, Acting GPD 89

John McCarthy 90-92

Peggy Speas 92-93

John McCarthy 94

Kyle Johnson 95-99

Ellen Woolford 99-

Some Consequences of Word Faithfulness

Toni Borowsky

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One of the interesting results of the Lexical Phonology program of Kiparsky 1985 was the account provided for the differential application of rules at the various levels of the phonology. The same rule, subject to different constraints such as Structure Preservation or the Strict Cycle Constraint, could have different outputs depending on where in the phonology it applied. Work in Optimality Theory has provided new explanations for some of these effects, in particular for those effects known as over- and underapplication (see for example McCarthy and Prince 1995, Benua 1995, 1997). The main focus of this paper is so-called “normal application” where the wellformedness constraint outranks or is equally ranked with faithfulness constraints. This situation is called “normal” because it describes the situation which is expected in a derivational model; where the rule applies if and only if its structural description is satisfied. The idea of relativised faithfulness as outlined in Benua 1997, or positional faithfulness (Beckman 1998) allows for another possible situation: that is, a wellformedness constraint may outrank the faithfulness constraints but its satisfaction may result in different outputs due to the effects of the relativised faithfulness constraints. This is a ‘normal’ application situation; the structural description of the rule (constraint) is met in all cases but the results of the rule application can be minimally different.

As shown in Selkirk 1982 and Borowsky 1986, 1993, and more recently in an OT interpretation in Benua 1998, WORDS and ROOTS have characteristically different phonological properties. Coming from a slightly different point of view Casali 1997 applies the ideas of positional faithfulness to the explanation of vowel elision showing that the vowel targeted for deletion is largely determined by positional faithfulness, and as I will claim below in particular by WORD-faithfulness. This paper considers other phonological phenomena which exhibit different results and suggests that they too can be explained as a consequence of by WORD-faithfulness.

The bulk of the paper is concerned with the explanation of the pattern of progressive voicing assimilation. Lombardi 1995, 1996 *et anni seq.* has shown that

progressive voicing assimilation is rare and offers a solution in which other constraints are shown to override the usual regressive assimilation constraint ranking. Building on her idea I show that progressive voicing assimilation is associated systematically with WORD -level morphology and I go on to claim that this is due to WORD -faithfulness(or O-O₂ faithfulness (Benua 1998). We see that the explanation of the voicing assimilation patterns bears a strong resemblance to the explanation for the resolution of vowel sequences as discussed by Casali 1997 providing further evidence for the WORD/ROOT distinction and its associated differential faithfulness .

1. Casali's explanation of vowel elision

When sequences of vowels arise by morphological concatenation in languages which disallow both vowel sequences in syllables and onsetless syllables, it is commonly the case that the last vowel of the series survives while the others delete. Examples are given in (1).

(1)

Chichewa (examples from Mtenje 1992)

/si - u - pita/ --> [supita] 'you will not go'

Neg-2sg-go

/zi - a - gona/ --> [zagona] 'they have slept

NCl-Perf- sleep

For the moment let us use the shorthand constraint V_2 WINS and $*V_1 V_2$ to explain the deletion in these forms. When V_2 WINS outranks MAX it forces the deletion of the first vowel as shown in the tableaux below.¹

(2)

si -u - pita	$*V_1 V_2$	V_2 WINS	Max
->si-u-pita	*		*
si- u -pita	*	*	*

As shown by Casali 1997 the V_2 WINS pattern may be overridden in certain circumstances - most notably when one of the vowels is in a lexical category (i.e. a WORD or a ROOT) and the other is in a nonlexical categories such as affixes or function words. In this situation the vowel of the lexical category is the survivor in preference to the vowel of the non lexical category. Casali identifies the following environments (among others) in which faithfulness holds preferentially: word initial, in content words, in root words²

¹ The V_2 pattern has not yet to my mind received a convincing explanation though see Rosenthal and Lamontagne ms. In the material presented here I rely on the observations and explanations of Casali 1997 with respect to most of the facts but continue to use the mystery constraint V_2 WINS when no other explanation suffices.

² I do not include all Casali's positional faithfulness constraints here. I have restricted myself to those which illustrate the point I am making. Other cases he discusses are perceptual- long vowels survive in preference to short vowels, or morphological - the beginnings of morphemes are more faithful than the ends. Some of these are covered by the interpretation given in this paper.

When any of these constraints play a role the V₂WINS pattern breaks down. He provides special faithfulness constraints some of which are given below.

- (3) MAXWI : Every word-initial segment in the input must have a corresponding segment in the output
 MAXLEX: Every input segment in a lexical word³ or morpheme must have a corresponding segment in the output
 MAX: Every segment in the input must have a corresponding segment in the output

These constraints are universally ranked: MAXWI >>MAX; MAXLEX >>MAX. Notice the positional faithfulness constraints MAXWI and MAXLEX both refer specifically to the WORD and as such are WORD-faithfulness constraints in my view, or O-O₂ constraints in Benua's terms.

The system of constraints given in (3) accounts for the various patterns of vowel elision observed. Thus, modulo some special cases, V₁ deletes when it occurs in a prefix or function word and is followed by a content word; V₂ deletes when it occurs in a suffix or function word which follows a content word. Consider the following example from Etsako where the function word /Ona/ 'the' both precedes and follows a noun. Two sets of vowel sequences arise and are resolved differently but both in favor of the vowels of the lexical word. In the first sequence the first vowel (that of the function word) is deleted leaving the vowel of the real word which happens to be V₂. In the second sequence the first vowel of the function word goes and V₁ (the vowel of the real word) wins. (The reader should assume the constraint *V₁ V₂ is at the top of the ranking forcing deletion of one of the vowels in all the examples below.)

- (4) /ɔna eyi ɔna/ --> [ɔneyina]
 the tortoise the 'this tortoise'

/ɔna eyi ɔna/	MAXLEX	MAXWI	MAX
->ɔna-eyi ɔna		*(?)	**
ɔna eyi ɔna	!*	* and *(?)	**
ɔna eyi ɔna	!**	*	**
ɔna eyi ɔna	!*		**

The crucial factors in this example are the WORD-faithfulness constraints (MAXLEX and MAXWI) which determine which vowel deletes.

³ I take Casali's 'lexical word' to correspond to my 'WORD' which refers to those forms which have exited the first level of the Lexical Phonology and thus it corresponds also with a form at Benua's O-O₂. I use the terms ROOT- and WORD-faithfulness instead of O-O₁ and O-O₂ because they are simpler to refer to.

When elision takes place with two lexical words, as in a compound for example, elision universally targets V1 according to Casali. He puts this down to the MaxWI constraint. I claim however that this occurs because when there is a tie with respect to word-faithfulness the constraint hierarchy will be resolved in terms of the general pattern and word-faithfulness will not have any effect. Whatever is the explanation for V₂WINS between two affixes is also the explanation for the pattern with compounds because this is the one situation in which the word faithfulness constraints will be violated equally no matter which vowel is deleted. Consider the examples below:

(5)

egs. <u>Emai</u> :	<u>Ogori</u> :
/kɔ ema/ --> [kema]	ebi oboro --> [eboboro] 'good water
plant yam	water good
/kɛ ɔka/ --> [k ɔka]	ɔtele ɔkeka --> [ɔtelɔka] 'big pot'
share maize	pot big

ke oka	MAXLEX	MAXWI /V ₂ WINS
-> ke ɔka	*	
ke ɐka	*	!*

Both words in the compound are subject to the same Wordfaithfulness constraint (MAXLEX) and there is a tie. The decision falls to the lower ranked constraint and V₂ wins.

Casali's explanation for vowel sequences which arise with two affixes involves some the additional constraints Max MI (Morpheme-Initial) and Max MS (Monosegmental morpheme⁴). Consider for example the form given in (1) above repeated here with Casali's constraints.

(6)

si -u - pita	MAXMS	Max
->si-u-pita		*
si- u -pita	*	*

The compounded case in (5) above can be seen as a return to the unmarked pattern of deletion when the WORD-faithfulness constraints are knocked out by the tie. The second vowel wins. Similarly V₂ wins between two affixes where WORD-faithfulness constraints are irrelevant.

⁴ This constraint is probably equivalent in some sense to the constraint Morphreal which ensures a morpheme gets some surface realization. If a morpheme consists only of one segment the morphreal will help ensure that it is not deleted- or not entirely deleted. MAXMS doesn't seem enough however. Consider a situation where there are three affixes such as /CV-V-V- .../ where the last vowel wins. MaxMS won't by itself pick out the correct vowel to save.

Many cases of suffixes following roots exist where V2 wins. Casali's analysis predicts that V₂ should delete in this circumstance and thus these cases raise a problem for Casali and suggest that there is still something about V2 wins which we do not understand⁵. The problem can be accounted for if the constraint the constraint MAXLEX distinguished between ROOTs and WORDs. Casali rejects individual constraints because he considers the single constraint to encode the general preference for preserving material which "typically encode greater semantic content." (p500) As shown by Borowsky 1993 and Benua 1998 and as we shall see below, there is a difference between words and roots and their relationship to faithfulness constraints and two subsets of constraints are required: those which ensure faithfulness to WORDs (MAXWD, IDWD, DEPWD = O-O₂.) and those which ensure faithfulness to ROOTs (MAXRT, IDRT, DEPRT = O-O₁.) and the latter may be ranked differently from the former. Thus where Casali has a single constraint universally ranked high we now have two constraints and the MAXRT constraint is ranked below the crucial mystery constraint. Consider (7) from Siswati..

(7)

imbisi-ana	MAXWD	V ₂ WINS	MAXRT	Max
->imbisa:na			*	*
imbisina		*!		*

Thus the vowel deletion facts show a robust V₂ Wins effect which I propose we understand as the normal/unmarked case. Wherever WORD-faithfulness constraints do not have an effect the unmarked pattern is observed. Where WORD-faithfulness plays a role then the V2 Wins effect may be knocked out of the computation. The result is that the same process of vowel deletion has different outputs depending on the morphological construction.

In this paper I propose to consider other kinds of processes whose differential results can be described as a result of the effect of WORD-faithfulness. The paper is structured as follows: I begin with a discussion of voicing assimilation following on from the work of Lombardi (1995, 1996, 1998). I show that progressive voicing assimilation has two remarkable properties firstly it is characteristically found in the WORD-level phonology and secondly it seems always to be assimilation to voicelessness. Lastly I consider briefly whether the same kind of word-faithfulness effect can account for other asymmetrical patterns observed with other phonological processes such as vowel harmony.

⁵ It seems to me that the reason must be a perceptual one. Presumably vowel elision arises because the hearer does not hear both vowels in fast speech and ends up only hearing/listening to the last one maybe because it is 'nearest'. The positional faithfulness story is not incompatible with this view since as Casali points out the vowel in lexical material is easy to retrieve so if you don't actually hear it you can think you heard it because you know what it is.

2. Voicing Assimilation in Dutch and English

Lombardi 1995, 1996, 1997 presents an analysis of voicing assimilation which accounts for the fact that voicing assimilation is generally regressive which is outlined below. According to her the few documented cases of progressive voicing assimilation can be explained as due to the interplay of the general voicing assimilation constraints with, in each case, other morphological or phonological constraints which have the effect of reversing the direction of assimilation. She provides a comprehensive discussion of each case of progressive assimilation and provides an account for each one providing in each case the appropriate additional constraint. I show in this paper that in fact only one additional assumption is necessary for the explanation of progressive assimilation patterns and that is WORD-faithfulness.

I adopt in its entirety Lombardi's (1996) analysis of voicing assimilation. (Lombardi's analysis builds on her own earlier work and makes assumptions justified in that work. I refer the reader to Lombardi 1991 et ann seq.) Regressive voicing assimilation is described as follows: Assimilation is due to satisfaction of the constraint AGREE which requires that sequences of obstruents have the same value for voicing.

(8) AGREE: Obstruent Clusters agree in voicing

Voicing is privative and marked. This is encoded in the constraint *_{LAR} which is violated by voiced consonants though not by voiceless consonants.

(9) *_{LAR}: Don't have Laryngeal features

In addition there is IO correspondence ensuring that voicing does not change.

(10) Ident Laryngeal(_{IDLAR}): Consonants should be faithful to underlying laryngeal specification

Voicing assimilation occurs when the constraints are ranked: AGREE >> _{IDLAR} >> *_{LAR}.

(11)

pik+ben	AGREE	_{IDLAR}	* _{LAR}
->pikpen		*	*
pigben		*	!***
pikben	*!		*

This kind of voicing assimilation is always toward the unmarked - that is, the result is always a sequence of voiceless consonants.

The crucial aspect of Lombardi's 1996 analysis is the introduction of a positional faithfulness constraint which takes into account the privileged status of onsets with regard

to the voicing constraint⁶. This is encoded in the constraint: Ident Onset Laryngeal (IDONSLAR) which ensures the faithful parsing of onset voice. (This constraint is clearly perceptually motivated in that the cues for voicing are often found in the release of obstruents.)

- (12) Ident Onset Laryngeal (IDONSLAR): Onsets must be faithful to underlying laryngeal specification

This constraint outranks the other constraints governing the identity of voicing in consonants but is itself outranked by AGREE. The following tableaux illustrates. The successful candidate is the one in which the onset consonant is faithfully parsed. Assimilation is in favour of the marked voiced contrast.

- (13)

pik+ben	AGREE	IDONSLAR	IDLAR	*LAR
pikpen		*!	*	*
->pigben			*	**
pikben	*!			*

The constraint AGREE says nothing about the direction in which assimilation should occur and thus progressive assimilation is equally possible as a means of satisfying this constraint. However the positional faithfulness constraint, in the normal ranking, always induces regressive assimilation. In Lombardi's account, progressive assimilation is only "possible when some other constraints come into play outranking the effects of the positional faithfulness constraint."p 39. I will show that this is indeed true and that the relevant factor inducing progressive assimilation is always word-faithfulness.

2.1. Dutch

Dutch has an interesting pattern of neutralization and voice assimilation which is discussed in detail in Lombardi's work. Regular voicing assimilation in Dutch is regressive except in obstruent+fricative sequences which always show progressive assimilation always devoicing the fricative⁷. Dutch also has progressive voicing assimilation with nonfricatives. The regular or weak past in Dutch is formed by adding the suffix /-de/ to verbs. A voiced allomorph occurs following voiced segments: vowels, sonorants and voiced obstruents; a voiceless allomorph occurs after voiceless obstruents. The examples in (14) illustrate.

⁶ Voicing is not the only feature of onsets which is privileged- see Beckman for a full discussion of positional markedness and onset privilege.

⁷ I shall omit this from the discussion. Lombardi 1995 proposes a fricative specific constraint which forbids voicing on fricatives which follow obstruents. This constraint outranks the rest and ensures the correct outcome - see Lombardi p11.

(14). (examples from Lombardi and v.d. Hulst and Kooij)

verb	past tense	gloss
brei en	breide	knit
rijmen	rijmde	run
leeven	leevde	live
krabben	krabde	scratch
stappen	stapte ⁸	step
schrappen	schrapte	scrape
blaffen	blafte	bark

In (15) we see examples of regressive assimilation in compounds.

(15) (egs from Lombardi and Gussenhoven and Jacobs)

/kas + buk/	[kazbuk]	‘cash book’ cf.	[kas, kase]	cash sg.,pl.
/kaz+bot /	[kazbot]	‘cheese boat’	[kas, kaze]	cheese, sg.,pl
/kaz+pers/	[kaspers]	‘cheese press’		
/kas+post/	[kaspost]	‘cashbook entry’		
/goud korts/	[xɑʊtkɔrts]	‘gold fever’		
/lees bril/	[le:zbril]	‘reading glasses’		
/laat bloeier/	[la:d blɔjər]	‘late bloomer’		

Compounding and affixation of /-de/ are word-level morphological processes but the patterns of assimilation differ in exactly the same way as did the vowel deletion patterns discussed above. When the conflict is between a word and an affix faithfulness to to word is paramount; when the conflict is between two words the pattern reverts to the usual pattern - in this case regressive assimilation.

In the Dutch affix we might have expected that the assimilation trigger is the onset however in fact it is the target of assimilation instead. Word faithfulness as formalized in the constraint IDWD⁹ outranks IDONSLAR and thus sanctions the violation of IDONSLAR, with the result that the voicing of the affix changes rather than the voice of the base-final consonant- progressive voicing assimilation rather than regressive.

(16) IDWD: Don’t change features of the WORD¹⁰

⁸ I believe these forms can be pronounced in casual speech with voice throughout the cluster.

This is not problematic - we assume that for these speakers the ranking of the relevant O-O₂ Identity constraint and the Id Ons constraint is not fixed and in the casual speech situation the IdOns constraint dominates.

⁹ Notice that IDWD is a shorthand constraint, In these forms it refers to the identity of the laryngeal feature in the word and should more properly be: IDWD-LAR in contrast to IO-IdLar which corresponds to IdentLar above. I use the shorthand version to make the point that the **WORD** domain is the crucial thing - identity of words overall is a feature of the phonology. In the tableaux in the following sections IDWD will be used to stand for identity in the word domain to the value of the harmonizing feature/s and of place features as well.

¹⁰ Specifically: Correspondents in a WORD-level output relation agree in voice.

The output relation referred to here corresponds exactly to Benua’s O-O₂ (Benua 1997).

(17)

stap+de	AGREE	IDWD	IDONSLAR	IDLAR	*LAR
stapde	*!				*
-> stapte			*	*	
stabde		*!		*	**

Notice that once the effects of IDONSLAR are cancelled out by higher ranked IDWD, AGREE is satisfied by the unmarked sequence and the constraint making the final choice is *LAR.

In compounds each word should satisfy IDWD. However, satisfying AGREE means one of the consonants must change thus resulting in an IDWD violation no matter which way assimilation goes. The forms tie with respect to the IDWD constraint. The decision then falls, in what we have seen to be the ‘usual’ pattern, to IDONSLAR and the form with regressive voicing assimilation is the winner. In this way the pattern is exactly parallel to the vowel sequences pattern in compounds where the ‘usual’ second-vowel-wins situation is reverted to in the compound situation where the word faithfulness constraints are equally violated by deletion of either vowel .

(18)

kas+buk	AGREE	IDWD	IDONSLAR	IDLAR	*LAR
kasbuk	*!				
-> kazbuk		*		*	**
kaspuk		*	*!	*	

kaz-pers	AGREE	IDWD	IDONSLAR	IDLAR	*LAR
kazpers	*!				
-> kaspers		*		*	
kazbers		*	*!	*	**

2.2. English

English has both regressive and progressive voicing assimilation. Voicing assimilation is observed generally as a static regularity in monomorphemic words, examples in (19)¹¹.

¹¹ There are quite a lot of exceptions; many are old derived forms (some look like level 2 derivatives eg. *roadster*): *disgust disguise disgrace* (these may be pronounced [zg]). Some are from the Greek vocabulary : *obtuse, obsolete*, but once again these are often pronounced especially in casual speech with assimilated clusters; *o[pt]use*).

(19)	abdomen [bd]	observe
	absurd ([ps] or [bz])	absent
	subdue,	subject
	fidget	absolve (?absolution [ps])
	risky	adze
	wispy	mist
	elect	cocktail
	lecture	rupture

Regressive assimilation, though very restricted, can also be observed under derivation. This assimilation is limited to a couple of idiosyncratic lexical items and occurs frequently with fricatives, which I will not attempt to account for here. I will confine my discussion to the voicing patterns. Notice that all the examples below show regressive assimilation with the change in voicing showing up in the base and never in the affix.

- (20) a. /-th/
- | | | |
|----------|--------------------------|-----------------------|
| five | fifth | (also fifty, fifteen) |
| twelve | twelfth | |
| hundred | hundredth | |
| thousand | thousandth ¹² | |
| broad | breadth [bretθ] | |
| wide | width [witθ] | |
- b. irregular inflection: /-t/
- | | | |
|---------|--------------------|---|
| leave | left | |
| bereave | bereft | (cf. <i>bereaved</i> [vd]..derived with regular past tense) |
| cleave | cleft | |
| heave | heft | (adjective; verb has <i>heaved</i> as past tense) |
| lose | lost ¹³ | |
- c. irregular inflection: /-z/
- | | |
|-------|---------|
| leaf | leaves |
| sheaf | sheaves |
| thief | thieves |
| calf | calves |
| wolf | wolves |
| wife | wives |
| knife | knives |
| etc | |

¹² Even though here the assimilation is not reflected in the spelling, [tθ] seems to me to be a better pronunciation than *hundre[dð] or ?hundre[dθ].

¹³ We could add verbs ending in [d] which have [t] in the past: *bend~bent*, *lend lent*, *build built*, *spend spent*, *rend rent*, *send sent*. In derivational terms, the affix /-t/ attaches triggering assimilation and the resulting geminate degeminates: *spend+t* --> *spent-t* --> *spent*.

- d. words in *-scribe*:
 describe description, descriptive
 scribe scripture, script
 scribble
- e. words in *-ceive*:
 conceive conception, conceptive
 receive reception

An interesting alternation, which according to Jespersen 1909/1961, is a remnant of Verner's law, shows that assimilation is regressive word-internally as well. Words with orthographic *x* are pronounced either [ks] or [gz] and in some cases the *k ~g* alternation is the result of voicing assimilation to the [z] which arose historically as a result of the voicing of an [s] in / _V (see Jespersen p203)¹⁴. This can be seen in the alternations below¹⁵:

(21)	[ks]	[gz]
	exhibition	exhibit
	exercise	exert, exertion
	execute	executive
	exhale	exhalation ¹⁶

Consider now the account of the regressive assimilation pattern in English. Observe the interaction of Lombardi's constraints in tableaux (22) and (23) in which we see the selection of the regressively assimilated candidates for two English words. In (22) we see a voiced stop becoming voiceless when an affix which begins with a voiceless consonant is attached. In (23) we consider the case of regressive assimilation preceding a voiced stop.

¹⁴ This change can be seen in words like: *disease* (cf. ME *disese*), *design* (cf. MF *designer*) *disaster* (cf. MF *desastre*, OI *disastro*), *desire* (cf. ME *desiren*), *resemble*, *resent* *dessert* etc. Compare: *disobey* *disagree* *disadvantage* all with [s], where in contrast the s is part of the prefix and the preceding vowel has secondary stress.

¹⁵ It must be noted that some words do not participate in this alternation at all and others have optional variants whatever the stress; for example: *exit* may have a voiced cluster or a voiceless cluster: [egzit] or [eksit] even though the s voicing rule would not apply in this environment. Nevertheless, the crucial point here is that the cluster always agrees in voice. its never *[ekzit]. The alternation also occurs sometimes in non ks/gz clusters. For example, *absolve ~ absolution* may be pronounced [æbzolv~ æpsoluʃən]. Note that this is not the case for all speakers some of whom have non agreeing clusters [bs] in the second word.

¹⁶ The last example may be pronounced as [egzðələʃən] or [ekshələʃən]. Where the voiceless [h] is pronounced the preceding consonants are also voiceless. This can be observed also in forms like: *extort ~ extortion* (both [kst]) which do not show a voicing alternation because all segments in the cluster must agree in voicing with the last consonant, the [t] which is voiceless. So this example shows regressive assimilation as well.

(22)

describe +tion	AGREE	IdOnSLAR	IdLAR	*LAR
descri [bz] ion		*!	*	**
->descri [ps] ion			*	
descri [bs] on	*!			*

(23)

executive	AGREE	IdOnSLAR	IdLAR	*LAR
->e[gz]ecutive				**
e[ks]ecutive		*!	*	
e[kz]ecutive	*!		*	*

The analysis must be augmented for the cases where a single word-final consonant induces an alternation. Since the affix laryngeal value remains faithful, I introduce a constraint asserting that the affix be faithfully parsed. We can assume this to be in the same family as Casali's constraint MAXMS. That is: IDMS, or IDMORPH.

(24) IDMS: don't change a morpheme which consists of only one segment

(Notice that a constraint like this is essentially the same as : AFFIXFAITH (refs. Alderete 1997, McCarthy and Prince 1993). Whatever we call it it is only required here where the single consonant is the morpheme¹⁷.)

Below I show two tableau illustrating the interaction of this constraint with the rest of Lombardi's system.

¹⁷ The AFFIXFAITH constraint is probably unnecessary. If we had a different explanation for the voicing assimilation effects in words like *leaves*, *houses* the observed patterns would fall out without AFFIXFAITH merely as a response to *LAR. This can be seen clearly in the tableau for *fifth*.

Mohanan 1993 observes that all voicing assimilation in English is to voicelessness. This could be true if another analysis for the fricative cases and the execute~executive alternation were available. This is not inconceivable. Then the explanation in terms of IdOnSLAR would fall away and the account for English would be, as suggested by Mohanan, entirely in terms of markedness. However notice that this will not in itself explain anything more than the direction of assimilation and as we shall see below the peculiar laryngeal status of the two levels of affixes also requires explanation.

However AFFIXFAITH may not be wholly unjustified. Level 1 affixes consistently cause changes in the base that they attach to while remaining themselves faithful (the strict cycle condition forbids a change1 affix alone; such a change would have to change the base too). While in most cases it seems clear that satisfaction of markedness by changing the base is less costly than an alternative which changes the affix (*ser[e]nity* is better than *ser[i:]nty* say), it is not always so obvious (though certainly not inconceivable) that a markedness argument could be reached: consider *syllabicity*, which has spirantized and changed the place of the final *k* (at least two feature changes) and is nevertheless better than an alternative which changes the backness of the vowel say, *syllabi[k]uty* (only one feature change).

(25).

five+th	AGREE	IDMS/AFFAITH	IdLAR	*LAR
fivθ	*!			*
fivð		*!	*	**
->fifθ			*	

(26)

leaf+z	AGREE	IDMS/AFFAITH	IdLAR	*LAR
leafz	*!			*
leafs		*!	*	
->leavz			*	**

So, Lombardi's system accounts for all the regressive assimilations of English. We must note also that all the cases of regressive assimilation are associated with level 1 or Root-level morphology hence IDWD is irrelevant. (The parallel constraint IDRT, which we have not considered here, would be relevant. However it would be outranked by the constraint ensuring faithfulness to the affix .)

Progressive voicing assimilation in English is associated with all the regular inflections. In these cases it is always the affix which shows the voice change. Progressive voicing assimilation is highly productive and is found also after vowel deletion in casual speech variants of certain auxiliaries. All the affixes concerned are the level 2/WORD-level variety so in these cases we should see the effects of faithfulness to WORDS.

(27) a. *regular inflection plural:*

rope~rope[s] robe~robe[z],
 reef~reefs, five~fives,
 cat~cats dog~dogs...
 pipe~pipes scribe~scribes

b. *past:*

kick~kick[t] hug~hug[d],
 leaf~leafed heave~heaved
 loose~loosed hose~hosed
 bereave~bereaved

c. *3ps sg.*

the cat walk[s]... the train speed[z]
 he leafs through... the man heaves ..

d. *possessive:*

Pete'[s] ball Jed'[z] cat etc
 the reef's ecology the hive's honey
 Jack's ball the scribe's pen

e. *contracted* is:

Pete'[s] going... Jed'[z] leaving ...
 Leif's singing Genevieve's running
 etc.

As noted by Lombardi, progressive voice assimilation is very rare. It is thus very interesting for us that it occurs productively in English while regressive assimilation which is supposed to be the normal pattern is observed in the irregularities of the language. Notice that if regressive voicing assimilation is the normal pattern we would expect it to be observed in the irregular historical detritus. The difficulty comes when we ask ourselves why it does not occur in the regular phonology as well. Why is the productive pattern the progressive assimilation one? The answer must also account for the fact that it is observed with word-level or post word-level morphology.

Notice that the usual ranking of markedness above faithfulness at the first level and faithfulness above markedness at the second level will not provide an explanation of the English facts. AGREE is satisfied at both levels. There is assimilation at the second level, it is just not regressive. The phonology selects the progressively assimilated forms which are faithful to the base word, rather than the regressively assimilated forms which have changes in the base word. We see from this that IDWD is ranked equal to or above¹⁸ all the other constraints involved in the account of voicing alternations.

(28)

cat+z ¹⁹	IDWD	AGREE	IDMS/AFFAITH	IdLAR
catz		*!		
-> cats			*	*
cadz	*!			*

IDWD rules the regressively assimilated form out. Because IDWD outranks IDMS/AFFAITH, a voicing change in the affix is permitted and the progressively assimilated form is the successful candidate. (Even without IDMS/AFFAITH, the correct output will emerge because of IDWD.)

With the addition of IDWD the account of progressive assimilation in English is straightforward. Word-level identity forces faithfulness to the base and the assimilation constraint is satisfied by altering the affix instead. Since the only assimilating affixes are these productive word-level suffixes it follows that all productive voicing assimilation is progressive. Notice the analysis predicts that a word-level prefix should assimilate regressively for the same reasons. No such prefix exists in English to use as a test case however.

¹⁸ Actually IDWD probably outranks AGREE in English. The fact that there is no regular Voicing Assimilation between compounds as in Dutch shows that AGREE does not dominate IDWD. IDWD comes into effect only in compounds then and blocks assimilation. Between a word and an affix it ensures that the laryngeal quality of the word is always faithful.

It has been pointed out by Mohanan 1993 that in English the voiced segment always assimilates to the voiceless one- i.e. the change is always in favor of the unmarked form²⁰ This alone might be considered explanation enough for English voicing assimilation, especially the productive progressive assimilation pattern. But such an explanation fails to explain why it is the WORD-level suffixes that behave this way. Why are there no voiceless suffixes at the WORD-level which cause regressive assimilation? Why are the level 1/ ROOT-level affixes voiceless and the level 2 /WORD-level affixes voiced? The analysis I propose allows for the possibility that the affixes at either level could be either voiced or voiceless - the correct patterns will come out whatever they are underlyingly but more importantly the analysis suggest a reason for why the affixes are distributed this way.

The existence of only voiceless consonantal suffixes²⁰ can be explained at the ROOT-level as a markedness >> faithfulness effect as is characteristic of I-O faithfulness. Bound root level morphemes tend to be unmarked in general; they are coronals they are voiceless; they exhibit restricted sets of vowels etc. because the effects of dominant markedness constraints would preserve the unmarked forms which will anyway be more frequent. Voiceless suffixes are unmarked - regressive voicing assimilation resolves everything in favor of the unmarked value for voicing. It is less clear why there are only voiced suffixes at the word-level. If only voiced suffixes occur and voicing assimilation is always resolved to the unmarked then the affixes will be affected by the change, as indeed they are. However if there were voiceless suffixes as well, and if the voicing assimilation situation is always resolved toward the unmarked then violations of word-faithfulness would be forced by such affixes. So the distribution of voiced and voiceless suffixes could be construed to be itself a consequence of word-faithfulness.

Richness of the Base allows the possibility that the WORD-level suffixes might just as well be voiceless. The same constraint ranking will pick out the correct output in this situation. No matter what the voicing status of the suffix, word-faithfulness will ensure progressive voicing assimilation²¹.

(29)

cat+s	IDWD	AGREE	IDMS/AFFAITH	IDLAR
catz		*!		*
-> cats			*	
cadz	*!			*

The word-faithfulness explanation allows for a unified analysis of both regressive and progressive voicing assimilation in English which parallels in many respects assimilation in Dutch and vowel deletion cross-linguistically.

²⁰ Assuming there is some other explanation for the /z/ of *wolf* *wolves* etc. (see fn 17)

²¹ Lombardi's account of these facts utilizes Harms' generalization (1973) which asserts that a voiced segment cannot follow a voiceless one at the end of a syllable because it violates sonority. As Lombardi has noted however, Harms' generalization cannot account for the facts if the affixes are underlyingly voiceless.

3. Harmony Mismatches

Clements 1977 observed that vowel harmony systems generally have what he called ‘root control’. That is, it is the property of the vowels of the root which determine the quality of the vowels in the affixes and not the other way around. The property of root control has also been described as an instance of positional faithfulness. Beckman 1997 and 1998 proposes that roots are privileged positions requiring faithfulness. In this section I consider how the privileged status of WORDs will affect harmonic processes with a discussion of so-called mismatches (Selkirk 1980, Nespors and Vogel 1982).

Mismatches are found in compound constructions. While they are single morphological domains they often have more than one phonological domain. Thus a compound in a harmonizing language may be made of two words with distinct harmonic properties and no harmonic process will change that. Further, if an affix is attached to the compound as a whole that affix will harmonize with the vowels of the adjacent word. The result is that it appears to be attached to that word directly instead of to the compound as a whole. So, a suffix attached to a compound made of two words with different harmonic patterns behaves like a suffix attached to a disharmonic root which harmonises with the vowel in the preceding syllable. This pattern is called a ‘mismatch’ by Nespors and Vogel) because the structure of the phonological word is not isomorphic with that of the morphosyntactic word. Mismatches like these have been more recently discussed in the Pre OT literature in such works as Cohn 1989 and Zsiga 1992 who argue for a cyclic analysis. In OT they have been described in terms of alignment (Cohn and McCarthy 1994) as well as receiving faithfulness accounts (Kenstowicz (1996)).

WORD-faithfulness makes a very clear prediction about compounds made of words which differ in their harmony. Any word compound²² automatically has as many prosodic domains as there are words in that compound since each of the words must itself satisfy the prosodic constraints governing words. Given WORD-faithfulness the harmony-inducing constraint/s could not effect any change in the words of the compound.

Let us consider Hungarian which has backness harmony: suffix vowels share the backness value of the root. Examples (Taken from Nespors and Vogel 1986) are given in (30). The harmonic domains are shown in b.

- (30)a. öleles ‘embracement’
 ölelesnek ‘embracement Dat sg.’
 hajonak ‘ship Dat sg’ hajo ‘ship’

²² Note there are also root compounds which will not be subject to O-O₂ identity. Eg. compare the word *shepherd* with *sheepskin* and *goatherd*. The first is a root compound while the latter are both word compounds. We know this because *shepherd* has one stressed syllable and the vowel of *sheep* is shortened by the level 1 process which shortens vowels when they are followed by two consonants. *Sheep* in *sheepskin* has a long vowel even though there are three consonants following it; and there are two stresses. While English does not have a great many root compounds, many languages have regular processes of root compounding as well as word compounding.

b.

[-_B öleles -nek -_B]
 [+_B hajo + nak +_B]

The patterns of harmony in compounds depends on the harmonic domains of the words which make up the compound. Harmony does not change the backness value of either of the two words. They may be the same or they may be different as shown below:

- (31) [+_B Buda +_B][-_B Pest-_B] 'Budapest' *Budapast
 [-_B konyv-_B] [+_B tar+_B] 'library' ('book+collection') *konyvter
 [+_B alul jaro+_B] 'tunnel' ('under +path')
 [+_B Buda +_B][-_B Pest-_B] [+_B alul jaro+_B] 'Budapest tunnel'

Any compound whose constituents are disharmonic remains disharmonic and if affixed the compound behaves exactly as it would if it were a disharmonic root- the affix harmonizes with the adjacent vowel. The harmonic domains of an affixed compound are shown below.

- (32) { { { } { } } } *morphological structure*
 [+_B lat +_B] [-_B kep+''unk-_B] *phonological structure*
 'our view' (latkep 'view' ''unk 'our')
 *latkepunk

Without going into details about the description of the harmony process (see for example Cole and Kisseberth 1995, Beckman 1997, Reddel 1996 for analyses of harmony within OT) we can see how our system will account for this pattern. In the tableaux below we see that the optimal form is the one which satisfies WORD-faithfulness (IDWD) at the expense of a violation of harmony because there are two harmonic domains. The last form has two violations of harmony because the affix has not harmonized. The first and third forms each have fatal violations of IDWD because the backness value of the the words making up the bases have been altered.

(33)

lat+kep+unk	IDWD	Harmony
{ { [+ _B lat + kap } unk+ _B } }	*!	
->{ { [+ _B lat+ _B] [- _B kep]''u nk- _B } }		*
{ { [- _B let kep] ''unk- _B } }	*!	
{ { [+ _B lat] [- _B kep- _B] } unk+ _B }		**

From this point of view the mismatch pattern is unsurprising and parallels the root controlled pattern discussed in Beckman. What would happen however in an affix controlled harmony?

Imagine a hypothetical situation in a dominant/recessive language in which the harmonic value spreads from the affix onto its host? In a compound in this language the

affix could in principle trigger a change in the adjacent word so that that word harmonised with the affix but not with the word on its other side.
word

(34) $\{ \{ [\text{let} \text{ }_{-B}] [\text{kop} \text{ }_{+}] \text{unk} \text{ }_{+B}] \}$

This is a logically possible mismatch pattern yet, to my knowledge, such a case is unattested²³. WORD-faithfulness predicts that this situation would be highly marked.

The prediction is that harmony can, in root level constructions, be either ROOT or affix controlled but in WORD-level constructions Harmony should only be WORD-controlled. that is, there can be no harmony into WORD compounds which changes the vowels of the word adjacent to the affix. Only the affixes should change. This prediction seems to be born out. It is not inconceivable for a dominant affix to trigger changes in the host word so why is the pattern in (34) so rare? A dominant WORD -faithfulness constraint makes changes in the host word impossible without massive word-faithfulness violations. If however the constraint motivating harmony outranks the word-faithfulness constraints then violations will be permitted equally in **both** of the words forming the compound so the mismatch pattern would not occur. The mismatch pattern requires some kind of dominant word-faithfulness to ensure that the word boundaries are recognized.

While there are no reported examples of this mismatch pattern with regressive affix dominant harmony there are some interesting cases where minimal word -level violations seem to occur in contrast to the usual long distance harmony patterns in the language. I would like to propose that these examples could be seen as minimal word-faithfulness violations. The point is that while it is unlikely that a harmony rule could affect a whole word because that would result in massive violations of WORD-faithfulness, it is possible that the grammar might choose to satisfy harmony minimally governed by the number of WORD-faithfulness violations. One such violation would be better than three - and so on.

In his discussion of harmony in Nez Perce, which has dominant affix regressive harmony, Aoki 1966 observes:

“In terms of word classes, morphological words and harmonic sequences are always coterminous in verbs, eg./wu:lɛlikɛpɛsɛ/ ‘I am

²³ Note the pattern in (34) must be distinguished from a similar one which at first looks like it may be this pattern is in fact a construction in which the affix attaches to the second word or root prior to compounding and not one in which the affix is attached to the whole compound: $\{ \{ \text{root} \text{ }_{-B} \} \{ \text{root} \text{ aff} \text{ }_{+B} \} \}$

An example like this occurs in Warlpiri which has a regressive dominant harmony occurring in verbs. Regressive harmony *kiji-rni* ‘throw NonPast’; *kuju-rnu* ‘throw- Past’. In the form *miyi-kupu-rnu* ‘food winnow’ which is a Nominal Nomic Agentive compound, we can see that the second member of the compound has harmonized with the suffix. The morphological analysis given by Nash for forms like these is: $\{ \{ \text{miyi} \} \{ \text{kupurnu} \} \}$

$\{ \text{food} \} + \{ \text{winnow-Past} \}$

and hence the example is in fact not a counter example.

riding into bushes', /wo:lalikapasaqa/ 'I rode into bushes recently'. On the other hand there is considerable discrepancy in substantives: for example, the word for the *Red River* in Idaho has three freely varying forms: /tukpe:nwawa:m/, /tukpa:nwawa:m/, /tokpa:nwawa:m/ ..." p 761

The difference in the patterns in verbs and nouns could be attributed to the ROOT/WORD distinction. Complex verbs like these, made of bound root plus affixes are frequently ROOT-level structures. They are, as a result, single harmonic domains.

- (35) [wu:lelikepese_{-F}]
[wo:lalikapasaqa_{+F}]

The harmony constraint in Nez Perce dominates ROOT-faithfulness (O-O₁) constraints with the result that all the vowels of the form harmonize.

- (36)

/wU:lElIkEpEsE+ qa/	Harmony	IDRT
->{wo:lalikapasaqa _{+H} }		*
{wu:lelikepeseqa _{-H} }	*	

WORD-faithfulness (O-O₂) comes into the picture with the nouns (which are free forms). If IDWD is not crucially ranked above the harmony constraint variation occurs. It may block harmony completely however the phonology will always be able to choose between a series of possibilities going from the least unfaithful with one harmonized vowel to a completely unfaithful possibility, where all the vowels are unfaithful. So harmony is gradient in this circumstance because of the conflict between the requirement of faithfulness to word and the markedness constraint: harmony. I do not know how the system accounts for why all the different variants occur but it seems to me these gradient patterns indicate that when violating a constraint like this the grammar prefers less violation to more violation.

- (37)

/tUkpE:nwAwa:m	IDWD	Harmony
->tukpe:n{wawa:m _{+H} }	*	**
tuk{pa:nwawa:m _{+H} }	**	*
{tokpa:nwawa:m _{+H} }	***	

- (38)

/tUkpE:nwAwa:m	Harmony	IDWD
tukpe:n{wawa:m _{+H} }	**	*
tuk{pa:nwawa:m _{+H} }	*	**
-> {tokpa:nwawa:m _{+H} }		***

In rapid speech in Nez Perce harmony often occurs across word boundaries by one syllable. Compare the normal speech and rapid speech variants in the following phrase:

- (39) normal speech /ʔitamya:tas ʔewsi:x/ ‘they are for sale’
 rapid speech /ʔitamya:tɛs ʔewsi:x/

These examples suggest that while WORD faithfulness is dominant in careful speech, in rapid speech minimal violations occur. The point is that they are minimal- on syllable rather than the whole phrase and they seem to indicate that while the fully harmonized forms may occur (like one of the options for Red River), the preferred pattern is the one with the minimal violation: that is, only one vowel harmonizes. A similar explanation might be offered for other cases where the harmonizing feature is known to spread to only one adjacent vowel: see for example the discussion of local harmony in Chamorro and Lango²⁴ in Poser 1982.

4. Nasal Place Assimilation

In the last section of this paper I turn to another set of facts which seem to support the ideas in this paper. Nasal Place Assimilation, like voicing assimilation, is a process which characteristically spreads place features regressively from a segment to a preceding nasal. Padgett 1997, following Lombardi, explains this with a positional faithfulness constraint requiring faithfulness to place in onsets: IdentOns-Pl. I will not give details of his analysis here. It need only be noted that once again the analysis predicts regressive assimilation and thus any progressive assimilations that occur require special explanation.

Such an explanation is therefore required for the pattern of progressive nasal assimilation observed in Dutch. Vd. Hulst and Kooij observe that in diminutives in Dutch nasal assimilation is unusually progressive. The diminutive is marked with the word-level suffix *-tje*. It has various allomorphs as shown in (37). We will be concerned only with last the three forms showing assimilation.

(40)	bal + tje	balle[c]e	‘little ball’
	stoel	stoel[c]e	‘little chair’
	lap	lapje	‘little rag’
	mes	me[ʃ]je	‘little knife’
	mand	ma[nc]je	‘little basket’
	koning [N]	koni[ŋk]je	‘little king’
	besem	bese[mp]je	‘little broom’

In all forms like the last three above where the word ends in a nasal consonant the obstruent of the suffix assimilates in place to the place of the nasal rather than the other way round. Thus these forms cannot be pronounced **koni[nc]e* or **bese[nc]e*. The

²⁴ In Chamorro the first vowel of a word harmonises when the word is preceded by a high vowel particle. In Lango certain suffixes cause the last vowel of the preceding form to harmonize. In Somali which has ATR harmony which is root controlled, certain determiners which attach to nouns as suffixes cause the final vowel of the noun to harmonize with the determiner.

In these cases the morphemes concerned are certainly consistent with the assumption that they are word-level morphemes however at the moment this remains speculation.

words remain faithful and the affix undergoes the rule in exactly the same way as we saw above in section 2. The tableaux in (41) illustrate:

(41)

duim +tje	NAS-AGREE	IDWD	IDOnsPL
->duimpje			*
dui[ŋç]e		*!	
dui[mç]e	*!		
koni ŋ +tje	NAS-AGREE	IDWD	IDOnsPL
->koni[ŋk]je			*
koni[ŋç]e		*!	
koni [ŋç]e	*!		

The nasal assimilation constraint dominates the others so assimilation is obligatory. IDWD dominates the positional faithfulness constraint and hence the form in which the affix assimilates rather than the word final consonant is selected by the constraint hierarchy. Thus we see another case in which WORD-faithfulness results in a constraint being satisfied in a different way.

There is another analysis for this case which relies instead on the markedness hierarchy. The Dutch diminutives can be analysed as a case in which the direction of assimilation is determined by the place hierarchy: the coronal consonant is always the undergoer of harmony and since it is the affix here which is coronal it will always be the affix which undergoes the assimilation.²⁵ Mohanan 1993 has observed of English that nasal assimilation only takes place from obstruents onto preceding coronal nasals. The same seems to be true in general of Dutch. Thus there are words like *komkommer* ‘cucumber’ or *hemd* ‘shirt’ which show that all nasals do not assimilate to a following stop. Across word boundaries coronal nasals may assimilate in place to following stops however notice that word-initial coronals do not assimilate to preceding nasals as in examples (38) and (39). So the regressive pattern is still required by the phonological system. The fact that the assimilation direction is determined by markedness with the diminutives is not enough to explain the facts. Instead, as we saw with vowel sequence elisions and voicing assimilations, the explanation requires use of positional faithfulness constraints in particular : WORD-faithfulness.

²⁵ An analysis like this is supported by facts such as those given below from Afrikaans in which the affix begins with a dorsal consonant instead : -*ki* and the assimilation seems to go always in the direction of the lesser marked consonant following the hierarchy: Id labial>>Ident dorsal>>Ident coronal. Thus assimilation is regressive when the word-final consonant is coronal and progressive when the word-final segment is labial. This pattern is discussed in detail in Borowsky in progress.

duim+kie	dui[mpi]
koniŋ	koni{ŋki}
soen	soi{ŋki}

In fact we see a little of the same effect in fast speech in Dutch where the word-final coronal nasal is pronounced as a palatal nasal : ma[=ç]je .

In this paper I have attempted to show that faithfulness of words is a robust phenomenon in grammar. I have discussed various processes which apply to different kinds of morphological inputs and shown that faithfulness to the WORD has the effect of causing different kinds of outputs in satisfaction of the same constraints.

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The Effects of Parallelism and Prosody in the Processing of Gapping Structures¹

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0. Abstract

How do perceivers assign an interpretation to an ambiguous sentence like *Bill took chips to the party and Susan to the game*, which may be assigned a gapped (Susan took chips) or a non-gapped structure (Bill took Susan)? The results of two experiments designed to answer this question suggest that the interpretation of such sentences is influenced by parallels between arguments in their syntactic features and in their prosody. But the most important determinant of an interpretation is structural economy. The gapped analysis involves building more structure than the non-gapped interpretation, so it is dispreferred.

1. Introduction

Gapping is an optional syntactic process that seems to delete identical material from the second of two conjoined sentences, as in the following examples:

- (1) a. Some ate beans and others rice.
- b. Sam gave a note to Sarah and John to Sue.

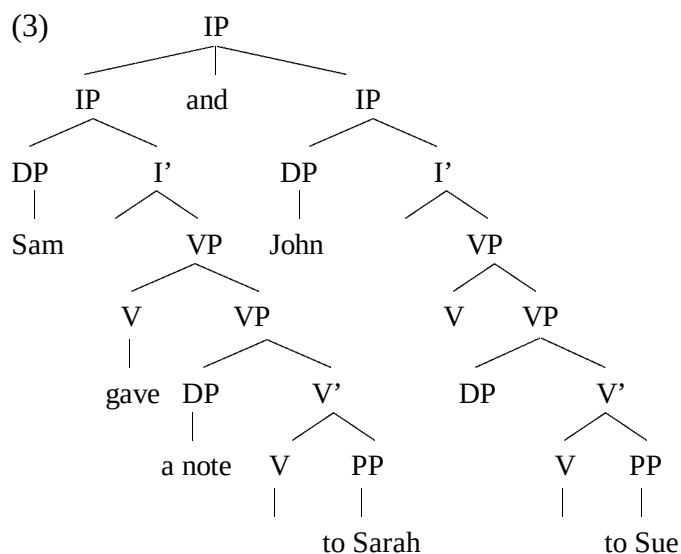
¹ I am indebted to Lyn Frazier, Charles Clifton, and Lisa Selkirk for their generous help in designing the studies presented here, and to them as well as Kyle Johnson, Barbara Partee, and Maria Nella Carminati for discussion and comments on earlier versions of this article. This work was partially supported by NIH Training Grant in Psycholinguistics HD-07327 and Research Grant HD-18708.

The deleted material always includes the verb, and may also include further constituents such as the object (Johnson, 1997; Kuno, 1976; Sag, 1980). The second conjunct is left with only new material, usually the subject and a postverbal element. A gapping sentence with the form of (1b) is potentially ambiguous, in that the DP following and could be the subject or the object of the verb. The sentence could contain two conjoined sentences, one of which is incomplete (2a), or contain conjoined sets of arguments below the verb (2b):

- (2) a. [Sam gave a note to Sarah] and [John to Sue]
 b. Sam gave [a note to Sarah] and [John to Sue]

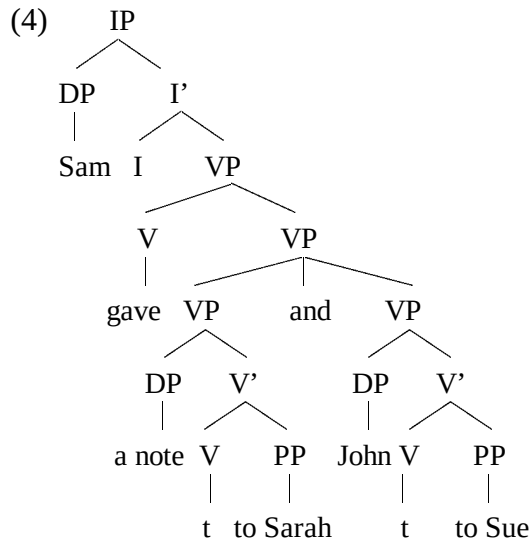
This particular example favors the reading in (2a), since John is a better subject than object, and is more parallel to the subject of the first clause, Sam, than the object, a note. Notice that in both cases, the PP has the same syntactic relation to the verb. The main ambiguity is what structural position is given to John, the DP after the conjunction (which I will call the ambiguous DP). The resolution of this ambiguity will be the focus of the present work, since few studies of the processing of ambiguous ellipsis sentences exist.

The conjoined sentences in this study will all contain a subject, verb, object, and PP, as in (1b) and (2). One simplified syntactic structure for this sentence, on the gapping analysis, is shown in (3):²



I assume that a complete syntactic structure such as (3) is built for an ellipsis sentence. This structure is then interpreted through copying of information from the first conjunct (see Dalrymple, Shieber, & Pereira, 1991, for one explicit way of interpreting an ellipsis structure). On the other analysis, this sentence would have a simpler structure in which only the arguments below the verb are conjoined, as shown in (4):

² See Johnson (1997) for a review of the syntax of gapping and a discussion distinguishing it from other types of ellipsis, as well as a new proposal about the mechanism and structures involved in gapping. Larson (1988) presented the original proposal that constituents like those conjoined in (4) could exist.



Note that the structure in (4) is smaller than that in (3), in that it contains fewer nodes. (The details of these structures are not important to this research; it is only necessary for the gapping analysis to be full clausal conjunction, while the non-gapping analysis involves conjunction of some lower phrasal category.)

There are several plausible ways that one could imagine processing an ambiguous gapping sentence. In ellipsis structures like gapping, the material after and will be a set of unconnected constituents, with less lexical and syntactic information available for structuring the sentence than usual. Any other sources of information, such as analogies to the complete first conjunct, ought to be useful in determining the roles of ambiguous arguments. So, one might use the parallels between conjuncts to line up the arguments in the incomplete second conjunct.

Several studies have shown that in conjunctions, even without ellipsis, parallelism of many types is helpful to the processor, in that the second conjunct is easier to process if it is parallel to the first in some way (e.g., Black, Coltheart, & Byng, 1985; Frazier, Clifton, & Munn, 1997; Frazier, Taft, Roeper, Clifton, & Ehrlich, 1984). In Frazier et al. (1984), ungapped conjoined sentences were constructed using matching and non-matching structures, such as object DPs vs. sentential complements (e.g., Jim believed all Tom's stories (were literally true) and Sue believed Jim's stories (were fictitious)). Other conditions alternated verb passivity, object animacy, subject thematic roles, and heavy NP position. In most conditions, parallelism affected reading times for the second conjunct, showing that the second conjunct was easier to process if it was similar to the first. Frazier et al. (1997) found that conjoined phrases of like syntactic category and phrases of approximately the same size were processed faster than non-parallel phrases. Similar preferences were observed in a sentence-completion study by Altmann, Henstra, and Garnham (1993), and following work by Henstra showed that subjects preferred the definiteness of conjoined NPs to match (as cited in Frazier et al., 1997). Turning to gapping, Grosu (1985) showed that syntactically non-parallel constituents could be acceptable in gapping sentences, under certain focus conditions. But Black et al. (1985) showed that processing was impeded when the subjects of gapping clauses differed in number, even when that did not affect the form of the gapped verb (e.g.,

Your **aunts** saw ghosts and Mary apparitions is less acceptable than Your **aunt** saw ghosts and Mary apparitions).

This work suggests that parallelism can be an important factor in the processing of conjoined elements. I will test the hypothesis that parallelism might have a very central role in creating an initial structure, as laid out in the following hypothesis:

- (5) Strong Parallelism Hypothesis
 - a. parse each minimal constituent after a conjunction as a DP or PP, etc.
 - b. compare the post-conjunct constituents to first conjunct constituents, and line them up in the same syntactic positions as the constituents they are most parallel to
 - c. build syntactic structure placing parallel constituents in parallel syntactic positions

On this hypothesis, the parser processes the words in the second conjunct, forming minimal phrasal constituents, and then immediately looks back to the first conjunct. It evaluates whether the second conjunct constituents are like particular constituents in the first conjunct, and lines them up accordingly into a syntactic tree. There are numerous ways to vary the parallelism of constituents such as arguments: these include the manipulation of syntactic factors like definiteness, number, and form (proper names vs. other noun phrase types) as well as more semantic factors like animacy, gender, and coherence within a field (e.g., nurse and doctor are both terms from medicine, and thus more parallel than nurse and engineer). If the DP following and is very much like the subject of the first conjunct, and not like the object of the first conjunct, a gapping analysis would be favored over a lower conjunction analysis, since this ambiguous DP would be placed in the subject position of the second conjunct.

When we turn to auditory processing, prosody is another possible source of information. Prosodic factors have been used to disambiguate structures in numerous other studies (e.g., Lehisté, 1973; Price, Ostendorf, Shattuck-Huffnagel, & Fong, 1991), and have been shown to be important in at least one other ellipsis construction, Right-Node Raising (Selkirk, 1997b). Parallelism of prosodic elements such as prosodic boundaries, pitch accents, and pitch range could be used here to line up arguments in a gapped conjunct. Before looking at prosodic factors in the processing of gapping sentences, though, we should find out how their syntactic structures are built independent of prosody, and how factors such as structural parallelism are used. That way we can look at prosodic factors in sentences for which the baseline structural bias has already been determined. Therefore, the first study presented will be a reading study.

It may be that processing a gapping sentence is not as special an endeavor as the previous hypothesis suggests; perhaps simple structural preferences determine the favored structure. This is expressed in the following hypothesis:

- (6) Minimal Structure Hypothesis
 - a. build up constituents using no more nodes than necessary
 - b. evaluate structures using semantics, parallelism, pragmatics, and prosody
 - c. choose the most economic structure consistent with this information

This hypothesis postulates that the language processor builds up the smallest syntactic structures that are consistent with the input. In a gapping sentence, the smallest structure will be a lower conjunction structure, as in (4). But since further information can be considered, factors like parallelism between arguments and the pragmatic likelihood of this smallest structure can help favor the gapping structure in (3) instead. Under this hypothesis, gapping sentences and conjunctions are treated much like any other sentences of the language. The strongest version of this hypothesis would claim that structural economy is the main factor determining an analysis, so that the less economical gapping structure should only be favored when several types of information suggest it. The Minimal Structure Hypothesis is clearly based on and consistent with the Minimal Attachment principle in the Garden Path model (e.g., Frazier, 1978; Frazier & Rayner, 1982; Frazier, 1987).

The frequency and acceptability of some types of gapping sentences have been questioned since early work on the constructions (as reviewed in Sag (1980)). Hankamer (1971) proposed that gapping sentences of just the structure under discussion here were impossible, because they were ambiguous with a simpler structure. Kuno (1976) and others noted that Hankamer's examples were constructed with all arguments parallel to each other, with little information to support a gapping analysis. Thus Kuno claimed that these sentences were possible as long as information to favor a gapping analysis was present. I have adopted this view, since I also find these sentences acceptable. Furthermore, some subjects in my experiments gave up to 80% gapping analyses of these sentences, suggesting that gapping structures are acceptable to at least part of the subject population as well. It is true, though, that the predictions of a frequency-based account of the processing of gapping sentences might be basically indistinguishable from the predictions of a structure-based hypothesis, since the gapping analysis of these sentences is likely to be less frequent than the argument conjunction analysis.³ I suggest that the ambiguity of these gapping structures with the simpler conjunction analysis could help explain their relative infrequency; thus the Minimal Structure Hypothesis could be viewed as a theoretical rationale behind a frequency argument, which is otherwise simply an empirical observation.

The hypotheses presented in (5) and (6) obviously differ in their predictions. The Parallelism Hypothesis proposes that parallels between arguments in the gapped conjunct and the first conjunct are used to structure the input. If the ambiguous DP is more like the subject of the first conjunct, then a gapping analysis should be reached; if the ambiguous DP is more like the object of the first conjunct, then a lower conjunction analysis should be picked. The Minimal Structure Hypothesis proposes that general structural economy helps determine the structure that is built and other factors are used to evaluate computed structures. If structural economy is the most important factor, then the lower conjunction analysis should always be favored, and the gapping structure should only be picked if several other factors suggest it (such as semantic anomalies based on the verb or parallels between arguments).

³The frequency of structures does not always correlate with their syntactic complexity (Gibson, Schutze, & Salomon, 1996), so in principle the frequency of gapping structures could be higher than that of the less complex conjunction structures. The greater syntactic complexity of gapping structures, though, is known, and correlates with the results of the studies presented here.

2. EXPERIMENT I

This experiment was designed to test the Minimal Structure and Parallelism Hypotheses about the processing of gapping sentences, and thus evaluate the relative importance of structure and parallelism in processing ellipsis sentences.

Method

Subjects. The students in a Linguistics 101 course at the University of Massachusetts, Amherst participated in this experiment as part of one of their weekly section meetings. The data of non-native English speakers were then excluded, as well as that of subjects who were unable to finish the questionnaire during the time allotted, leaving a total of 68 subjects. The subjects had not been exposed to analyses of any sentences as complicated as those that were part of the study, so there is little chance that they knew too much about the sentences due to this class.

Stimuli. In designing this experiment, I found that verbs strongly affected the parallelism of arguments in a sentence, due to their selection restrictions. The three verb types used to form different conditions will be explained with reference to the experimental sentences in Table 1:

Table 1: Sentences for Experiment I

Condition	Example sentences
Bake A	<u>Alice</u> bakes cakes for tourists and <u>Caroline</u> for her family
Bake B	Alice bakes <u>cakes</u> for tourists and <u>brownies</u> for her family
Take A	<u>Josh</u> visited the office during the vacation and <u>Sarah</u> during the week
Take B	Josh visited Marjorie during the vacation and <u>Sarah</u> during the week
Introduce	<u>Dan</u> amazed the judges with his talent and <u>James</u> with his musicality

Some verbs, like bake, usually have human subjects, but non-human objects. So in the Bake A example, Caroline is a better subject of bake than it is an object, since one doesn't usually bake people, and it is parallel only to the subject of the first clause in animacy. Verbs like take or visit can have human or non-human objects, so the ambiguous DP (Sarah) could be parallel in animacy to both the object and the subject, as in the Take B examples, or the subject alone, as in the Take A examples. And verbs like introduce or amaze only take human arguments, so the ambiguous DP (James) is at least parallel in animacy to both arguments in the first conjunct of the Introduce sentence. (A listing of the experimental sentences in this study can be found in the Appendix.)

The materials in this experiment were constructed to allow several main comparisons. First, sentences with parallelism between the first clause subject and the ambiguous DP (and non-parallelism between the object and the ambiguous DP) were constructed within each verb type: the Bake A, Take A, and Introduce sentences. (The ambiguous DP after and is italicized in each sentence above, along with whichever argument it is consistently parallel to.) These

sentences differ in how much parallelism is allowed by the verb, since Bake verbs must take non-human or inanimate objects while Introduce verbs must take all human arguments. Thus the ambiguous DP in a Bake A or Take A sentence is parallel in animacy and number, gender, or definiteness to the subject, and not the object; the ambiguous DP in an Introduce sentence is parallel in animacy to both prior arguments, but parallel in number, gender, or definiteness only to the subject. The sentences also differ in which analysis the pragmatics favors; for example, the Bake A sentences are implausible on the non-gapping analysis, because that puts the human ambiguous DP in an object position with a verb that prefers inanimate objects, while the Take A and Introduce sentences are fairly natural on both analyses. Thus the comparison between the Bake A, Take A, and Introduce sentences is expected to show that the parallelism and pragmatic factors bias the results toward gapping most in the Bake A sentences, and least in the Introduce sentences.

Second, the other two sentence types were designed to check the sentence biases in conditions of neutral or opposite parallelism. Specifically, the Bake B sentences have inanimate ambiguous DPs which are parallel only to the object, not the subject, of the first clause; comparison of these sentences to the Bake A sentences will show whether the biasing factors of parallelism and plausibility are equally able to favor the gapping and non-gapping analyses. The Take B sentences have the object of the first clause as animate and slightly parallel in form to either the first subject or the ambiguous DP; comparison of these sentences to the Take A sentences will show whether the stronger parallelism in the Take A sentences is able to favor the gapping analysis.

Procedure. This experiment was a written questionnaire study. The sentences were divided into two lists so that subjects would not have to answer too many questions. Within these lists, there were two conditions, based on which Bake and Take sentences were in the A and B parallelism conditions, for a total of four questionnaire types. Thus each subject saw 7 Bake sentences (3 or 4 Bake A versions and 4 or 3 Bake B versions), 6 Take sentences (3 Take A's and 3 Take B's), 5 Introduces, and 12 filler sentences of varying ambiguity, for a total of 30 sentences. The order of the sentences on each questionnaire was randomized and then amended so that consecutive sentences were never of the exact same type. The four different questionnaire versions were handed out in mixed order. Each type was completed by 14-19 subjects.

The experimenter read instructions to the subjects. Each sentence on the questionnaire was followed by three questions. The first question asked them to select the best paraphrase of the sentence. They were given two choices plus a space to write in their own paraphrases if they didn't like either of the choices provided. For the sentence Alice bakes cakes for tourists and Caroline for her family, the two paraphrases were a) Alice bakes cakes, and she bakes Caroline, too (the non-gapping analysis) and b) Alice and Caroline bake for people (the gapping analysis). The order of the choices was varied, so that the gapping paraphrase was the first choice only half of the time. The second question asked subjects to rate on a scale of 1-5 how hard it was to understand the sentence, with 5 as hard. The third question asked subjects what other meaning the sentence might have, and gave them space to write in an answer. They were also encouraged to write in 'a' or 'b', if the paraphrase they hadn't picked in the first question was another possible meaning. This third question was interpreted as a rating of the ambiguity of the sentence.

Stimulus Pre-testing. The verb groupings and the plausibility of the sentences in this study were tested with a separate group of subjects. To ensure that the verb types in this study actually differed in what type of object they selected for, 6 subjects were instructed to fill in the object blanks in unconjoined sentence frames using all of these verbs (e.g., Alice bakes ___ for ___).⁴ Bake verbs took inanimate objects 94.1% of the time, Take verbs took non-human or inanimate objects 75% of the time, and Introduce verbs took inanimate objects only 8.3% of the time (differences are significant: Bake vs. Introduce, $F = 86.8$, $p < 0.001$; Bake vs. Take, $F = 4.8$, $p = 0.04$; Take vs. Introduce, $F = 49.1$, $p < 0.001$). This confirms that the verbs have distinct subcategorizations, with Take verbs as the most variable.

The plausibility of sentences in this study was confirmed by having 12 subjects rate unambiguous clauses corresponding to the complete conjuncts built on the different analyses. Thus for each Bake sentence frame, five clauses were rated for plausibility, as in the following list:

- (7) Original: Alice bakes cakes for tourists and (A-Caroline/B-brownies) for her family.
 Tests: a. Alice bakes cakes for tourists (First clause)
 b. Alice bakes Caroline for her family (Non-gap A)
 c. Alice bakes brownies for her family. (Non-gap B)
 d. Caroline bakes cakes for her family. (Gap A)
 e. The brownies bake cakes for the family. (Gap B)

All subjects rated the common first clause, (a), as well as one of the plausible clauses, (c) or (d), and one of the implausible clauses, (b) or (e). Similar sets of sentences were constructed for the Take and Introduce sentence frames (except that the Introduce sentences only came in an A version, so only three clauses could be tested); implausible filler sentences were added to form two lists of 110 sentences. The average plausibility ratings are shown in the table below, with 1 being plausible and 5 being implausible (SDs in parentheses):

Table 2: Experiment I Materials Plausibility Ratings

	Bake verbs	Take verbs	Introduce verbs
First clause	1.2 (0.26)	1.1 (0.24)	1.1 (0.21)
Non-gap A	4.3 (0.50)	1.2 (0.21)	1.2 (0.21)
Non-gap B	1.0 (0.06)	1.3 (0.33)	na
Gap A	1.2 (0.16)	1.2 (0.26)	1.2 (0.41)
Gap B	4.8 (0.30)	1.3 (0.40)	na

⁴The use of a following prepositional phrase, as in the experimental sentences, caused subjects to produce DPs in the blank after the verb on all but one trial.

From this table, it is clear that most of the sentences were quite plausible, and that there was little variability in the plausibility ratings.⁵ The only significantly implausible experimental conditions were the Bake conditions containing either an animate object (Non-gap A) or an inanimate subject (Gap B), against the verb's selection preferences (Non-gap A vs. Non-gap B, $F_1 = 853$, $p < 0.001$; Gap B vs. Gap A, $F_1 = 1573$, $p < 0.001$). This confirms that response differences between these sentence types will be based on factors other than plausibility (that is, subjects will not choose more gapping analyses for a sentence type simply because of a difference in the plausibility of the analyses, except in the Bake sentences, where plausibility was manipulated on purpose).

Results

The total percentages of gapping and non-gapping responses for Experiment I by subjects, as well as the ambiguity and difficulty ratings, are shown in Table 3.

Table 3: Results of Experiment I

Condition	% Gapped Answer	% Other Analysis Possible	Gap Difficulty Rating	% Non-Gapped Answer	% Other Analysis Possible	Nongap Difficulty Rating
Bake A	81.1	22.7	2.43	18.9	18.5	2.83
Bake B	3.7	(5.0)*	(2.7)*	96.3	2.1	1.91
Take A	40.2	37.8	3.07	59.8	13.0	2.47
Take B	3.9	(16.7)*	(3.42)*	96.1	8.7	2.11
Introduce	20.9	(12.6)*	2.45	79.1	15.2	2.45

*Note: these averages are based on data from only a few items, due to low gapping response rates, and should thus be considered speculative

The Bake A sentences (with gapping-biased parallelism and plausibility) were given the gapping analysis 81.1% of the time, and 22.7% of these responses were rated as ambiguous, in that the other interpretation was possible. The ambiguity percentage for the non-gapping analysis was similarly high (18.5%), which makes sense considering the implausibility of this analysis. The Bake B sentences received the gapping analysis only 3.7% of the time, and ambiguity percentages were low for both analyses. Thus the gapping analysis was picked most often for the Bake A sentences, but they were rated as quite ambiguous on either analysis, while the Bake B sentences were unambiguously non-gapping. The difference in ambiguity ratings between Bake A and Bake B sentences was significant (Bake A gapping vs. Bake B non-gapping: $t(13) = 5$, $p < 0.001$). The Bake A sentences were also rated as more difficult

⁵There was one sentence of the Take type which appeared to be less plausible than the rest (2.33 plausibility rating vs. 1.3): *Allan/Suzanne drove the food to the picnic/beach* (Take A #1). Apparently subjects did not like the combination of the verb *drive* with an unrelated inanimate object, since the fill-in questionnaire elicited only animate objects or objects related to driving (distances or vehicles) with this verb. However, this implausible use occurred whichever analysis of the sentence was chosen, since it was in the first clause of the sentence, so it is unlikely to have greatly affected the Take A results.

on either analysis (2.43 and 2.83) than the Bake B sentences on the non-gapping analysis (1.91), and these differences were significant ($t(12) = 3.17, p < 0.01$; $t(12) = 3.26, p < 0.01$).

The Take A sentences (with gapping parallelism) received fewer gapping responses than the Bake A sentences, 40.2%, with 37.8% of those responses noting that the non-gapping analysis was also possible; the other 59.8% of the responses were non-gapping, and only 13% of those noted any ambiguity (this difference in ambiguity was significant, $t(11) = 2.8, p = 0.02$). The Take B sentences received almost exclusively non-gapping responses (96.1%), like the Bake B sentences, and were rated as not very ambiguous on this analysis (8.7%; this ambiguity rating is also significantly lower than for the Take A gapping analysis, $t(11) = 3.3, p < .01$). The Take A sentences were significantly more difficult on the gapping analysis (3.07) than the non-gapping analysis (2.45; $t(11) = 2.95, p = 0.013$). The Take A sentences were also more difficult on either analysis than the Take B sentences on the non-gapping analysis (3.07 and 2.45 vs. 2.11; $t(11) = 4.1, p = 0.002$; $t(11) = 2.3, p < .05$). Thus the Take A sentences were rated as ambiguous in two ways. First, the responses were split more evenly than in any other condition, so subjects differed in which analysis was preferred overall. Second, when they chose the gapping analysis, they found the sentences more difficult and many of them noted that another analysis was possible.

The Introduce sentences were given gapping structures only 20.9% of the time. For these sentences, the differences in ambiguity ratings and difficulty ratings were non-significant. Comparisons between the percent gapping responses for the different conditions were all significant by subjects and items. So the Bake A sentences were rated as gapping significantly more than the Bake B sentences ($F_1 = 438, p < 0.001$; $F_2 = 318, p < 0.001$), the Take A sentences were rated as gapping significantly more than the Take B sentences ($F_1 = 85, p < 0.001$; $F_2 = 43, p < 0.001$), the Bake A sentences got more gapping responses than the Take A sentences ($F_1 = 83, p < 0.001$; $F_2 = 38, p < 0.001$), and the Take A sentences got more gapping responses than the Introduce sentences ($F_1 = 24, p < 0.001$; $F_2 = 7, p = 0.014$).

Discussion

Comparing the Bake A, Take A, and Introduce percentages, one can see that the sentences with the strongest gapping-biased parallelism (Take A and Bake A) received more gapping responses than the sentences with weaker parallelism (Introduce), and that the extra pragmatic bias in the Bake A sentences raised the rate of gapping responses even higher. The comparison between the Bake A and Bake B sentences shows that even when parallelism and pragmatic factors favor the gapping analysis, it is not unanimously preferred and easy, as the non-gapping analysis is in the Bake B sentences. The comparison between the Take A and Take B sentences shows that strong parallelism between arguments can significantly raise the rate of gapping responses, for the same sentence frame. Also, the Take B results show that the non-gapping analysis is overwhelmingly favored when parallelism is not clearly a factor. Finally, the difficulty and ambiguity ratings show that the gapping analysis is rated as more difficult and more ambiguous than the non-gapping analysis unless the non-gapping analysis is quite implausible (as in the Bake A sentences).

These results suggest that parallelism and plausibility do have a role to play in the interpretation of these sentences. They suggest also that structural factors are more important, however. If pure parallelism were used to structure these sentences, then the gapping analysis

should be preferred and easy in the Bake A, Take A, and Introduce sentences. The arguments in the second conjunct should be lined up in the positions corresponding to whichever argument in the first conjunct is more parallel, and this structure should be built. Since in fact the gapping analysis was only predominant (over 50%) when an extra pragmatic factor biased toward it as in the Bake A sentences, and the gapping analysis was rated as more difficult overall, the Strong Parallelism Hypothesis is disconfirmed.

The Minimal Structure Hypothesis, however, can more easily explain this pattern of results. The strong bias toward the non-gapping analysis reflects that this is the smaller, simpler structure, while the importance of parallelism and pragmatics is consistent with an evaluation of structures based on further information in the sentence. The greater difficulty and ambiguity of the gapping analysis suggests also that there is a processing cost for settling on a less economic structure. One way to implement this would be to have the parser build structures serially. In that case, the simpler structure would always be built first, and the gapping structure would involve reanalysis based on the parallelism and pragmatic information. Alternatively, both structures could be built, but additional activation of the gapping analysis through further information would be necessary to outweigh the structurally simpler non-gapping analysis. Whichever mechanism is used, though, the structural bias is clear.

3. EXPERIMENT II: PROSODY

Background and Design

The previous study showed that parallelism and word-based factors could affect the parsing of ambiguous gapping sentences, and that a general structural bias favored the lower conjunction analysis of these sentences in the absence of clear evidence to the contrary. However, auditory processing is often held to be more central to language, so it is an important question whether these results carry over to the auditory realm, since a written study may not get at the central workings of the processor. The second experiment was designed to test whether the same kind of results would be found in an auditory study as in the written study, and to evaluate in addition the relative contributions of structure and prosody to the resolution of the ambiguity of these sentences. It was also hypothesized that parallelism in the prosodic domain could play a role in the processing of these ellipsis structures.

I was concerned with two questions relevant to the prosodic representations for the sentences. On the one hand, I wanted to find out whether the results seen in the written study would hold for auditory processing, or whether they were just an artifact of the study conditions. To find the same pattern of ambiguities, I wanted to exploit a prosody that would be compatible with both interpretations of a gapping sentence, allowing the structural factors that had been important in the written study to determine the output: a Baseline prosody (Kjelgaard, 1995; Speer et al., 1996). The existence of such an ambiguous prosody would also show that gapping sentences do not require a special prosody for their interpretation. But this prosody would, by design, show no effect of prosodic structure on the analysis of the sentence, and thus would not help determine what role prosody could play in parsing. Thus I also wanted to find biasing prosodies, one that would favor the gapping analysis and one

that would favor the non-gapping analysis: Cooperating Gapping and Nongapping prosodies. With these I could examine the relative roles of prosody, prosodic parallelism, and structural factors in parsing gapping sentences. Although many possible prosodies may exist with these properties, particular instantiations had to be chosen in order to carry out this study; I will not claim to have found the only ambiguous and biasing prosodies possible for these gapping sentences, just one plausible set of them.

Work on processing and prosody goes back several decades (see Cutler, Dahan, & Donselaar, 1997, for a review). A portion of this work has focused on the relation between prosody and syntax, particularly syntactic disambiguation (e.g., Lehisté, 1973; Price et al., 1991; Speer, Kjelgaard, & Dobroth, 1996). Since prosodic choices often do not unambiguously signal syntactic structures (Pierrehumbert, 1980), these studies have tended to use clear prosodic boundaries, which may coincide with major syntactic boundaries, for disambiguation. Cooper and Paccia-Cooper (1980) found that boundary effects are also seen at ellipsis sites, signaling that prosodic boundaries are often found where syntactic deletion has taken place. These boundaries are signaled by duration and fundamental frequency (F0) differences.

In the case of the gapping sentences under discussion, however, it appeared that boundary effects would not be enough to disambiguate the structures. In particular, Cooper and Paccia-Cooper (1980) suggest that a prosodic boundary should be found between the ambiguous DP and the PP of the second conjunct in a gapping construction, due to the deletion (...and John # to Sue). However, Selkirk (1997a, b) found that one natural phrasing of a sentence with a DP and PP following the verb also has a prosodic boundary between the DP and PP. Thus a prosodic boundary can be present in the second conjunct on either analysis of a gapping construction. The boundary found in a non-gapping second conjunct is likely to be a Major Phrase boundary (Selkirk, p.c.), as opposed to the Intonational Phrase boundary in a gapping conjunct, but this difference in size is the only boundary difference. Further, in both the gapping and non-gapping analyses, a boundary is likely before and, signaling either the end of an IP or a VP. Therefore, the location of prosodic boundaries before and and to Sue can not disambiguate these gapping sentences.

However, there are other aspects of prosody that could be used in the processing of gapping sentences. First of all, the location of pitch accents could be important, as seen in other processing work (e.g., Birch & Clifton, 1995; Schafer, Carter, Clifton, & Frazier, 1996; Schafer, Clifton, Frazier, & Carlson, 1998). Pitch accents often signal the presence of new or contrastive information (Pierrehumbert, 1980; Selkirk, 1984, 1995, 1997a, b). In these sentences, the material left in the second conjunct of a gapping sentence is in a contrastive focus relation with material in the first conjunct (Johnson, 1997; Kuno, 1976; Sag, 1980), as in (8):

(8) Dan amazed the judges with his talent and James with his musicality.

If (8) is interpreted as a gapping sentence, then James contrasts with Dan, and with his musicality contrasts with with his talent. The conjuncts are two different instantiations of X amazed the judges with Y, and each conjunct puts in different values for X and Y. Similarly,

if (8) is a non-gapping conjunction, James contrasts with the judges, and with his musicality contrasts with with his talent. Either way, the second conjunct constituents will contrast with information in the first conjunct, and thus receive pitch accents. Biased prosodies could vary the placement of pitch accents in the first conjunct, then, to mark which arguments in the first conjunct contrast with arguments in the second conjunct. This accent placement will clearly increase the parallelism of corresponding arguments in the conjuncts.

Another prosodic variable is the choice of pitch accent types. The prosodic theory of Pierrehumbert (1980) and Beckman and Pierrehumbert (1986) allows for several different types of pitch accents, which may correlate with particular discourse situations (Pierrehumbert and Hirschberg, 1990). In the present study, the parallelism of corresponding arguments might be increased by choosing similar pitch accents.

Finally, the pitch range used can affect processing. Marcus and Hindle (1990) present a theory of parsing in which pitch range and prominence information are used to structure material within prosodic boundaries. Several processing studies have found that the discourse structure of a long utterance (such as a set of instructions or a paragraph) can be highlighted by the use of pitch range, with higher pitch peaks being found for high-level topic changes and lower pitches at topic ends (e.g., Lehisté, 1975, 1979; Swerts & Geluykens, 1994). Studies have also examined the relation between focus conditions and pitch peak height within a sentence (Bartels & Kingston, 1994; Rump & Collier, 1996), and found that the relative heights of pitch peaks can favor different discourse interpretations of sentences, with the location and choice of pitch accents held constant. In the present experiment, parallelism of pitch range will be used to highlight arguments in a contrastive relation to each other. Thus three prosodic factors have been identified here that will be used to produce biased prosodies by varying the parallelism of arguments in the two conjuncts.

Prosodic Hypotheses. In designing this experiment, I was testing the following general hypothesis:

- (9) General Prosodic Hypothesis
 - a. Baseline: there exists a natural prosody which is compatible with both interpretations of gapping sentences, and which allows the biases of the sentence construction to be seen
 - b. Cooperating: there exist prosodies which favor the gapping and the non-gapping interpretations of these sentences, so prosody can be shown to affect the processing of these sentences

That is, I wanted to find a prosody that would leave the sentences ambiguous, as well as prosodies which would bias perceivers toward the gapping and non-gapping interpretations. The existence of prosodic representations with these properties would show that a gapping structure could be reached without a “special” prosody (one unique to gapping). Before this study, it was not known whether gapping structures were available with an ambiguous prosody. This result would also show that prosodic factors could nevertheless affect the processing of ambiguous gapping sentences. Specifically, it would show that pitch accent type, range, and placement could be used to bias interpretation, despite ambiguous prosodic

boundaries. To my knowledge, neither of these hypotheses had been tested before, so the influence of prosody on the processing of gapping structures was quite unknown. Besides testing for the existence of prosodic effects on processing, this experiment was designed to evaluate the relative roles of prosodic parallelism and structural economy on the auditory processing of gapping sentences.

If the Strong Parallelism Hypothesis holds for auditory processing despite its problems in the written domain, and prosodic parallelism is the central factor in the processing of a gapping sentence, then a gapping analysis should be reached whenever the ambiguous DP has the same pitch accent and range as the subject of the first conjunct and not the object. If the Minimal Structure Hypothesis holds, and structural economy is still more important, then prosodic parallels should only be able to slightly raise the base rate of gapping responses for a sentence in the Cooperating Gapping condition, and slightly lower it in the Cooperating Nongapping condition.

To sum up, this experiment was intended to test whether there are Baseline and Cooperating prosodies for gapping sentences. The Baseline prosody should allow whatever structural bias the sentence has to determine the interpretation, and thus should show the same pattern of results as the visual experiment. The Cooperating prosodies should allow prosody to bias the interpretation. The experiment also tested how much Cooperating prosody can affect the interpretation, in order to decide whether the Minimal Structure hypothesis is correct or whether prosodic parallels can have a very central role in processing.

Method

Subjects. Fifty-one undergraduates who were taking Psychology courses at the University of Massachusetts participated in this study in exchange for course credit. All were native English speakers.

Stimuli. The experimental sentences used in this study were taken directly from the questionnaire in experiment I, so that the results could be compared. Sentences of the Take A (variable object) variety were used for the Baseline condition. These were the most ambiguous sentences in the written study, with a 40% gapping response rate, and it was hoped that a similar result could be achieved with a neutral prosody. Sentences of the Introduce (animate object) variety were used for the Cooperating conditions.⁶ These sentences were found to be fairly biased against a gap reading in the questionnaire study, with a 21% gapping response rate, although both interpretations had sensible meanings (unlike the Bake sentences, which had strong pragmatic biases). Thus these sentences left a lot of room to show the effects of Cooperating Gapping prosody, if it could raise the rate of gapping responses. Each Introduce sentence was produced with both the Cooperating Gapping and

⁶This experimental design was chosen so that several sets of auditory results could be compared to the results of the questionnaire study. That is why different sets of sentences were produced using the Baseline vs. Cooperating prosodies. Another possible design would have tested ambiguous and biased prosodies on one type of sentence. This would have enabled the three different prosodic structures to be compared directly, but would have allowed only one point of comparison to the questionnaire study.

Cooperating Nongapping prosody (but each subject heard only one version of any particular sentence). The sentence types are exemplified in Table 4 and described below:

Table 4: Sentences for Experiment II

Condition	Example sentences
Baseline prosody: Take A sentences	Jane recommended a movie to her co-worker and Doris to the boss
Cooperating Gapping prosody: Introduce sentences	[Bob insulted the guests during dinner] and [Sam during the dance]
Cooperating Non-gapping prosody: Introduce sentences	Bob insulted [the guests during dinner] and [Sam during the dance]

The prosodies will be described using the ToBI transcription system (Beckman & Ayers, 1994), which is based on the intonational phonology system of Pierrehumbert (1980). In the Cooperating prosodies, I chose to use parallel placement of pitch accents, parallel pitch accent types, and parallel pitch peak heights all at once, in order to maximize the helpful effect of the prosody on the structuring of the sentences. The Cooperating Gapping prosody has the form shown in (10):

- (10) Cooperating Gapping prosody
 BOB insulted the guests during DINNER and SAM during the DANCE
 L* H- H* L- H% L* H- H% H* L- L%

Both elements in the second conjunct are accented, since they are contrastive with elements in the first conjunct. In the first conjunct, only the subject and PP are accented, but not the object. Thus the ambiguous DP (Sam) is more parallel to the subject of the first conjunct than the object, favoring a gapping analysis. On the subjects of both conjuncts (Bob and Sam) there are L* accents followed by H- phrase tones; on both PPs there are L+!H* accents. And not only are parallel pitch accents used on corresponding elements in the two conjuncts, but the actual F0 values reached during the accents are very similar. That is, the H* accents on the PPs reach similar heights, which are in a different pitch range than the H tones at the edges of the subject DPs. Intonational Phrase boundaries are found following dinner and Sam; the large boundary after Sam slightly favors a gapping analysis. The bias towards a gapping analysis was confirmed by several informants, as well as the results of this experiment.

The Cooperating Non-gapping prosody is quite similar to the Cooperating Gapping prosody above, differing only in the placement of accents in the first conjunct and the size of the boundary in the second conjunct, as in (11):

- (11) Cooperating Non-gapping prosody
 Jane asked my DAD about his CAREER and SHARON about POLITICS
 H* L* H- H* L- H% L* H- H* L- L%

Here the parallel L* accents followed by H- phrase tones are placed on the object of the first conjunct and the ambiguous DP, while the accents on the PPs are identical to those seen in Figure (10). Again, parallelism between corresponding elements is highlighted by their realization in similar pitch ranges with the same type of pitch accents. A non-prominent H* pitch accent is seen on the subject of the first conjunct, possibly due to a preference for a pitch accent near the beginning of a prosodic phrase (Selkirk, p.c.). An Intonational Phrase boundary is present at the end of the first conjunct, but there is only a Major Phrase boundary between the ambiguous DP and the PP in the second conjunct. The larger prosodic boundary for the gapping prosody in (10) is probably motivated by a combination of the preference for a boundary after a focused element and the preference for a boundary at a deletion site.

The Baseline condition prosody is quite different from the Cooperating prosodies above. First of all, pitch accents are present on all of the arguments of the sentence, rather than being restricted to the pairs of elements in a contrastive focus relation. This means that the pitch accent location does not favor one analysis over the other. Secondly, the pitch accents in the sentence are all the same (H*), so the choice of pitch accent types also shows no exclusive parallels between arguments. Finally, the pitch range parallels seen in the other prosodies are not produced here. The accents in the first conjunct follow a neutral downstepping pattern, and the ambiguous DP is not clearly more parallel in pitch to either argument in the first conjunct. This is consistent with a failure to anticipate, within the first conjunct, any contrastive focus relationships between arguments in the two conjuncts. These properties can be seen in (12):

(12) Baseline prosody

Jane recommended a movie to her co-worker	and Doris	to the boss
H* L-	!H* L- !H* L- H%	H* !H- L% H* L- L%

There is an Intonational Phrase boundary in the second conjunct, which is consistent with either a gapping or non-gapping interpretation, but slightly favors a gapped reading. Due to the lack of parallelism in pitch accent location and choice, this prosody has the potential to leave the sentence quite ambiguous. In addition, the H* accents on all arguments make this prosody a logical choice for an out-of-the-blue utterance, with all of the arguments presenting new information (Pierrehumbert and Hirschberg, 1990; Selkirk p.c.); this discourse situation is quite unmarked, so this prosody is more natural than one that requires more specific or contrastive focus conditions.

The sentences in this experiment were recorded on cassette tapes by a native speaker of English with training in prosody and a relatively neutral northern California accent. The stimuli were then digitized (in ESPS xwaves and Wave formats) for analysis and playback by a computer. They were checked for consistency in several ways. Several colleagues with experience in prosody listened to the sentences to check that the prosody appropriate for each condition had been produced. Pitch tracks of each item were given a full ToBI transcription, in order to check that the same prosodic properties were produced for all items in each condition. The properties that were checked included the choice and location of pitch accents and prosodic boundaries. Measurements of the pitch peaks of each experimental sentence were taken, which showed great consistency between sentences of each type (SDs

ranged from 6-15 Hz). The durations of pauses were measured to check that similar pauses had been produced at the correct locations in each sentence. Baseline prosodies were produced with a pause before and (average duration = 332.5 ms) and a pause after the ambiguous DP (412.3 ms). Cooperating Gapping sentences had pauses in the same locations (444.7 ms and 395 ms), as did Cooperating Non-gapping prosodies (241 ms and 82 ms). These durations support the tonal analysis of the sentences above: all conditions had Intonational Phrase boundaries before and, the Baseline and Cooperating Gapping prosodies had Intonational Phrase boundaries after the ambiguous DP, and the Cooperating Non-gapping prosody had a Major Phrase boundary after the ambiguous DP.

Procedure. Each subject heard all 12 Take A sentences with the Baseline prosody, 5 Introduce sentences with the Cooperating Gapping prosody, and 5 Introduce sentences with the Cooperating Non-gapping prosody. Two types of filler sentences were also included in the experiment: adverb clause fillers (e.g., Susie learned that Bill telephoned after John visited) with varying boundaries and H* pitch accents on arguments, and relative clause fillers (e.g., I asked the pretty little girl who's cold) with L* accents and one H* prominence that varied in location. Each subject heard a total of 58 sentences, in an individually randomized order. (See the Appendix for a listing of the experimental sentences in this study.)

The sentences were played through speakers into a sound-proof booth with a computer screen and two levers. Subjects pressed a lever to hear a sentence, and then pressed again when they had heard and understood the sentence. This caused a question to appear on the screen, with two answers below it, one on the left and one on the right. Subjects pressed the left or right lever to choose the answer that best fit what they thought the sentence meant. For the experimental sentences, the question asked subjects to choose the best paraphrase of the sentence they had heard. The position of the answer was varied so that half of the time the gapping response was on the left, and half the time it was on the right. The paraphrases used were the same ones that had been used in the questionnaire study. A computer recorded response times and response choices.

Results and Discussion

The major results from this study are the percentages of gapping responses in the various conditions, as shown in Table 5, and how they compare to results from the questionnaire study.

Table 5: Results for Experiment II

Conditions	Response % by Subjects	Questionnaire %
Baseline: Take A	38.3% gapping	40.2% gapping
Cooperating Gap: Introduce	44.1% gapping	20.9% gapping
Cooperating Non: Introduce	27.5% gapping	

The first line of Table 5 shows that the Baseline prosody performed as intended: the results of the auditory study replicated the results of the questionnaire study almost exactly (by items, 38.4% compared to 39.5% gapping responses, $r = .727$; difference non-significant, $t(12) =$

.26, $p = .8$). So the Baseline prosody did not bias the interpretation, and the structural factors that had produced the written results were able to have the same effect in the auditory study. The Take A sentences in this condition could take human or non-human objects, so the ambiguous DP could be an object or subject. But only the ambiguous DP and the subject of the first conjunct were made structurally parallel. Thus these sentences were rated in both studies as possible but ambiguous gapping sentences. This confirms part (a) of the General Prosodic Hypothesis: there is a natural Baseline prosody that is neutral with respect to the gapping and non-gapping interpretations. This also shows that the results of the questionnaire study are not artifacts of written language, since the Baseline prosody produced clearly comparable results. Finally, this confirms that the gapping analysis does not demand a specific prosody to be constructed.

The Cooperating Gapping prosody produced more gapping responses than the Cooperating Nongapping prosody, 44.1% to 27.5%. This difference was highly significant by subjects ($t(51) = 4.285$, $p < 0.001$) and by items ($t(10) = 3.041$, $p = 0.014$). So the prosodic differences between the conditions were able to affect the processing of these sentences. Specifically, subjects were able to use the prosodic parallelism between the ambiguous DP and a corresponding first clause argument to help determine the final sentence structure. Also, part (b) of the General Prosodic Hypothesis is confirmed, since there are biased prosodies that produce higher and lower gapping response rates. Further, the structure of the biased prosodies suggests that not only phrase breaks, but also parallelism of pitch accents and pitch range can be used in processing to favor different syntactic structures.

However, the difference between the gapping response percentages for the Cooperating prosody conditions, though significant, was not very large: 16.6%, and neither prosodic condition received a majority of gapping responses. Thus the hypothesis that there are prosodies that favor the gapping and non-gapping interpretations is confirmed, but the Strong Parallelism Hypothesis is not supported in the auditory realm either. This hypothesis predicted that the parallelism found in Cooperating prosodies should dictate the favored structural analysis of these sentences. Here, the prosodic effect was not seen to outweigh the structural biases of the sentences and there is no evidence that prosody is the central mechanism for interpreting these sentences.

In the written study all of the experimental sentences received well over 50% non-gapping responses, except when the non-gapping interpretation of the sentences was anomalous (as in the Bake A sentences, which got only 18.9% non-gapping responses). Also, subjects who took the gapping analysis of sentences generally rated them as more ambiguous or difficult than those who chose the non-gapping analysis. These results supported the idea that the economic non-gapping structure was preferred, even if the parallelism of arguments suggested otherwise. In the auditory study, the non-gapping structure was still overwhelmingly favored, in all conditions. The effect of prosody seen here is comparable in size to the effects of verb type or argument parallelism in the questionnaire study, so the prosody seems to be a factor of only as much importance as these variables in determining the ultimate analysis of these sentences. The strongest Minimal Structure Hypothesis predicted that the most economic syntactic structure would be the preferred analysis, with other factors

like prosodic parallelism influencing the choice between structures. Thus this remains the best model for processing these sentences in either modality.

One thing is a bit puzzling about this data compared to the results of the questionnaire study: the gapping response rates for both the Cooperating Gapping and the Cooperating Nongapping prosodies were higher than the gapping response percentage found in the written study (44.1% and 27.5% vs. 20.9%, respectively). We might have expected a lower gapping response rate for the Cooperating Nongapping condition than in the questionnaire. Perhaps the Introduce sentences were particularly hard to read as gapping structures, and improved a great deal simply by being spoken. In addition, the pitch accent choices in the Cooperating Non-gapping prosody may have been consistent with a gapping analysis. Specifically, the small but perceptible pitch accent on the subject of the first conjunct in this prosody may have been enough to make this argument a possible contrastive element to the ambiguous DP, though not an overtly parallel one. Perhaps this is the reason that the gapping analysis appeared to be more plausible in this auditory study than in the questionnaire study.

In both the auditory and written studies, subjects' responses to these sentences differed, with some choosing the gapping analysis for almost all sentences and others rarely choosing the gapping analysis. These subject differences did not correlate with handedness, SAT scores, or other information which was collected about the subjects. This is reminiscent of the many debates in the linguistics literature about the acceptability of various gapping sentences (as reviewed in Sag, 1980), and the results of my own informal surveys of linguists and friends. These gapping sentences seem to be marginal for some people, while other people freely accept them in many forms. It seems unlikely, then, that the simple task of choosing a paraphrase of these sentences forced these subject differences.⁷

Overall, the results of this auditory study support the results of the questionnaire study. A Baseline prosody was found which is a natural way to pronounce a gapping sentence, but allows the ambiguity of the sentence to emerge just as in reading. This suggests that the questionnaire study shows something real about the processing of these sentences, and that the structural factors identified in that study are also relevant to auditory processing. It also shows that gapping structures can be built in the absence of biasing prosodic information. Cooperating prosodies were found that favor gapping and non-gapping interpretations of these sentences, though the bias they added was under 20%. So there is a role for prosodic parallelism in the processing of these sentences, but not a central role, as the biased prosodies did not disambiguate the sentences. A Minimal Structure account is more consistent with the overall pattern of results in these experiments.

4. Conclusion

Ambiguous gapping sentences seem to be assigned an interpretation based mostly on structural economy, since a bias toward non-gapping structures was found in all experimental

⁷There were some differences between items in both studies as well. These response differences did not correlate with specific differences in form between sentences (for example, definite subjects vs. proper name subjects), and are assumed to be due to a complex of lexical factors.

conditions (except Bake A). This evidence supports the Minimal Structure hypothesis about the processing of gapping sentences. Specifically, this suggests that perceivers favor structural economy in processing, though they can consider many types of information in determining an interpretation. This work is consistent with a view of processing as a modular system in which the simplest structures are built first and then reanalyzed based on semantic and parallelism information (as in the Garden Path model). A model with reanalysis would also explain why the gapping analysis is rated as more ambiguous or difficult than the non-gapping analysis; it would only be built as a second structure, subsequent to processing of other information. The results are also derivable through the interaction of weighted constraints, as long as structural preferences (based on economy or frequency) are most heavily weighted (e.g. Tanenhaus, Spivey-Knowlton, & Hanna, 1996). Finally, this hypothesis proposes that the processing of gapping sentences can be captured without any special, construction-specific mechanism, and instead follows general principles of language processing.

The results show that factors such as verb type and parallelism between conjuncts (including prosodic parallelism) are important factors in the processing of gapping sentences, since there were significant response differences between experimental sentences with different parallels between conjuncts. But the Strong Parallelism Hypothesis, which gives parallelism a central role in processing, gave the wrong predictions about gapping sentences. The more economic structure was preferred in the Take A and Introduce sentences, despite parallelism that favored the gapping structure; only when plausibility also favored the gapping structure, as in Bake A sentences, was the economic structure not preferred. Thus it is plausible that factors like parallelism mainly influence the activation of a less economic structure or lead to the reanalysis of sentences which have been given the favored non-gapping syntactic structure.

As the first known auditory study of ambiguous gapping sentences, the second experiment significantly furthers our knowledge of the processing of these structures. Closely comparable results were obtained in the visual processing study and the ambiguous (Baseline) prosodic condition. Therefore, the results cannot be due to gapped sentences only occurring in speech or only in written language. This also shows that a neutral prosody exists which allows either analysis of a gapping sentence to be chosen, depending on what other biases are present in the sentence. Gapping sentences thus are not so exotic that they can only be interpreted as gapping structures with a specific prosody. In addition, this Baseline prosody shows that the presence of a prosodic boundary at the ellipsis site was not enough to disambiguate these sentences.

Biased prosodies were also found. These Cooperating prosodies involved only a small difference in boundary size, and primarily differed in the location of pitch accents within the unambiguous first clause. The different pitch accent locations led to different parallelism conditions between the ambiguous DP and first clause arguments. The effects seen in these conditions support the idea that parallelism of many types is helpful in the processing of conjoined elements. The results also confirm that prosodic boundaries are not the only prosodic variables that can influence syntactic processing. Finally, all of the prosodic results support the prosodic assumptions used to generate the prosodies; parallelism of pitch accent

type, range, and location was found to bias sentence interpretation in a case where prosodic boundaries could not disambiguate the sentences.

Prosody has been discussed above as if it could play no role in the initial structuring of an input. For auditory processing, this can not be wholly true. A prosodically structured string appears to be the input that the parser receives. The full phonological representation of such input may not be computed immediately, however. The interpretation of prosodic elements can depend on the syntactic and semantic representations of a sentence, so full realization of the consequences of a prosodic choice might have to wait until these other representations are computed. This research shows that an auditory version of the Strong Parallelism hypothesis, in which prosodically parallel arguments are lined up on that basis initially and then syntactically structured, can not be right. Prosodic choices were not seen to override the structural biases of sentences, so the asymmetry between the gapping and non-gapping analyses was still present.

There are many questions for further research raised by these experiments. For example, the prosodies used here were constructed to test many aspects of prosody at once. A further study might separate these, so that one could clearly test the relative contributions of prosodic boundary sizes, pitch accents, and pitch range on processing. There may be other prosodies, with different choices of pitch accents, that would show even larger prosodic effects. Also, deletion structures of many types occur in conjoined sentences where parallelism is likely to play a role. Further research on ambiguous and unambiguous deletion structures should provide more evidence for the contribution of parallelism of many types to processing, and help determine the domain of sentence types for which parallelism is important. Finally, on-line studies of parallelism and deletion structures will help sort out the way that structural economy and other factors interact to determine an interpretation.

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Appendix

Gapping sentences:

Bake A and B

1. A. Alice bakes cakes for tourists and Caroline for her family
B. Alice bakes cakes for tourists and brownies for her family
2. A. Matt herds sheep in the mountains and Jason in the valleys
B. Matt herds sheep in the mountains and goats in the valleys
3. A. The doctor wore pearls to the conference and the nurse to the benefit
B. The doctor wore pearls to the conference and emeralds to the benefit
4. A. Sue gave cookies to the kids and Jennie to the neighbors
B. Sue gave cookies to the kids and pecans to the neighbors
5. A. Megan put books on the desk and Jim on the bookshelf
B. Megan put books on the desk and CDs on the bookshelf
6. A. Robin tells jokes to adults and Sandra to children
B. Robin tells jokes to adults and stories to children

7. A. John built tables for the new school and Sheldon for the Senior Center
B. John built tables for the new school and shelves for the Senior Center
8. A. The lawyer bought candy for the secretaries and the chef for his wife
B. The lawyer bought candy for the secretaries and balloons for his wife
9. A. Amanda sliced vegetables for the salad and Joan for the stew
B. Amanda sliced vegetables for the salad and beef for the stew
10. A. Mark picked wallpaper for the bedrooms and Andrea for the dining room
B. Mark picked wallpaper for the bedrooms and carpet for the dining room
11. A. The faculty washed dishes after the reception and the students after the party
B. The faculty washed dishes after the reception and silverware after the party
12. A. The neighbors sold lawn furniture at a yard sale and the pastor at the church bazaar
B. The neighbors sold lawn furniture at a yard sale and old dishes at the church bazaar
13. A. Tina mixed martinis for her parents and Alexandra for her friends
B. Tina mixed martinis for her parents and daiquiris for her friends
14. A. Mom mended socks with a needle and Janie with a sewing machine
B. Mom mended socks with a needle and jeans with a sewing machine

Take A and B

1. A. Allan drove the food to the picnic and Suzanne to the beach
B. Allan drove Theresa to the picnic and Suzanne to the beach
2. A. Gregory discusses politics with his wife and Steve with his secretary
B. Gregory discusses Melanie with his wife and Steve with his secretary
3. A. Pete took cookies to school and Mary to the park
B. Pete took the kids to school and Mary to the park
4. A. Jane recommended a movie to her co-worker and Doris to the boss
B. Jane recommended Justine to her co-worker and Doris to the boss
5. A. Josh visited the office during the vacation and Sarah during the week
B. Josh visited Marjorie during the vacation and Sarah during the week
6. A. Patrick criticized the food at the dinner and Joanna at the party
B. Patrick criticized Bridget at the dinner and Joanna at the party
7. A. The guest of honor found dust in the living room and the hostess in the dining room
B. The guest of honor found Dave in the living room and the hostess in the dining room
8. A. The director brought chips to the party and Susan to the potluck
B. The director brought Marie to the party and Susan to the potluck
9. A. Samantha replaced the plants in the office and Janice at the front desk
B. Samantha replaced the intern in the office and Janice at the front desk
10. A. The mayor discussed finances with his aides and the fire chief with the councilmen
B. The mayor discussed the judge with his aides and the fire chief with the councilmen
11. A. Tammy described the zoo to her mother and Susie to her sister
B. Tammy described Amelia to her mother and Susie to her sister
12. A. Jason brought his cleats to practice and Bob to the game
B. Jason brought his sister to practice and Bob to the game

Introduce

1. Theresa introduced a new policeman to the mayor and Susan to the councilmen

2. The producer invited an actress to the premiere and the director to the party
3. Jane asked my dad about his career and Sharon about politics
4. The diplomat met some senators at the reception and the ambassador at a meeting
5. Morgan annoyed my mother with his questions and David with his clumsiness
6. Joan complimented the hosts on the decorations and Tanya on the food
7. The president misled investors during the campaign and the vice-president during the cover-up
8. Dan amazed the judges with his talent and James with his musicality
9. Bob insulted the guests during dinner and Sam during the dance
10. Grandma scolded Jenny about her manners and Aunt Viv about her posture

Filler sentence examples from prosody study:

Adverb clause (# marks an Intonational Phrase break):

1. A. Susie learned that Bill telephoned # after John visited.
B. Susie learned that Bill telephoned after John visited.

Relative Clause (bold marks the H* pitch-accented word, others are low):

1. a. I asked the pretty little girl **who's** cold
b. I asked the pretty little girl who's **cold**
c. I asked the pretty little girl **who** is very cold
d. I asked the pretty little girl who is very **cold**

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Morphological Haplology and Correspondence^{*}

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1. Introduction

When the Arabic feminine singular morpheme *ta* attaches to the verbal prefix *ta*, the resulting form is not the expected **tata*, but instead *ta*:

(1) $ta + ta + kassaru \rightarrow takassaru$ *it (fem.sg.) breaks, *tatakassaru* (Wright 1971: 65)

This is a typical example of morphological haplology: while there are two phonologically identical morphemes underlyingly, only one phonological string appears in the surface form (Stemberger 1981, Menn & MacWhinney 1984).¹ There are two fundamental questions about morphological haplology (hereafter ‘haplology’) that any analysis of the phenomenon must address:

- What is the nature of haplology?
- What triggers haplology?

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¹ Phonological haplology is basically a diachronic process (Hock 1991:109, Grammont 1933), and is the idiosyncratic deletion of phonetically similar sequences of morpheme-internal material.

In response to the first question, I propose that haplology is coalescence. In other words, underlying phonological material of different morphemes merges in the output – there is no deletion.

The most popular answer to the second question is that there is a OCP-like constraint that bans adjacent identical strings (e.g. Menn & MacWhinney 1984, Golston 1995, Plag 1998, Yip 1998, forthcoming). This view is rejected in this paper. Instead, I argue that haplology can be triggered by any relevant markedness constraint.² Furthermore, I argue in §4 that there is no OCP-like constraint that directly bans adjacent identical strings.

These two ideas – that haplology is coalescence and it is triggered by any relevant markedness constraint $\mathbb{C}$ – are given formal expression in terms of the Optimality Theoretic constraint ranking $\| \text{MAX} \gg \mathbb{C} \gg \text{UNIFORMITY} \|$. This ranking requires underlying segments to be preserved (obeying MAX), while allowing them to coalesce (violating UNIFORMITY) in order to produce an output with less structure (so satisfying $\mathbb{C}$). A variety of constraints interact with this ranking to produce a typology of haplological processes.

This paper is organised as follows: In §2, I present a proposal for dealing with haplology in Optimality Theory. In §3, empirical evidence that haplology is coalescence is presented. In §4, the constraints that trigger haplology are discussed, and alternatives are examined. A typological investigation of haplological processes is presented in §5: it is shown that there are many different types of haplology, including partial-identity haplology (§5.1), reduplicative haplology (§5.2), stem-edge and non-local haplology (§5.4.1, 5.4.3), and coextensive haplology (§5.4.2). Alternative theories are examined in §6, and conclusions are presented in §7.

2. Haplology and Correspondence

One of the principal proposals of this paper is that haplology is coalescence. In other words, when two input strings such as Arabic /ta/ {fem.sg.} and /ta/ {verbal prefix} haplogize to form [ta], neither actually deletes; instead, the output [ta] is the simultaneous realisation of both input strings. To formally express this coalescence, McCarthy & Prince's (1995, 1997) Correspondence Theory will be employed.

In Correspondence Theory, a relation called 'correspondence' holds between input and output segments. A number of constraints regulate correspondence relations. For coalescence, the following are crucial:

² 'Relevance' is defined in §4.3. In short, a constraint is relevant if it is violated by the haplogizing morpheme. For example, *coronal is relevant for *ta*, and so can trigger *ta* haplology, but *labial is not.

- (2) MAX “Every segment in the input corresponds to a segment in the output.”
- UNIFORMITY “No segment in the output corresponds to more than one segment in the input.”

As established by McCarthy (1995), McCarthy & Prince (1995), and Lamontagne & Rice (1995), if MAX and a coalescence-triggering constraint $\mathbb{C}$ are ranked above UNIFORMITY, coalescence occurs:

(3) **The Basic Ranking**

/t ₁ a ₂ / + /t ₃ a ₄ /	MAX	$\mathbb{C}$	UNIFORMITY
(a) t ₁ a ₂ t ₃ a ₄		x!	
(b) t ₁ a ₂	x x!		
(c) t _{1,3} a _{2,4}			x x

The subscript numbers indicate correspondence relations. For example, the *t* of the leftmost input string corresponds to the first segment in candidate (a), as indicated by the subscript ‘1’s. Similarly, both input /t/’s correspond to the [t] in candidate (c), as indicated by the subscript 1 and 3.

Candidate (a) fails because it has not undergone coalescence, fatally violating the coalescence-triggering constraint $\mathbb{C}$ (the identity of which will be discussed below). In candidate (b), one of the input strings has no correspondent (i.e. has been deleted). Because of this, not every input segment has an output correspondent, so MAX is fatally violated. Candidate (c)’s only failing is that an output segment corresponds to more than one input segment, violating UNIFORMITY. However, since UNIFORMITY is ranked below the other constraints, its violations are inconsequential. This means that (c) is the most harmonic form.³

From this tableau, it is evident why MAX and $\mathbb{C}$ must dominate UNIFORMITY: if the rankings were reversed candidate (c)’s UNIFORMITY violations would be fatal, and either deletion – (b) – or full-realisation – (a) – would result, depending on the ranking of MAX and $\mathbb{C}$. So, the ranking of MAX and $\mathbb{C}$ above UNIFORMITY is crucial for coalescence, and therefore for haplology.

This leaves the identity of the constraint that triggers haplology – $\mathbb{C}$. The position advocated here is that $\mathbb{C}$ is any markedness constraint, including constraints such as *F (F is a feature), ALIGN (McCarthy & Prince 1993a), and others. This is discussed in detail in §4.3. For the moment, to give some substance to $\mathbb{C}$, the constraint *STRUC will be used (Prince & Smolensky 1993: fn.13, Zoll 1993, 1996). *STRUC militates against structure, incurring a violation for every node in the output form. It is used here because it is the markedness constraint *par excellence* – in banning structure it directly expresses a property that is shared by almost all markedness constraints. The difference between it

³ Keer (1999) proposes that UNIFORMITY does not exist. If so, there would have to be a constraint on morphological affiliation to prevent haplology in every situation: a segment cannot belong to more than one morpheme in the output – i.e. MORPHDIS (McCarthy & Prince 1995:§3.8). With this constraint, the present approach translates straightforwardly into Keer’s terms.

and other markedness constraints is the extent of discrimination: while *STRUC bans all structure, other markedness constraints are more selective (e.g. *labial only bans instances of the feature [labial]). While *STRUC will be used in the following discussion, it must be remembered that *any* markedness constraint can be a potential trigger for haplology, as long as it is relevant (see §4.3). This proposal competes with one in which *C* *directly* induces haplology: such a constraint would prohibit adjacent identical phonological strings (i.e. an OCP-like constraint). It is argued in §4 that no such constraint exists.

In the tableaux in following sections, only violations of *STRUC that candidates do not have in common are shown in order to conserve space.

The haplology-triggering constraint has an effect on the basic ranking. MAX must outrank *STRUC, otherwise deletion would occur:

(4)

/kæt/	MAX	*STRUC
(a) Ø	x x x!	
(b) kæt		x

Candidate (a) fails because it has no phonological content (symbolised by Ø); since no input segment has an output correspondent, it fatally violates MAX. Candidate (b) is the most harmonic form since it satisfies MAX, despite violating *STRUC. It is obvious that reversing the rankings would have a very harmful effect: if *STRUC outranked MAX, no form would ever be able to surface with phonological content. Constraints other than *STRUC have similar effects: ranking the trigger constraint above MAX causes deletion.

In summary, the Basic Ranking for haplology is as follows:

(5)

<u>Basic Ranking for Morphological Haplology:</u> MAX » C » UNIFORMITY where C is a relevant markedness constraint.
--

This account is not quite complete, though. As it stands, the Basic Ranking allows haplology between any two affixes, whether they are identical or not. This is because MAX simply requires an input segment to have an output correspondent – it does not require the correspondents to be identical. Identity is enforced by another constraint – IDENT-F:

- (6) IDENT-F If an input segment is α F then its output correspondent is α F.
 (i) F is a feature
 (ii) α is a featural specification (+ or -)

With IDENT-F ranked above C, only identical strings can coalesce. This is illustrated in the tableau below:

(7) The Basic Ranking

❶	/t ₁ a ₂ / + /t ₃ a ₄ /	MAX	IDENT-F	℄	UNIFORMITY
	(a) t ₁ a ₂ t ₃ a ₄			x!	
	(b) t ₁ a ₂	x x!			
	(c) t _{1,3} a _{2,4}				x x
❷	/t ₁ a ₂ / + /d ₃ i ₄ /				
	(a) t ₁ a ₂ d ₃ i ₄			x!	
	(b) t ₁ a ₂	x x!			
	(c) t _{1,3} a _{2,4}		x x!		x x

Haplology between /ta/ and a featurally identical string is shown in ❶. As shown in tableau (3), the coalesced candidate (c) fares better than any other here. The most important point is that it does not violate IDENT-F; even though [t_{1,3}] in candidate (c) corresponds to both /t₁/ and /t₃/ in the input, IDENT-F is satisfied since the output segment has the same featural specifications as its input correspondents. The same is not true of the coalesced candidate in ❷.

A case of non-identical strings is presented in ❷. In contrast to ❶, the coalesced candidate (c) in ❷ violates IDENT-F. This is due to the fact that the candidate does not preserve all the features of both its input correspondents. The crucial feature here is [voice]: while output [t_{1,3}] preserves the [-voice] feature of its input correspondent /t₁/, it disagrees in voicing with its [+voice] input correspondent /d₃/. This demonstrates why coalescence of non-identical strings does not occur: doing so necessarily entails violation of IDENT-F. The workings of IDENT-F are discussed in detail in §5.1.

This section has presented the outline of a Correspondence-based theory of haplology. Before considering its typological implications (§5), the two premises on which it is based will be examined: the following section will provide evidence that haplology is coalescence, and §4 will advocate the idea that haplology can be triggered by any relevant markedness constraint, and not one that directly bans adjacent identical strings.

3. Haplology is Coalescence

The deletion and coalescence approaches to haplology make different predictions about the morphological affiliation of output segments. In the deletion approach, phonological material of one of the morphemes is not present in the output while the other's is preserved. Hence, there is no phonological realisation of one of the underlying morphemes in the surface form. This is illustrated in the diagram below; this shows the output of the concatenation of the Arabic morphemes *ta* {fem.sg} and *ta* {verbal prefix}:

$$\begin{array}{ccc}
 \text{(8)} & \begin{array}{c} /ta/ \\ \nabla \end{array} + \begin{array}{c} /ta/ \\ \nabla \end{array} & \rightarrow \begin{array}{c} [ta] \\ \nabla \end{array} \\
 & \text{FEM.SG} \quad \text{V-PREFIX} & \text{FEM.SG} \quad \text{V-PREFIX}
 \end{array}$$

Here, the phonological content of the verbal prefix is not present in the output (the *fem.sg.*'s phonological material could equally have been deleted – the choice is arbitrary).

In comparison, with coalescence the phonological contents of both morphemes are present in the output. However, since they have merged, the resulting phonological string is affiliated to both morphemes:

$$(9) \quad \begin{array}{ccc} \text{/ta/} & + & \text{/ta/} \\ \nabla & & \nabla \\ \text{FEM.SG} & & \text{V-PREFIX} \end{array} \rightarrow \begin{array}{c} [\text{ta}] \\ \swarrow \quad \searrow \\ \text{FEM.SG} \quad \text{V-PREFIX} \end{array}$$

The different output structures produced by deletion and coalescence provide a way to determine which strategy is being used. Specifically, constraints that make reference to a segment's morphological affiliation are predicted to apply differently in the two cases. This is shown to be a testable prediction in the following sections, with evidence adduced from Japanese (§3.1) and French (§3.2).

3.1 Japanese

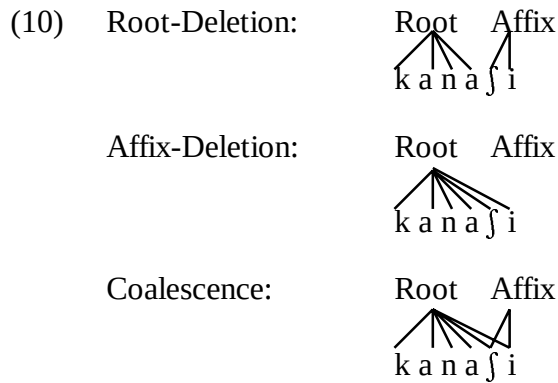
Lawrence (1997) argues that haplology involving the Japanese Classical Predicative (CP) suffix *-si* [ʃi] is coalescence, and not deletion.^{4,5} The following reproduces the essentials of his argument, with slight modifications.⁶ The reader is referred to Lawrence (1997) for further details.

As established in the preceding section, the deletion and coalescence approaches produce different output structures. These two proposals result in three possible outcomes for haplology: (1) deletion of root material, (2) deletion of affixal material, and (3) coalescence. These are graphically illustrated below by the haplologized form [kanaʃi], from /kanasi/ 'sad' + /si/:

⁴ Thanks to Wayne Lawrence for bringing this to my attention, and for subsequent discussion. Thanks to Jennifer Smith for elucidating various aspects of Japanese accentuation. For further discussion of Lawrence's approach to haplology, which is somewhat different from the present proposal, see §6.

⁵ In Japanese, coronal sibilants palatalise before /i/, hence /si/ → [ʃi], and /zi/ → [ʒi].

⁶ The modification is in regard to the conception of the accented vs non-accented distinction in Japanese roots. Lawrence divides roots into those that permit accentuation vs those that prohibit it. The view taken here is that roots that permit accentuation have an underlying accent, while those that prohibit accentuation do not.



Accent placement allows these three alternatives to be distinguished. In Japanese, words may surface as either accented or unaccented. Surface accents have two sources: either they exist underlyingly, or they are supplied by an affix. The CP suffix is such an affix: when suffixed to an underlyingly unaccented root, *-si* induces an accent to appear on the syllable that immediately precedes it (i.e. preaccentuation): e.g. /aka/ ‘red’ + /si/ *CP* → [akãʃi].

The Root-Deletion, Affix-Deletion, and Coalescence approaches make different predictions about where the CP’s accent will fall when it haplogogizes. In the case of the underlyingly unaccented /kanasi/, for example, the accent is predicted to fall on the word-penultimate syllable in the Root-Deletion and Coalescence cases. This is evident from the representations above since the word-penultimate syllable immediately precedes the affixal material. This is the correct prediction, producing the attested form [kanãʃi].

In comparison, the Affix-Deletion approach does not predict this outcome. If the affix’s phonological material is deleted no accent should appear at all, producing *[kanaʃi]. The alternative is to suppose that this is a case of opacity: preaccentuation takes place before the affix is deleted. However, this approach makes the wrong predictions:

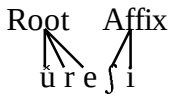
- (11) /kanasi/ + /si/ → (1) concatenation: [kanaʃiʃi]
 → (2) preaccentuation: [kanaʃĩʃi]
 → (3) haplology: *[kanaʃĩ]

As shown, this predicts that the accent should be on the final syllable, not on the penult. So, the Root-Deletion and Coalescence approaches both predict the correct outcome while the Affix-Deletion proposal does not.

Another accentual process provides evidence that the Root-Deletion approach is incorrect. When *-si* is suffixed to an underlyingly accented root, the underlying accent appears on the penultimate vowel of the root: e.g. /siro/ ‘white’ + /si/ → [ʃiroʃi], where *siro* is underlyingly accented.⁷ The Root-Deletion and Coalescence approaches make different predictions about where the accent should fall when haplology has taken place.

⁷ Note that with underlyingly accented roots, *-si* does not cause preaccentuation.

The following structures show the output of the concatenation of underlyingly accented /uresi/ ‘happy’ with the CP suffix /si/ as predicted by the Root-Deletion and Coalescence proposals:

- (12) Root-Deletion: 
- Coalescence: 

Because accent falls on the penultimate vowel of the root, it is predicted to fall on [u] in the Root-Deletion approach, and on [e] in the Coalescence approach. The actual output is [urɛ̃ʃi], so confirming the Coalescence prediction.

In summary, both Root- and Affix-deletion make false predictions about accent placement. In order for accent placement to be explained, the [ʃi] that results from *-si* haplology must belong to both the root and the affix simultaneously, so supporting the Coalescence approach.

3.2 French

Another case of haplology that supports the coalescence view is found in French with the suffix *-iste* /ist/. The following data is taken from Corbin & Plénat (1992):

- | | | |
|------|---|--|
| (13) | /bodis/ <i>Baudis</i> {name} + /ist/ | → [bodist], *[bodisist] |
| | /deiksis/ <i>deixis</i> + /ist/ | → [deiksist], *[deiksisist] |
| | /analiz/ <i>analyse</i> + /ist/ | → [analist], *[analizist] ⁸ |
| | /elefantiasis/ <i>elephantiasis</i> + /ist/ | → [elefãtiasist], *[elefãtiasisist] |
| | /maʁini/ { <i>Name</i> } + /ist/ | → [maʁinist], *[maʁiniist] |

This case differs from the ones discussed above in that only part of the affix haplologizes. Similar cases will be discussed in §5. For the moment, it is enough to recognise that *-iste* haplologizes with stem-end material.

Again, there are three possibilities: (1) deletion of root material, (2) deletion of affix material, or (3) coalescence. Representations of these three proposals are given below, showing the output [deiksist] from the input /deiksis/ + /ist/:

⁸ This example shows that *-iste* haplologizes with forms ending in /iz/, not just /is/. Cases where the two haplologizing strings are not quite identical are common, and are discussed in §5.1.

- (14) Root-Deletion: 
 Affix-Deletion: 
 Coalescence: 

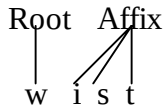
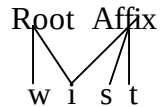
There are two restrictions related to this haplology that allow these alternatives to be distinguished. The first is a limit on the size of the target of *-iste* haplology:⁹

- (15) (a) /kʁiz/ *crise* + /ist/ → [kʁizist], *[kʁist]
 (b) /gi/ *Guy* {name} + /ist/ → [gi(j)ist], *[gist]
 (c) /wi/ *oui* + /ist/ → [wi(j)ist], *[wist]

The data shows that *-iste* cannot haplologize with a root that is ‘too small’. More precisely, the root must consist of more than a single mora (i.e. a vowel) if haplology is to apply to it.

The restriction can only be formulated naturally under two of the approaches to haplology. This is shown by considering the ill-formed haplologized output of /wi/ ‘yes’ + /ist/ → *[wist] as it would appear under the three different possibilities:

- (16)

Root-Deletion	Affix-Deletion	Coalescence
		

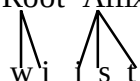
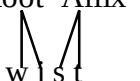
Why are these ill-formed? With Root-Deletion there is a readily identifiable reason: there is not enough material left in the root. Here, French requires a lexical morpheme (i.e. a root) to contain at least one moraic element (i.e. a vowel), a condition that Root-Deletion violates. This is a plausible restriction since many languages have minimal size requirements on lexical morphemes.¹⁰

A similar restriction can be stated for coalescence. This time, though, the size restriction must be more narrowly stated: a lexical morpheme must contain at least one moraic element that is *unique* to it (i.e. not an exponent of another morpheme). The plausibility of this restriction derives from related constraints such as MORPHEAL, which require every morpheme to have some phonological realisation (Samek-Lodovici 1993 and many others).

⁹ The term ‘target’ will be used to refer to the string with which the haplologizing morpheme coalesces.

¹⁰ See Plénat (1992) for some discussion of minimal word effects in French.

A restriction is not so easily formulated with Affix-Deletion. Unlike the other two approaches, the root *does* contain a mora that is unique to it in the ill-formed output (as shown above). This raises a conundrum: what is the essential quality that differentiates the ill-formed **wist* from the well-formed *wiist* in the Affix-Deletion approach? The well- and ill-formed structures are shown below for comparison:

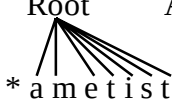
- (17) Well-Formed: Ill-Formed:
- | | |
|--|--|
| Root Affix
 | Root Affix
 |
|--|--|

Assuming that an output-oriented size requirement on the root restricts the application of this haplology, the forms above present a puzzle since the root has the same content in both the ill- and well-formed outputs. This poses a significant problem in an output-oriented theory of grammar such as Optimality Theory. From a theory-internal point of view, the inability to identify an adequate output constraint implies that the premise is incorrect – in other words, *-iste* haplology does not involve deletion of affixal material. In short, only the Root-Deletion or Coalescence approaches present plausible explanations for the minimal size requirement.

The second restriction decides between the root-deletion and the coalescence approach. As shown in the following data, *-iste* cannot entirely haplologize:

- (18) (a) /ametist/ *amethyst* + /ist/ → [ametistist], *[ametist]
 (b) /evaɾist/ *Évarist* {Name} + /ist/ → [evaɾistist], *[evaɾist]

Again, a natural output-oriented restriction can only be formulated in two of the three approaches. One of these is the Affix-Deletion approach. This restriction is evident from the output of the failed **[ametist]* with affix-deletion:

- (19) Root Affix
- 

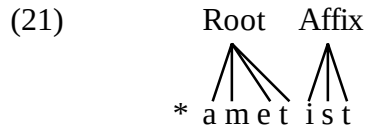
In this form, there is no output segment affiliated to the affix. This restriction can be formulated as a requirement that an input affix must have at least one phonological exponent in the output. The plausibility of this constraint is found in other constraints that have been proposed elsewhere such as MORPHEAL (mentioned above).

A similar restriction can be stated for the coalesced form, as shown by the ill-formed output:

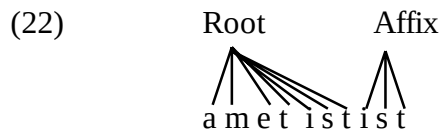
- (20) Root Affix
- 

The restriction can be stated as “An affix must have an output exponent that is unique to it”. The plausibility of these restrictions is supported by the fact that roots have a very similar requirement, as demonstrated above.

When it comes to Root-deletion, though, it is difficult to formulate an adequate restriction:



The form of the affix in this ill-formed output is identical to that in a well-formed one:



The same argument as used in the minimum-size requirement can be employed here: if the restriction on this type of haplology is an output-oriented size requirement on the affix, Root-Deletion presents a conundrum since the affix has the same form in both the ill- and well-formed outputs. As above, this eliminates the Root-deletion approach as a plausible solution to this problem.

So, the minimal-size restriction on roots eliminated the Affix-deletion approach as viable, while the size restriction on affixes gave evidence against Root-deletion. This leaves coalescence as offering the only plausible account of size requirements on French *-iste* haplology.

In conclusion, evidence from Japanese and French supports haplology as coalescence. This raises a significant issue from a theoretical point of view: if haplology is coalescence, then an adequate theory must not only permit haplology as coalescence but be unable to produce haplology as deletion. This issue is addressed in the next section.

4 What Triggers Haplology?

It was proposed in §2 that any markedness constraint is able to trigger haplology. This proposal is a significant departure from previous work, where it is assumed that there is some OCP-like constraint that specifically bans adjacent identical strings (Menn & MacWhinney 1984, Golston 1995, Plag 1998, Yip 1998, forthcoming). The aim of this section is to examine the virtues of the present proposals, and argue against the alternatives.

One virtue of the present approach is its theoretical economy: no new constraints are needed to deal account for haplology. The faithfulness constraints used – MAX, UNIFORMITY, IDENT – have been shown to have many applications elsewhere (McCarthy

& Prince 1995, 1997 and references cited therein), and the trigger of haplology can be any markedness constraint – a point discussed in detail in §4.3.

A more empirically significant aspect of the present approach is that using a markedness constraint to trigger haplology instead of an OCP-like one cannot result in haplology as deletion. This is argued to be the case in the following section. In fact, the existence of an OCP-like constraint that bans adjacent identical strings is explicitly denied in §4.2. The nature of the triggering constraint is examined in §4.3.

4.1 *Haplology is not Deletion*

If haplology is coalescence and not deletion, an adequate theory must be able to produce the former but not the latter. In other words, it is not enough to show that one's theory can result in haplology as coalescence – it must also be unable to produce haplology as deletion. The aim of this section is to show that a theory of haplology that employs a markedness constraint as the trigger of haplology can only result in coalescence. Again, *STRUC will be used to represent markedness constraints. This is only for the sake of concreteness: the results of this section are the same no matter what markedness constraint is used (see §4.3).

Half of the aim of this section has already been achieved: it was shown in §2 that *STRUC can be used to trigger haplology as coalescence. It remains to show that it cannot cause haplology as deletion. To do this, let us proceed *reductio ad absurdum* and assume that *STRUC can be used to motivate haplology as deletion.

Since haplology is a morpheme-specific process there must be a separate version of MAX for every morpheme; for a haplologizing morpheme M, then, there is a constraint MAX-M.¹¹

In order for deletion to occur, the trigger of haplology (*STRUC in this case) must outrank MAX-M. If this were not so, preservation of underlying segments (due to MAX-M) would take precedence over minimisation of structure (due to *STRUC), and deletion would not occur. This was shown in §2 – if MAX outranks the triggering constraint, coalescence occurs.

However, if *STRUC outranked MAX-M, the triggering environment for haplology would be lost: M would delete in all contexts, not just next to an adjacent identical string. This is illustrated in the following tableau. Again, this presents the case of Arabic haplology with the leftmost morpheme /t₁a₂/ as the haplologizing morpheme and the constraint MAX-*ta* which refers to it. The rightmost morpheme /t₃a₄/ has a MAX-M constraint that is ranked above *STRUC (i.e. it is non-haplologizing), so it cannot be deleted (hence no candidates in which it is deleted are presented):

¹¹ The morpheme-specific nature of haplology has been discussed by Stemberger (1981). If there are no morpheme-specific MAX constraints but just one MAX for all morphemes, deletion would occur in every morpheme, not just the haplologizing one. This is illustrated in tableau (4) above.

(23)

❶ /t ₁ a ₂ / + /t ₃ a ₄ /	*STRUC	MAX- <i>ta</i>
t ₁ a ₂ t ₃ a ₄	x x!	
☞ t ₃ a ₄		x
❷ /t ₁ a ₂ / + /d ₃ i ₄ /		
t ₁ a ₂ d ₃ i ₄	x x!	
☞ d ₃ i ₄		x!

In ❶, *ta* deletes when adjacent to an identical string. However, it also deletes when next to a non-identical string such as *di* in ❷. This situation cannot be remedied by permuting the ranking of other constraints. In particular, ranking IDENT-F above *STRUC has no effect since IDENT-F only requires *correspondents* to have identical features and there are no relevant correspondents in the output form: if an input *x* segment has no correspondent in the output, IDENT is not violated if *x*'s features do not appear (for related discussion of this point see §5.1).

In summary, assuming that *STRUC can motivate haplology as deletion leads to a contradiction: in order for deletion to occur *STRUC must outrank MAX, but in order for haplology to occur, MAX must outrank *STRUC. Of course, this result generalises to whatever constraint is used as the trigger (see §4.3).

This result is achieved because of the way identity between the haplogizing affix and its target is enforced: there is no direct comparison of identity between the haplogizing affix and its target by the triggering constraint. Instead, the comparison of featural identity of the affix and its target is undertaken by IDENT-F. However, IDENT-F only comes into play when there is coalescence; when there is deletion, IDENT-F is irrelevant, so identity between the haplogizing affix and its target are likewise irrelevant. This irrelevance of featural identity under deletion is what results in indiscriminate deletion in every environment. In short, the division of labour employed in the present approach – with the identity requirement of haplology the responsibility of IDENT-F and the triggering the responsibility of the markedness constraint – precludes haplology as deletion.

The argument presented in this section is only true if the triggering constraint does not directly compare the featural identity of the haplogizing affix and its target. Specifically, if haplology is triggered by a constraint that bans adjacent identical strings, haplology as deletion can result. This is demonstrated in the next section.

4.1.1 The OCP and Deletion

The main alternative to the present proposal is to employ a constraint that directly bans adjacent identical strings. This approach has been implemented by a number of authors in various ways (Golston 1995, Russell 1997, Plag 1998, Yip 1998, forthcoming), and is seen as an extension of the OCP (Leben 1973, McCarthy 1986). This constraint will be termed the ‘generalised OCP’ here to differentiate it from the traditional OCP. One of the problems with such a proposal is that the generalised OCP allows haplology as deletion.

This is illustrated in the following tableaux with the Arabic prefixes *ta* {fem.sg.} and *ta* {verbal prefix}. OCP(*ta*) bans adjacent sequences of /*ta*/, and MAX-*ta* requires the contents of the feminine singular morpheme *ta* – represented as /*t*₁*a*₂/ – to be realised. All other MAX-M constraints are high-ranked, so nothing but /*t*₁*a*₂/ can be deleted.

(24) OCP with deletion:

❶ / <i>t</i> ₁ <i>a</i> ₂ / + / <i>t</i> ₃ <i>a</i> ₄ /	OCP(<i>ta</i>)	UNIFORMITY	MAX- <i>ta</i>
(a) <i>t</i> ₁ <i>a</i> ₂ <i>t</i> ₃ <i>a</i> ₄	x!		
☞ (b) <i>t</i> ₃ <i>a</i> ₄			x
(c) <i>t</i> _{1,3} <i>a</i> _{2,4}		x x!	
❷ / <i>t</i> ₁ <i>a</i> ₂ / + / <i>d</i> ₃ <i>i</i> ₄ /			
☞ (a) <i>t</i> ₁ <i>a</i> ₂ <i>d</i> ₃ <i>i</i> ₄			
(b) <i>d</i> ₃ <i>i</i> ₄			x!
(c) <i>t</i> _{1,3} <i>a</i> _{2,4}		x x!	

This tableau shows that the generalised OCP can produce a deletion version of haplology. This is achieved by ranking the generalised OCP and UNIFORMITY above MAX. In ❶, the fully realised candidate (a) fatally violates the generalised OCP, leaving the coalesced form (c) and the deletion form (b). The deletion form is chosen since it does not violate UNIFORMITY.

In comparison, ❷ shows that deletion does not take place with non-identical strings. This is due to the fact that the fully realised candidate (a) does not violate the OCP. Since (a) does not violate any other constraint, it is the most optimal form.

The following tableau shows that the OCP can also be used to motivate haplology as coalescence:

(25) OCP with coalescence:

❶ / <i>t</i> ₁ <i>a</i> ₂ / + / <i>t</i> ₃ <i>a</i> ₄ /	OCP(<i>ta</i>)	MAX- <i>ta</i>	UNIFORMITY
<i>t</i> ₁ <i>a</i> ₂ <i>t</i> ₃ <i>a</i> ₄	x!		
<i>t</i> ₃ <i>a</i> ₄		x!	
☞ <i>t</i> _{1,3} <i>a</i> _{2,4}			x x
❷ / <i>t</i> ₁ <i>a</i> ₂ / + / <i>d</i> ₃ <i>i</i> ₄ /			
☞ <i>t</i> ₁ <i>a</i> ₂ <i>d</i> ₃ <i>i</i> ₄			
<i>d</i> ₃ <i>i</i> ₄		x!	
<i>t</i> _{1,3} <i>a</i> _{2,4}			x x!

The difference between this tableau and the preceding one is that MAX outranks UNIFORMITY. As shown, this produces haplology as coalescence.

So, an OCP-like constraint can produce both haplology as deletion and as coalescence. The reason for this has to do with identity. Haplology has two aspects: (1) it is an attempt to minimise structure (or more generally to avoid constraint violation) and (2) it will only occur if all underlying featural specifications are retained in the output form

(the identity requirement). In the approach advocated in this paper, the identity requirement is actuated by IDENT-F, while the structure-minimisation part is due to the triggering constraint. In comparison, the OCP approach amalgamates both of these aspects into one constraint: the generalised OCP requires minimisation of structure only if there is identity. It is the amalgamation of these two aspects into one constraint that allows haplology as deletion.

Because of this, the claim in this paper is that a constraint that bans adjacent identical strings is undesirable and unnecessary. There are further reasons for denying that such a constraint exists in Universal Grammar. These are discussed in the next section.

4.2 Against the OCP

Using a generalised version of the OCP has been a popular way to explain haplology. One implementation of this idea is Plag (1998) and Yip's (1998, forthcoming) version of the OCP, which bans adjacent identical constituents. Yip argues that these elements can be morphological and phonological (e.g. affix)¹² and Plag that they can only be phonological (e.g. onset, nucleus).¹³ For example, OCP(affix) bans adjacent affixes with identical phonological content.

One difficulty with both these approaches is the assumption that the haplogizing affix and its target are always identical in terms of some constituency. For example, OCP(affix) bans adjacent identical affixes with the same phonological content. This comes up against difficulties with cases where affixes haplogize with stem material (see §5.4.1). For example, the Japanese Classical Predicative *-si* haplogizes, so presumably there is a constraint of the OCP(affix) variety – OCP(affix-*si*), banning adjacent identical instances of an affix *-si*. However, this approach incorrectly predicts that there should be no haplology in the case of *kanasi* 'sad' + *si*. This is because the non-haplogized candidate [kanasisi] does not violate OCP(affix-*si*). In order to violate OCP(affix-*si*) there must be two adjacent identical *affixes* containing /si/; this is not found in [kanasisi] since [si] is part of a root, not an affix. This problem arises in all cases of affixal haplology with root material.

The same issue arises for phonological constituents. For example, Plag argues OCP(onset) bans identical onsets in adjacent syllables: i.e. **si*sa. The other constraints Plag proposes are OCP(nucleus) which bans identical nuclei in adjacent syllables, and OCP(onset, coda) which bans an identical onset and coda in the same syllable (i.e. *[C_iVC_i]_σ).

¹² Yip (1998) and Brentari (1998) suggest that a more general constraint – *REPEAT – may subsume the OCP's role in this area, and perhaps generally. I believe that the same arguments against Yip's OCP presented here apply to *REPEAT. Apart from this, Yip's proposal shares some relation to the present one in that it employs a constraint very much like UNIFORMITY (MORPHDIS). The reader is referred to Yip's work for further discussion.

¹³ Apart from using the OCP as the trigger of haplology, Yip's is similar to the present approach in several respects: Yip's approach uses simultaneous realisation which is somewhat akin to coalescence – see §6 for discussion on this point. The reader is referred to Yip's work for further details.

The difficulty with this approach is that in many cases the target and haplologizing element do not form coherent phonological constituents. This is found in French, where *-iste* /ist/ haplologizes with roots ending in *-is* (§3.2). For example, *Baudis* + *iste* forms [bo.dist], not *[bo.di.sist]. But which OCP constraint does the non-haplologized *[bo.di.sist] violate? It does not violate OCP(onset) since no two onsets are alike, nor OCP(onset,coda), since the onset [s] of the final syllable and its coda [st] differ. This leaves OCP(nucleus) alone, which this form does violate since the final syllable's nucleus and the one preceding it are identical – both have [i]. However, if only OCP(nucleus) is relevant in this process, then the identity of the stem-final consonant should be irrelevant. This incorrectly predicts that *Lénine* /lenin/ + *iste* should form the haplologized [le.nist], not [le.ni.nist] since this latter form violates OCP(nucleus). The attested form, though, is [leninist] (Corbin & Plénat 1991:105).

Non-total haplology also presents a problem for the OCP. Non-total haplology occurs when only part of the affix coalesces. For example, French *-iste* haplologizes with stems ending in /i/ or /is/. Such a situation is impossible to describe with one OCP constraint. For example, if the constraint was OCP(*iste*) this should only ban sequences of [ist+ist]. To ban [i+ist] and [is+ist] another two OCP constraints are needed, each referring to *substrings* of the morpheme *-ist*: OCP([i]-*iste*), which bans adjacent [i]'s if one belongs to *iste*, and OCP([is]-*iste*), which bans adjacent [is] sequences as long as one belongs to *iste*. There are a number of similar examples:

- Spanish Plural: (i) *paraguas* + *es* → *paraguas umbrellas*,
(ii) *casa* + *es* → *casas houses*

This would require OCP([e]-*es*) and OCP([es]-*es*).

- Koine Greek *mega*: (i) *mega* + *garon* → *megaron*,
(ii) *mega* + *eθos* → *megeθos*

This would require OCP([ga]-*mega*) and OCP(V-*mega*)

- French *ité*: (i) /fɔʁtɥi/ *fortuit* + /ite/ *ité* → /fɔʁtɥite/
(ii) /ilisit/ *illicite* + /ite/ *ité* → /illisite/

This would require OCP([it]-*ité*) and OCP([i]-*ité*).

At the very least, the generalised OCP must be made more complex to account for these cases.

Another difficulty is that haplology does not always apply to strictly local strings. In Swedish, the suffix /ar/ haplologizes with the suffix /are/ [arə]: e.g. *dom* 'judge' + *are* [arə] {agentive} + *ar* → *domare*, **domarear*. The formulation of the OCP would have to be made more complex to deal with such cases since the requirement of adjacency is central to it. An account of this pattern using the present approach is given in §5.4.3.

The observations made in preceding paragraphs suggest that the implementation of the OCP approach to account for haplology is far from straightforward. While it is true that haplology can involve adjacent identical strings, not all cases of haplology conform to this: haplology can occur between non-adjacent strings, and many cases of haplology involves only partially identical strings. In comparison, the present approach can account

for both partial-identity haplology and non-adjacent haplology without introducing any new constraints. This is discussed in detail in §5.

One way to potentially avoid these difficulties is to deny that the OCP refers to constituents at all. Instead, it could simply refer to adjacent identical strings. This is initially appealing since a constraint that bans adjacent identical strings seems to be a more general version of the traditional OCP (Leben 1973, McCarthy 1986). However, while the original formulation of the OCP applies to adjacent identical *elements* on the same autosegmental tier; in haplology, it has to refer to adjacent identical *strings*. This latter sort of OCP will be termed the ‘generalised OCP’ below to differentiate it from the traditional sort.

Invoking the traditional OCP gives the generalised OCP a significant precedent. In fact, if the generalised OCP is the traditional OCP, the argument in this paper that the *STRUC approach is more economical loses its force. After all, if the generalised OCP is the traditional OCP (assuming that the traditional OCP is needed), there is no need to add a new constraint to the grammar to trigger haplology. This poses an even more significant problem: if the generalised OCP is the traditional OCP and does exist in the grammar, then haplology as deletion is possible and there must be two available strategies for haplology – the OCP approach and the present approach. Of course, this all depends on the generalised OCP being the same as the traditional OCP.

It is not. The traditional OCP can be defined as requiring that a relation of non-identity hold between adjacent entities. The key formal difference between the traditional OCP and its generalised version centres on the notion ‘entity’. In the traditional OCP, the entities are individual elements, making the OCP a first-order relation. In the generalised OCP, though, those entities are *sets* of elements, making the OCP a second-order relation. In this sense, then, the traditional and generalised OCPs are formally distinct – they are not the same constraint, and the existence of one does not necessitate the existence of the other. So, the generalised OCP is an addition to the grammar – it is distinct from the traditional OCP. This conclusion means that the present proposal is more desirable from the point of view of Occam’s razor since nothing needs to be added to the grammar. This result also means that the generalised OCP can be eliminated as a viable constraint, so eliminating the possibility that haplology is deletion.

So, an OCP that refers to constituents is not adequate to trigger haplology. The alternative – i.e. allowing the OCP to range over adjacent strings without regard to constituency – is also undesirable since it constitutes an addition to the grammar and cannot be derived from already constraints already known to exist. This leads to the conclusion that there is no such constraint. More generally, there is no constraint that directly compares the identity of two strings.

This claim may be too general, though. It not only bans OCP constraints on strings, but also the traditional OCP, which bans adjacent identical elements. If the traditional OCP is retained, though, haplology as deletion can take place in a limited fashion: it can motivate haplology as deletion when the haplogologizing morpheme is mono-segmental (e.g. Nisgha *t* – §5.4.2). This may suggest that the traditional OCP should also be dispensed with. Certainly, the validity of the OCP has recently been

questioned (e.g. Ito & Mester 1996, 1998, see also Keer 1999). In any case, even if the traditional OCP is retained, haplology as deletion is only possible with mono-segmental affixes; in all other cases, it must be coalescence.

4.3 *Identity of the Trigger*

One of the claims of this paper is that there is no constraint that is specifically designed to trigger haplology – in particular, there is no generalised OCP. Because there is no constraint that is specific to haplology, any constraint can in principle serve as a trigger. The aim of this section is to explore the consequences of this proposal.

While any constraint can in principle serve as the trigger of haplology, there is one (almost trivial) restriction: the constraint must be relevant. A constraint is relevant if it is violated more in a non-haplogized form than in its haplogized counterpart. For example, *STRUC is the ideal trigger; it will always be less violated in the haplogized form since that form always has less structure than its non-haplogized counterpart. Other constraints can also serve as the trigger of haplology, though. Brett Hyde (p.c.) has pointed out that most ALIGN constraints can also be used as a trigger.¹⁴ For example, ALIGN(σ , L, PrWd, L) requires the left edge of every syllable to be aligned with the left edge of a PrWd. This means that the more syllables a form has, the more it will violate this constraint. Since affixation often causes the addition of a syllable to the base form, a haplogized counterpart will violate ALIGN(σ , L, PrWd, L) less than the non-haplogized form. The only other caveat is that the triggering constraint cannot compare the identity of the haplogizing affix and its target. As shown in the preceding section, if a constraint does refer to identity there are undesirable effects. In other words, a generalised OCP cannot trigger haplology. No other markedness constraint (that I am aware of) has been proposed that refers to identity in this way, so all others are potential triggers of haplology.

One concern that this proposal raises is that of ‘delicacy’ (Cohn & McCarthy 1994): one would expect that being able to use any markedness constraint would predict a large variety of different types of haplology, each differing in some minute way. If the differences are too minute, this raises the danger of predicting unattested processes. In haplology, the danger has to do with the triggering environment. One would expect that the constraint *labial, for example, would trigger haplology in quite a different environment than ALIGN(σ , L, PrWd, L).

It is somewhat surprising, then, that the choice of triggering constraint has hardly any effect on where haplology applies. So far, *STRUC has been shown to produce haplology in the right environment: i.e. when the haplogizing affix is identical to an adjacent string. Most other markedness constraints have the same result. For example, an anti-feature constraint such as *labial causes haplology to apply only between identical strings. This is shown in the following tableau with *labial taking the place of *STRUC. The haplogizing affix in this case is /b₃a₄/:

¹⁴ That ALIGN constraints can be used to minimize structure has been demonstrated and discussed extensively in Spaelti (1997).

(26)

① /b ₁ a ₂ / + /b ₃ a ₄ /	MAX	IDENT-F	*labial	UNIFORMITY
(a) b ₁ a ₂ b ₃ a ₄			x x!	
(b) b ₁ a ₂	x x!		x	
(c) b _{1,3} a _{2,4}			x	x x
② /b ₁ i ₂ / + /b ₃ a ₄ /				
(a) b ₁ i ₂ b ₃ a ₄			x x	
(b) b ₁ a ₂	x x!		x	
(c) b _{1,3} a _{2,4}		x!	x	x x

In ①, *labial correctly triggers haplology with identical strings. In comparison, there is no coalescence with non-identical strings in ②. The same results are obtained with all *F (F is a feature) constraints.¹⁵

This result is obtained because of the division of labour employed in the present approach: while markedness constraints provide the impetus for preferring the coalesced candidate over all others, the environment in which this can be actualised is determined by the faithfulness constraints – in particular, IDENT-F. IDENT-F requires featural identity, and so effectively prevents non-identical strings from coalescing (see §5.1 for further discussion of IDENT-F's effect).

Certainly, some markedness constraints do have an overt effect on their environment. This is true of some prosodic constraints. For example, a metrical constraint such as LAPSE will only motivate haplology when the non-coalesced candidate has adjacent unstressed syllables (hence, haplology only occurs when the two strings are identical and the alternative is to have adjacent unstressed syllables). The reason for this is that IDENT does not regulate metrical structure (since metrical structure is not present in the input), so cannot control this aspect of the environment. This is not an undesirable result, though: Plag (1998) discusses a number of cases of haplology which can be analysed as being triggered by constraints on metrical structure and syllabic form (esp. English *-ize* and German noun-forming *-er*).

In summary, the fact that the trigger of haplology can be any markedness constraint does not predict a vast number of minutely different types of haplology. This is due to the fact that the environment for triggering haplology is largely under the control of the faithfulness constraint IDENT-F. Since IDENT-F permits haplology only under identity and outranks the triggering constraint, there is little room for variation in the triggering environment for haplology.

¹⁵ With *F constraints as triggers for haplology there is one proviso: the haplologizing affix must violate *F. For example, *coronal cannot be used to trigger haplology of the affix /ba/ since /ba/ does not contain a [coronal] feature. It is not enough for the *target alone* to violate the *F constraint: if the target violated *F but the haplologizing affix did not they cannot be featurally identical and so cannot coalesce (because of IDENT-F).

5 Typology

The purpose of this section is to show that a typology of haplological processes results by varying the ranking of other constraints with respect to the Basic Ranking $\| \text{MAX} \gg \text{C} \gg \text{UNIFORMITY} \|$ established in §2. These other constraints are of two main types: faithfulness and markedness. Faithfulness constraints regulate correspondence relations, while markedness constraints refer to the structure of the output form. The interaction of faithfulness constraints with the Basic Ranking is examined in §5.1-5.3. Of particular interest are the IDENT constraints, which require preservation of phonological features. Varying the ranking of these constraints determines how identical the affix must be to its target (§5.1). The effect of faithfulness constraints on dimensions other than the input-output one is also examined: it is demonstrated that haplology also applies in reduplication (§5.2). Other faithfulness constraints are also discussed, including those that preserve adjacency and precedence relations (§5.3).

The interaction of markedness constraints with the Basic Ranking is examined in §5.4. The markedness constraints that are of particular interest are those that regulate the position of morphemes. It is demonstrated that various rankings produce a range of results, accounting for the effect of morphological constituency on haplology.

Again, *STRUC will be used in this section as the triggering constraint. As discussed in the previous section, the choice of triggering constraint is largely irrelevant.

5.1 Identity

In the prototypical case of haplology, the strings that coalesce must be featurally identical. This was explained in §2 as the effect of IDENT-F, which requires featural identity between an input segment and its output correspondents. The definition of IDENT-F is repeated here for convenience:

- (27) IDENT-F If an input segment is αF then its output correspondent is αF .
 (i) F is a feature
 (ii) α is a featural specification (i.e. + or -)

IDENT-F is actually a family of constraints: there is an IDENT constraint for each feature (e.g. IDENT[coronal], IDENT[voice], etc.). For the sake of brevity, IDENT-F will be used below to refer to all IDENT constraints.

As shown in §2, to require complete featural identity between strings in haplology, IDENT-F must outrank the triggering constraint C. This ranking ensures that the preservation of underlying feature specifications outweigh the need to avoid violating C (i.e. to coalesce). This is illustrated in the tableau above with the Swedish plural suffix *-er*, which only haplologizes with completely identical strings. The first input form consists of the noun *kemiker* ‘chemist’ and the plural suffix *-er*. Due to haplology, these form *kemiker*, not **kemikerer* (Stemberger 1981:797). The second form, *rör* ‘choir’ + *er*, is given as a comparison; haplology does not take place here since *rör* does not end in an

-er sequence. Once again, *STRUC will be used as the triggering constraint, for the sake of concreteness.

(7) **Total Identity Haplology: IDENT » C**

①	/kemike ₁ r ₂ /+/e ₃ r ₄ /	MAX	IDENT-F	*STRUC	UNIFORMITY
	a. kemike ₁ r ₂ e ₃ r ₄			x x!	
	b. kemike ₁ r ₂	x x !			
	c. kemike ₃ r ₄	x x !			
☞	d. kemike _{1,3} r _{2,4}				x x
②	/rö ₁ r ₂ / + /e ₃ r ₄ /				
☞	a. rö _{1,3} r _{2,4}		x!		x x
	b. rö ₁ r ₂	x x!			
	c. re ₃ r ₄	x x!			
	d. rö ₁ r ₂ e ₃ r ₄			x x	

In ①, the fully realised candidate (a) fails because of its excessive amount of structure. Candidates (b) and (c) are examples of deletion: in (b) the affix's phonological material has not been realised, while in (c) the root's has been deleted; these are both ruled out by the high-ranking MAX. This leaves only the coalesced candidate – (d).

In comparison, the coalesced candidate (a) in ② is not the most harmonic. This is due to the fact that both underlying /ö/ and /e/ have the same output correspondent, but the features of *both* /ö/ and /e/ are not retained. More specifically, the [-round] specification of the underlying /e/ does not appear in the output, fatally violating IDENT-F.¹⁶ Again, the candidates with deletion – (b) and (c) – are both eliminated by MAX. This leaves the candidate with full realisation: (d). Although this candidate violates *STRUC more than any other form, this is irrelevant since all competing candidates have been ruled out by higher ranked constraints. Example ② illustrates the crucial ranking of IDENT-F over *STRUC. If the ranking was otherwise, the coalesced candidate (a) would be preferred over candidate (d). Hence, if a string only haplogizes with a featurally identical string, this is due to the ranking of IDENT-F over *STRUC.

In short, there is no need to trigger haplology by means of a constraint that directly bans identity between the haplogizing affix and its target (as does the generalised OCP). As noted in previous sections, the approach advocated here fragments the generalised OCP: while the generalised OCP both bans structure and requires identity, the present approach parcels this out to two different constraints – *STRUC bans structure and IDENT-F requires identity. This division of labour makes predictions about potential types of haplology. In particular, the status of IDENT-F as the identity-enforcing constraint allows the potential for variation in the exactness of identity required between the haplogizing affix and its target. This is the subject of the next section.

¹⁶ The candidate [re_{1,3}r_{2,4}] would fare equally badly: with this the [+round] feature of underlying /ö/ is not present. A form with only a coalesced [r] – i.e. [rö₁r_{2,4}e₃] – fails for another reason: it does not preserve underlying precedence relations since r₄ follows e₃ in the input, but precedes it in the output. Preservation of precedence relations are discussed in §5.3.

(28)

Identical Haplology:
IDENT-F » C

5.1.1 Partial-Identity Haplology

Total-identity haplology results if every IDENT constraint outranks the triggering constraint. However, since constraints are freely rankable in Optimality Theory, there should be cases where the ranking is reversed with the triggering constraint outranking IDENT constraints. Such a situation is called ‘partial-identity haplology’, and is the subject of this section.¹⁷

In the prototypical case, the haplogizing affix and its target (the string it haplogizes with) are featurally identical. However, there are a number of cases where partial identity suffices. A few of these are listed below (others will be mentioned in later sections):

- (29)
- Japanese Classical Predicative *-si* [ʃi]: haplogizes with both [ʃi] and [ʒi].
e.g. /imizi/ *extreme* + /si/ → [imizi], *[imiziʃi] (Lawrence 1997)

 - Nisgha 3rd person singular *t* [t]: with any voiceless coronal ([s], [t], or [ʈ]).
e.g. /luutk'almit/ *dies in the fire* + /t/ → [luutk'almit], *[luutk'almitʈ]
/naks/ *marry* + /t/ → [naks], *[nakst] (Russell 1995)¹⁸

 - French Noun forming *-iste* /ist/: haplogizes with: /is/ and /iz/
e.g. /analiz/ *analyse* + /ist/ → [analist], *[analizist]
(Corbin & Plénat 1992)

Informally speaking, some features simply do not matter in partial-identity haplology. For Japanese and French, the feature [voice] is irrelevant in computing the identity of adjacent strings, while for Nisgha only [coronal] and [voice] (and perhaps [consonantal]) matter – all others are irrelevant.

To capture this is straightforward in the present proposal. To say that certain features ‘do not matter’ means that there is no need to preserve them. Since the preservation of featural identity is regulated by IDENT-F, this amounts to ranking IDENT-F low in the constraint hierarchy, where F is the relevant feature.

This is exemplified by Japanese *-si* [ʃi]. In this case, the voicing of the consonant is irrelevant in determining whether haplology takes place. This means that IDENT[voice] must be ranked low. In fact, the following tableau shows that it must be ranked below the triggering constraint – *STRUC in this case. In the following tableau IDENT-F' stands for the set of IDENT constraints that refer to every feature except [voice]:

¹⁷ In the most extreme case, *STRUC would outrank all IDENT-F constraints. This means that an affix would coalesce in every environment, regardless of identity. This means that the affix would never have any independent realisation, effectively making it a zero morph.

¹⁸ See Russell (1995) for arguments that this is not simply due to an OCP on adjacent coronal consonants.

(30) **Japanese -si Partial Haplology**

/imiz ₁ i ₂ / + /s ₃ i ₄ /	MAX	IDENT-F'	*STRUC	IDENT[voice]	UNIFORMITY
(a) imiz ₁ i ₂	x x!				
(b) imiz ₁ i ₂ j ₃ i ₄			x x!		
(c) imiz _{1,3} i _{2,4}				x	x x

The candidate with deletion – (a) – crucially violates MAX. This leaves candidates (b) and (c). Of the two, candidate (c) is the most harmonic since it has less structure. The fact that candidate (c) does not preserve /s/'s underlying [-voice] specification is irrelevant, due to the low ranking of IDENT[voice].

In short, the tableau shows that it is more harmonic to haplogize and be unfaithful to an underlying [voice] specification in Japanese than to violate the triggering constraint C.

(31)

Partial-Identity Haplology: If feature <i>f</i> is irrelevant, then $\ C \gg \text{IDENT-}f\ $
--

5.1.2 Root-Faithfulness

Cases of partial-identity haplology all have one thing in common: an underlying feature does not appear in the output. For example, in the Japanese case, underlying [-voice] does not appear while for French it is underlying [+voice]. This raises the question of prediction: which feature is preserved in partial haplology?

I propose that it is the root's feature that is preserved.¹⁹ This is due to root-specific faithfulness constraints of the type IDENT_{ROOT}F (McCarthy & Prince 1995, Urbanczyk 1996, Alderete 1997, Beckman 1998):²⁰

- (32) IDENT_{ROOT}F: If segment *x* is αF and a member of a root then x_C is αF .
 (i) x_C is the correspondent of *x*.²¹

¹⁹ Stemberger (1981:792) makes a stronger claim: "it is always the affix, the outermost Z, that is absent." Counter-evidence against this claim is found in Nisgha, where *t* always haplogizes with an adjacent morpheme in the same word whether it is preceded or followed by that morpheme (Russell 1995). Because of this, I take the weaker view that it is always the root's features that are retained. This is weaker because this says nothing about which feature will be preserved when two affixes coalesce.

²⁰ Affix faithfulness constraints may also exist, in which case they must always be ranked below root faithfulness constraints. The alternative is to have a root faithfulness constraint, a general faithfulness constraint, and no affix faithfulness constraints. It makes no difference how these are ranked - the same result is obtained.

²¹ The proposals in this paper – that an output segment can be specified as both root and affix – allow another possible root-faithfulness constraint: IDENT_{OUTPUT-ROOT}[F]: "If *x* is αF , then x_C is αF iff x_C is a member of a root." This applies not only to underlying root elements, but to affix segments that have haplogized with root material. The effects of such a constraint will not be explored here.

For example, in the Japanese case of $[imizi] + [i] \rightarrow [imizi]$, the root's [+voice] feature is preserved over the affix's [-voice] specification due to the constraint $IDENT_{ROOT}[voice]$.

(33) **Japanese Root-Faithfulness**

/imiz ₁ i ₂ / + /s ₃ i ₄ /	IDENT- _{ROOT} [voice]	IDENT-[voice]
$\text{imi}z_{1,3}i_{2,4}$		x
$\text{imi}s_{1,3}i_{2,4}$	x!	x

(34)

In Partial-Identity Haplology, the Root's feature will be preserved in deference to $IDENT_{ROOT}F$

However, this does not predict that the root's underlying feature will *always* be preserved. In some cases, a phonological constraint outranks $IDENT_{ROOT}F$, forcing unfaithfulness to the root. For example, in French it seems that faithfulness to the affix's feature outweighs faithfulness to the root: *analyze* /analiz/ + /ist/ $\rightarrow$ [analist], *[analizt]. Here, the [+voice] specification of the root does not appear in the output. However, this does not necessarily mean that the [-voice] specification of the affix has specifically been preserved. The fact that the [-voice] specification emerges receives a phonological explanation: [zt] codas are not permitted in French, due to voicing assimilation. This constraint, which I will term $*zt]_{\sigma}$ for convenience, outranks $IDENT_{ROOT}[voice]$:²²

(35) **French Phono-Constraint » Root-Faithfulness**

/anali ₁ z ₂ / + /i ₃ s ₄ t/	$*zt]_{\sigma}$	IDENT- _{ROOT} [voice]	IDENT-[voice]
$\text{anali}_{1,3}z_{2,4}t$	x!		x
$\text{anali}_{1,3}s_{2,4}t$		x	x

(36)

If a root feature f is not preserved in partial haplology, there is some phonological constraint P that outranks $IDENT_{ROOT}f$.

Of course, this does not make any prediction about the preservation of features when two affixes haplologize. Which feature is preserved in such cases could be dependent on a variety of factors such as affix-specific faithfulness, other phonological processes, preservation of certain marked features or default to unmarked features. In other words, it is predicted that there will be no simple pattern in cases of affix-affix haplology.

5.2 Reduplicative Haplology

Haplology seems to be the opposite of reduplication: reduplication creates two adjacent identical strings while haplology eliminates them (Wurzel 1976, Dressler 1977). It might be somewhat surprising, then, that reduplicants can haplologize. It is argued that

²² As noted, $*zt$ is properly expressed as voicing assimilation, and so should properly be replaced by some constraint to that effect. It is not the present concern of this paper to do so, however, so I leave the exact form of this constraint up to the reader's personal preferences and imagination.

The Polynesian language Samoan has a foot-sized prefixal reduplicant. Some examples are given below, with the reduplicant underlined:

- [Mosel & Hovdhaugen 1992: 224-5]

.23

- fly* (frequentive)

All the exceptions have bases of the form $C_i V_k C_i V_k$.

This can be explained as a type of haplology of the reduplicant. Instead of two identical *input* strings having a single *output* correspondent, two identical strings in the *base* have just one in the *reduplicant*. More concretely, *lele* ‘fly’ consists of two [le] strings, which correspond to a single [le] in the reduplicant.

To explain this, the same ranking that was used for other cases of haplology can be employed. The major difference is that the correspondence constraints refer to the Base-Reduplicant dimension:

(39) Reduplicative Haplology in Samoan

RED + /p ₁ a ₂ p ₃ a ₄ /	MAXBR, IDENT _{BR} ^F	*STRUC	UNIFORMITY _{BR}
(a) p ₁ a ₂ p ₃ a ₄ p ₁ a ₂ p ₃ a ₄		x x!	
(b) p _{1,3} a _{2,4} :p ₁ a ₂ p ₃ a ₄			x x

MAXBR ensures that every element in the base has a correspondent in the reduplicant, while UNIFORMITY_{BR} prohibits a reduplicant segment from having two base correspondents. As shown here, the fully reduplicated form (a) *papapapa* crucially violates the triggering constraint *STRUC, leaving the coalesced reduplicant (b) as the winner.

²³ The fully reduplicated forms are produced in formal registers of Samoan. The data presented here is from my own fieldwork, conducted in 1996 and 1997. Exactly the same pattern has been reported in Boumaa Fijian (Dixon 1988:198) and Maori (Williams 1971:xxxiv).

There is one additional ingredient to this ranking: LINEARITY-BR must be ranked below *STRUC. LINEARITY-BR preserves the precedence relations of the base in the reduplicant. If this was not violable, haplology could not take place since [p₃] follows [a₂] in the base, but the order is reversed in the reduplicant of candidate (b).²⁴ Cases where LINEARITY is violated on the IO dimension are discussed in the next section.

(40)

<u>Reduplicative Haplology:</u> MAX-BR, IDENT_{BR}-F » C » UNIFORMITY_{BR}, LINEARITY_{BR}
--

While this ranking accounts for reduplicative haplology in outline, some other constraints are also needed to achieve the correct output in Samoan:

- That the reduplicant has a long vowel (i.e. [pa:], not *[pa]) is due to a constraint on the size of the reduplicant, which crucially outranks *STRUC (see McCarthy & Prince 1995:§4.3 for details).

- Coalescence of vowels without coalescence of consonants is prohibited:

e.g. pata → patapata, *pa_{1,2}tpa₁ta₂

This is due to a syllable wellformedness constraint prohibiting codas (NOCODA). This is ranked above *STRUC (and above every faithfulness constraint as well, since Samoan does not permit codas in any syllable).

- Coalescence of consonants without vowel coalescence is also prohibited:

e.g. papi → papipapi, *p_{1,2}aip₁ap₂i

There are few formal differences between the form *[p_{1,3}a₂i₄p₁a₂p₃i₄] and [p_{1,3}a_{2,4}:p₁a₂p₃a₄]. Both violate LINEARITY since the order of [a₂] and [p₃] in the base is reversed in the reduplicant and both admit UNIFORMITY violations. The main point in which they differ is in *adjacency* relations. In the reduplicant [p_{1,3}a_{2,4}] of [p₁a₂p₃a₄], all *adjacency* relations of the base are preserved: p₁ is adjacent to a₂, a₂ is adjacent to p₃, and p₃ is adjacent to a₄. This can be compared to the ill-formed reduplicant [p_{1,3}a₂i₄] of the base [p₁a₂p₃i₄]: in this base [p₃] and [i₄] are adjacent, whereas they are not in the reduplicant. So, a constraint on retaining adjacency relations must outrank *STRUC.

This results of this section are significant because they show that the Basic Ranking can apply on more than one faithfulness dimension. This generality lends support to the current approach.²⁵

5.3 Other Faithfulness Constraints

While limitations on space preclude a more in-depth examination of the effect of other faithfulness constraints on haplology, a couple more will be discussed briefly in this section.

²⁴ In cases of haplology discussed in previous sections, LINEARITY was *not* violated since precedence relations do not hold between morphemes underlyingly.

²⁵ As a final note, Samoan is not an isolated case: in Nakanai (Johnston 1980) a foot-sized reduplicant also fails to fully copy bases of the form C_iV_kC_iV_k: e.g. lolo → lololo *hearing*, *lolololo, bebe → bebebe *butterflies*, *bebebebe.

Dressler (1977) observes that the German suffix *-en* haplogizes with roots ending in *-en*. However, it also haplogizes with roots ending in *-ern*: e.g. *Eisern* ‘iron’ + ‘en’ → *eisern*, **eisenern*, **eisen* ‘made of iron’. This haplology is surprising since the two strings are not identical: one contains an *r*. In descriptive terms, the suffix *-en* has split in half in order to coalesce. This means that constraints that require retention of underlying adjacency (i.e. CONTIGUITY) must be ranked below **STRUC*:

(41)

	$e_1e_2r_2n_3 + e_4n_5$	<i>*STRUC</i>	CONTIGUITY
☞	(a) $e_1e_2r_2n_3e_4n_5$	x x!	
	(b) $e_1e_{1,4}r_2n_{3,5}$		x

Candidate (a) has more structure than candidate (b), and so is not as harmonic. Candidate (b), on the other hand, violates CONTIGUITY since e_4 and n_5 are adjacent in the input, but this is not so in the output. This violation is not crucial though, since it is ranked below **STRUC*. In standard cases of haplology, where such splitting does not take place, CONTIGUITY is ranked above **STRUC*.

Another case involves the preservation of underlying precedence relations. Corbin & Plénat (1992:105) report the following patterns of haplology with the French suffixes *-iste* /ist/ and *-ique* /ik/:

- (42) Boulganine + iste → *boulganiste*, **boulganiniste*
 oasis + ique → *oasique*, **oasisique*
 stalactite + ique → *stalactique*, **stalactitique*
 Thucidide + iste → *thucidiste*, **thucididiste*.

The common characteristic of the roots is that they all end in a C_1iC_1 sequence. The explanation adopted here (akin to Corbin & Plénat’s autosegmental approach) is that the underlyingly identical consonants coalesce. This allows the suffix to haplogize with the root-final /i/, thereby reducing **STRUC* violations.

Crucial to this analysis is the fact that underlying precedence relations are not maintained: in the input, the root-final C follows /i/, but in the output it precedes it. This means that the faithfulness constraint that requires input precedence relations to be maintained (LINEARITY) must be violated – i.e. ranked below **STRUC*:

(43)

	$oas_1i_2s_3 + i_4que$	<i>*STRUC</i>	LINEARITY
☞	(a) $oas_1i_2s_3i_4que$	x x!	
	(b) $oas_{1,3}i_{2,4}que$		x

The non-coalesced candidate (a) is eliminated due to its excessive structure. This leaves the coalesced form (b). Here, input s_1 and s_3 have coalesced, as have input i_2 and i_4 . The coalescence of the *s*’s violates LINEARITY because i_2 precedes s_3 in the input, but not

in the output. Other examples of haplology where LINEARITY is ranked low include the English suffix *-ize*, discussed in Plag (1998).

5.4 Markedness and Position

The markedness constraints that have the most visible effect on haplology are those that regulate the position of affixes. This section will examine these constraints and their interaction with the Basic Ranking.

In almost all cases of haplology, an affix will only haplogize with material at a stem-edge. Specifically, a suffix will only haplogize with stem-end material, and a prefix will only haplogize with stem-initial material. The restriction to stem-edges will be shown to result from ALIGN constraints (McCarthy & Prince 1993a). Different rankings of these constraints will be shown to produce a variety of effects. Apart from accounting for standard stem-edge haplology (§5.2.1), non-stem-edge haplology (§5.2.3-4) and coextensiveness (§5.2.2) will be discussed.

5.4.1 Stem-Edge Haplology

In the theory of morphological concatenation proposed in McCarthy & Prince (1993a), the direction of attachment of a morpheme is regulated by an affix-specific ALIGN constraint. ALIGN constraints have the following form:

- (44) $\text{ALIGN}(\alpha, \text{Edge}_1, \beta, \text{Edge}_2)$: For all α there is some β s.t. Edge_1 of α and Edge_2 of β coincide.
 (i) Edges are ‘Left’ or ‘Right’.

Constraints on the direction of attachment for affixes are of the sort $\text{ALIGN}(\text{affix}, \text{Edge}, \text{MCat}, \text{Edge})$ where MCat is a morphological category. As an example, for the Japanese suffix *-si* there is a constraint $\text{ALIGN}(si, R, \text{Stem}, R)$ requiring the right edge of *si* to be aligned with the right edge of a stem. This is only satisfied if *si* appears after the root, as in $[[\text{aka}]\text{si}]$, where $[]$ are stem boundaries. If *si* appeared before the root, its right edge would not be aligned with a right stem-edge: $*[[\text{si}]\text{aka}]$.

The requirement for *si* to appear at the right stem-edge can be maintained in stem-edge haplology. For example, in the haplogized form $[[\text{kana}\text{si}]]$, from *kanasi* + *si*, the affix’s phonological material is still at the right-edge of a stem even though it has coalesced. This can be contrasted with a case of root-internal coalescence such as $*[[\text{siro}]]$, from *siro* ‘white’ + *si*. In this form, the affix *si* has coalesced with root segments but it does not appear at the right edge of a stem, fatally violating $\text{ALIGN}(si, R, \text{Stem}, R)$.²⁶

²⁶ LINEARITY is not relevant here as I assume that morphemes are unordered in the input. Even if it was assumed that morphemes were so ordered, LINEARITY could not explain this case since *all* cases of haplology would have to violate it, not just non-local cases. Hence, stem-internal haplology would still be indistinguishable from the stem-edge variety.

This requirement that the same-edge alignment constraint $\text{ALIGN}(\text{M}, \text{Edge}_i, \text{Stem}, \text{Edge}_i)$ be unviolated effectively limits haplology to take place at the edge of stems.

(45)

Stem-Edge Haplology (first formulation):

$\text{ALIGN}(\text{same-edge}) \gg \mathbb{C}$

In the summary above, $\text{ALIGN}(\text{same-edge})$ is an abbreviation for $\text{ALIGN}(\text{M}, \text{Edge}_i, \text{Stem}, \text{Edge}_i)$. In following sections, different-edge alignment – i.e. $\text{ALIGN}(\text{M}, \text{Edge}_k, \text{Stem}, \text{Edge}_i)$ where $i \neq k$ – will be abbreviated as $\text{ALIGN}(\text{different-edge})$.

5.4.2 Coextensive Haplology

In the cases discussed so far, the haplogizing affixes have coalesced with any (near-)identical string, whether that string constituted an entire morpheme or not. For example, French *-iste* haplogizes with stems ending in [is], and Japanese *-si* haplogizes with stems ending in [ʃi]. However, some morphemes will only haplogize if their target constitutes an entire morpheme. This is dubbed ‘coextensive’ haplology here. Several cases are listed below (see Menn & MacWhinney 1984: 522-523 for other examples):

- Arabic *ta* {verbal prefix}: only haplogizes before the feminine singular marker *ta* (Wright 1971: 65).
e.g. *ta + ta + kassaru* → *takassaru* *it(fem.sg.) breaks* (intransitive), **tatakassaru*
cf *ta + tabaʔa* → *tatabaʔa* ‘follow’, **tabaʔa*
- English possessive: haplogizes only with the plural (Stemberger 1981: 794-5, Russell 1997, Yip 1998).
e.g. *cat + plural + possessive* → *cats* [kæts], *[kætsəz]
cf *niece + possessive* → *niece’s* [nisəz], *[nis]
- Russian *-sk* ‘inhabitant of’: only haplogizes with the homophonous adjective-forming morpheme *-sk* (Aronoff 1976, Dressler 1977).
e.g. *Tom {Placename} + sk {adjective-forming} + sk + i* → *tomski*, **tomskski*
cf *Bask Basque + sk + i* → *baskski*, **baski*
- Classical Greek *e-* {past}: only haplogizes with the perfect *e-* (Stemberger 1981: 799).
e.g. *e + e + phthime:n* → *ephthime:n*, **e:phthime:n*
cf *e + ergon* → *e:rgon*

The constraints used so far cannot distinguish between coextensive and non-coextensive haplology. For example, the ALIGN constraint discussed in the previous section is of no use here since it is satisfied equally well if the coalesced material does not consist of an entire morpheme. However, ALIGN constraints do offer a way to explain coextensive haplology. If the stem edges are indicated in a coextensive form, it is noticeable that both edges of the haplogizing affix coincide with a stem-edge:

- (46) (a) Tom + sk + sk + i → [[[tom]sk]i]
 (b) Bask + sk + i → [[[bask]sk]i], *[[[bask]]i]

In the haplogologized form in (a), the left edge of the affix is adjacent to a right stem-edge. This can be compared with the ill-formed haplogologized form in (b), *[[[bask]]i]; here, the left edge of the haplogologized affix is not adjacent to any stem-edge.

This observation can be expressed as a constraint requiring the left edge of the suffix *sk* to align with the right edge of a stem. With this and the other ALIGN constraint outranking the triggering constraint $\mathbb{C}$ (*STRUC in this instance), coextensiveness results (see Russell 1997 for a similar analysis of the English possessive and plural):

(47)

① Tom + sk + <u>sk</u> + i	ALIGN(<i>sk</i> , L, Stem, R)	ALIGN(<i>sk</i> , R, Stem, R)	*STRUC
[[[[Tom]sk]sk]i]			x x!
[[[[Tom]sk]i]			
② Bask + sk + i			
[[[bask]sk]i]			x x
[[[bask]]i]	x x!		

As shown in the most harmonic form in ①, both edges of *sk* align with stem edges, so satisfying both ALIGN constraints. This is not the case in the failed candidate in ②, though. Here, the left edge of *sk* is not aligned with the right edge of any stem.

(48)

Coextensive Haplogy: ALIGN(different-edge), ALIGN(same-edge) » $\mathbb{C}$
--

Having introduced the different-edge alignment constraint ALIGN(M, E_i, Stem, E_k), the statement of stem-edge non-coextensive haplogy as presented in the preceding section must be revised. Since the same-edge alignment constraint dominates *STRUC in both coextensive and non-coextensive haplogy, the difference must lie in the ranking of the different-edge alignment constraint: in coextensive haplogy, this constraint must outrank *STRUC, while in non-coextensive haplogy the ranking is reversed. With *STRUC outranking the different-edge alignment constraint, there is no need for the internal edge of the haplogologizing affix to align with the edge of a stem, so permitting haplogy with root-internal material.

(49)

Non-Coextensive Stem-Edge Haplogy (final version): ALIGN(same-edge) » $\mathbb{C}$ » ALIGN(different edge)

The proposal in this section effectively means that every affix has two relevant ALIGN constraints – each referring to a different edge.²⁷ The introduction of the second

²⁷ This raises a potential situation where the relevant ALIGN constraints for an affix might be ALIGN(M, E_i, Stem, E_k) and ALIGN(M, E_i, Stem, E_i). As a more concrete example, let us suppose that *sk* had the constraints ALIGN(M, Right, Stem, Left) and ALIGN(M, Right, Stem, Right). This will not cause any difficulties in affix order, though, since the constraints are mutually conflicting. Since constraints are

ALIGN constraint – the one referring to opposite edges – has applications in other cases of haplology, as shown in the following section.

5.4.3 Stem-Internal Haplology

In the previous section it was shown that haplology is restricted to the ends of stems because of the ranking of the triggering constraint $\mathbb{C}$ between two ALIGN constraints. Since ranking is freely variable, this makes a number of predictions. In fact, with the constraints ALIGN(same-edge), ALIGN(different-edge), and $\mathbb{C}$ there are four rankings that are relevant to haplology. Two have already been investigated, and have been used to account for coextensive and non-coextensive stem-edge haplology. This section investigates one of the remaining rankings:

(50) ALIGN(different-edge) » $\mathbb{C}$ » ALIGN(same-edge)

This ranking is the reverse of the one for non-coextensive stem-edge haplology. It is noteworthy that since ALIGN(same-edge) is ranked below $\mathbb{C}$, the haplogizing affix does not need to coalesce with stem-edge material. However, since ALIGN(different-edge) is ranked above $\mathbb{C}$, the internal edge of the affix must always appear at the right edge of a stem if it is a prefix, and at the left edge of a stem if it is a suffix.

An example of this ranking is found in Swedish with the non-neuter plural *-ar* (Stemberger 1981:797-8). This haplogizes after the agentive morpheme *-are* [arə]:²⁸

(51) *dom* ‘judge’ + *are* {agentive} + *ar* → *domare*, **domarear*, **domarar*

The surprising fact here is that *ar* does not haplogize with a stem-final substring. Instead, it haplogizes with material *internal* to the stem. This fact means that ALIGN(*ar*, R, Stem, R) must be outranked by $\mathbb{C}$ – *STRUC in this case. If this was not so, the form *domarear* should be most harmonic.

However, *ar* cannot haplogize with any *ar* sequence in a stem. Specifically, it can only haplogize with an affix beginning with *ar* (i.e. the agentive *are*). This fact can be explained when the stem location of stem edges is taken into account. In the haplogized [[[dom]are]], where ar is the haplogized string, the left edge of the non-neuter plural *ar* is at the right edge of the stem containing *dom*. This accords with the constraint ALIGN(*ar*, L, Stem, R), which essentially requires *ar* to be a suffix. With this constraint ranked *above* *STRUC the correct results are obtained:

totally ranked, one of the two ALIGN constraints has to outrank the other. Which one prevails determines whether the morpheme is a prefix or a suffix.

²⁸ Haplology is optional with nouns ending in non-morphemic *-are* (e.g. *hammare* + *ar* → *hammare* or *hamrar*). However, it is questionable whether this is really haplology (see Stemberger 1981:798 for discussion).

(52)

❶ dom + are + ar	ALIGN(<i>ar</i> , L, Stem, R)	*STRUC	ALIGN(<i>ar</i> , R, Stem, R)
[[[dom]are]ar]		x x!	
[[[dom]are]]			x
❷ hamare + ar			
[[hamare]ar]		x x	
[[hamare]]	x!		x

In ❶, *domare* is the most harmonic candidate since the left edge of *ar* is aligned with the right edge of a stem and it has minimal structure. In ❷, however, the [are] sequence is part of a larger morpheme – *hamare*. Because of this, the haplogitized *hamare* is not preferred since *ar* has haplogitized with a substring internal to the stem, hence the left edge of *ar* does not appear adjacent to a right stem boundary. This crucially violates ALIGN(*ar*, L, Stem, R).²⁹

(53)

<u>Restricted Non-Edge Haplology:</u> ALIGN(different-edge) » C » ALIGN(same-edge)

5.4.4 Unrestricted Haplology

The free ranking of ALIGN constraints with respect to *STRUC also predicts another type of morpheme: one which can haploglize with any string in the stem, regardless of its location. This occurs if all ALIGN constraints are ranked below *STRUC: the desire to minimise structure will outweigh any need to keep affixes in their proper position.

There are very few such examples, and none are entirely convincing.³⁰ It is possible that this is simply an artefact of the limited data available on morphological haplology and that such cases do exist. After all, cases where affixes do appear internal to a stem – i.e. infixes – do exist. Unrestricted haplology would be the haploglizing analogue of infixes. On the other hand, if such affixes do not exist, the current approach overpredicts.³¹

²⁹ One potential objection to this proposal is that the final schwa in *are* [arə] is ‘transparent’ in some sense. However, there is no reason to think that it is epenthetic, and so does constitute part of the morpheme. It is difficult to see how the schwa can be ignored outright in this case.

³⁰ A possible case of this is found in Old Provençal (Anglade 1921: 269-270, Platt 1981). The first person singular suffix *-i* is optionally omitted with verbs of the *-ar* conjugation: *gir* + *i* → *giri* or *gir*, *tir* + *i* → *tiri* or *tir*, *vir* + *i* → *viri* or *vir*. Anglade (1921:270) notes that this was attested in the Toulous dialect in the middle of the 14th century. This could be seen as non-local haplology, but equally (and probably more likely) it could be seen as apocope, or the OCP constraint operating on the vowel tier. Anglade does not provide any further information.

³¹ It is possible that there is an entirely different constraint that bans non-local coalescence in general. A theory of coalescence that is based on proposals that are very similar to the present ones can be found in Keer (1999). Like the present approach, Keer’s system predicts non-local coalescence (when LINEARITY is ranked low) – a situation that does not seem to occur. I suspect that the resolution to Keer’s theory will also solve the problems identified here.

To conclude this section, the ranking of morpheme-specific ALIGN constraints provides an explanation for a variety of effects in haplology ranging from stem-edge haplology to coextensive haplology.

6 Alternative Theories

The thesis of this paper is that haplology is coalescence. However, a variety of other analyses have been presented: haplology has been argued to be (1) deletion (Jespersen 1954, Cardona 1968, and Harris 1980), (2) vacuous rule application (Stemberger 1981, Menn & MacWhinney 1984), and (3) simultaneous realisation (Stemberger 1981, Plénat 1991, Corbin & Plénat 1991, Lawrence 1997). In this section, each of these alternatives will be discussed in turn.

Of the variety of proposals regarding the nature of haplology, deletion can be rejected immediately; the cases discussed in §3 show that at least some instances of haplology are coalescence (see Stemberger 1981 for other arguments). This leaves vacuous rule application and deletion.

An alternative is vacuous rule application (Stemberger 1981, Menn & MacWhinney 1984). In vacuous rule application, affixation is seen as a ‘checking device’. For example, the phonological entry of the English possessive suffix is simply stated as “Stem must end in [s]”. When confronted with a stem that already ends in [s], such as a form with the plural, this requirement is already satisfied and the phonological structure of the stem does not need to be altered. Vacuous rule application has been implemented in Optimality Theory by the means of constraints (see esp. Russell 1995). For example, instead of the possessive suffix contributing phonological material to the input, it is seen as applying a constraint on the phonological form of the output. In the present paper, it has been assumed that affixes are not constraints – they are actual input elements. However, the conclusions made in this paper are equally consistent with an output-oriented model. In a sense, the output-oriented model also treats haplology as coalescence: in the constraint-based view of affixation, the [s] in the possessive plural of *cat* – i.e. [kæts] – is a realisation of *both* the possessive and the plural morphemes.

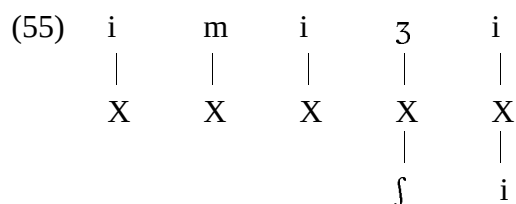
The theory of simultaneous realisation differs from the coalescence view. Stemberger (1981), Plénat (1991), Corbin & Plénat (1992), and Lawrence (1997) suggest that haplology is the association of segments of different morphemes to the same X-slots (or root nodes). This is possible since the featural material exists on different autosegmental planes. This is illustrated below with the Japanese morpheme *-si* and the root *kanasi* (Lawrence 1997):

(54)	k	a	n	a	ɲ	i
	X	X	X	X	X	X
					ɲ	i

As Lawrence points out, the fact that two X-slots have two sets of featural material each does not pose any interpretive difficulty since the material is identical. This explains why haplology occurs to identical strings – if two different sets of features were associated to the same timing slot this would create a fatal ambiguity in interpretation.³²

This proposal is close to the coalescence view in that segments (i.e. root nodes/X slots) simultaneously belong to two different morphemes in the output. However, the point of divergence is that in the view of simultaneous realisation a segment has two sets of features; in the coalescence view, a segment only has *one*.

An objection to simultaneous realisation is that not all haplology involves identical strings (§5.1). However, Lawrence (1997) counters this argument by claiming that (at least for Japanese *-si*) underspecification plays a role. In Japanese, *-si* can haplologize with [ʒi], represented in the following structure (Lawrence 1997:383):



At this point, it seems that interpretive chaos would arise since one X slot has conflicting [voice] specifications – [ʃ] is [-voice] while [ʒ] is [+voice]. However, Lawrence argues that this can be explained if /s/ is underspecified for [voice] – i.e. /s/ has no [voice] specification at all. This means that the X slot is unambiguously marked as [+voice] (also see de Haas 1988).

Lawrence's proposal makes one interesting prediction: in cases of non-identical haplology only the specified feature will be preserved. This makes a different prediction from the proposal made herein – that the root's feature will be preserved over that of the affix's. The point of divergence between Lawrence's and the present proposal would arise when the affix has a non-underspecified segment and the root has an underspecified one: Lawrence's approach predicts that the affix's segment would surface while the root's would be obscured, whereas the present approach predicts the opposite.

Of all the cases of haplology that I have examined, none provide the necessary conditions to decide between the two proposals. This is unsurprising. Affixes usually contain unmarked phonological material (Beckman 1998). Hence, if an affix haplologized with a root, Lawrence's proposal would predict that the root's feature would be maintained because they are more marked (hence overtly specified) than the affix's. The present proposal would predict the same since faithfulness to Root features outweighs faithfulness to affix features. Nevertheless, in all likelihood there is a case that can decide between these two proposals. Unfortunately, this must be left for further research.

³² Lieber (1987) proposes a principle that explicitly prohibits a segment from bearing different featural specifications at the same time.

Lawrence's approach does raise one issue, though: it seems to predict that there should be no cases of total identity haplology. For example, Arabic *ta* could coalesce with a morpheme *da*. Since /t/ is (presumably) unspecified for [voice], its simultaneous realisation with /d/ should not cause any interpretive clash. The fact that there are cases of total identity haplology suggest that this approach is too powerful.³³

In any case, there is no good evidence to suggest that the coalescence view is incorrect. In fact, it shares several features with the simultaneous realisation and vacuous rule application theories.

7 Conclusions

In this paper I have argued that morphological haplology is coalescence. Like other cases of coalescence, it can be explained by the following constraint ranking:

(56) MAX » C » UNIFORMITY, where C is any relevant markedness constraint.

The interaction of a variety of other constraints, especially IDENT-F and ALIGN, produces a typology of haplological processes. This accounts for a wide variety of attested processes, including partial-identity haplology, coextensive haplology, and reduplicative haplology.

One of the main points of this analysis is that there is no need to posit a generalised OCP – a constraint that bans adjacent identical strings – and that such a constraint has undesirable consequences. In fact, the proposals made herein have not introduced any new constraints into the grammar. This reduces the phenomenon of morphological haplology to a special case of correspondence.

Appendix: Constraints and Ranking Summaries

From McCarthy & Prince (1995, 1997):

MAX- $\alpha\beta$: Every segment x in α has a correspondent x' in β .

(i) $\alpha, \beta \in \{\text{Input, Output, Base, Reduplicant}\}$

IDENT- $\alpha\beta$ F: If segment x is γF in α then x 's correspondent x' is γF in β .

(i) F is a feature. γ is a feature specification.

³³ Of course, this argument is dependent on the theory of underspecification assumed (i.e. Radical Underspecification here – Archangeli 1984). Underspecification is generally agreed not to be an option in Optimality Theory (Prince & Smolensky 1993). A way out of this is to proposed that haplology and default-feature specification rules can have varying orders. If haplology occurred before default feature insertion, partial-identity haplology would result; if the order was reversed, this would be total identity haplology. It is difficult to square this approach with theories of underspecification, though, where it is standardly assumed that default features are filled in after the phonological component.

UNIFORMITY: A segment in the output may not have more than one correspondent in the input.

From McCarthy & Prince (1993a):

ALIGN(α , Edge₁, β , Edge₂): For all α there is some β s.t. Edge₁ of α and Edge₂ of β coincide.

(i) Edges are ‘Right’ or ‘Left’.

Rankings:

Note: $\mathbb{C}$ is any relevant markedness constraint (see §4.3)

Haplology: MAX » $\mathbb{C}$ » UNIFORMITY

Total-Identity: IDENT-F » $\mathbb{C}$.

Partial-Identity: If feature f is irrelevant, then $\mathbb{C}$ » IDENT- f

Root-Faithfulness: is due to IDENT_{ROOT} f

(i) If a root feature f is not preserved in partial haplology, there is some phonological constraint P that outranks IDENT_{ROOT} f .

Stem-Edge (§5.4.1, 5.4.2): ALIGN(M, E_i, Stem, E_i) » $\mathbb{C}$ » ALIGN(M, E_k, Stem, E_i)

Restricted Non-Edge (§5.4.3): ALIGN(M, E_k, Stem, E_i) » $\mathbb{C}$ » ALIGN(M, E_i, Stem, E_i)

Coextensiveness (§5.4.2): ALIGN(M, E_k, Stem, E_i), ALIGN(M, E_i, Stem, E_i) » $\mathbb{C}$

Unrestricted Haplology (§5.4.4): $\mathbb{C}$ » ALIGN

Reduplicative (§5.2): MAX-BR, IDENT_{BR}-F » $\mathbb{C}$ » UNIFORMITY_{BR}, LINEARITY_{BR}

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Comparing Serial and Parallel SPLT Models of Processing: Evidence from Catalan¹

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1. Introduction

In the study of human language processing, the attention to sentences containing temporary or permanent ambiguity has led to many insights. The experiment that we present here is part of this tradition. Its main goal is to contrast the predictions that a serial (garden-path) model of processing, on the one hand, and a parallel model, on the other hand, make in respect to a case of temporary ambiguity in a specific construction of Catalan. Based on the results obtained in a questionnaire in which subjects were asked to rate the difficulty of a series of sentences, it is concluded that the processing of the constructions presented here pose a challenge to both models. Still, the garden-path model explains all but one of the findings, while the parallel model fails to offer a satisfactory account of almost any of them. The comparison between the two models is resolved in favor of the garden-path model, although some adjustments to the theory as it stands might be necessary if a complete account of the data is to be obtained.

2. The case under study

In this experiment we used sentences that contained a temporary structural ambiguity, that was resolved later in the sentence. None of the sentences are finally ambiguous, but only at some point in their processing, as it happens with the so-called ‘garden path sentences’.

¹ I want to express my sincere gratitude for their teaching, guidance and comments on the subject matter of this paper to the following people: Lyn Frazier, Chuck Clifton and Elisabeth Gilboy. My apologies to them for all that I have not grasped yet, despite their efforts. Many thanks also to my mother, Maria José Daussà, and Mar Garachana, who helped me collecting the data. Infinite thanks go to Bill Hanley and Anita Nowak for their love, friendship and encouragement. I am more generally grateful to the whole community of the Linguistics Department at the University of Massachusetts in Amherst; it is a real privilege to be part of it.

The ambiguity of (1) is due to the fact that in Catalan, the conjunction that introduces the second term of a comparison is homonymic with a relative pronoun. They are both *que*:²

- (1) Ha plogut més en aquests tres dies que no ha fet sol a Barcelona
 Has.it rained more in these three days which not has made sun in Barcelona
 que no en tot el mes
 than not in all the month
 ‘It rained more in these three days that have not been sunny in Barcelona than in the whole month’

The sentence in (1) in which the first instance of *que* introduces a relative clause and the second instance of *que* introduces the predicted second term of the comparison, contrasts with the sentence in (2), where this order is reversed (i.e., the first *que* introduces the second term of the comparison, and the second *que* introduces a relative clause).

- (2) Ha plogut més en aquests tres dies que no ha fet sol a Barcelona,
 que
 has.it rained more in these three days than not it.has made sun in Barcelona,
 which

hem visitat per primer cop
 have.we visited for first time

‘It rained more in these three days than it has been sunny in Barcelona, that we visited for the first time’

To strengthen the parallelism, in the examples of (1) and (2) both sentences are identical up to the disambiguating point, when the second *que* clause appears and the final structure of the sentence becomes clear. In other words, both sentences are equally ambiguous, since the ambiguous region is the same in each case. The sentences are also equally plausible. For this reason, any preference in parsing one over the other will have to be explained.

3. Hypotheses and predictions

Different theories of sentence processing give different accounts of the way the ambiguous sentences presented in §2 are parsed. I will first briefly present how two of such theories approach the phenomenon. We will then see, in §3.2, that they offer different predictions that can be tested in this experiment.

² Notice that the PP *in Barcelona* can be argued to be attached both to the clause expressing the raining and to the one of not being sunny. As such, it is marked with a pause, indicating its dislocation:

Ha plogut més aquests tres dies que no ha fet sol, a Barcelona.
 This pause makes the oral counterpart of (1) unambiguous.

1.1. The garden path account

Motivated in part by considerations of memory limitations, the garden path model assumes that the sentence is processed sequentially. The processor starts building syntactic structure with the first words it encounters, and incorporates new words coherently with the structure that is already built. In ambiguous sentences, like in non-ambiguous ones, the processor's analysis is determined by well-known processing principles such as Minimal Attachment³ and Late Closure⁴. If new material appears in the sentence that can not be included into the present structure, the processor re-structures its analysis to incorporate the new information. This reanalysis requires an extra effort on the processor, which is translated into time-consuming or difficulty terms.

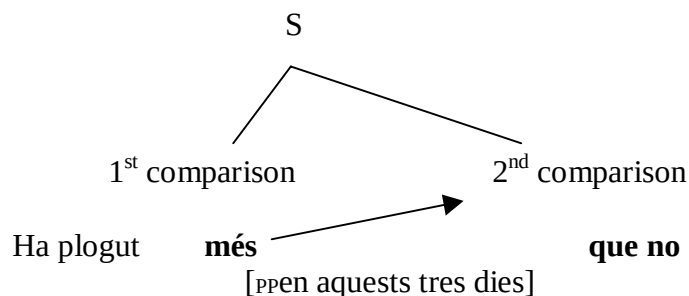
In the case at hand, the account goes as follows. Let's examine the processing of the ambiguous sentence (1), repeated here for convenience as (3):

- (3) Ha plogut més en aquests tres dies que no ha fet sol a Barcelona
has.it rained more in these three days which not has made sun in Barcelona

que no en tot el mes
than not in all the month

'It rained more in these three days that have not been sunny in Barcelona than in the whole month'

In (3), when the comparative term *més*, 'more', appears, the expectation of a second term of the comparison is predicted. This prediction has to be held until the right syntactic element instantiates it. Whatever fills the prediction will start by the complementizer *que*. Within the framework of a Frazier and Clifton (1996), it was hypothesized that when the first *que* appears in the sentence, the reader will start computing the second term of the comparison, since it corresponds to a primary relation:⁵



³ Do not postulate any potentially unnecessary nodes (Frazier 1978).

⁴ If grammatically permissible, attach new items into the clause of phrase currently being processed (i.e., the clause or phrase postulated most recently) (Frazier 1978).

⁵ Primary phrases and relations include: a. the subject and main predicate of any (+ or -) finite clause; b. complements and obligatory constituents of primary phrases (Frazier and Clifton 1996). The second term of a comparative sentence is included under b. A relative clause, however, is a secondary phrase.

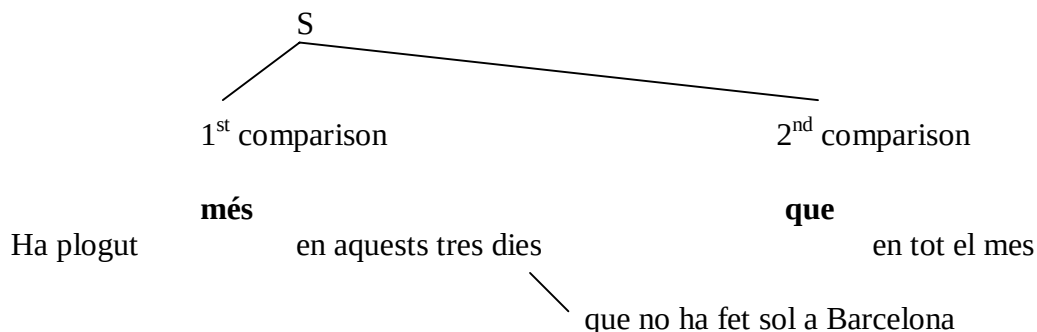
According to the Construal Principle, a phrase XP will be first interpreted as instantiating a primary relation, and only when this hypothesis is contradicted, it will be interpreted as instantiating a secondary relation.

The hypothesis can be maintained until the end of the sentence, since (3') below is a perfect sentence:

(3') Ha plogut més en aquests tres dies passats que no ha fet sol a Barcelona

meaning: "it has been raining more than it has been sunny, on these last three days in Barcelona".

However, when the rest of the sentence is presented, this analysis is disconfirmed, and a reanalysis of the structure is necessary. The parser has to realize that the first *que* is a relative pronoun introducing a relative clause attached to a noun of the first term of the comparison, while the second *que* is the true introducer of the predicted second term of the comparison:



Sentences like (3) are misleading, in the sense that the preferred initial analysis is not the one that is finally adopted for the sentence. A non-misleading counterpart of the sentence above is the one presented in (2), where the second term of the comparison and the relative clause are introduced in the same order that the processor expects (i.e., instantiating predictions first).

1.2. The parallel processing account

An alternative parallel parsing account of this kind of sentences consists on the parser computing all possible structures derived from the ambiguity of *que*, and holding them in equal status until the disambiguating information is available. Still, another possibility is that when the processor hits an ambiguous item, it holds the material unstructured until it can assign it an unambiguous interpretation. These two accounts impose a greater memory load, but they involve no initial commitment to any analysis and therefore no reanalysis.

1.3. Predictions

I will next specify some predictions the models outlined above make in respect to the case at hand and the design of the experiment.

a. Differences in processing difficulty

A serial model of processing makes the strong prediction that the RelCl-2nd term sentence is harder to read than the 2nd term-RelCl one. This is so because in the first case the processor has to revise an already formed structure, while in the second case the preferred structure is confirmed and there is no revision to be made. In the experiment, this is expected to have the result of the RelCl-2nd term sentence being higher ranked in a scale of difficulty than the 2nd term-RelCl one.

A parallel model of processing predicts that there be no difference in difficulty between the RelCl-2nd term sentence and the 2nd term-RelCl one. Since in this model both possible structures are computed when the ambiguous word is encountered, and in both cases one of them has to be systematically discarded at the disambiguation point, there is the same processing work in all cases, and no reason why discarding one hypothesis or the other should affect the processing difficulty. This scenario makes the experimental prediction that both groups of sentences will be ranked equally in a scale of difficulty.

The sentences of groups 1 and 2 in our experiment address this question.

b. Attachment preferences

As we saw before, the Construal model presented in Frazier and Clifton (1996) predicts that the 2nd term-RelCl sentences correspond to the preferred analysis because in them the ambiguous word introduces a sentence instantiating a primary relation, and hence represent the preferred analysis.

A parallel processing model such as the parallel version of Gibson's (1998) Syntactic Prediction Locality Theory (SPLT) also predicts that the 2nd term-RelCl sentences embody a preferred analysis. In his model, memory cost is considered in evaluating the hypothesis. In the cases at hand, it means that the processor computes both possible analyses, and chooses the less costly one. Because the filling of an expectation is always less costly than carrying it along, the non-misleading sentences are preferred over the misleading ones.

Even though both models make the same predictions as for which is the preferred analysis, they differ in still one prediction. For Gibson, a sentence in which the second term of the comparison is delayed (in the case at hand, by the introduction of a relative clause) will have the same cost, other things being equal, in an ambiguous and a non-ambiguous sentence; this cost will be higher than in sentences in which the second term of the comparison is introduced more immediately. For the garden path model, however, the difficulty is given by the ambiguity of the word *que*, which is initially interpreted, unambiguously, as introducing the second term of the comparison. If this ambiguity were not present, a sentence in which a relative clause intervenes between the two terms of the comparison should not be substantially more difficult to process than a sentence in which the relative clause is introduced at the end. That is, no garden-path will occur. The sentences of group 3 in our experiment aim to address this question.

4. Design of the experiment

The experiment took the form of a written questionnaire in which a total of 30 subjects were asked to read sentences and rate them according to their difficulty in understanding them. Each subject was given thirty-two sentences and rated them individually in 0 to 5 scales. The subjects were told that 0 meant no difficulty, 2 medium difficulty, and 5 high difficulty.

4.1 Sentences

Two groups of experimental sentences were constructed: ambiguous and unambiguous.⁵ There were eight temporarily ambiguous sentences with two versions of each, and eight unambiguous sentences with two versions of each. This gave a total of sixty-four sentences, which were distributed in two lists of thirty-two sentences each.

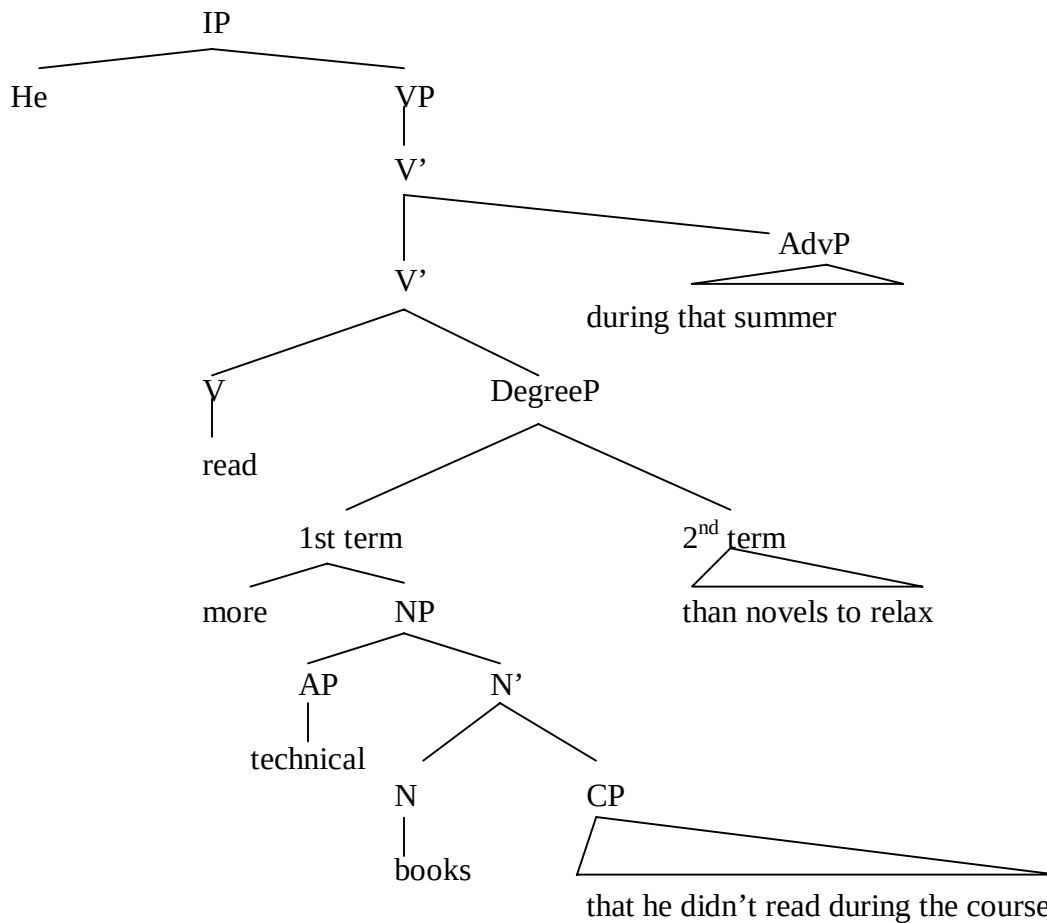
Group 1: Temporarily Ambiguous Sentences

This first group corresponds to temporarily ambiguous sentences. In one format (4a) the first instance of *que* introduces a relative clause, and the second instance of *que* introduces the second term of the comparison. This group was labeled ‘misleading’, because it favors the interpretation of the first *que* as introducing the expected second term of the comparison, when it is actually introducing a relative clause. An example is given below:

- (4a) Va llegir mes llibres tecnicos durant l’estiu que no va llegir durant el curs, que no novel.les per a relaxar-se.

“He read more technical books during summer that he didn’t read during the course, than novels to relax”

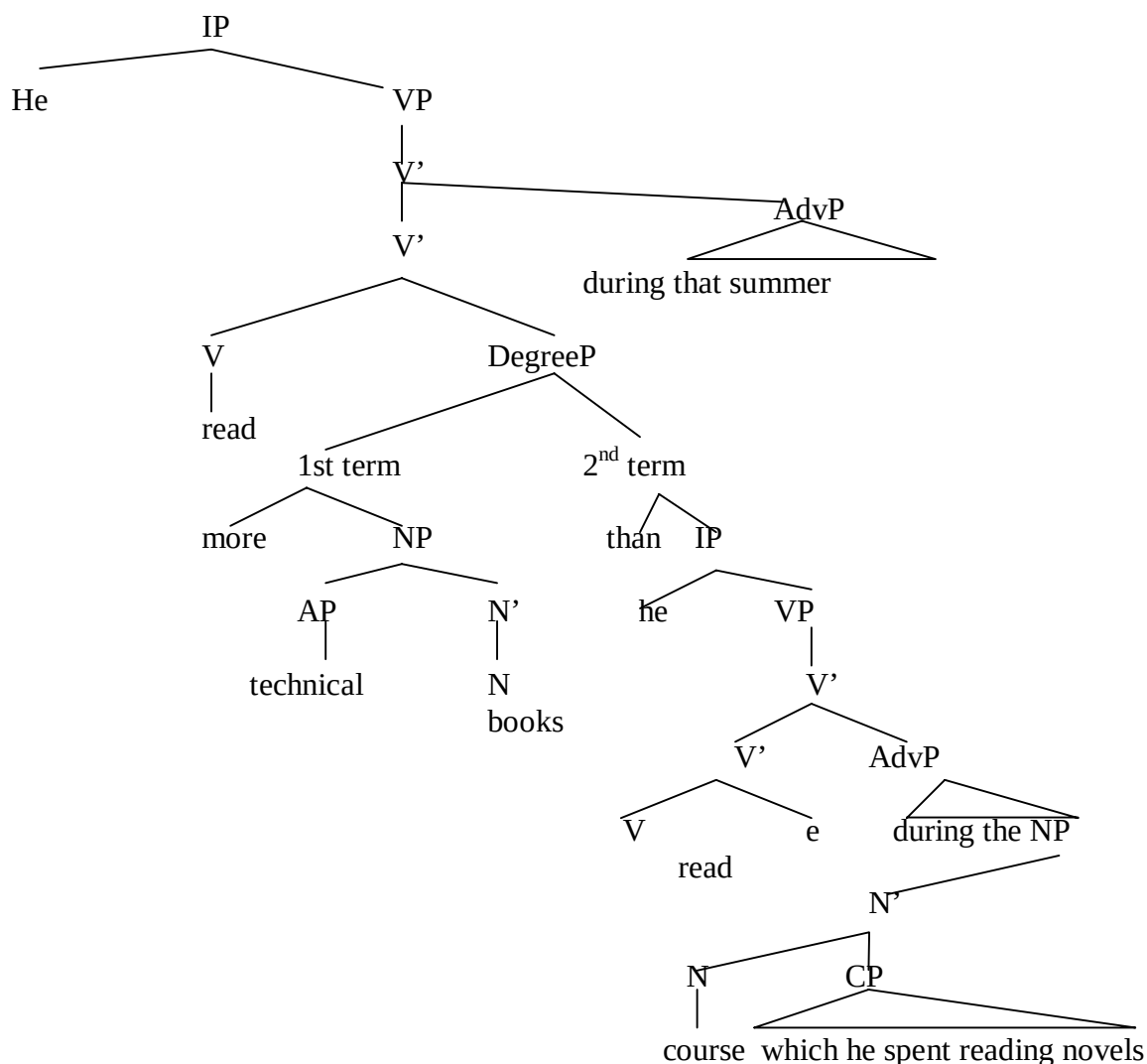
The syntactic structure of (4) is roughly as follows:



The second form of group 1 consists of comparative sentences in which the second term of the comparison is introduced by the first instance of *que*, while the second instance of *que* introduces a relative clause. These sentences are labeled 'non-misleading' since, as opposed to the ones in group 1, no ambiguous element intervenes between the prediction and its fulfillment. An example and its rough syntactic structure are given below.

- (4b) Va llegir mes llibres tecnicos durant l'estiu que no va llegir durant el curs, que va passar llegint novel.les.

"He read more technical books during the summer than he read during the course, which he spent reading novels."



The sentences in group 1 form minimal pairs that start with the same string of words, which correspond to the two structures. Each subject sees only one of each pair, to avoid the possibility that the subject is comparing the two alternatives when rating the difficulty of the sentences.

Group 2: Non-ambiguous Sentences

Sentences in group 2 had exactly the same syntactic structure than those in group 1, with two versions of each category. The relevant difference was that the relative sentence in both versions of group 2 was introduced by an unambiguous relative pronoun, which could not be taken by the introducer of the second term of the comparison. The disambiguation was made possible by using a different relative pronoun (*on* 'where', *quan* 'when', *qui* 'who'), or by using *que* preceded by a preposition (*en que*, 'in which', for example).

The reason for this group was to discard the possibility that the degree of difficulty the subjects reported was due to purely structural factors, instead of the ambiguous character of the word *que*, as assumed in the text. Therefore, these sentences

acted as controllers of the ones in the former groups. At the same time, they addressed prediction b. of §3.

An example of a minimal pair is given below. In the first sentence, the relative clause intervenes between the first and second term of the comparison. In the second sentence, the relative clause is introduced after the second term of the comparison has been instantiated:

- (5a) Alguns insectes tenen més desenvolupats els organs amb els que capten estímuls visuals que la capacitat de processar aquests estímuls

“Some insects have the organs with which they capture visual stimuli more developed than the capacity to process these stimuli”

- (5b) Alguns insectes tenen més desenvolupats els organs visuals que la capacitat de processar els estímuls que capten amb aquests organs

“Some insects have the visual organs more developed than the capacity to process the stimuli that they capture with these organs”

Group 3: Fillers

This group is composed by sixteen filler sentences. These sentences are of the same length and syntactic complexity than the sentences of the former groups. They contain no ambiguity and are included just as a control for the default degree of difficulty assigned to unproblematic sentences of approximately the same length and number of embedded sentences than the ones under study. One example is given below:

- (6) Quan llegire l’ultima frase d’aquest questionari podre anar a fer coses mes interessants que aquesta

“Once I finish this questionnaire I will be able to go to do things that are more interesting than this one”

4.2 Lists

Two lists were constructed with the sentences. Each list contained thirty-two sentences: sixteen fillers from group 3 (common to both lists), eight ambiguous sentences from the group 1 (four of each structural category), and eight unambiguous sentences of the group 2 (again fours of each category). In each list there was only one sentence of the minimal pairs within groups 1 and 2.

The sentences were randomly ordered. A further restriction on the shape of the lists was applied to this result: sentences from the same condition were separated by at least one filler. Whenever this situation arose, a filler was used as separation. Fillers were allowed to be adjacent to each other.

4.3 Subjects

Thirty subjects were tested. They were all Catalan native speakers living in Barcelona. They were presented with written instructions and handed out a written questionnaire, which they completed in the presence of the experimenter. There was fifteen people tested for each list.

5. Results

To calculate the degree of difficulty of the sentences, each sentence was assigned the numeric value in the scale and the number of sentences within each type divided the total. The result is reported below:

GROUP 1a: ambiguous Relative Clause first
 GROUP 1b: ambiguous Second Term Comparison first
 GROUP 2a: unambiguous Relative clause first
 GROUP 2b: unambiguous Second Term Comparison first
 GROUP 3: fillers

Sentences	Mean
GROUP 1a	1.95
GROUP 1b	1.4
GROUP 2a	0.6
GROUP 2b	0.7
GROUP 3	0.3

6. Discussion

The results provide us with evidence to draw some conclusions about the questions raised in §1.3. As it was done then, I will here divide the discussion in two parts, addressing two different –but related—issues.

To start with, there is a substantial increase in difficulty in the misleading sentences, as opposed to all the others. The garden path account explains it by saying that these sentences involve a reanalysis of the construction the parser makes in the first instance, and hence the discomfort noticed by the subjects. The parallel processing model does not offer any account of the data. From this it is concluded that the present results can be taken as evidence in support of a model compatible with the predictions of the garden path theory.

As pointed out above, Gibson's SPLT theory also predicts that the misleading sentences be more difficult, since they embody the least economical analysis. On this point, then, the garden path account cannot be told apart from the SPLT model, and hence the importance of the next set of results.

It will be recalled that in Gibson's model any preferred analysis should have a lower memory and integration cost (translatable in our experiment as less difficult) than a non-preferred one. As a consequence, sentences in which expectations created by former elements are instantiated sooner will be less costly, regardless of any ambiguity (as far as it is a temporary ambiguity). If so, the non-ambiguous pairs of groups 3 and 4 should present the same pattern as their counterparts in the ambiguous ones of groups 1 and 2, since they are structurally identical and only vary on the temporary ambiguity of the latter, non-existent in the former ones.

As we saw, the results do not confirm this hypothesis. Sentences of groups 1 and 2 are rated higher in the difficulty scale. The SPLT model does not have any explanation for this pattern.

On the other hand, these results are consistent with the predictions of the garden path model, in which the higher difficulty of the sentences in groups 1 and 2 as compared with groups 3 and 4 is due by the ambiguous character of the former ones. The only result that challenges the garden path theory (and that is equally unexplained by the SPLT) is that the preferred analysis is harder when the sentence is ambiguous than when it is not. Two possible explanations suggest themselves: on the one hand, it could be that off-line judgements leave time for further analysis; on the other hand, it could be that preferred analysis are chosen more often than the alternative (e.g., 80% of the time), but are not chosen invariably (100% of the time). The data of this experiment does not shed light in any of these alternatives.

7. Conclusion

The goal of this experiment was to present some further evidence for the debate between different current models of language processing, mainly one based on serial, depth-first parsing, and one based on parallel parsing. It was argued that the results obtained in the experiment were better explained in terms of the garden path model as outlined in its most recent version in Frazier and Clifton (1996).

Specifically, a serial processor of the kind assumed in the garden path theory can explain why the RC-first analysis is more difficult than the alternative. The reason is that a primary relation is preferred to a secondary one when parsing ambiguous sentences. Moreover, a serial processor can explain why the difference is only present with ambiguous sentences: because only in those cases the parser is garden-pathed.

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Movement into a *Theta*-Position: Evidence from the Middle*

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This paper examines empirical evidence for and conceptual bases of the θ -criterion proposed in Chomsky (1981). Although it was formalized as a condition on chains in the final chapter of Chomsky (1981),¹ the θ -criterion had a conceptual basis in the notion of D-structure characterized as a syntactic representation of thematic relations: All the positions in which a thematic role (θ -role) is licensed are occupied by an argument phrase at the D-structure level, and argument phrases always have their θ -roles licensed in their D-structure position. When they move, they can only move into a non- θ -position because all the θ -positions have already been occupied. With syntactic movement always moving

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¹ In the final chapter of Chomsky (1981), the θ -criterion is formulated as follows:

- (i) *θ -criterion*: Given the structure S , there is a set K of chains, $K = \{C_i\}$, where $C_i = (\alpha^i_1, \dots, \alpha^i_{n_i})$, such that:
If θ is an argument of S , then there is a $C_i \in K$ such that $\theta = \theta^i_j$ and a θ -role is assigned to C_i by exactly one position P .
If P is a position of S marked with the θ -role R , then there is a $C_i \in K$ to which P assigns R , and exactly one α^i_j in C_i is an argument.
(Chomsky 1981:335)

categories upward, an argument phrase always has its θ -roles licensed in the lowest position it has occupied, that is, the tail of its chain. In the Minimalist Program, attempts have been made to minimize any apparatus in the language faculty except what is absolutely necessary at the interfaces with the articulatory-perceptual system and the conceptual-intentional system, and to explore the possibility that D-structure does not exist as a level of representation. The θ -criterion in this research program loses the conceptual basis it used to have in Chomsky (1981). Based on such considerations, some researchers such as Bošković (1994) and Hornstein (1997) have claimed that the θ -criterion is empirically incorrect, as well as conceptually undesirable, and that human language allows movement into a θ -position.

In this paper, I will first demonstrate that the subject of middle sentences in English is moved from a θ -position to another θ -position. I will then argue that nonetheless movement between two θ -positions is not always possible. This means that the θ -criterion as a descriptive generalization is partially correct and partially wrong. I will propose that the dividing line between the legitimate cases and illegitimate cases of movement into a θ -position lies in the difference in the type of semantic role that is licensed in the derived position. Movement into a θ -position is not allowed if the semantic role licensed in the derived position is a θ -role anchored to event interpretation. For example, a DP cannot move into a θ -position and have an agent role licensed in that position. On the other hand, movement into a θ -position is possible if the moved phrase enters into a predication relation in the derived position, and is assigned the semantic role of the bearer of the property described by the predicate. In this case, the semantic role licensed in the derived position is not anchored to event interpretation. I will propose that the licensing of event-anchored θ -roles involves checking of some formal features between the verb and its argument DPs. This will explain why movement into a θ -position is not possible if the moved phrase has an event-anchored θ -role licensed in the derived position. There are two possible ways to implement this proposal. These two alternatives and some of their consequences will be discussed in the final section.

1. English Middles

1.1. The Syntactic Status of the Subject

Let us first look at a piece of evidence showing that the subject of middle sentences is moved from the object position. Carrier and Randall (1992) point out that middles allow a resultative phrase predicated of the surface subject:

- (1) a. New seedlings water flat (easily).
 b. My socks won't scrub clean (easily).
 c. Permanent press napkins iron flat (easily).
 (Carrier and Randall 1992:191)
- (2) This table wipes clean easily.
 (Levin and Rappaport Hovav 1995:40)

In this sense, middle sentences pattern with passives and unaccusatives. Given the assumption that a resultative phrase may be predicated of a postverbal DP but not of a subject, as argued

by Levin and Rappaport Hovav (1995), the examples above indicate that the subject of middle sentences is moved from the object position.

On the other hand, there is reason to believe that the subject of middle sentences is an external argument. Levin and Rappaport (1988) and Hovav Rappaport and Levin (1992) argue that nonevent *-er* nominals are limited to external arguments. For example, unaccusative verbs such as *disappear* and *collapse* do not allow nonevent *-er* nominals. They argue that *-er* nominals of certain cooking verbs such as *broiler*, *roaster*, and *steamer* are not counterexamples to this generalization if it is assumed that they are derived from middle predicates and that the subject of middle sentences is an external argument.

Another piece of evidence showing that the subject of middle sentences is a θ -position comes from the interpretation of quantificational phrases in the subject position:²

- (3) a. All of these books were finished easily.
- b. It was easy to finish all of these books.
- c. Each of these books was easy to finish (but it was not necessarily easy to finish all these books).
- (4) a. All of these books read easily.
- b. All of these books are easy to read.

The passive sentence in (3a) allows the two readings to be paraphrased in (3bc). The quantifier is included in the scope of *easily* in the former reading, and is outside the scope of the adverb in the latter reading. The middle sentence and the *tough*-sentence in (4) only allow the reading where the quantifier is outside the scope of *easily/easy*. (4ab) do not mean that it is easy to read all of these books.

This difference between passives on the one hand and middles and *tough*-sentences on the other is accounted for by the assumption that the scope of a quantifier phrase is sensitive to the highest position of its chain in which a semantic role is licensed. A quantificational phrase can be lowered to its original position only if a semantic role is not licensed in the derived position. The quantificational subject in passives can be lowered to the object position because no semantic role is licensed in the subject position. The quantificational subject of *tough*-sentences cannot be lowered because it has not been moved from a position lower than the *tough*-predicate. The observation that the quantificational subject of middles cannot be lowered indicates that a semantic role is licensed in the subject position so that this position cannot be disregarded in the interpretation.

So far, I have argued that the subject of middle sentences is moved from the object position (and therefore has a semantic role licensed in the object position) and has another semantic role licensed in the subject position. In what follows, I will discuss what semantic roles are licensed in these positions and what licenses each role.

² I would like to thank David Pesetsky for pointing out this fact to me.

1.2. Zero-Form Affix Assigning the External Role

In this subsection, I will discuss the semantic role licensed in the subject position of middle sentences.

Condoravdi (1989) argues that the interpretation of middle sentences involves generic quantification over events. Sentence (5a), for example, is claimed to involve the logical form given in (5b).

- (5) a. This bread cuts smoothly.
 b. $G [e: \text{bread}(x), \text{cut}(e), \text{Patient}(e,x)] [\text{smooth}(e)]$
 (Condoravdi 1989:181)

G is the generic operator, and e is a variable for the event argument. It should be kept in mind that middle sentences themselves are not generic statements on events. To see this, consider the following situation and the sentences in (7) and (8).

- (6) There are a small number of high-ranking government officials who are offered bribes very frequently, and they take them all. There are also many poor and honest bureaucrats who are rarely offered bribes, and when they are, they turn them all down. 90% of the bribes are offered to the high-ranking officials and all are accepted. 10% of the bribes are offered to the other bureaucrats and they are all turned down.
- (7) Bureaucrats bribe easily.
- (8) a. One can bribe bureaucrats easily.
 b. It is easy to bribe bureaucrats.

(8ab) allow the reading to be judged true under the situation in (6) as well as the reading to be judged false under (6). However, (7) only allows the reading to be judged false under (6).

This means that (7) is a generic statement on bureaucrats rather than a generic statement on events of bribing bureaucrats. This observation shows that while middle sentences entail a generic quantification over events, they are not themselves statements on events. Rather, they are statements on the referent of the subject.³

The meaning of middle sentences, then, can be characterized as follows:

- (9) The referent of the subject x bears a property such that the generalization on events $Ge [C(e, x)] [\dots e \dots]$ holds of x .

³ Passive sentences behave in the same way as middle sentences with respect to the proportion problem. For example, (i) is judged to be false under the situation given above.

(i) Bureaucrats are bribed easily.

The system of semantic role licensing proposed in the present article allows the possibility that the derived subject in passives may or may not have a semantic role of property-bearer licensed in the subject position. It may be the case that this is preferred when passive sentences are understood to be generic.

Again G is the generic operator, and e is a variable for the event argument. As is usually the case with generic quantification, the nuclear scope contains a focused element in the sentence.

$C(e, x)$ in the restrictor clause indicates that it contains e and x and is otherwise contextually determined. The meaning of example (5a) above, repeated here as (10a), can be characterized as (10b).

- (10) a. This bread cuts smoothly.
 b. This bread x bears a property such that the generalization on events $Ge [\text{cut}(e), \text{Patient}(x)] [\text{smooth}(e)]$ holds of x .

I will add another element to (9) in the following subsection.

If this is correct, the middle predicate takes an argument which is interpreted as the bearer of the property characterized in (9). This accounts for the observation that middle predicates behave as stative predicates and reject progressive forms and temporal adverbs for many speakers, though judgments vary to a considerable extent.

The middle predicate then consists of a transitive verb root plus an element that demotes the original external argument with the agent role, and adds a new external argument interpreted as the bearer of the property described by the predicate.⁴ Since middle predicates do not contain any overt marking, the element in question must be a zero-form affix.⁵ In addition to the demotion of the original external argument and the addition of a new external argument, the accusative Case must be absorbed so that movement from the object position to the subject position is triggered. This may be done by the zero-form affix proposed here or by the other zero-form morpheme to be proposed in the following subsection.

1.3. Zero-form Preposition Heading an Adjunct

1.3.1. Responsibility

Van Oosten (1977, 1986), Fellbaum (1986), and Fagan (1992) argue that unlike the subject of a passive sentence, the subject of a middle sentence is understood to be responsible for the generalization on events entailed by the sentence. The following sentences illustrate the difference between the two constructions:

- (11) a. Stupidly, these shirts can't be washed in the machine.
 b. Stupidly, these shirts don't wash in the machine.
 (Fellbaum 1985:28)

⁴ The idea that middle predicates contain an invisible morpheme that demotes the external argument and absorbs accusative Case from the verb was first proposed by Keyser and Roeper (1984), and pursued in Keyser and Roeper (1992).

⁵ See Pesetsky (1995) for evidence based on nominalization for the existence of a zero-form affix in middle predicates.

The adverb *stupidly* in (11a) can be understood either as an evaluation of the property of the shirts (i.e., their property of not being machine-washable) or as an evaluation of the situation described by the sentence. The same adverb in (11b) can only be understood as an evaluation of the property of the shirts. The following examples illustrate the same point:

- (12) a. The clothes wash with no trouble because they're machine-washable.
 b. *The clothes wash with no trouble because I have lots of time.
- (13) a. It's no trouble to wash the clothes because they're machine-washable.
 b. It's no trouble to wash the clothes because I have lots of time.
 (Van Oosten 1977:460)

The difference between middles and passives indicates that the characteristic of middles observed here does not follow from the syntactic position of the subject.

It has been argued that middle formation is limited to predicates that take an affected or delimiting object. (See, for example, Roberts (1986), Hale and Keyser (1987), and Tenny (1992).) For instance, Tenny (1992) cites the following examples as cases that can be ruled out by either restriction:

- (14) a. *The traffic jam avoids easily.
 b. *Fleeing burglars pursue easily.
 (Tenny 1992:9)

It seems that the low acceptability of these examples can also be accounted for by the semantic characterization of middle sentences which has been discussed here. Very informally, middle sentences presuppose a situation that can be characterized as follows:

- (15) Given that the possible agents do whatever possible/reasonable to perform the action described by the predicate, whether the attempts succeed or not (in bringing about the situation described by the corresponding non-middle sentence) still depends on the nature of the referent of the subject of the middle sentence.

I will call this characteristic of middle sentences *the responsibility requirement* on the subject of middles. Given our knowledge of the world, (14a) does not satisfy this requirement. Whether or not one can avoid the traffic jam (easily) depends not on the nature of the traffic jam itself, but largely on other factors such as whether there are other routes one could take to get to one's destination. (14b) does not seem to satisfy the responsibility requirement either. *Pursue* means "follow with an intention to catch" and it does not mean "actually succeed in catching" or even "getting closer to." If one makes whatever possible/reasonable effort to pursue someone, then one has already succeeded in pursuing the person (whether or not the pursuit turns out to be successful in the sense that one actually catches the person). There seems to be no room where the person to be pursued provides the crucial factor for the pursuit to be realized. See Fagan (1992:78) for an account on these lines of why *discuss* and *invite* do not form good middles.

The responsibility requirement accounts for the fact that verbs with an affected object in general make good middles. This is because the actions they describe are most suitable for satisfying the requirement. Such verbs describe actions which bring about a change of state on the part of the logical object. It is quite conceivable that one might try to perform such an action but fail to bring about the intended change of state. Given the responsibility requirement, therefore, it is not clear whether an independent requirement based on affectedness or delimitedness is necessary.

The responsibility requirement is either absent or at least less obvious in *tough*-sentences. For example, (16) allows the reading that the traffic jam has a property of being difficult to avoid due to its surrounding circumstances.⁶ While the judgment seems to be rather difficult for (17), at least some speakers find it possible with a reading in which *stupidly* is an evaluation of the situation, as well as with a reading in which it is an evaluation of the shirts. Native speakers also find (18a) at least more acceptable than (18b).

- (16) The traffic jam is difficult to avoid.
- (17) Stupidly, these shirts are difficult to wash in the machine.
- (18) a. ?These clothes are difficult to wash for me because the laundry room is crowded.
- b. *These clothes do not wash easily because the laundry room is crowded.

This observation suggests that the responsibility requirement does not follow from the subject being the property-bearer. Middle sentences must contain an element to which this semantic characteristic can be attributed. Since middle sentences do not contain an overt element that could serve this function, the element must lack phonetic content. In the rest of the section, I will propose that middle sentences contain a zero-form preposition which heads an adjunct, and that it has a meaning that can be paraphrased as “due to.” The responsibility requirement on the middles and the absence thereof in *tough*-sentences can thus be attributed to the presence and absence of this preposition. The meaning of middle sentences can now be characterized as follows:

- (19) The referent of the subject *x* bears a property such that the generalization on events $Ge [C(e, x)] [\dots e \dots]$ holds of *x* due to (some property of) *x*.

1.3.2. Internal Arguments

Middle sentences do not allow overt internal argument phrases to follow the predicate. Consider the following examples:⁷

⁶ I would like to thank Roger Higgins for pointing out the contrast between the middle sentence in (14a) and the *tough*-sentence in (16).

⁷ These examples are significantly less acceptable than the examples with a resultative phrase discussed in 1.1. above. This observation indicates that resultative phrases have a status different from that of internal arguments.

Carrier and Randall (1992) lists (i) among examples with a resultative phrase.

- (i) Those cookies break into pieces (easily).

- (20) a. *Books send to libraries best in boxes. (Roberts 1986:221)
 b. *Money gives (to) victims of natural disasters easily. (Fagan 1992:79)
 c. *These kids give books easily. (Pesetsky 1995:263)
 d. *A cup of coffee offers (to) a guest easily. (Fagan 1992:79)
-

It may appear to be a counterexample to the generalization that middle predicates cannot be followed by their internal arguments. It is not, however, because *break* can be unaccusative.

Another set of apparent counterexamples is illustrated by (ii). Notice that what appears to be an internal argument follows the adverb:

- (ii) This clever rolling drawer stores and protects shoes in eight separate compartmentsCthen stows neatly under a bed.
 (Fagan 1992:80)

When the locative phrase precedes the adverb, the example is much less acceptable:

- (iii) ??This chest stows under a bed neatly.

The following example, in which *nicely under a bed* and *neatly in a closet* are conjoined with *or*, indicates that these expressions each can form a constituent:

- (iv) Nicely under a bed or neatly in a closet, this chest stows anywhere you like.

In fact, (iv) is better than the following example, in which the prepositional phrases are separated from the adverb:

- (v) ??Under a bed or in a closet, this chest stows neatly.

These observations suggest that the locative PP in (ii) is not an internal argument of the verb, but forms a constituent with the adverb.

A third kind of apparent counterexamples is found in cases where apparent middle predicates are lexicalized intransitive verbs. For instance, many speakers allow the following example:

- (vi) This book sells well to college students.

One of my informants who does not find middle sentences fully acceptable finds this example perfect. Furthermore, Fagan (1992) points out that sentences with *sell* allow eventive interpretation that is not possible with ordinary middles. For instance, while the interpretation of (vii) involves modality which makes it closer to (viii) than to (ix), (x) allows the reading given in (xi).

- (vii) Stows on floor or shelf. (an advertisement of a shoe chest) (Fagan 1992:54)
 (viii) One can stow the shoe chest on the floor or shelf.
 (ix) The shoe chest is stowed on the floor or shelf.
 (x) Harlequin Romances, worldwide, sell six copies a second. (Fagan 1992:55)
 (xi) Harlequin Romances, worldwide, are sold six copies a second.

Thus, it seems that at least some speakers allow *sell* as an intransitive verb. Since it is lexicalized as such, it is free from the above generalization. Such idiosyncratic cases do not raise a problem for the present discussion as long as the general tendency holds. Also, it is not surprising if we find dialectal or idiolectal variations on particular predicates.

- (21) a. Small packages ship easily. (Fagan 1992:79)
- b. *Small packages ship most customers easily. (Fagan 1992:79)
- c. ??Small packages ship to most customers easily. (Fagan 1992:79)
- (22) a. John convinces easily.
- b. ?*John convinces to leave easily.
- c. ??John convinces easily that his friends are loyal.
- d. ??John convinces easily of his friends fidelity.
(Hale and Keyser 1987:31-32)
- (23) a. John doesn't persuade easily.
- b. *Fred persuades to do crazy things the best. (Roberts 1986:223)
- c. *Executives don't persuade that they should resign easily.
- d. *Executives don't persuade into resignation easily.
- e. *John doesn't persuade into anything easily.
- (24) a. These witnesses bribe easily.
- b. ?These witnesses bribe into silence easily.
- c. *These witnesses bribe to say nothing easily.

As Hale and Keyser (1987:32) point out, the restriction is reminiscent of the Sole Complement Generalization on prenominal adjectival passives discussed by Levin and Rappaport (1986): An argument of a verb can be the subject of a middle sentence only if it may stand as sole NP complement to the verb.⁸ The following contrast between *deprive* and *rob* illustrates the point. *Deprive* takes two complements obligatorily, and does not allow middle sentences with either argument. *Rob* obligatorily takes a complement with the source role and optionally takes a complement with the theme role. It allows the middle only with the source argument as the subject:

- (25) a. The new government deprived the people of political rights.
- b. *The new government deprived the people.
- c. *The new government deprived (of) political rights.
- (26) a. *Political rights deprive (of) easily.
- b. *Immigrants deprive (of political rights) easily.
- (27) a. They robbed the bank of their money.
- b. They robbed the bank.
- c. *They robbed (of) the jewels.
- (28) a. These banks rob easily.
- b. *Jewels rob (of) easily.

It is well-known that middle sentences behave differently from passive sentences in that they do not allow a *by*-phrase.^{9, 10} (See, for example, Keyser and Roeper (1984), Fellbaum (1986), Fagan (1992), Stroike (1992), and Zribi-Hertz (1993).)

⁸ Endo (1986) points out the same observation for the middle.

⁹ The prohibition against overt *by*-phrases in the middle is stricter than what is observed with *-able* adjectives in examples as in (i).

(i) ?The comet was observable by John.

- (29) a. *This book reads easily by most readers. (Fagan 1992:52)
 b. *Bureaucrats bribe easily by foreign companies.

In passive sentences, the external argument of the verb is suppressed and optionally realized as a *by*-phrase. The *by*-phrase has the same status as the theme argument of *rob* for example in that it is present in the argument structure or at least compatible with the lexical conceptual structure, but need not be projected in the syntactic structure.¹¹ If it is assumed that the same is true in middle sentences, the ungrammaticality of a *by*-phrase in middle sentences will simply be a subcase of the generalization that middle predicates cannot be followed by an internal argument. *By*-phrases are excluded from middles not because they are related to the suppressed role but because they serve as an internal argument. The descriptive generalization then is that middle predicates cannot be followed by their internal arguments including *by*-phrases.

A similar restriction on internal arguments is observed with English verbs which take an experiencer argument in the object position. In the next subsection, I will review Pesetsky's (1995) account of this restriction, which I will extend to the middle construction in the subsequent subsections.

1.3.3 Object-Experiencer Predicates

Pesetsky (1995) points out that object-experiencer predicates do not allow internal argument PP's. This is illustrated by the following examples:¹²

- (30) a. The article in the *Times* angered/enraged Bill. (Pesetsky 1995:18)
-

While *-able* sentences allow *by*-phrases of a generic type as in (ii), middle sentences resist *by*-phrases regardless of their content.

- (ii) The comet was observable by anyone owning a powerful telescope.
 (Quirk et al. 1985)

¹⁰ Native speakers find middle sentences with a *by*-phrase somewhat more acceptable if the *by*-phrase is marked with *even* and separated from the predicate by an intonation break:

- (i) a. ??Bureaucrats bribe easily even by foreign companies.
 b. ?That horrible kind of bureaucrat bribes easily, even by FOREIGN companies.

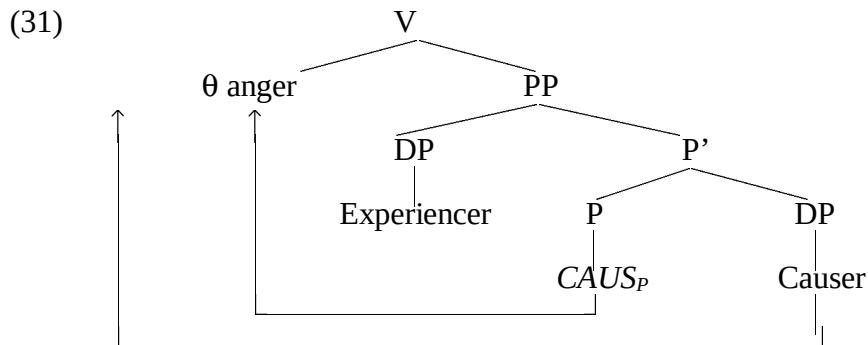
This observation suggests that *by*-phrases are conceptually compatible with middle sentences, but that syntax does not allow them to be packed together with middle predicates.

¹¹ See Hale and Keyser (1987, 1988) for the view that the agent of a middle sentence is implied by the lexical conceptual structure of the predicate without there being an agent θ -role.

¹² Pesetsky (1995:300f, note 57) points out that the *at*-phrase becomes more acceptable if it is given as an afterthought. This is reminiscent of the observation that a *by*-phrase becomes more acceptable in the middle if it is separated from the predicate by an intonation break.

- b. *The article in the *Times* angered Bill at the government.
(Pesetsky 1995:60)
- c. Bill is angry at the government.

Pesetsky (1995) proposes that sentences with an object-experiencer predicate such as *anger* contain a zero-form preposition which heads an adjunct phrase and assigns the causer role to its internal argument. Since this preposition, which he calls *CAUS_P*, does not have ability to check Case, its internal argument must move to the subject position to have its Case checked. The zero-form preposition *CAUS_P* is affixal in that it must undergo head movement and adjoin to the verb. This is illustrated in the following structure:



Pesetsky (1995) proposes that sentences have two types of syntactic structures: *cascade structures* and *layered structures*. In cascade structures, all branching nodes are binary and adjuncts are c-commanded by complements. In these respects, cascade structures have configurations much like V-shell structures proposed in Larson (1988). In layered structures, ternary branching is possible and the head and its complements form a constituent excluding the adjuncts. The above structure shows the configuration in Cascade Syntax. Since *CAUS_P* heads an adjunct phrase, it is c-commanded by the verb and its complements in Cascade Syntax.

Pesetsky (1995) notes that object-experiencer predicates do not allow nominalization. The nominalized forms can only be used with the experiencer in the subject position as the examples in (32) indicate.

- (32) a. *the news's continual surprise of Sue (Pesetsky 1995:74)
cf. The news surprised Sue.
- b. our continual surprise at the news (Pesetsky 1995:72)
- c. *the goings-on's frequent amusement of Sue (Pesetsky 1995:74)
cf. The goings-on amused Sue.
- d. Sue's frequent amusement at the goings-on (Pesetsky 1995:72)

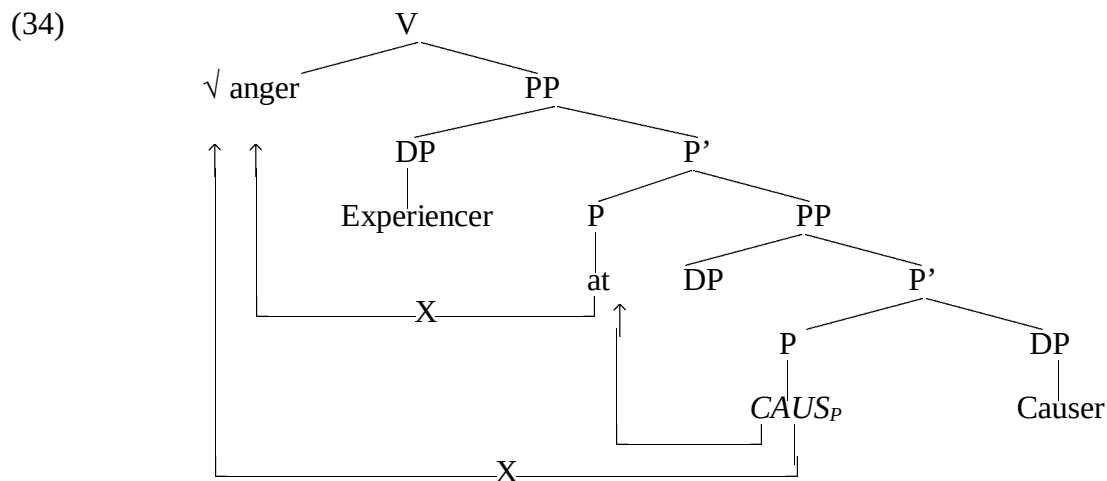
Pesetsky (1995) argues that this is due to what he calls Myers's Generalization:

- (33) Myers's Generalization
Zero-derived words do not permit the affixation of further derivational morphemes.

(Pesetsky 1995:75)

The generalization itself is supported by the observation that where there is a phonological string that is assigned to two syntactic categories, only one of the categorizations can take a derivational affix. For example, while the verb *support* allows the adjectivizing affix *-ive* to form *supportive*, the noun *support*, which is derived from the verb by zero-derivation, does not allow an adjectivizing affix to form **supportial*/**supportious*. If one assumes that object experiencer predicates require a zero-form preposition $CAUS_p$, which also serves as an affix, as Pesetsky (1995) argues, the observation in (32) falls under (33). In (32ac), the affixation of the nominalizing suffixes (*-Ø* and *-ment*) is blocked by the previous affixation of $CAUS_p$. In the well-formed cases in (32bd), the nominalizing suffixes are attached directly to the intransitive verb roots without $CAUS_p$. Thus, Pesetsky (1995) argues that the ungrammaticality of nominalization provides evidence for the existence of a zero-form preposition.

Pesetsky (1995) assumes that overt prepositions are not affixal, in that they cannot adjoin to a verb. If an overt preposition intervenes between the verb and the zero-form preposition as in the following structure, it blocks the head movement of the zero-form preposition:



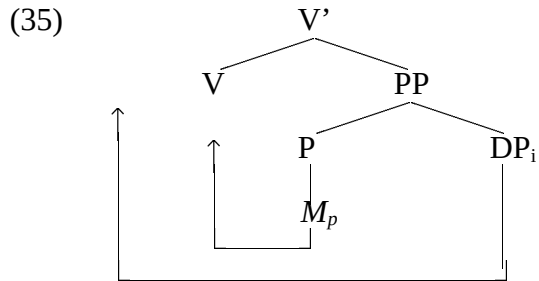
Since $CAUS_p$ cannot reach the verb, its lexical property that it must be adjoined to a verb is not satisfied. $CAUS_p$ cannot adjoin directly to the verb either, for the head movement of the zero-form preposition is subject to the Head Movement Constraint (Travis (1984), Baker (1988)), and therefore cannot skip the intervening head. Thus, (30b) above is ruled out for syntactic rather than semantic reasons.

In 1.3.5., I will argue that this analysis can be extended to middle sentences to account for the observations mentioned in 1.3.1. and 1.3.2. Before presenting the analysis, I will review Pesetsky's (1995) analysis of middle sentences. While Pesetsky (1995) argues for a zero-form preposition in English middles, he appears to assume that the zero-form preposition in the middle has a status different from that in sentences with an object-experiencer predicate. I will argue in 1.3.5. that it heads an adjunct in the same way as the zero-form preposition in

sentences with an object-experiencer predicate. Pesetsky's (1995) account of the ill-formedness of (30b) will thus be extended to the ill-formedness of middles with an overt internal argument PP or with a *by*-phrase.

1.3.4. Back to the Middle: Pesetsky's (1995) Analysis of Middle Sentences

Pesetsky (1995) proposes that a zero-form preposition is also involved in middle sentences, as shown in the following structure:



M_p in (35) stands for the zero-form preposition for middle sentences.¹³ M_p does not have the ability to check Case and it absorbs Case from the verb. The DP, which is θ -selected by both V and M_p , moves to the subject position to have its Case checked.

In the above structure, the object DP is not a sister to the verb. This is allowed in the system Pesetsky (1995) proposes, in which an argument category (DP or CP) can be θ -selected by a predicate if they meet the following conditions:¹⁴

- (36) The argument category θ is θ -selected by a predicate θ if
- a. θ is c-commanded by θ ,

¹³ Pesetsky (1995:261) uses G to represent this zero-form morpheme. I use M_p to avoid confusion with the zero-form preposition he proposes for another construction.

¹⁴ The following are Pesetsky's (1995) original formulations of these conditions.

- (i) If θ θ -selects θ as an internal argument, θ is *semantically related* to θ .
- (ii) In Cascade Syntax, a θ -role R internally θ -selected by the head θ must satisfy either of the following conditions.
 - a. an argument bearing R occupies a position *internally selected* by θ , or
 - b. a θ -selector of R heads a position *internally selected* by θ .

Semantic relatedness and *internal selection* are defined as follows.

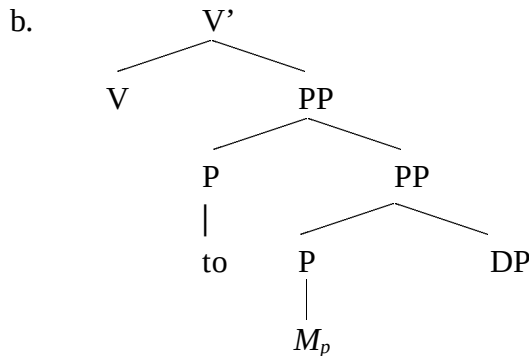
- (iii) An argument category θ is *internally semantically related* to a predicate θ iff
 - a. θ is c-commanded by θ , and
 - b. there is no argument category θ such that θ c-commands θ and θ dominates θ .
- (iv) θ *internally selects* θ iff θ c-commands θ , and there is no argument category θ such that θ c-commands θ and θ c-commands θ .

- b. there is no argument category θ which is c-commanded by θ and which c-commands θ , and
 - c. there is no argument category θ which is c-commanded by θ and which dominates θ .
- (DP and CP count as argument categories.)

DP_i and V in (35) satisfy these conditions because DP_i is c-commanded by the verb, there is no DP or CP that is c-commanded by the verb and c-commands DP_i , and there is no DP or CP that is c-commanded by the verb and dominates DP_i .

Pesetsky (1995) points out that postulating a zero-form affixal preposition in the middle has two desirable consequences. First, the analysis correctly predicts that middles do not allow preposition stranding. (See Keyser and Roeper (1984) and Fagan (1988) for related discussion.) To see this, consider the following structure:

- (37) a. *Sue talks to easily. (Pesetsky 1995:263)



The movement of M_p to V is blocked by the intervening P. The possibility that M_p is generated between the verb and the preposition is ruled out by the standard assumption that movement is a last resort and movement into an A-position is always Case-driven. If M_p shows up between V and P, it does not absorb Case from P, so that the object of P has its Case checked by P and therefore cannot move.

Second, middle predicates cannot be nominalized, as illustrated in (38). Pesetsky (1995) points out that this observation follows from the existence of the zero-form morpheme M_p attached to the predicate:

- (38) a. *the bureaucrats easy bribery
 b. *the book's easy translation
 (Pesetsky 1995:261)

As in the case with $CAUS_p$, the affixation of M_p blocks the further affixation of the nominalizing suffix.

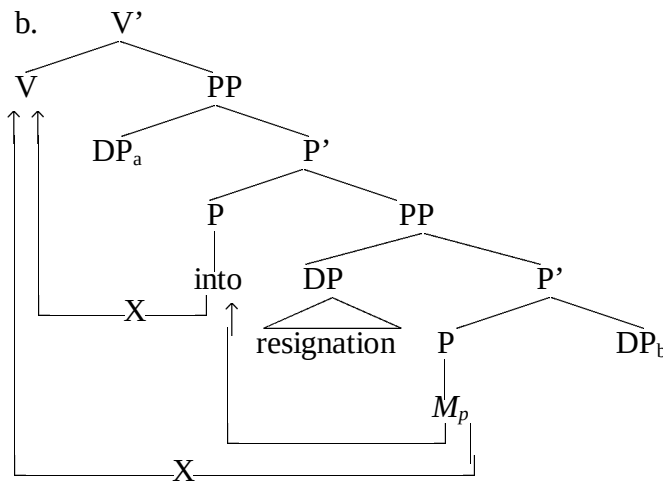
1.3.5. M_p Heads an Adjunct

In 1.3.1. above, I argued that middle sentences must contain an element which does not have phonetic content, and which serves as the source of the responsibility requirement.

Suppose now that the zero-form preposition M_p discussed above is this element, and that it has a meaning which can be roughly characterized as “due to (some property of).” This is the type of meaning that is most likely to be assigned to an adjunct. I will now explore this possibility, and demonstrate that it can account for the ill-formedness of middle sentences with an overt internal argument PP or with an overt *by*-phrase.

If M_p heads an adjunct, the PP headed by M_p must be lower than all the internal arguments in Cascade Syntax. The predicate of (39a) then should have the structure in (39b).

(39) a. *Executives don't persuade into resignation easily.

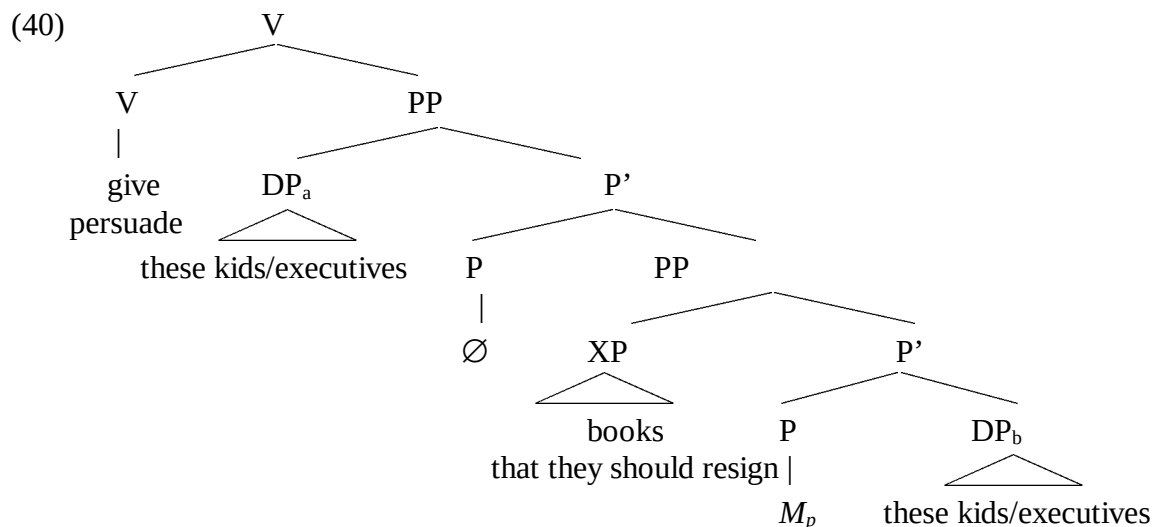


I will come back to the status of DP_a and DP_b . For the moment, it is enough to assume that DP_a can be θ -selected by the verb, and that DP_b can be θ -selected by M_p . Let us now consider M_p . Like $CAUS_p$ discussed in 1.3.3. above, M_p is affixal and must adjoin to the verb, but this movement is blocked by the overt P *into*, which itself is not affixal. Therefore, M_p should be incompatible with internal arguments headed by an overt P. This is exactly what has been observed in (20)-(28).

Middle sentences with an overt agent phrase should have the same configuration as (39b), and thus be ruled out for the same reason: The head movement of M_p is blocked by the intervening *by*. If M_p adjoins to *by* and stops there, the lexical property of M_p that it must be attached to a verb will not be satisfied. If it skips *by* and adjoins directly to the verb, the Head Movement Constraint will be violated. In either case, the derivation is ruled out for a syntactic reason rather than for a semantic reason. The analysis requires no stipulation for the agent in the middle sentences. The incompatibility of a *by*-phrase follows from the assumption that middle sentences involve suppression of the original external argument as in passive sentences and the proposed hypothesis that they contain a zero-form preposition which heads an adjunct.

Before I conclude this subsection, let us consider the status of DP_a and DP_b in the above ill-formed derivation. DP_a serves as an internal argument of V, and DP_b serves as an internal argument of M_p . Both DP positions are necessary to satisfy the θ -selection by the V and M_p . DP_a may not serve as an internal argument of M_p because it is not c-commanded by the zero-form preposition. DP_b , on the other hand, may not serve as an internal argument of V because it does not satisfy the condition in (36b) above: The DP *resignation* is an argument category, is c-commanded by V, and c-commands DP_b .¹⁵ If movement from a θ -position into another θ -position is allowed freely, the DP *executives* should be allowed to move from the position of DP_b to the position of DP_a , and then to the subject position. I assume such movement is not possible for the following two reasons.

First, suppose that DP can move from the position of DP_a to the position of DP_b . Then, in cases where the intervening P is also affixal, the middle construction is expected to be possible. This possibility arises for sentences with double objects as in (20c) and sentences with a CP complement as in (23c), if such sentences have the structure shown in (40).



The observation that (20c) and (23c) are ungrammatical provides a reason to suspect that movement from the position of DP_b to the position of DP_a is not possible.

The second reason to believe that such movement is not possible comes from the discussion to be presented in the following sections. I will argue that movement into a θ -position is not possible if the semantic role licensed in the derived position is a θ -role anchored to event interpretation. Since the case discussed here falls into this category, movement should not be possible if the proposal is on the right track.

¹⁵

The condition (iib) in note 14 cannot be used to sanction DP_b as an internal argument of V, since M_p does not θ -select the role θ -selected by the verb.

Thus, middle sentences with an internal argument phrase headed by an overt P are ruled out for two reasons. One is that the movement of M_p is blocked by the overt P, and the other is that the movement of DP from the position of the complement to M_p to the position of the complement to the verb is not allowed.¹⁶ Nonetheless, in well-formed middle sentences without an overt internal argument, DP moves from the position within VP, where it has θ -roles licensed by V and M_p , to the subject position, where it has another semantic role licensed by the predicate.

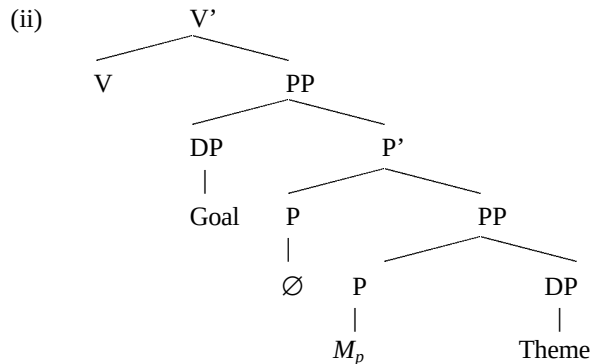
1.3.6. Summary

In this section, I have argued that the subject of middle sentences in English moves from one θ -position into another θ -position. It moves from the position of DP in the configuration given in (41), where it serves both as complement to the verb and as complement to the zero-form preposition M_p . It thus has one semantic role licensed by the verb and another licensed by M_p . Since M_p absorbs Case from the verb, the DP moves to [Spec, IP] to have its Case checked. On its way, it enters [Spec, VP], where it has still another semantic role licensed by the middle predicate. The third role is that of the external argument of the middle predicate added by the zero-form affix M_{aff} .

¹⁶ Consider the following example:

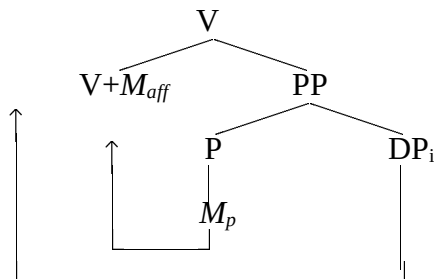
- (i) *Money gives victims of natural disasters easily. (Fagan 1992:79)

According to the proposed analysis, such sentences should be allowed, if they have the following configuration in Cascade syntax:



M_p adjoins to P_θ , which then adjoins to V. The theme DP should then be allowed to move to the subject position. To exclude this possibility, I assume that M_p absorbs Case from the verb rather than from P_θ , so that neither the goal DP nor the theme DP will have their Case checked in these positions.

(41)



2. Unergative Verbs with Reflexive Meaning

I have argued that the subject of English middles moves from a θ -position to another θ -position. In this section, I argue that movement into a θ -position should not be allowed freely.

If UG allows movement into a θ -position freely, the following examples should appear to children to be good candidates for cases with such movement. They would analyze *wash/shave/dress* as always requiring two θ -positions and optionally having accusative Case:

- (42) a. John washed.
 b. John shaved.
 c. John dressed.

The interpretation that the missing object is coreferential with the subject would follow from the movement analysis because the object position and the subject position would necessarily be occupied by the same argument. This possibility is suggested in Lasnik (1995), although nothing he proposes in that article depends on it.

If the above cases involve movement from the object position into the subject position, they should exhibit diagnostics of movement. For example, sentences with these apparently intransitive forms should allow a resultative phrase just as passives, unaccusatives, and middles do. However, the following examples show that they do not:

- | | | | |
|------|----|----------------------------------|--------------------------------|
| (43) | a. | *John washed clean. | cf. John washed himself clean. |
| | b. | *John shaved clean. | cf. John shaved himself clean. |
| (44) | a. | The table has been wiped clean. | (passive) |
| | b. | The bottle broke open. | (unaccusative) |
| | c. | This table wipes clean (easily). | (middle) |

The sentences in (42), therefore, should not be analyzed as involving movement between two θ -positions. Their reflexive interpretation must be lexically specified, rather than being accounted for on the basis of syntactic movement. This is not the simplest analysis one can imagine under the assumption that movement into a θ -position is freely allowed by UG, but it is descriptively more adequate. The simplest analysis is the movement analysis, which is descriptively inadequate. To let children choose the more descriptively adequate lexical analysis over the simpler but descriptively inadequate movement analysis without having

access to negative evidence, UG must somehow restrict movement into a θ -position so that the movement into a θ -position will not be allowed in (42).

To summarize the discussion so far, UG must allow movement into a θ -position for the subject of middle sentences but not for the subject of unergative sentences with reflexive interpretation. The θ -criterion as a descriptive generalization then is correct for unergative sentences with reflexive interpretation, but incorrect for middle sentences. In the next section, I will discuss what difference there is between the cases where the θ -criterion holds and cases where it does not, and what guarantees its effects where it holds.

3. Predication Roles and Event-Anchored θ -Roles

3.1. Proposal

The view presented here draws on the distinction between the thematic roles that are anchored to event interpretation and the semantic roles licensed solely by predication.¹⁷ The former, which I call *event-anchored θ -roles*, include thematic roles such as agent, theme, goal, and so on. The latter, which I call *predication roles*, are the roles borne by the external argument of individual-level predicates, typically the role of the bearer of the property described by the predicate.¹⁸ The subject of the unergative *wash* and *shave* in eventive sentences as in (45) bears an event-anchored θ -role of the agent. The subject of middle sentences as in (46), if the above analysis is correct, bears a predication role licensed in the subject position, and bears an event-anchored θ -role of theme licensed in the object position.¹⁹

(45) John washed, shaved, and put on clean clothes.

(46) The mayor bribes easily.

Movement into a θ -position is allowed in (46), in which the moved DP enters into a predication relation in the derived position and has a predication role licensed in this position.

Movement into a θ -position is *not* allowed in (45), where the moved DP would have the event-anchored θ -role of agent licensed in the derived position. The contrast suggests the following generalization:

¹⁷ An alternative view is found in Baker (1989), in which he suggests the possibility that an argument may not receive more than one θ -role from any given θ -role assigner. I will not discuss this possibility here.

¹⁸ The notion of *predication role* pursued here is slightly different from the role licensed to external arguments in Williams (1980), where some event-anchored roles such as the agent role are assigned through predication.

¹⁹ I am assuming that this DP also bears an event-anchored θ -role licensed by the zero-form preposition discussed above. As I mentioned above, this licensing is done in the following configuration, in which the DP serves both as complement to the verb and as complement to the preposition:

(i) ... [V [P DP]]

- (47) Movement from one θ -position into another θ -position is not possible if an event-anchored θ -role is licensed in both positions.

Movement from one θ -position into another θ -position is allowed if only a predication role is licensed in the latter position.

In the following subsections, I will present two possible ways this generalization is derived.

Both are based on the idea that licensing of event-anchored θ -roles involves checking of some formal features between the argument DP and the verb. (See Lasnik (1998b) and Bošković and Takahashi (1998).) In the following discussion, I will call these features θ -features. I will assume that a single DP may bear two or more event-anchored θ -roles, and that when they do, they bear a θ -feature for each θ -role. DPs thus bear the same number of θ -features as the event-anchored θ -roles they bear.

3.2. Alternative 1: θ -Features as Strong Features

Suppose now that the θ -features on DPs are strong features (at least in English), and must be eliminated (almost) immediately upon its introduction into the phrase marker in order not to lead to cancellation of the derivation. (See Chomsky (1995, Chapter 4) and Lasnik (1998a).) The θ -feature on a DP can be eliminated when it has been checked off against the corresponding feature of the verb. I will call the latter θ -feature of the head without going into its exact nature. An event-anchored θ -role is licensed for a DP when the θ -feature it has for the θ -role is checked off against the θ -feature of the head.²⁰

As a result, it follows that argument DPs must have their event-anchored θ -role(s) licensed in the first possible position for θ -checking, or the derivation will be canceled. Movement into a θ -position with an event-anchored θ -role is, therefore, ruled out. This successfully excludes the incorrect movement analysis of unergatives with reflexive interpretation discussed above. According to the movement analysis, DP enters into derivation with a θ -feature for the theme role and a θ -feature for the agent role. The θ -feature for the theme role can be checked off in the object position, and the theme role is licensed. The θ -feature for the agent role, however, must also be checked off in this position. If it is not, the derivation will be canceled. If it is, the DP can move into the subject position, the position where the agent role should be licensed. The agent role, however, cannot be licensed in this position because the DP does not bear a θ -feature that can be checked off against the θ -feature of the head.

Predication, by assumption, does not involve the checking of such features. DPs that enter into a predication relation do not need a θ -feature. Therefore, a DP that has had its θ -feature(s) checked off in its original position may move into another position to enter into the predication relation with a predicate.

²⁰

I assume that DPs enter into derivation along with their Case features, which are then checked against the Case feature of an appropriate head category. That is, Case is not assigned to DPs by a Case-assigner. Therefore, even if Case is a visibility condition of θ -role licensing, Case-checking is not required to take place prior to the checking of θ -features.

The notion of strong features has been proposed in previous literature to account for cases where overt movement takes place. When viewed as an element that derivation cannot tolerate, a strong feature on the head (e.g., the EPP-feature) triggers overt movement into its Spec. (See Chomsky (1995).) On the same conception, a strong θ -feature on an argument DP ensures that the DP has its event-anchored θ -role(s) licensed in the first possible position. The hypothesis that θ -features are strong derives part of the effects that were attributed to the θ -criterion in Chomsky (1981), namely that an argument DP may have its θ -role(s) licensed in only one position, in fact, in the position of the tail of its chain. The θ -criterion does not need to be stipulated in the system of grammar without D-structure. In addition, it follows that the requirement is now limited to event-anchored θ -roles, the semantic roles licensed by predication being exempt from it.

3.3. Alternative 2: θ -Features as Relational Properties

The second possibility presented here does not rely on the notion of feature strength proposed in Chomsky (1995). It pursues the view that θ -features are features that need to be interpreted, rather than to be eliminated.

Event-anchored θ -roles are relational notions. For example, there is no agent or theme in isolation. An agent is the agent of an action. A theme is the theme of a change of state/location. The notions of event-anchored θ -roles make sense only if the argument is related to the head denoting the event. This consideration suggests that the θ -feature that an argument phrase bears for an event-anchored θ -role becomes [+Interpretable] only if the DP has entered into a checking relation with the head.

Suppose now that the outputs of syntactic operations are sent to the LF-component cyclically, as argued, for example, by Higginbotham (1995). When an argument DP is merged with a verb, the result is sent to the LF-component before it is merged with another element (or at least before the DP has a chance to move into another position). It then follows that the θ -feature of a DP must be checked as soon as the DP is introduced in the derivation.

For example, consider the movement analysis of the unergatives with reflexive interpretation again. The DP enters the derivation with [theme] and [agent], and merges with the verb. The θ -feature of [theme] is immediately related to the event argument of the verb, but the configuration is not appropriate for checking the θ -feature of [agent] against the verb.²¹ Therefore, the θ -feature of [agent] remains [-Interpretable] when the DP together with the verb is sent to the LF-component. The derivation is ruled out before the DP has a chance to move into the subject position to have the agent feature related to the verb.

²¹ One can assume, for example, that checking of the agent feature requires the existence of a higher v, as proposed by Hale and Keyser (1993).

The θ -criterion, in this case, follows from the conception of event-anchored θ -roles and cyclic interpretation. The predication role is again exempt because the argument DP does not bear a θ -feature that needs to be related to an event-bearing head.

3.4. Consequences

Finally, let us consider some of the consequences that the two alternatives have. First, from the basic idea outlined in 3.1 that licensing of predication roles does not involve checking of θ -features, it follows that a predication role may or may not be an extra; an argument DP may bear a predication role in addition to its event-anchored θ -role(s) or it may bear a predication role without bearing an event-anchored θ -role. In the former case the DP bears a θ -feature for each event-anchored θ -role it bears. In the latter case, the DP bears no θ -feature. I have argued that the subject of middle sentences bears both a predication role and event-anchored θ -roles. Other candidates for cases with a DP bearing both a predication role and an event-anchored θ -role include the subject of sentences with deontic modals (Bošković (1994)) and the subject of some passive sentences in Japanese and *get*-passives in English (Lasnik and Fiengo (1974), Kuroda (1979), Hoshi (1991, 1994)). Some possible cases where an argument DP bears a predication role without any event-anchored θ -role(s) include the subject of *tough*-sentences in English (Partee (1971), Chomsky (1981:309)), the so-called major subjects (the subjects preceding another subject in a single clause) in Japanese (Kuno (1973), Saito (1982)), and the subject of indirect passives in Japanese (Kuroda (1965, 1979), Washio (1989-90, 1995)).²²

²² Another possible consequence of the idea proposed here is that external arguments may have their semantic role licensed in different positions depending on the type of the role involved. For an argument DP to bear an event-anchored θ -role, it must occupy a position within a VP (or an eventive AP) because it must have its θ -feature checked against the θ -feature of the head. For an argument DP to bear a predication role, on the other hand, it only needs to be in a configuration where a predication relation can be established. Williams (1980) argues that predication is possible between an argument NP ('DP in this article) and its sister constituent. On the assumption that all branching nodes are binary, his condition taken literally restricts predication to the following configuration:

- (i) [θ DP VP/AP]

θ in this configuration will necessarily be a projection of DP or VP/AP. Therefore, if Williams's condition is literally carried over to the system where all branching nodes are binary, predication roles, as well as event-anchored θ -roles, will be licensed within the predicate phrase. On the other hand, suppose that predication is possible in the following configuration where F is some functional category (e.g., INFL):

- (ii) [_{FP} DP [F VP/AP]]

Then, an argument DP need not be within VP/AP in order to have its predication role licensed. This potential difference between event-anchored θ -roles and predication roles may lead to a motivation for the hypothesis, advocated by Diesing (1988) and Kratzer (1989), that the subject of a stage-level predicate originates in VP/AP, while the subject of an individual-level predicate is base-generated in [Spec, IP]. The subject of a stage-level predicate must occupy [Spec, VP/A] to have its event-anchored θ -role licensed via checking of its θ -feature against the θ -feature of the head V/A. The subject of an individual-level predicate does not have a θ -feature, and therefore does not need to enter into a checking relation with the head V/A.

The two alternatives have different consequences as well. While the first alternative does not allow any event-anchored θ -role to be licensed in a derived position, the second alternative allows one case in which a DP moves into a θ -position where an event-anchored θ -role is licensed. Namely, movement into a θ -position should be possible if the event-anchored θ -role licensed in the derived position is the same role that is licensed in the base position. Such a possibility has been proposed by Pesetsky (1995) for object-experiencer predicates. His analysis, therefore, is compatible with the second alternative but not with the first alternative.

On the other hand, the first alternative allows the possibility that θ -features are weak in some other languages. Such a possibility has already been explored by Bošković and Takahashi (1998) for analyzing scrambling in Japanese. If θ -features are weak in a language, it is expected to allow resultatives with unergative verbs with reflexive interpretation. That is, examples like *John washed/shaved clean* are expected to be grammatical in such a language.

The validity of these consequences remains to be examined. The choice between the two alternatives, as is clear from the above discussion, requires careful examination of various constructions across languages.

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Ellipsis and E-type Anaphora^{*}

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1. Introduction

It is well-known that ellipsis involving a proform as its part can exhibit flexibility in anaphoric interpretations — often in somewhat unexpected ways. In this work, I will attempt to show that when we clarify how anaphora involved as part of ellipsis comes to be represented in covert syntax, we will also have a better understanding of the way the so-called E-type anaphora is represented in covert syntax. In particular, I will first point out that ellipsis can provide a type of strict identity interpretation for a reconstructed proform which is akin to the interpretation recognized in the E-type anaphora. I will then argue that the parallelism between the two constructions arises due to the involvement of the same operation of 'reconstruction' in the form of copying applying in covert syntax. It should be made clear at this point that the research presented in this work almost exclusively concerns the syntactic aspects of these phenomena and leaves out their semantics. We will, in other words, attempt to answer the question what syntactic operations are responsible for the semantic characteristics of these constructions, but will leave unanswered the question how they should be represented semantically.

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Implementing this working hypothesis, we can, for instance, offer a very simple account of the well-known ambiguity observed in VP-Ellipsis in (1):

- In particular, the two distinct interpretations of the second clause — 'Bill loves his own wife' (sloppy identity) and 'Bill loves John's wife' (strict identity) — can be captured in terms of the two distinct orders in which syntactic binding and the reconstruction of the elided VP can apply as covert syntactic operations (Kitagawa (1991b)). For instance, as illustrated by the derivation in (2) below, sloppy identity arises when nominal binding applies **after** the reconstruction of the VP takes place:

- Sloppy identity arises in (1), in other words, when the VP containing an **unbound** proform is reconstructed at the ellipsis site.² Strict identity arises, on the other hand, when the VP containing a **bound** proform is reconstructed. That is, when syntactic binding applies before VP-reconstruction applies, as illustrated by the derivation in (3):³

- ¹ See Kitagawa (1991b), Kitagawa (1994) and Kitagawa (1995) for the motivation for such covert syntactic operations. Kennedy (1997) reaches a similar conclusion, arguing for the relevance of Quantifier Raising in antecedent-contained deletion.

² See Kitagawa (1991b) for the motivations to adopt this particular approach, and also for arguments that sloppy identity is independent of λ -abstraction.

³ Another possible derivation for strict identity is to reconstruct an unbound proform his and let it be coreferential with the antecedent John in the first clause. See Kitagawa (1991b) for an analysis which does not leave this as a possibility.

A virtually identical analysis permits us to capture the sloppy-strict ambiguity observed in the empty nominal (or DP-Ellipsis) construction in Japanese as in (4):⁴

- (4) John-wa [_{DP} **zibun**-no anyoo-bangoo]-o wasuretesimatteita ga,
 -TOP self-GEN PIN.number-ACC forgot though

Okusan-wa [_{DP} **e**] oboeteita.
 Wife-TOP remembered

'While John forgot his PIN number, his wife remembered { his / her } number.'

Here, the elided DP can be interpreted either as 'John's wife's own PIN number' (sloppy identity) or 'John's PIN number' (strict identity), and each of these readings can be ascribed to the distinct order in which the two covert operations applied.⁵ When the reconstruction of DP takes place first, and then the syntactic binding of zibun 'self' does as in (5) below, an **unbound** proform is reconstructed at the ellipsis site, and sloppy identity arises:

- (5) a. LF_i: John-wa [_{DP} zibun-no PIN]-o wasurete... Okusan-wa [_{DP} **zibun-no PIN**]-o
 oboete... |_____↑
 b. LF_k: John₁-wa **zibun**₁-no PIN-o wasurete... Okusan₂-wa **zibun**₂-no PIN-o oboete...
 |_____ |_____

When the order of application is reversed as in (6) below, on the other hand, a **bound** proform is reconstructed at the ellipsis site, and strict identity arises:⁶

- (6) a. LF_i: John₁-wa [_{DP} **zibun**₁-no PIN]-o wasurete... Okusan₂-wa [_{DP} **e**] oboete...
 |_____ |
 b. LF_k: John₁-wa [_{DP} zibun₁-no PIN]-o wasure... Okusan₂-wa [_{DP} **zibun**₁-no PIN]-o
 oboe... |_____↑

Finally, this analysis allows us to assimilate certain interpretations of overt pronouns to those involved in the ellipsis constructions we have examined above. The sloppy identity of a 'pronoun of laziness' in the celebrated 'paycheck sentence' as in (7)

⁴ In this work, I will not take any definite position as to what categorial status nominal expressions in Japanese, especially those without phonetic content, have. I will, however, tentatively label the ellipsis construction in question as DP-Ellipsis since it will allow us to reduce all the anaphoric properties we will deal with below to the category D(eterminer).

⁵ Otani and Whitman (1991), following Huang (1991), argue that the sloppy identity observed in (4) is due to the hidden existence of VP-Ellipsis in Japanese. Hoji (1998), on the other hand, attempts to neutralize most of their arguments, claiming that the interpretation in question does not involve genuine sloppy identity, but is what he calls a 'sloppy-like reading.' According to Hoji, a sloppy-like reading is an epiphenomenon that arises when a phonetically empty object NP (rather than DP) as in (4) is interpreted on a par with a bare nominal supplied by the context of discourse. Although I believe that there are good reasons to adopt 'DP-reconstruction' over 'Disguised VP-Ellipsis' and 'Supplied N Head,' I must leave their comparison to another occasion. See some discussion on the 'Supplied N Head' approach below.

⁶ As illustrated by the interpretive restriction in (i) below, zibun must be bound:

- (i) [₂ **Kebin Kosunaa**-ga turetekita bodiigaado]-ga **zibun**_{2/*1}-no okusan-to odotta.
Kevin Costner₁-NOM brought bodyguard-NOM **self**_{2/*1}-GEN wife-with danced

'The bodyguard Kevin Costner brought danced with **self**'s (= his own) wife.'

Strict identity in (6), in other words, cannot be derived in the way described in Footnote 3.

involves a lexical (i.e., phonetically non-empty) proform. Furthermore, the Bare Output Conditions, one of the main tenets of the minimalist program, require the phonetic/phonological features of lexical items to be non-existent (or invisible) at the LF-interface.⁸ As far as the covert syntax is concerned, in other words, there should not exist any reason to discriminate between the phonetically empty proforms involved in ellipsis and overt proforms like pronouns of laziness. In both cases, when an anaphoric relation is established between a proform and its **mutually non-c-commanding** antecedent (which perhaps presupposes agreement in one or more of their formal features like category, number, person and gender), the semantic features of the latter is reconstructed onto the former. Based upon such considerations, we can assimilate all of VP-Ellipsis in (1), DP-Ellipsis in (4) and pronouns in (7) and (9), rejecting the view that ellipsis involves full reconstruction at LF while anaphora does not. Note that postulating PF-deletion for ellipsis does not permit us to assimilate pronouns in (7) and (9) to ellipsis. (We will discuss PF-deletion further below.) This provides the general background for the analysis proposed below.⁹

⁸ Chomsky's Spell-Out is designed to strip away all the lexical information relevant only to PF and send the rest to LF. Alternatively, we may let all the lexical information carried over to both PF- and LF-derivations, and define what features each interface selectively sees. In this approach, phonetic contents of lexical items, for instance, are not visible at LF. This alternative is cost-less since the correct application of Spell-Out presupposes the distinction between those lexical features relevant to PF and those relevant to LF at any rate. It may also be a better alternative than Spell-Out if it turns out that certain formal features play a role at both interfaces,

⁹ Tomioka (1998) presents the examples in (i) below and claims that sloppy identity for pronouns of laziness in English have tighter restriction than that for the empty proforms in Japanese as in (4):

- (i) a. Gary likes **his mother**. Tim likes **her**, too.
 — her = *Tim's mother
- b. Gary lost **his ID** in the gym. Tim lost **it** in a classroom.
 — it = ???Tim's ID
- c. Gary thinks **his teachers** are geniuses, but Tim thinks **they** are nuts.
 — they = ???Tim's teachers

With somewhat tighter sequencing of eventualities, and especially with genericity, as in (ii) below, however, sloppy identity becomes possible in similar discourses:

- (ii) a. Quite often, a young husband has not learned the proper way of expressing his affection to **his wife**, but an old man usually knows how to please **her**.
 — her = an old man's wife
- b. John and Bill have totally different policies concerning the upbringing of their own children. While John disciplines **his children** quite often, Bill tries to let **them** learn right from wrong on their own.
 — them = Bill's children
- c. Many dog lovers walk **their dogs** in the park, but of course there are thousands of people who have no choice but to walk **them** on the street.
 — them = the dogs of thousands of people.

This suggests that syntactic derivations should converge for these sentences, while the resulting representations are perhaps subject to further interpretive restrictions.

2. Strict Identity in Ellipsis

Let us now examine the interpretation of VP-Ellipsis in English as in (11) and (12):

(11) [A statement made by the principal of a boys' school]

In our school, **every student**_x [_{VP} respects **his**_x teacher], and the parents also expect me to [_{VP} e].

(12) In this school, **every student**_x [_{VP} respects **his**_x teacher], but unfortunately, the principal doesn't [_{VP} e].

In both these sentences, the first clause involves a proform that is bound by a quantificational antecedent and is interpreted as a variable. When the VP in this clause is interpreted at the ellipsis site, the bound proform his_x contained in the VP exhibits a type of 'strict identity,' being interpreted as something like their or those. Thus, the elided VPs in (11) and (12) are interpreted roughly as 'respect **their** (or **those**) teachers.'¹⁰

Similar interpretations are obtained also when the antecedent VP contains a bound anaphor each other as a possessor as in (13) below, provided that the speaker permits 'couple-internal' reciprocity in its antecedent clause as in (14) to begin with:

(13) [A statement made by a marriage counselor]

Every couple_x [_{VP} criticizes **each other**_x's odd habits], and quite often, I am also inclined to [_{VP} e].

(14) **Every couple**_x criticizes **each other**_x's odd habits.

In (11)-(14), ellipsis follows either an infinitival marker to or a negated auxiliary verb. It therefore seems inappropriate to reduce the strict identity in (12), for instance, to the pragmatics-based interpretation of do as a main verb. The strict identity in question, in other words, seems to be made possible indeed by VP-Ellipsis rather than by the pragmatic control of 'deep anaphora' in the sense of Hankamer and Sag (1976)).¹¹

Furthermore, when the bound proforms their and each other in (15a-b) below are reconstructed at the ellipsis sites, they are interpreted as 'about forty percent of the students' and 'about forty percent of couples,' respectively, rather than as 'students' or 'couples':

¹⁰ Grammar also permits sloppy identity here, although we will concentrate on strict identity in our discussion.

¹¹ The pronoun him in (i) below cannot strictly refer to Bill:

(i) Mary blamed **him**_i, and **Bill**_i did [_{VP} e], too.

As has been discussed in Kitagawa (1991b, pp. 504-505), this puzzling interpretive restriction can be explained if the elided VP is reconstructed in covert syntax, and the resulting LF-representation is subject to the Condition B of the Binding Theory, as illustrated in (ii):

(ii) LF: Mary blamed him_i, and **Bill**_i did [_{VP} blame **him**_i], too

VP-Ellipsis involving do, in other words, does in fact exhibit properties that can be captured if it involves syntactic reconstruction and binding rather than pragmatic control.

- (15) a. The survey indicates that, in our school, **about forty percent of the students**_x, quite mistakenly, [_{VP} consider **their**_x SAT scores as satisfactory], but as principal, I must say I cannot [_{VP} e].
- b. [A statement made by a marriage counselor]
- About forty percent of couples**_x [_{VP} complain about **each other**_x's appearance(s)] even when I can find absolutely no reason to [_{VP} e].

The reconstructed proform in each of these examples, in other words, is intended to refer to the members of the set linguistically specified by the quantified antecedent of the 'original' proform in the antecedent VP rather than to refer to the entire set of 'students' or 'couples,' which, one might claim, is contextually made available.

Moreover, the elided VP in (16) below is interpreted as 'like **each** contestant's performance':

- (16) The contestants came up to the stage and performed one by one.
Every contestant_x seems to have [_{VP} liked **his**_x performance],
 but each time, the judge apparently didn't [_{VP} e].

The availability of this distributive interpretation at the ellipsis site also suggests that the strict identity here is based upon the interpretation of the proform bound by a quantificational element, and that a contextually available set reading as mentioned above is irrelevant. In short, the strict identity in question does **not** seem to arise because of the reference to the pragmatic context but rather due to some syntactically established anaphoric relation.¹²

Returning now to the sentences in (11)-(13), let us provide the observation that their non-elliptical counterparts as in (17) and (18) below are not well-formed. In particular, the proform showing up in the second clause cannot be legitimately bound by its antecedent in the first clause:

- (17) In our school, **every student**_x [_{VP} respects his_x teacher], but unfortunately, the principal doesn't [_{VP} respect ***his**_x teacher].
- (18) **Every couple**_x [_{VP} criticizes **each other**_x's odd habits], and quite often, I am also inclined to [_{VP} criticize ***each other**_x's odd habits].

What this indicates is that when the proforms in (11)-(13) are interpreted at the ellipsis site, they **cannot** undergo the process of syntactic binding in that position. The unsuccessful binding in (17) and (18) also suggests, first, that the ellipsis in (11)-(13) cannot be handled by PF-deletion applying to (17) and (18) as their base-generated and hence LF representations. Second, these ellipsis constructions cannot involve simple and full reconstruction of the **unbound** proform by any of LF-Copy, semantic or pragmatic accommodation, or a version of the E-type strategy which regards proforms simply as descriptions in disguise.

One may try to account for the grammaticality of (11)-(13) by combining LF-Copy of the antecedent with the 'vehicle change' analysis proposed by Fiengo and May (1994). As illustrated in (19), for instance, vehicle change can yield a well-formed LF of (13) with their as the 'pronominal correlate' of (the trace of) other's:

¹² I am grateful to Hajime Hoji and Ayumi Ueyama for useful discussion on this issue.

- (19) LF: **Every couple**_x [_{vp} criticizes **each other**_x 's odd habits], and quite often, I am also inclined to [_{vp} criticize **their**_x odd habits]

Note that the locality constraint imposed on anaphor binding will be irrelevant at the ellipsis site in (19). A similar analysis applied to (20) below, however, would yield an incorrect result. Notice that vehicle change would incorrectly provide a well-formed LF as in (21) for the ungrammatical sentence (20):

- (20) ?***Every couple**_x [_{vp} criticizes **each other**_x], and quite often, I am also inclined to [_{vp} e].
- (21) LF: **Every couple**_x [_{vp} criticizes **each other**_x], and quite often, I am also inclined to [_{vp} criticize **them**_x]

We thus should not make an appeal to vehicle change to deal with the ellipsis in (12),¹³ either.

Finally, suppose that one attempts to capture the strict identity in (11) by bringing the second clause containing the reconstructed proform into the domain of its antecedent in the first clause as illustrated in (22) below, along the line of 'dynamic binding' (Chierchia (1995), et al.): (The representation is simplified and the irrelevant details are omitted.)

- (22) $\forall_x$ [_{ip} student (x) $\wedge$ respect (x, x's teacher) $\wedge$ respect (I, x's teacher)]

Even if the reconstructed anaphor in (13) can be brought into the binding domain of every couple in a similar way, however, the subject of the second clause I (or PRO bound by I) would remain to be the local binder of the reconstructed anaphor each other, and the locality constraint on anaphor binding would still remain unsatisfied.¹⁴ Moreover, quite importantly, it must be assumed that this strategy is not available when the proform to be 'dynamically bound' is base-generated as in (17). It therefore would remain unanswered why dynamic binding applies only when ellipsis is involved.

¹³ Fiengo and May (1994, p. 269) report that the strict identity in question is possible in the antecedent-contained deletion as in (i):

- (i) **The men**_i [_{vp} introduced **each other**_i to everyone that the women did [_{vp} e]].

Most of over ten speakers I have checked with reject such a reading, although they accept a sloppy identity interpretation. In addition, all of them including the few who are not sure if strict identity is absolutely impossible in (i) find a similar sentence as in (ii) below ungrammatical:

- (ii) **The men**_i [_{vp} introduced **each other**_i to everyone that I { did [_{vp} e] wanted to [_{vp} e] }].

Note that the plural subject the women in (i) as the potential local antecedent of the reconstructed anaphor is replaced by the singular subject I in (ii). The ungrammaticality of (ii) then would lead us to the rejection of the vehicle change analysis in both (i) and (ii). See Kitagawa (1991b, p. 527), however, for some ideolectal variations concerning sloppy identity involving each other. Note also that the ungrammaticality of (20) would remain unaccounted for in the pragmatic account of the strict identity in (13). Kitagawa (1991a) offers an account of the contrast between (13) and (20).

¹⁴ See Huang (1983) and Kitagawa (1994, pp. 355-357), among others, for the discussion on the constraint that anaphors must be bound by the closest antecedent.

Let us now examine the interpretation of the empty nominal (i.e., DP-Ellipsis) in Japanese as in (23):

- (23) siritu-daigaku-no **dono** **kyoozyu**_x-ga [_{DP} **zibun**_x-no gakusee]-o suisensite-**mo**,
private-college-GEN which professor-NOM [_{DP} self-GEN student]-ACC
recommend-ever

Monbusyoo-wa [_{DP} e] saiyoosi-nai-daroo.
Ministry.of.Education-TOP [_{DP} e] employ-not-perhaps

'No matter which professor of a private college may recommend self's (= his or her own) student, the Ministry of Education will probably not employ them.'

In this sentence as well, the first clause involves a proform bound by a quantificational antecedent, and the bound proform contained in the DP exhibits a type of 'strict identity' when this DP is interpreted at the ellipsis site. Thus, the elided DP in (23) is interpreted roughly on a par with *sono gakusee* 'that student' or *sono hito-no gakusee* 'that person's student.' Here again, the non-elliptical counterpart of (23) as in (24) below does not permit a similar interpretation since the proform *zibun* 'self' showing up in the second clause cannot be legitimately bound by its quantificational antecedent in the first clause:

- (24) siritu-daigaku-no **dono kyoozyu**_x-ga [_{DP} zibun-no gakusee]-o suisensite **mo**,
monbusyoo-wa [_{DP} ***zibun**_x-no gakusee]-o saiyoosi-nai-daroo.
self-GEN student]-ACC

This fact forces us to reject the analysis of (23) which lets PF-deletion of an DP apply in the base-generated representation like (24). Any reconstruction of the unbound *zibun* or its dynamic binding will be also inappropriate.

One may also try to account for the grammaticality of (23) by reconstructing only the head nominal from the first clause and derive a representation as in (25):

- (25) siritu-daigaku-no dono kyoozyu-ga [_{DP} zibun-no [_N gakusee]]-o suisensite mo,
monbusyoo-wa [_{NP=N} **gakusee**]-o saiyoosi-nai-daroo.
student-ACC

'No matter which professor of a private college may recommend self's (= his or her own) student, the Ministry of Education will probably not employ **students**.'

Based upon the analysis of empty nominals as NPs rather than DPs, this approach attempts to reduce the strict identity in (23) to the definite interpretation a bare noun in Japanese can exhibit (among other interpretations), as exemplified by (26) (See Footnote 5):

- (26) John-wa **reezaa purintaa**-o tukatta.
-TOP laser.printer-ACC used

'John used the laser printer(s) / a laser printer / laser printers.'

Tomioka (1998), for instance, attempts to derive the definiteness associated with the interpretation of an empty nominal as in (23) by letting the 'iota' operation apply to the reconstructed nominal head as in (25). When the representation as in (25) contains a base-generated bare nominal *gakusee* 'student,' however, this nominal does not exhibit the interpretation comparable to the empty nominal in (23), but is interpreted as the generic '**student**.' The sentence therefore expresses that the Ministry of Education will probably not employ **any student** (as opposed to, for example, someone who has already

been teaching as a full-time faculty member.) Anyone who attempts to ascribe the strict identity in (23) to the flexible interpretation of bare nominals in Japanese, therefore, would have to explain the absence of a similar interpretation in its base-generated counterpart (25).

Moreover, the sentence in (23) makes up a quite natural discourse when it is followed by a sentence like (27):

- (27) kokuritu-dai-no gakusee-zyanai-to-ne.
 national university-GEN student-must.be
 'It's got to be a student of a **national university**.'

The students referred to by the empty nominal in (23), in other words, must be those from **private colleges** rather than just 'students,' and such a reading is established only by way of the anaphoric relation established by zibun, which is contained in its antecedent DP zibun-no gakusee 'self's student.' These facts suggest that the reconstructed content of the empty nominal in (23) is not the head nominal only but the entire DP.

To recapitulate so far, we have examined VP-Ellipsis in English as in (28) and (29) (= (11) and (13)) and DP-Ellipsis in Japanese as in (30) (= (23)), all of which can be descriptively characterized as in (31):

- (28) [A statement made by the principal of a boys' school]
 In our school, **every student**_x [_{VP} respects **his**_x teacher], and the parents also expect me to [_{VP} e].
- (29) [A statement made by a marriage counselor]
Every couple_x [_{VP} criticizes **each other**_x's odd habits], and quite often, I am also inclined to [_{VP} e].
- (30) siritu-daigaku-no **dono kyoozyu**_x-ga [_{DP} **zibun**_x-no gakusee]-o suisensite-**mo**,
 private-college-GEN which professor-NOM [_{DP} self-GEN student]-ACC
 recommend-ever
 Monbusyoo-wa [_{DP} e] saiyoosi-nai-daroo.
 Ministry.of.Education-TOP [_{DP} e] employ-not-perhaps
 'No matter which professor of a private college may recommend self's (= his or her own) student, the Ministry of Education will probably not employ them.'
- (31) a. A proform in the first clause is **c-commanded** by its quantificational antecedent and is interpreted as a **bound variable**.
 b. **Ellipsis** is involved in the second clause, and the ellipsis site is **outside** the **c-command** domain of its antecedent.
 c. The proform in the antecedent clause is successfully interpreted also at the ellipsis site despite the **lack of a c-commanding binder**.
 d. This **proform** is interpreted at the ellipsis site as a **definite** description of the members of the set defined by the quantificational antecedent of the original proform.

Comparing (28)-(30) with their base-generated counterparts, we have also arrived at the interim conclusion that the derivation of these sentences does not involve any of PF-deletion, reconstruction of unbound proforms or head nominals, vehicle change, and dynamic binding.

This conclusion does not leave us too many options, but suggests, first, that the content of the elided phrase in each of (28)-(30) is **covertly reconstructed** from the antecedent clause, and second, that it is carried out **without** involving the reconstruction of the proform in its **unbound** state. I will therefore adopt the analysis in which the proforms in these sentences are **syntactically bound in the antecedent clause**, and then **covertly copied** into the ellipsis site.¹⁵ Under this analysis, since the proform reconstructed at the ellipsis site in each of (28)-(30) has been already bound in the antecedent clause, it need not undergo the covert process of syntactic binding again. It thus escapes binding failure in the second clause of their base-generated counterparts, observed, for example, in (32) (= (17)):

- (32) In our school, **every student** [_{VP} respects his_x teacher], but unfortunately, the principal doesn't [_{VP} respect ***his**_x teacher], too.

This analysis is based upon the working hypothesis that a proform that has undergone syntactic binding maintains its bound status even after it is reconstructed elsewhere in the syntactic representation. This in fact is what we need to assume even for the strict identity involving non-quantificational antecedent of the proform, for example, for the strict identity of the reconstructed each other and zibun 'self' exhibit in (33) and (34) below, respectively. Recall that both each other and zibun must be bound to be well-formed at LF (See Footnote 6):

- (33) **They**₁ [_{VP} liked **each other**₁'s papers], and I did [_{VP} e], too.

- (34) John-wa [_{DP} **zibun**-no ansyoo-bangoo]-o wasuretesimatteita ga,
 -TOP self-GEN PIN.number-ACC forgot though

Okusan-wa [_{DP} **e**] oboeteita.
 Wife-TOP remembered

'While John forgot his PIN number, his wife remembered { his / her } number.'

Recall also that covert copying applies when a proform and its antecedent (and hence an 'elided' phrase and its antecedent as well) **do not c-command** each other.¹⁶ Thus the proposed analysis allows us to capture all the descriptive characteristics of (28)-(30) described in (31) above except for (31d). It must be left unexplicated in this work how exactly the definiteness of the proform arises at the ellipsis site in (28)-(30). Since the copying of a bound proform plays the central role in the proposed approach, however, this result is not at all surprising. Note that when we adopt a discourse constraint like the Novelty Condition (Heim (1982)), a copied bound proform should never be allowed to be reintroduced into the discourse as an indefinite item.

¹⁵ Covert copying is assumed to apply within a single discourse, if necessary, across sentence and utterance boundaries.

¹⁶ Under Chomsky's (1995) 'Copy plus Delete' analysis of movement, covert copy here can be regarded as a case of covert movement in which Copy applies without being followed by the application of Delete when neither the extraction site nor the landing site c-commands the other.

The LF-derivation of (12) is provided in (35):

(35) a. Syntactic Binding:

LF_i: In our school, **every student**_x respects **his**_{xσ} teacher,
|_____|

but unfortunately, the principal doesn't [_{vp} e]

b. VP-Copy: (cf. Williams (1977))

LF_j: In our school, every student_x [_{vp} respects his_{xσ} teacher],
|_____|

but unfortunately, the principal doesn't [_{vp} respect his_{xσ} teacher]
↑

First, as in (35a), the syntactic binding of his takes place in the antecedent clause. Then, as in (35b), his as a bound proform (whose bound status is indicated by a subscript-σ as a purely mnemonic marker rather than as part of a formal representation) is copied into the ellipsis site as part of the copied antecedent **VP**.

The LF-derivation of the Japanese example (23) is also provided in (36) below, in which zibun as a bound proform is copied, this time as part of a copied **DP**-antecedent:

(36) a. Syntactic Binding:

LF_i: **siritu-daigaku-no dono kyoozyu**_x-ga [_{dp} **zibun**_{xσ}-no gakusee]-o
suisensite **mo**, |_____|

Monbusyoo-wa [_{dp} e] saiyoosi-nai-daroo.

b. DP-Copy:

LF_j: siritu-daigaku-no dono kyoozyu_x-ga [_{dp} zibun_{xσ}-no gakusee]-o
suisensite mo, |_____|
 Monbusyoo-wa [_{dp} zibun_{xσ}-no gakusee]-o saiyoosi-nai-daroo.
↑

3. From Ellipsis to E-type Anaphora

At this point, it is appropriate to bring E-type pronouns as in (37) into the scene:

- (37) a. **Few congressmen** admire Kennedy(, and) **They** are very junior.
 b. John owns **some sheep** and Harry vaccinates **them** in the Spring.
 c. **A dog** came in. **It** lay down under the table.

E-type pronouns are known to exhibit the properties summarized in (38) (Evans (1977), Evans (1980)):

- (38) a. They have **quantified** DPs as their **antecedents**.
 b. They are **not c-commanded** by their antecedents.
 c. Yet, they are successfully interpreted as **definite** descriptions.

We cannot help noting that the properties of E-type pronouns stated in (38) have much in common with those of the ellipsis constructions in (28)-(30) stated in (31) above. In particular, both phenomena permit an item involved in operator-variable

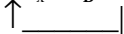
binding to be successfully interpreted in a remote position outside the c-command domain of the involved operator. Also, definiteness arises in the resulting interpretation in both cases. In the rest of this work, I would like to propose and argue that E-type anaphora and the ellipsis constructions in (28)-(30) are almost completely parallel — the syntactic derivation of both phenomena involves identical mechanisms, and they both yield the same type of strict identity, involving the copying of the projection of the category D(eterminer) in its bound state.

Near complete assimilation of the two phenomena can be achieved when we pay attention to the fact that they both involve a quantified element in the antecedent clause, which necessarily induces an operator-variable relation. The first thing we must do is to clarify how such a relation comes to be represented in covert syntax. Let us begin with the raising of the external argument under the Internal Subject Hypothesis. The first sentence in (37) above, for example, will be represented as in (39a) below after this operation takes place:

(39) a. Subject Raising:

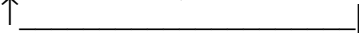
Few congressmen_y [VP [e] $_y$ admire Kennedy].


b. QR:

LF: **Few** $_x$ [D e] $_x$ congressmen] $_y$ [VP [e] $_y$ admire Kennedy]


Let us then assume that a version of Quantifier Raising (QR) applies in covert syntax to the quantificational D(eterminer) head, leaving behind a variable as illustrated in (39b). Note that the operations in (39) accomplish in covert syntax what Heim's (1982) NP-Prefixing and Quantifier Construal do. Alternatively, we may also adopt Chomsky's (1995, 202 ff.) 'Copy plus Deletion' analysis of movement as illustrated in (40):

(40) a. Copy for Subject Raising:

LF_j: [**Few congressmen**] $_j$ [VP [**Few congressmen**] admire Kennedy]


b. QR:

LF_j: **Few** $_x$ [D e] $_x$ congressmen] [VP **Few** $_x$ [D e] $_x$ congressmen] admire K.]


c. LF-deletion under Identity:

LF_k: **Few** $_x$ [~~D e~~] $_x$ congressmen] [VP **Few** $_x$ [D e] $_x$ congressmen] admire K.]

In this analysis, the subject raising copies the internal subject and reconstructs it in the external subject position, as illustrated in (40a). Each quantificational D then undergoes QR, as in (40b). Finally, as illustrated in (40c), part of each operator-variable construction in (40b) is deleted under identity in accordance with the Preference Principle for Reconstruction in (41) below, and derives a single operator-variable construction at LF:

(41) Minimize the restriction in the operator position. (Chomsky (1995, p. 209))

Under either analysis, QR leaves behind a DP which consists of a variable bound by an operator and an NP to be interpreted as the restrictor of this operator as in (42): (Again, the bound status of the variable is indicated by a subscript- σ .)

(42) Few_x [_{DP} [_D e]_{x σ} [_{NP} congressmen]]

In the rest of this work, we will refer to a DP of this type somewhat loosely as '**Bound Trace**' (with the capitals B and T) or simply as '**Trace**.' We then can translate the presence of a quantificational element in (37a-c) into the presence of a 'Bound Trace,' and each such Bound Trace is identified as the antecedent of an E-type pronoun as illustrated in (43a-c):

- (43) a. LF: Few_x [_{DP} [_D e_{x σ}] **congressmen**]_y admire K. **They**_y are very junior.
 b. LF: John owns some_x [_{DP} [_D e_{x σ}] **sheep**]_y and Harry vaccinates **them**_y ...
 c. LF: A_x [_{DP} [_D e_{x σ}] **dog**]_y came in. **It**_y lay down under the table.

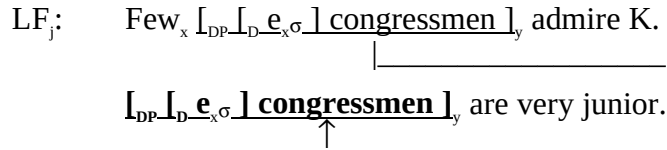
Suppose now that, as motivated by the analysis of pronouns of laziness, the interpretation of a pronoun indeed involves the covert copying of its antecedent **when no c-commanding relation exists** between them. Recall also that the Bare Output Conditions prohibit us from discriminating, in covert syntax, overt proforms from phonetically-empty proforms involved in ellipsis. We then can identify a point-by-point parallelism between E-type anaphora and the strict identity observed in the ellipsis constructions in (28)-(30). They both involve a DP as part or whole of the antecedent of some anaphoric item to be interpreted elsewhere in the discourse, and this DP consists of: (i) a projection of D (maximal or minimal) as a proform to be interpreted as a bound variable (e.g., [_{DP} his_{x σ}] in (44a) and [_D e_{x σ}] in (44c) below), and (ii) an NP functioning as the restrictor of the operator (e.g., [_{NP} teacher] in (44a) and [_{NP} congressmen] in (44c)):¹⁷

- (44) a. VP-Ellipsis in (28): [_{DP} [_{DP} **his**_{x σ}] [_{NP} teacher]]
 b. NP-Ellipsis in (30): [_{DP} [_{DP} **zibun**_{x σ}]-no [_{NP} gakusee]]
 c. E-type Anaphora in (43): [_{DP} [_D e_{x σ}] [_{NP} congressmen]]

Since the two phenomena now look parallel, not relating them would strike us as missing some generalization. I therefore would like to propose that our analysis of ellipsis constructions, which we concluded to involve the covert copying of a bound DP-proform, can and should be extended to the analysis of E-type anaphora as well. In particular, I propose that the LF-derivation of an E-type pronoun involves the copying of a Bound Trace showing up earlier within the discourse. The LF-derivation of the example (37a) is illustrated in (45):

- (45) a. QR:
 LF_i: Few_x [_{DP} [_D e_{x σ}] **congressmen**]_y admire K. **They**_y are very junior.
 ↑
 b. Copy:

¹⁷ Depending on the analysis of quantificational determiners and possessors in the pre-nominal position, the two constructions may turn out to look even more parallel. See Abney (1987) for relevant discussion.



First, as in (45a), the quantificational D undergoes QR in the first clause. Then, as in (45b), the DP-antecedent containing the trace of the raised D, i.e., our 'Bound Trace,' is copied onto the E-type pronoun. The E-type pronoun, thus, comes to be interpreted as a definite description like "**those** congressmen," in accordance with the Novelty Condition. The copied bound variable of the form [_D e_{xσ}], in other words, is interpreted on a par with something like a demonstrative determiner used anaphorically.

We can immediately mention a couple of empirical advantages. First, the contrast as in (46) is known to be recalcitrant to approaches which let E-type pronouns be interpreted based upon pragmatic contexts. Note that both sentences in (46) contain a pragmatically equivalent antecedent clause, and hence are predicted to equally allow the subsequent pronoun to be legitimately interpreted, contrary to the fact:

- (46) a. John has a wife and **she** hates him.
 b. *John is married and **she** hates him. (Evans (1977, 147))

In the syntactic copying approach like ours, the contrast follows naturally, since in (46a), there exists a Bound Trace to be copied as the antecedent of the pronoun after the indefinite undergoes QR, while in (46b), no relevant antecedent DP exists which can be copied onto the pronoun.

The proposed analysis involving DP-copy is also free from the overcopying problem as in (47) associated with other types of syntactic copying approaches like IP-copy by Heim (1990):

- (47) A: **A man** jumped off the cliff.
 B: **He** didn't jump. **He** was pushed. (Heim (1990, 172))

Heim's IP-Copy would copy and adjoin an antecedent IP as in (48) to he, and incorrectly force this pronoun to be interpreted as something like "a man that jumped off the cliff."

- (48) [_{IP} a man_i [_{IP} t_i jumped off the cliff]]

The proposed approach also wins a theoretical advantage of maintaining a single syntactic operation of covert copying for the analysis of VP-Ellipsis, DP-Ellipsis, E-type pronouns, and in fact pronouns of laziness as well.

4. Minimal Variable Binding and Logical Number

In this section, we will see first that the proposed approach to E-type anaphora encounters a potential problem. We will argue that this problem will be solved by postulating a type of economy condition of a general nature. It will then be pointed out that this economy-based solution will permit us to further broaden our empirical coverage thereby providing us with independent motivation for the proposed approach.

4.1 Overgeneration of Operators

First, let us observe that (49a) and (49b) are not synonymous:

- (49) a. Few congressmen_x admire Kennedy. **They**_x are very junior.
 b. Few congressmen_x admire Kennedy. **Few congressmen**_{y/*x} are very junior.

In (49a), the pronoun they may be intended to denote the set of individuals defined by few congressmen showing up in the previous sentence. The two instances of few congressmen in (49b), on the other hand, cannot be intended to define the same set of individuals, although the two distinct sets of individuals they define may end up with overlapping partially or perhaps even completely.

What this contrast implies to the proposed approach to E-type anaphora is that for the LF-derivation of (49a) we should not allow the covert computational process to duplicate the quantificational antecedent itself, while we still would like to have its Bound Trace to be copied. Since nothing we have postulated so far guarantees such selective application of covert Copy, we have a problem of overgenerating an operator at LF, as illustrated in (50):

- (50) a. Copy:
 LF_j: Few congressmen admire Kennedy. **Few congressmen** are very junior
 |
 b. QR:
 LF_k: **Few**_x [_{DP} [_D e]_{xσ} congressmen] admire Kennedy, and
 ↑
Few_x [_{DP} [_D e]_{xσ} congressmen] are very junior
 ↑

In this derivation, a covert operation first copies the quantificational DP few congressmen as in (50a) and then QR applies to both of the original and the duplicate of this operator as in (50b), yielding an LF-representation identical to that for (49b) — an undesirable consequence.

The restriction observed in (49b) actually seems to be a quite general crosslinguistic restriction imposed on the identity of two **base-generated** morphologically identical operators, as illustrated by the examples in (51):

- (51) a. subete-no syoosya-ga **aru daigaku-no** **subete-no** **gakusee**_x-o
 all trading firm-NOM **one university-GEN** **all** **student-ACC**
 husaiyoo-ni-sita ga, ikutukano ginkoo-wa **aru daigaku-no**
 didn't.hire but, some banks-TOP **one university-GEN**
subete-no **gakusee**_{y/*x}-o saiyooosita.
all **student-ACC** hired

'While all trading firms declined to hire any of the students of one university, some banks hired all of the students of **some other university**.'

- b. **Many people**_x were unhappy, and **many people**_{y/*x} left.
 c. **Someone**_x called. **Someone**_{y/*x} didn't leave a message.
 d. He has **a cat**_x and she hates **a cat**_{y/*x}. (cf. The Novelty Condition)

In the Japanese example (51a), for instance, the two instances of aru daigaku-no subete-no gakusee 'all the students of one university' must be intended to denote two different sets of students from distinct universities.

The examples in (51) again contrast with those in (52) below, in which a proform succeeds in establishing an anaphoric relation with a quantificational antecedent:

- (52) a. subete-no syoosya-ga **aru daigaku-no subete-no gakusee**_x-o
 husaiyoo-ni-sita ga, ikutukano ginkoo-wa [**e**_x] saiyoosita.

'While all trading firms declined to hire any of the students of one university, some banks hired **them**.'

b. **Many people**_x were unhappy, and **they**_x left.

c. **Someone**_x called. **He**_x didn't leave a message.

d. He has **a cat**_x and she hates **it**_x.

It therefore seems to be generally true that more than one instance of a morphologically identical operator cannot be intended to denote an identical set in a single discourse. Here, I would like to propose that this generalization follows from the economy constraint imposed on operators as in (53):

- (53) Minimal Variable Binding:

Variable binding is minimal — a 'single' operator establishes an operator-variable binding **only once in a derivation**.

The notion 'single' operator referred to in (53) is defined as in (54):

- (54) 'Single' Operator:

One or more instance of a morphologically identical operator constitutes a 'single' operator if they are intended to define an identical set.

When we assume that each instance of a quantificational element must undergo QR and binds its variable at LF, this economy constraint will yield the effect of prohibiting more than one instance of a 'single' operator from showing up at LF, whether they are base-generated or derived by the application of covert Copy. We may then consider that the covert copying of the quantificational DP in (50a) is in fact legitimate, but the constraint (53) rules out the multiple operator-variable relations established by a 'single' operator as in (50b). We thus can free ourselves from the problem of overgenerating operators at LF in the analysis of E-type anaphora.¹⁸

¹⁸ In the proposed approach, the Minimal Variable Binding in (53) does not rule out a sentence like (ia) below, whose semantics is often represented as in (ib), providing us with the impression that the operator can in fact establish more than one instance of operator-variable binding:

- (i) a. Every student respects **his** teacher.
 b. $\forall x [\text{student}(x) \rightarrow \text{respect}(x, x\text{'s teacher})]$

Whichever derivation in (ii) below we may adopt in the proposed approach, every establishes operator-variable binding only once in the derivation with its trace [_D e]_x, and the pronoun his establishes its variable status by being bound by [_{DP} e]_y in (iia) and by [_{DP} [_D e]_x student]_y in (iib):

- (ii) a. Every_x [_{DP} [_D e]_x student]_y [_{VP} [_{DP} e]_y respects **his**_y teacher]
 b. Every_x [_{DP} [_D e]_x student]_y respects **his**_y teacher

The Minimal Variable Binding in (53) can be independently motivated in an interesting way. Observe, first, the paradigm in (55) below. (55a) indicates that a universally quantified element every boy must be treated as singular. (55b), on the other hand, suggests that every boy in fact is plural. Making the situation even more complicated, (55c) illustrates that every boy can be ambiguous between singular and plural. A universally quantified element, in other words, exhibits rather unpredictable restriction as well as flexibility in its number agreement with other items:

- (55) a. **Every boy** { **is** / ***are** } happy.
 b. **Every boy** left. { ***He** / **They** } must be angry.
 c. **Every boy** knows that { **he** / **they** } should apologize.

A careful examination of this paradigm, however, will provide us with the following observations and generalizations. First, this paradigm in fact involves two distinct types of number agreement — 'inflectional' agreement in (55a) and 'referential' agreement in (55b) and (55c). It may be said, in other words, that every boy exhibits flexibility in referential agreement but not in inflectional agreement. This point can be confirmed when we observe that (55c) becomes ungrammatical when we alter the inflectional agreement while leaving the rest of the sentence intact as in (56):

- (56) *Every boy **know** that { **he** / **they** } should apologize.

The contrast between (55b) and (55c) further suggests that the flexibility in referential agreement is permitted **only when the antecedent c-commands the pronoun**.¹⁹ Furthermore, when we replace the quantificational subject every boy in (55c) with a non-quantificational subject as in (57a) and (57b) below, the referential agreement also becomes static. This suggests that the quantificational force of the antecedent is crucial in permitting the flexibility of referential agreement:

- (57) a. **That boy** knows that { **he** / ***they** } should apologize.
 b. **Those boys** know that { **they** / ***he** } should apologize.

All these observations follow when we extend the notion of linguistic number in the way described below, and combine it with the Minimal Variable Binding in (53).

First, we recognize what we will refer to as 'overt number,' which is the number associated with a 'nominal' lexical form in the lexicon (or in the numeration, if one opts for such an approach). This is perhaps the standard notion of linguistic number for syntacticians, and it has traditionally been regarded as relevant to both inflectional and referential agreement.

In addition to overt number, we recognize what we will refer to as 'logical number.' Logical number is activated by operator-variable binding and realized on the DP containing the trace of a raised D as a variable, and hence only quantificational

¹⁹ The so-called telescoping poses an exception to this generalization. It is quite possible that telescoping involves the covert copying of an N-projection rather than a DP. Such an analysis is compatible not only with the logical singularity a universal quantifier exhibits in telescoping but also with the fact that telescoping must be licensed by genericity in a broad sense. See Poesio and Zucchi (1992) and references therein for relevant discussion.

elements can exhibit logical number in addition to its overt number. Since it is activated for the first time at LF, it is relevant only to meanings, contrary to overt number, which may be relevant to both meanings and forms.²⁰ Logical number therefore plays a role in referential agreement but not in inflectional agreement, which has PF properties as its indispensable aspect. Overt number, on the other hand, is available both at PF and LF (See Footnote 8 for the alternative to Spell-Out), and it can play a role in both inflectional and referential agreement.

If a nominal element is non-quantificational, overt number generally is the only possible type of number it may have, and it never exhibits flexibility in either inflectional or referential number agreement, as observed in (57).²¹ A lexical form of a quantificational nominal also has its overt number. Every boy, for example, is associated with singular number just like the non-quantificational that boy is. In the proposed number system, however, this will not be the end of the story. While a quantificational element exhibits overt number before it undergoes QR, it exhibits, or more precisely its Bound Trace exhibits, logical number after it undergoes QR. As a result, if there exists discrepancy between the overt number and the logical number of a quantificational element, a possibility arises for some flexibility in its referential agreement.

I believe that the flexible referential agreement observed in (55c) above is one such case, in which either of the **singular overt** number associated with the lexical form every boy and the **plural logical** number associated with its Bound Trace may play a role in the referential agreement involving this quantificational antecedent. How does this discrepancy between the overt number and logical number of every boy arise? In particular, what is the source of its plural logical number? The answer to this question seems to lie in the function of the operator-variable binding established by the application of QR as in (58):

(58) LF: $\text{Every}_x [\text{DP } [e]_{x\sigma} \text{ boy}] \text{ left.}$
 $\uparrow \text{QR}$

Roughly speaking, this operator-variable binding establishes plural eventualities by letting the quantifier every pick out all the members of a presupposed set defined by its restrictor boy in a given pragmatic context, which, at least in default cases, is **non-empty and non-singleton**. Subject to slight modification below, we ascribe the non-singleton status of such a presupposed set as the source of the plural logical number of a universally-quantified nominal expression like every boy.

When we combine this extended notion of number with the Minimal Variable Binding (53) adopted above, we can capture the otherwise puzzling agreement facts in the paradigm (55) quite straightforwardly. First, the static nature of the singularity of every boy observed in (55a) can be ascribed to its overt number, which is the only number relevant to inflectional agreement. Second, we can also capture the flexibility of referential agreement in (55c), in which every boy c-commands the pronouns. As

²⁰ cf. May's (1985) semantic number of quantificational elements.

²¹ Certain non-quantificational nominal expressions like family, audience, and committee may exhibit flexibility in their **overt** numbers since their singular forms can refer to either a unit or the members of the unit:

- (i) a. the **family** that **has** just moved in
- b. My **family are** all very well.

illustrated in (59a) below, the singular pronoun he may agree with the lexical form every boy, which exhibits singular overt number. While the plural pronoun they has no chance to legitimately agree with every boy itself, after this quantificational antecedent undergoes QR as in (59b), this pronoun may agree with its Bound Trace, which exhibits plural logical number: (Dotted lines indicate referential agreement.)

- (59) a. Referential agreement with **overt** number (**before QR**):

LF: **Every boy** knows that **he** should apologize.

|.....|

- b. Referential agreement with **logical** number (**after QR**):

LF: [Every_x [I_{DP} I_D **e**]_{xσ} **boy**] knows that **they** should apologize]]

↑ QR |.....|

Finally, the absence of similar flexibility in referential agreement in (55b) also follows naturally. Recall that the pronouns are not c-commanded by their quantificational antecedent every boy in (55b), which is the structural condition for the application of covert Copy, as we have seen before. First of all, when the pronoun is plural as in (60a) below, legitimate referential agreement can take place only when the copied antecedent is plural. This situation can arise when every boy undergoes QR as in (60b), and the Bound Trace, which is plural, is identified with the plural pronoun they as in (60b), and copied as in (60c):

- (60) a. **Everybody** left. **They** must be angry.

- b. QR:

LF_i: **Every_x [I_{DP} I_D **e**]_{xσ} **boy**] left. **They** must be angry.**

↑ QR |.....|

- c. Copy:

LF_j: **Every_x [I_{DP} I_D **e**]_{xσ} **boy**] left. **I_{DP} I_D **e**]_{xσ} **boy**] must be angry.****

|.....|

Crucially, when the bound trace is copied as in (60c), the Minimal Variable Binding (53) is satisfied, and the derivation converges.

When the involved pronoun is singular, as in (61a) below, on the other hand, it must agree with the lexical form every boy, which is singular, rather than with its Bound Trace, which is plural. The copying of the operator in its lexical form therefore is required, as in (61b):

- (61) a. LF_i: **Every boy** left. **He** must be angry.

|.....|

- b. Copy:

LF_j: **Every boy_x** left. **Every boy_x** must be angry.

|.....|

- c. QR:

LF_k: **Every_x [I_{DP} I_D **e**]_{xσ} **boy**] left. **Every_x [I_{DP} I_D **e**]_{xσ} **boy**] must be angry.****

↑ |.....|

This derivation will eventually crash, however, failing to satisfy the Minimal Variable Binding (53) when both the original and the duplicate of every body undergoes QR and establish more than one instance of operator-variable binding by a 'single' operator, as in (61c).

Thus, the proposed covert copying approach incorporating the Minimal Variable Binding (53) and the extended number system permits us to capture the otherwise mysterious and arbitrary flexibility of number agreement observed in the paradigm (55).

4.2 Indefinites vs. $\forall$ and NEG

The extended number system we have adopted has further virtues. It is often pointed out in the literature that indefinites need not observe a 'scope-island,' while other quantificational elements like every and no must, as illustrated by the paradigm in (62):²²

- (62) a. **A** dog_x came in. **It**_x lay down under the table.
 b. **Every** dog_x came in. ***It**_x lay down under the table.
 c. **No** dog_x came in. ***It**_x lay down under the table. (Heim (1982, 13))

As has been noted sporadically in the literature,²³ and as has been observed in (55) above, however, every and no also need not observe a 'scope-island' when the pronoun is plural. See also (63) for more examples:

- (63) a. **Every** dog_x came in. **They**_x lay down under the table.
 b. [A detective trying to prove that Mary is lying says]:
 The truth is that John wrote **no** article_x.
 Mary therefore cannot possibly have read **them**_x.
 c. If John owns **no** sheep_x, there is no way for Harry to vaccinate **them**_x.

Some researchers disregard such examples, claiming that plural pronouns involve some anaphoric relation distinct from E-type anaphora. Chierchia (1995), for instance, states that "... every quantified noun phrase can make salient a set of entities (roughly, the set associated with its head noun). This set can then be referred to in subsequent discourse." (p. 4)

Simply stating that the set associated with the head noun can be referred to by a plural pronoun, however, leaves many important questions unanswered. For instance, the second clause in (64) expresses multiple eventualities quite naturally as its primary reading:

- (64) Every dog_x came in one by one, and **they**_x lay down where they_x were supposed to.

Therefore, when we interpret (64), it is quite natural for us to imagine a chain of events in each of which a dog comes in and lies down wherever it wanted, each dog ending up in a different place. When a plural nominal head is overtly expressed in the

²² See, for instance, Fodor and Sag (1982), Heim (1982) and Chierchia (1995) for relevant discussion.

²³ See, for example, May (1985) and Lappin (1988/89).

second clause as in (65) below, on the other hand, it is noticeably less natural to make a primary reading out of a similar distributive interpretation:

- (65) Every dog_x came in one by one, and **the dogs**_x lay down where they_x were supposed to.

The distributive interpretation in the second clause of (64) can be naturally ascribed to the existence of quantification in the first clause if the Bound Trace of every / no is copied onto they. If each plural pronoun in (63) simply refers to a set associated with the head nominal of its antecedent, on the other hand, the contrast between (64) and (65) would remain mysterious. This approach would also leave it unexplained why the head nouns do not yield similar plurality when they are quantified by existential quantifiers, as in (66):²⁴

- (66) a. A dog_x came in. ***They**_x lay down under the table.
b. **Some** dog_x came in. ***They**_x lay down under the table.

We can, on the other hand, capture all the facts in (62)-(66) in terms of referential number agreement when we postulate the logical number as in (67) below for the Bound Traces of the quantificational elements involved in these examples:

(67)	Overt Number	Logical Number
<i>Every / No</i>	Singular	Plural
<i>Some / A</i>	Singular	Singular

Though in the opposite way, a negative D no behaves exactly like every, and picks out **none** of the members of the presupposed non-empty, **non-singleton** set. It therefore exhibits plural logical number just like every. The existential D's some and a, on the other hand, do not involve any such non-singleton set in a given pragmatic context. They therefore exhibit singularity in both their overt and logical numbers. In all of (62)-(66) above, therefore, DPs containing every or no must referentially agree with a plural pronoun, while those containing a or some must referentially agree with a singular pronoun. A crucial basis of our analysis again is the corollary of the Minimal Variable Binding we have discussed—that is, these examples necessarily involve the copying of Bound Traces rather than the quantificational antecedents. Thus, the otherwise puzzling contrast between every/no and some/a follows straightforwardly in the proposed approach incorporating the Minimal Variable Binding and the extended number system.

²⁴ Providing examples like (i) and (ii) below, Lappin (1988/89) convincingly argues that the antecedent of a donkey pronoun (as a type of E-type pronoun) need not contain a weak D (contra Reinhart (1987)), and that there is no need for the quantifier containing the antecedent to c-command the donkey pronoun (contra Haik (1984)). Note that in (i) the set of at least half the films at the festival need not be identical for each critic:

- (i) Every critic who saw **at least half the films at the festival**_x liked **them**_x.
(ii) John spoke to [every student who submitted **a paper**_x] about the possibility of publishing **it**_x.

Earlier, we identified, as the source of the plural logical number, a non-singleton status of a set presupposed by a quantifier. The following example suggests that we need to be a little more precise in making such a statement:

- (68) Pick up **every book** on the desk, if there's any, and bring { **them** / ***it** } back to me.

Note that the expression if there's any indicates that the speaker does not presuppose the **actual** existence of any set of books on the desk. Yet, the plural pronoun them can be still anaphoric to every book. Incorporating this observation, we revise our generalization as in (69):

- (69) The logical number of an operator is plural if the '**candidate**' set it presupposes in a given pragmatic context is non-empty and non-singleton.

The intuitive idea behind this generalization is that the use of every and no presupposes the existence of a 'candidate' or 'potential' set of plural entities out of which the quantifiers select a designated quantity of the members, even if it does not presuppose the actual existence of such entities.²⁵

Finally, there are cases as in (70) below, in which E-type pronouns may show up **either** as singular **or** plural:

- (70) Every student turned in **a paper**_x.
 a. **It**_x went into his or her folder.
 b. **They**_x were all identical. (Heim (1990))

The phenomenon here strikes us as contradictory to the number agreement analysis provided above, in which we assumed that the Bound Trace of an existential quantifier is singular in its logical number. If we examine the example in (70) carefully, however, we notice that there is an extra factor involved. The first clause contains a logically plural quantificational expression every student c-commanding the indefinite as the antecedent of the E-type pronouns. On the contrary, when we replace every student in (70b) with the logically singular some student as in (71) below, a plural pronoun can no longer be anaphoric to the indefinite:

- (71) **Some** student turned in a paper_x. { **It**_x / ***They**_x } went into her folder.

The source of plurality in (70b), in other words, indeed seems to be the presence of a higher logically plural quantificational expression. How can this extra factor turn the singular Bound Trace of an existential quantifier into plural? Although I am not ready to offer any definite answer to this question, it seems plausible for us to tentatively ascribe this phenomenon to the distributivity involved in the scopal interaction between universal and existential quantifiers. That is, when an existential quantifier takes its own scope within the scope of a universal quantifier, the logically singular Bound Trace of an existential quantifier may distribute under the logically plural universal quantifier, and such distributed entities may be referred to not only 'individually' as singular but also 'collectively' as plural, as graphically illustrated in (72):

²⁵ The notion 'downward-entailing' operators does not seem to be relevant, either, since at least n and many, which are not downward entailing, can be (overtly as well as) logically plural. I am grateful to Leslie Gabriele for helping me clarify the relevant notion here.

- (72) λ
Distributed entities 'collectively' referred to

We still maintain, in other words, our position that the Bound Trace of an existential quantifier per se is logically singular.

We can confirm that this insight is leading us in the right direction when we examine the scope interaction of two quantificational expressions in an example like (73):

- (73) Every girl falls in love with **some prince**.
 a. **He**_x is distinctively noble and breath-takingly handsome.
 b. **They**_x are distinctively noble and breath-takingly handsome.

Just as in the case of (70) above, the existentially quantified element in (73) can induce either singular or plural E-type anaphora when it is interpreted distributively under the scope of the universal quantifier. On the contrary, if we eliminate such distributivity by letting the existential quantifier in (73) take scope higher than that of the universal quantifier, perhaps with an emphatic stress on some, plural E-type anaphora as in (73b) no longer seems to be permitted. It therefore seems possible to ascribe the plurality an indefinite exhibits as in (70) while maintaining its logical singularity as postulated in (67).

5. Summary

In this work, I first pointed out that some ellipsis constructions exhibit a type of strict identity involving a bound proform, and argued that such an interpretation be derived by the covert copying of a bound proform. I then pointed out quite pervasive parallelism between such ellipsis constructions and E-type anaphora, and proposed to extend the covert copying approach from ellipsis to E-type anaphora. The proposed analysis crucially postulates the covert copying of a Bound Trace of the form $[_{DP} [_D e]_{x,\sigma} NP]$, and the economy restriction imposed on the copied operators by the Minimal Variable Binding. It was also argued that the proposed approach can provide straightforward accounts for certain puzzles concerning agreement and quantifier scope when it is supplemented by the number system which distinguishes the overt number of the lexical form of a quantificational expression from the logical number of its Bound Trace.

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Dual Lexical Categories Vs. Phrasal Conversion in the Analysis of Gerund Phrases

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Abstract

Two rather different approaches have recently been proposed for handling the phrasal category mismatches exhibited by gerund phrases. The Dual Lexical Category account assumes that the external and internal properties of phrases can be specified separately, so that in the case of gerunds the external properties are those of NPs while the internal properties are those of VPs. Such property mismatches are licensed only when a special type of lexical item, one belonging to a particular type of dual lexical category, heads the phrase. In contrast, the Phrasal Conversion analysis assumes that nominalized phrases are created by affixing a nominalizing marker to a VP in the syntax, with the marker being realized on the head V of the phrase. This approach identifies two types of phrasal nominalization — one involving an overt marker, the other a zero-morph — parallel to the overt vs. zero-morph conversion processes which take place at the lexical level. The present paper will show that challenges to the Dual Lexical Category account posed by the Phrasal Conversion analysis can be met in a straightforward way, that there are in fact problems which the Phrasal Conversion approach itself faces, and that as a result of these difficulties the Dual Lexical Category approach is to be preferred over the alternative.

* [(By Peter Sells, Stanford University.) Tragically, Steven Lapointe died in February 1999. He had planned to submit this paper to this volume before he became ill, but withdrew it when the seriousness of his illness became known. Subsequently, we decided to resubmit the paper with some minor corrections and revisions. I am grateful to Jerry Sadock, James Yoon, Cathryn Donohue, Yukiko Morimoto and Cindy Goldberg for their assistance in this process. A website dedicated to Steven's linguistic work has been established at <http://lapointe.ucdavis.edu>. It has been my sad privilege to work on this paper on behalf of my friend. Here is the original acknowledgement:]

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Introduction

In a series of recent articles (Lapointe 1993a, 1993b, to appear; Lapointe and Nielsen 1996), a theory of mixed category phrases, of which gerund phrases form a particular subclass, has been developed which claims that such phrases are headed by a type of lexical item dubbed a DUAL LEXICAL CATEGORY (DLC). This is a lexical category of the form $\langle X|Y \rangle^0$ (read: "X stroke Y zero"), where the first part of the category ($\langle X|$) determines the external properties of the phrase of which it is a head, and the second part ($\rangle$) determines the internal properties. In terms of higher syntactic structure, the first part of a dual category licenses a phrasal category XP, the second part licenses a YP, and the general properties of the account dictate that the XP and YP stand in a mother/head daughter relation. In the case of gerund phrases, then, the gerund itself belongs to category $\langle N|V \rangle^0$, and so the whole gerund phrase has an NP-over-VP structure, from which the well-known syntactic property mismatches of these phrases in English and a number of other languages follow.

In contrast to this type of analysis, James Yoon has proposed in two recent papers (Yoon 1996a, 1996b) a PHRASAL CONVERSION (PhrCon) account of gerund phrases. The basic idea behind this approach is that nominalized phrases are created by affixing a nominalizing marker to a VP in the syntax, with the marker being realized on the head V of that phrase, while derived lexical Ns are created by affixing (usually the same) marker to a lexical V. Yoon identifies two types of nominalizing elements across languages, one of which serves only the function of nominalizing the category to which it is attached, while the other is used (i) in some contexts as a nonfinite verb marker and (ii) in others apparently as a nominalizer. On the PhrCon account the first kind of element is taken to be a real nominalizer, applying either in the syntax to produce nominalized phrases or in the morphology to derive lexically deverbal Ns. In contrast, the second type of affix is assumed not really to be a nominalizer at all; it simply produces an inflected form of a V, the first of the two functions noted above for these elements. Instead, a zero-morph performs the actual function of nominalizing the constituent in question. The zero-morph nominalizer requires the phrase or word to which it attaches to contain a head inflected for the second type of affix, which is why the latter appears to be the nominalizer in these constructions. Yoon shows that the two main nominalizing affixes in Korean belong to the first type, while the gerund ending in English and the infinitive ending in Spanish fall into the second group.

As part of his analysis, Yoon offers a number of objections and challenges to the DLC approach. In the present paper, I will show that all of these challenges can be met in a straightforward manner within the DLC approach. Furthermore, I will show that there are unresolved problems with the PhrCon account itself. Hence, I will conclude that, contrary to Yoon's claims, the DLC analysis would appear to be the more adequate of these two alternatives for handling the complex facts exhibited by gerund phrases.

The paper will proceed as follows. In section 1 I will briefly summarize the DLC account of gerund phrases, and in section 2 I will summarize the PhrCon approach. In sections 3 and 4 I will present Yoon's empirical challenges and theoretical objections to the DLC analysis, along with the responses to them. In section 5 I will enumerate the various problems that arise on the PhrCon account. I will conclude in section 6 with some general comments on the analysis of mixed category phrases.

1. The Dual Lexical Category Account

Pullum (1991) offers a thorough analysis of the facts concerning gerund phrases in English, like those in (1), and provides an account of those facts in terms of standard GPSG (Gazdar, Klein, Pullum, and Sag 1985).

- (1) a. (Sue's) buying an expensive present

- b. (Bill's) having eaten a large apple
- c. (Jane's) not watching the game

There are, however, several significant problems with that analysis (see in particular Lapointe 1993b, to appear). Consequently, the DLC account was developed to overcome those problems while maintaining the basic aspects of the analysis of the English gerund phrase data.

The DLC analysis is based on the following assumptions. A natural way to account for the categorial mismatches exhibited by mixed category phrases is to take seriously the notion that a given phrase type has both external and internal syntactic properties. Normally, the external and internal properties of a given type coincide, yielding standard types of phrases. However, they need not coincide, and when they do not, a mixed category phrase results. Since we do not want the external and internal properties of phrases to come unglued randomly in syntactic structures, it seems reasonable to assume that mixed category phrases arise only when they are headed by a special kind of lexical item, one which explicitly allows the external/internal property mismatch to occur. This is where the notion of a DLC enters the picture. I assume that DLCs are defined universally, both in syntax and in morphology,¹ and that as we will see shortly, the DLC format can be used to subsume standard lexical categories as well as those which head mixed category phrases. The definition of a DLC is given in (2).

- (2) Definition. A *dual lexical category (DLC)* is a category of type $\langle X|Y \rangle^0$, where
- a. X, Y are major lexical categories,
 - b. X determines the external syntactic properties of the phrase of which the item is lexical head, and
 - c. Y determines the internal syntactic properties of that phrase.

Under the definition in (2) it is natural to distinguish two kinds of DLCs: *symmetrical DLCs*, in which $X = Y$, and *asymmetrical DLCs* in which $X \neq Y$. It is then possible to prove the following proposition concerning the relation of DLCs to standard lexical categories (a proof is given in the Appendix to Lapointe 1993b).

- (3) Proposition. A phrase containing the symmetrical DLC $\langle X|X \rangle^0$ as lexical head is equivalent to a phrase containing the standard category X^0 as lexical head.

The theory of DLCs thus subsumes that of regular lexical categories in a completely straightforward way: symmetrical DLCs are equivalent to standard lexical categories and lexically head endocentric X' phrases in exactly the ways syntacticians have generally assumed.

As for asymmetrical DLCs, it is this type that is involved in the analysis of mixed category phrases. The main claim of the DLC approach to mixed category phrases is that such phrases, and only those phrases, are lexically headed by asymmetrical DLCs. Hence, a mixed category phrase only occurs when it is anchored by a lexical head of the appropriate $\langle X|Y \rangle^0$ category. In this way, the DLC approach takes immediate steps toward constraining when an XP-over-YP structure can occur. This claim, taken together with the definition in (2), leads to the following consequences about the general syntactic properties of mixed category phrases.

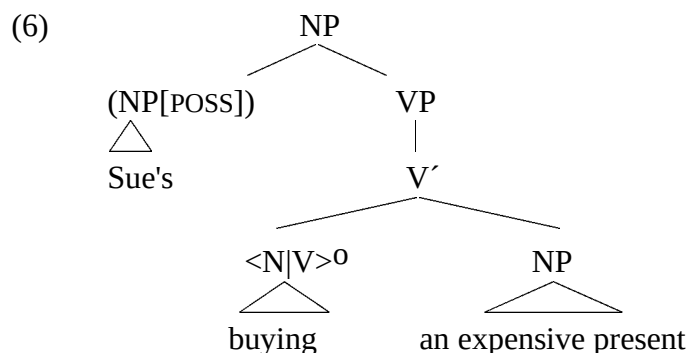
¹ Some of the morphological consequences of DLCs in gerund phrases are discussed in Lapointe 1993a.

- (4) *General syntactic consequences of the DLC approach to mixed category phrases* —
- The internal structure of a mixed category phrase is that of YP, and so the phrase structure of the category must go at least up to that bar-level in order to include all of the internal properties of YPs.
 - The category change-over point occurs just above YP, which has an X-type category as its mother node.
 - That X-type category must be XP, and not X' or X⁰, since the whole phrase has the external properties of XP, and none of the internal properties of X' or X⁰.²

If we now turn to the particular case of English gerund phrases (GPs), since we want the external properties to be those of category N and the internal properties to be those of category V, all we need to do is to assume that the gerund itself is a lexical item of DLC $\langle N|V \rangle^0$, created by the morphological rule attaching *-ing* to the base V.³ Given the general theory of DLCs just sketched, the specific consequences in the case of English GPs are those in (5).

- (5) *Specific syntactic consequences for English GPs* —
- The internal structure of English GPs is that of VPs.
 - The change-over point occurs at the maximal VP node of the internal phrase.
 - The VP is immediately dominated by a NP, and so the external structure of these GPs is that of NPs.

The PS rules of English will then include one which says NP $\rightarrow$ (NP[POSS]) VP; this rule, together with the consequences in (5) mean that a GP like (1a) will have the structure in (6).



The top part of this tree has just the kind of NP-over-VP structure which Pullum (1991) has shown is required in order to accommodate the facts about English GPs, while the whole structure is lexically anchored in the appropriate type of DLC, $\langle N|V \rangle^0$, and only this type of DLC will license the needed NP-over-VP structure.

As Lapointe (1993b) shows, this analysis accounts for the following ten fundamental properties of GPs in English which Pullum enumerates.

(A) *Evidence that gerund phrases have the external structure of NPs*

(A.1) GPs can appear in essentially any clause-internal NP position.

(A.2) Like regular NPs but unlike full clauses, GPs can be objects of Preps.

² As noted at several points below, the restriction to major lexical categories and the restriction that the change-over point always involves maximal-level phrase nodes need to be weakened in various ways.

³ Or, alternatively, by zero-derivation from the PRES.PART form of the V. Nothing in the following discussion crucially hinges on the choice between these alternatives.

These properties of GPs are illustrated below, where we find GPs in the standard NP positions allowed in English (7), and where we see that finite and nonfinite clauses are disallowed as objects of Preps (8).

- (7) a. Subject position — [Sue's buying an expensive present] surprised us.
 b. Direct object position — Betty couldn't comprehend [Sue's buying an expensive present].
 c. Object of Prep — Uncle Joe had to deal with [Sue's buying an expensive present].
- (8) a. * Uncle Joe had to deal with [that Sue had bought an expensive present].
 b. * Uncle Joe had to deal with [(for) Sue to buy an expensive present].

(B) *Evidence that GPs have some of the internal properties of NPs*

(B.1) The possessive marker that is used to indicate the subject NP in a GP is the same as the possessive marker used in regular NPs, namely, 's, as shown in (1) and (7) above. In contrast, a subject NP cannot be marked by any prepositional item, as shown in (9).

- (9) a. * By Sue/For Sue/To Sue/Sue's bought an expensive present.
 b. * By Bill/For Bill/To Bill/Bill's played the part of Scrooge.
 c. * By Santa/For Santa/To Santa/Santa's did not leave presents for the naughty children.

(B.2) The possessive NP in a GP is optional (cf. (1) again), just as in regular NPs, whereas the subject NP in a tensed clause is obligatory (10).

- (10) a. * ___ bought an expensive present.
 b. * ___ played the part of Scrooge.
 c. * ___ did not leave presents for the naughty children.

(C) *Evidence that GPs have the internal structure of VPs*

(C.1) GPs whose lexical heads are derived from transitive V bases occur with bare direct object NPs, as shown by many of the above examples. More generally, the internal arguments of GPs are morphologically marked in exactly the same way as in the corresponding regular VP.

(C.2) All nontensed auxiliaries, and no tensed auxiliaries or main verb forms, are permitted inside GPs in English, as illustrated in (11).

- (11) a. (Sue's) having bought the present
 b. (the present's) being bought in time
 c. (the present's) having been bought in time

(C.3) VP-level adverbial modifiers appear inside GPs, as shown in (12).

- (12) a. Sue's extravagantly buying an expensive present
 b. Bill's having noisily eaten the large apple
 c. Jane's obstinately not watching the game

(C.4) Adjective modifiers are not permitted inside GPs (13):

- (13) a. *Sue's extravagant buying an expensive present
 b. *Bill's having noisy eaten the large apple
 c. *Jane's obstinate not watching the game

(C.5) Relative clause modifiers are not permitted inside GPs as modifiers of those phrases, as indicated by the ungrammaticality of the phrases in (14). Notice that the intended ungrammatical reading in these phrase is the one in which the relative clause is modifying the content of the whole GP, and not just the final NP in the GP, as indicated by the bracketing.

- (14) a. * [Sue's buying an expensive present] that drove Aunt Mary crazy
 b. * [Bill's playing the part of Scrooge] that gave the critic indigestion
 c. * [Santa's leaving extra presents] that made the children ecstatic

(C.6) The negative particle *not* can appear before the gerund (1c), (12c), but it cannot appear before an N' in a regular NP (15).

- (15) a. * Sue's not presents
 b. * that not reindeer with the shiny nose

Hence, the DLC approach allows us to derive exactly the kind of structure that Pullum has argued we need on empirical grounds, while using a theory which provides a constrained approach to determining when a mixed category phrase in general can occur.⁴

⁴ It is interesting to ask what further restrictions there might be on asymmetrical DLCs. Since XP-over-YP structures are less frequently encountered across the world's languages than regular endocentric phrases, it seems reasonable to suppose that the universal theory of lexical categories has as a consequence the following:

- (i) a. Symmetrical DLCs are the unmarked type.
 b. Asymmetrical DLCs are the marked type.

We thus expect most languages to exhibit just symmetrical DLCs, some languages to exhibit both symmetrical and asymmetrical DLCs, and no language to exhibit just asymmetrical DLCs, and this appears to be true.

A separate sort of constraint involves the question of whether it is possible to have asymmetrical DLCs which are underived items in the lexicon. In earlier work (Lapointe 1993a,b), I proposed that there was a constraint which had the following restriction as a consequence:

- (ii) Asymmetrical dual category marking arises only as the result of a morphological or lexical process.

The idea here was that asymmetrical DLCs have to be morphologically generated or belong to a fixed, nonregular lexical class. Under this constraint, then, the answer to the above question would be that generally speaking asymmetrical DLCs do not occur as underived lexical items. There are, however, several unresolved issues here. One has to do with the status of bare-NP adverbials, mentioned immediately below in the text. The case involving fixed lexical classes in (ii) was included to handle just such items. However, it is not clear whether they should be treated as underived items (as I previously assumed) or as derived from the corresponding Ns by morphological conversion. If the latter proved to be the correct analysis, then we could eliminate this second case and say simply that items belonging to asymmetrical DLCs have to be morphologically derived. But there is a second, broader issue here. If DLCs are *lexical* categories, what prevents them from including underived lexical items? That is, what is really behind the constraint that leads to (ii), and why does it apply only to asymmetrical DLCs? Simply stating that asymmetrical DLCs are marked, as in (i) above, is not sufficient. There are therefore a number of serious questions that remain to be addressed along these lines.

It is important to note that the DLC analysis is intended to handle not only gerund phrases in English but other types of mixed category phrases as well. Lapointe (1993b) outlines how this approach can be used to account for the properties of participle phrases in English (Jackendoff 1977) by assuming that they are headed by <A|V> items, while facts about bare-NP adverbials in English (Larson 1985) can be accommodated by assuming that they are headed by <P|N> items. Of greater concern in the present context, Lapointe and Nielsen 1996 and Lapointe (to appear) demonstrate that nominalized phrases in a number of other languages — including *-mE* phrases in Turkish, and *ku-* phrases in Chichewa — exhibit the classic external-internal mismatch behavior of GPs and so admit of an analysis in which such phrases are headed by <N|V>⁰ items.

2. The Phrasal Conversion Account

In contrast to the DLC approach, Yoon (1996a,b) adopts a Phrasal Conversion account. Following earlier work on syntactic affixation (Anderson 1992; Yoon 1989), this account assumes that affixes can attach to phrases in the syntax as well as to constituents in the morphology, and that when this occurs, the affix is realized morphologically on the head of the phrase. Hence, on this approach, it is natural to assume that nominalized phrases are created by affixing a nominalizing marker to a verbal constituent in the syntax, with the marker being realized on the head V of the phrase, while derived lexical Ns are created by affixing a marker to a lexical V. On this view, then, GPs are considered to be just one type of nominalized phrase generated via syntactic affixation.

Yoon goes on to observe that there appear to be two types of nominalizing elements across languages. The first type, which I will refer to as a *dedicated nominalizer*, serves only the function of nominalizing the category to which it is attached, while the second type, which I will call a *double-duty nominalizer*, is used (i) in some contexts as a nonfinite verb marker and (ii) in others apparently as a nominalizer. Yoon goes on to argue that the two are to be distinguished in the following way. Dedicated nominalizers are taken to be real nominalizers, applying either in the syntax (to produce nominalized phrases) or in the morphology (to derive lexically deverbal Ns). In contrast, the double-duty affixes are assumed not really to be nominalizers at all; they simply produce various inflected forms of Vs, fulfilling function (i) above for these elements. Instead, in these cases a zero-morph performs the actual function of nominalizing the constituent in question. The zero-morph nominalizer requires the phrase or word to which it attaches to contain a head inflected for the double-duty affix. According to the PhrCon analysis, then, this subcategorization requirement is the reason why the double-duty affix always occurs in these constructions, and hence why it appears to be doing double duty as a nominalizer in the first place.

Yoon shows that dedicated nominalizing affixes can be found in Korean Type III nominalizations (the ones which exhibit properties parallel to GPs in English), as in (16).⁵

- (16) (after Yoon 1996a (12))
 % John-uy pap-ul mek-um
 John-GEN rice-ACC eat-NML
 'John's eating the/a meal'

Yoon also observes that such dedicated nominalizers are found in Turkish and in Quechua. On the other hand, double-duty nominalizers are found in English and

⁵ Type III nominalizations in Korean are acceptable only in restricted registers; see Lapointe and Nielsen 1995 for some discussion of this point.

Spanish. In English, the *-ing* ending serves not only as the apparent nominalizer in GPs but also acts as the present participle ending in regular VPs in standard progressive tense finite clauses (17). In Spanish, the *-ar/er/ir* marker occurs not only on the head of nominalized phrases but also on the V head of infinitive VPs (18).

- (17) a. Sue's buying an expensive present
 b. Sue was buying an expensive present.

- (18) a. nuestro cantar-las
 'our singing them'
 b. Luisa quiere cantar-las
 'Luisa wants to sing them'

One of the important points in favor of the PhrCon approach to nominalizing affixes is that very often among the world's languages, the same nominalizer is used to create both derived lexical Ns and nominalized phrases, and this is true regardless of whether the nominalizer is a dedicated affix or a zero-morph in a double-duty affix construction. Thus, alongside the GPs in (16) - (18) above for Korean, English, and Spanish, we find lexical deverbal nominals in (19) - (21) involving the same affixes in these languages .

- (19) (after Yoon 1996a (8b))
 cwuk-um-ulo/i/uy
 die-NML-INST/NOM/GEN
 'through death/death(NOM)/death's

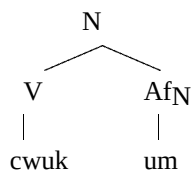
- (20) no recording of the Marseillaise

- (21) (after Yoon 1996a (12b))
 tus cantar-es
 your sing.INF-PL
 'your songs'

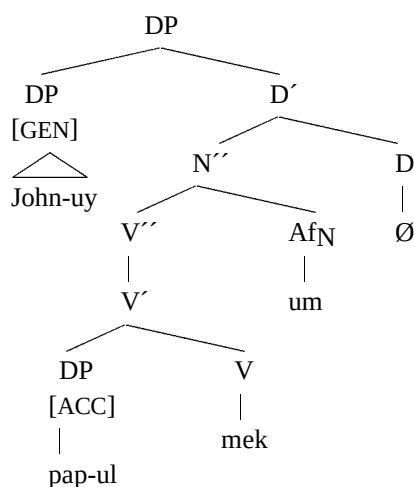
Yoon is careful to observe that the claim is not that every language necessarily has a single form which is used both to create derived lexical Ns and to mark nominalized phrases. However, in light of the fact that many languages appear to exhibit this correlation — that the same form that is used to nominalize VPs is also used to nominalize lexical Vs — it is reasonable to conclude that it is not an accidental fact in those languages which exhibit it. Hence, it is a correlation that we need to capture in whatever account we provide for nominalized phrases. The analysis which Yoon provides for the two types of nominalizers attempts to do just that. He assumes that the Korean nominalizer *-um* converts a V-type constituent of any bar level into a N-type constituent of the same level, as shown in (22).

- (22) Korean nominalizer: *-um* : $[V^n \text{ — }]_{N^n}$

Thus, if $n = 0$, we are dealing with a case of lexical derivation, as in (23).

(23) Derived lexical N — *cwuk-um*

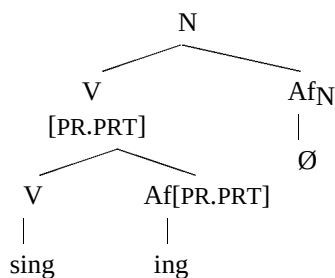
On the other hand, if $n = 2$ (which Yoon takes to be the maximal bar level for Korean), a full VP is being nominalized, as shown in (24).⁶

(24) Nominalized phrase — *John-uy pap-ul mek-um*

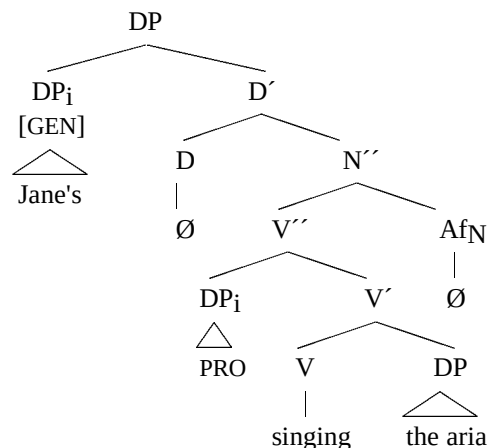
Cases involving double-duty affixes work in an exactly parallel fashion, except that the nominalizing affix is a zero-morph taking a specially marked verbal base form. Thus, in English, the *-ing* cases would involve a nominalizing affix with the properties in (25).

(25) English nominalizer: $-\emptyset : [V[PR.PRT]^n \text{ — }]_{N^n}$

Again, if $n = 0$, we have a case of lexical deverbal nominalization (26), whereas if $n = 2$, the result of affixation is a GP with the structure in (27).

(26) Derived lexical N — *singing*

⁶ There is a third possibility here, namely, when $n = 1$. Yoon does not explicitly discuss this possibility, but it proves to be a problem for the PhrCon approach, as we will see in section 5 below.

(27) Nominalized phrase — *Jane's singing the aria*

Yoon adduces two main sets of facts which correlate with the distinction between dedicated vs. double-duty nominalizations and hence support the different treatment of them in the PhrCon approach. The first set of facts is that in languages with dedicated nominalizers, the resulting phrasal nominalization forms can bear affixes which typically attach to Ns in the language, whereas languages with double-duty nominalizers do not permit such affixes on those forms. In particular, in the first type of language, the full range of case markers attach to gerund forms, as seen in the following Korean forms.

(28) (after Yoon 1996a, (7b))

- | | | |
|----|----------------------|-----------------------|
| a. | [mek-hi-m]-ulo | 'through being eaten' |
| | [eat-PASS-GER]-INSTR | |
| b. | [mek-hi-m]-i | 'being eaten (NOM)' |
| | [eat-PASS-GER]-NOM | |
| c. | [mek-hi-m]-uy | 'being eaten (GEN)' |
| | [eat-PASS-GER]-GEN | |

In contrast, in the second type of language plural markers which otherwise attach to Ns cannot also attach to gerunds, as shown by English examples like (29), where strictly lexical nominalizations like (29a) can be pluralized, but the gerund in a GP like (29b) cannot.

(29) (after Yoon 1996a (9))

- a. (frequent) singing-s of the Marseillaise
- b. *John's singing-s the Marseillaise

The PhrCon account of this set of facts runs along the following lines. In Korean case suffixes are themselves phrasal affixes, taking NPs into NPs (while being morphologically attached to the head N of the original NP). Such markers should be just as capable of attaching to NPs created by phrasal affixation as they are to regular NPs. Indeed they can, yielding case-marked gerund forms like those in (28). In contrast, the plural marker in English is a lexical affix which only attaches to Ns. On the PhrCon analysis, a GP includes an internal VP with a standard V as its lexical head. Hence, we should not expect that lexical head to be able to bear the plural suffix, since Vs in general do not bear such suffixes in English, and they do not (29b). On the other hand, in lexical nominalizations (29a) the resulting structure is that of a N. Here we do expect the plural marker to be attachable, and it is.

The second set of facts concerns the way in which gerunds behave in coordinate structures. Yoon (1996b, 80) observes that there is a contrast in the marking found on gerunds in English vs. Korean:

(30) (after Yoon 1996b (30), (32a))

- a. John's [[sing-*ing* the song]_{VP} and [play-*ing* the piano]_{VP} -Ø]_{NP}
- b. *John's [[sing-*ing* the song]_{VP} and [play the piano]_{VP} -Ø]_{NP}

(31) (after Yoon 1996b (31), (32b))

- a. John-uy [chayk-ul ilk-um]_{NP}-kwa [pap-ul mek-um]_{NP}
 John-GEN [book-ACC read-GER]-CONJ [rice-ACC eat-GER]
 John's reading the book and eating the meal'
- b. John-uy [[chayk-ul ilk]_{VP}-ko [pap-ul mek]_{VP}]_{NP}-um
 John-GEN [[book-ACC read]-CONJ [rice-ACC eat]]-GER
 = (33a)

The PhrCon account of such facts is again straightforward. In English examples like (30a), two present participle VPs are first coordinated, and the -Ø affix which derives NPs from such VPs in English (25) applies to the result. However, in (30b) the coordinate structure to which the -Ø affix has applied is itself ill-formed, since the first conjunct is a VP[PRES.PRT] while the second is a VP[INF], and in general it is not possible to conjoin phrases whose heads disagree in morphosyntactic features in this way.⁷ In Korean, on the other hand, the gerund affix simply attaches to VPs, without further restrictions. So, the affix can attach to each separate VP, creating two separate NPs which are then conjoined under an NP, as in (31a), or the two VPs can first be conjoined, with the resulting coordinate VP undergoing conversion to become an NP, as in (31b).⁸

3. Analytic Challenges to the DLC Approach

A number of the points raised in Yoon's discussion can be viewed as presenting challenges to, or arguments against, the DLC approach. These fall roughly into two categories: analytic difficulties and more general theoretical problems. I take up the former in this section and the latter in the following section.

3.1 Permitting CASE markers on gerunds. As we have seen, in languages like Korean, case markers typically attach quite freely to gerund forms. This is expected on the PhrCon analysis, since these markers attach in the syntax to NPs and are realized on whatever item is the lexical head of the phrase, regardless of the category to which that head belongs. In the cases in question, the head happens to be a V with a dedicated nominalizer suffixed to it, as in the Korean example (24). It is not clear, however, how such case markers would be able to attach to gerunds on the DLC account, since that analysis does not make appeal to a notion of phrasal affix. Furthermore, the gerund itself belongs to the category $\langle N|V \rangle^0$, and since case markers typically attach only to N^0 's, it

⁷ An alternative analysis of (30b) in which the -Ø affix applies just to the VP in the first conjunct is just as ill-formed, since then, on the PhrCon analysis, we would be conjoining an NP in the first conjunct with a VP in the second.

⁸ Yoon also observes a further fact, though one which is not directly relevant to the distinction between dedicated and double-duty nominalizers. In Spanish, infinitives in nominalizations can occur with object clitics, just as they can in regular nonfinite clauses, while lexical derived nominals based on infinitives cannot. I return to this set of facts shortly.

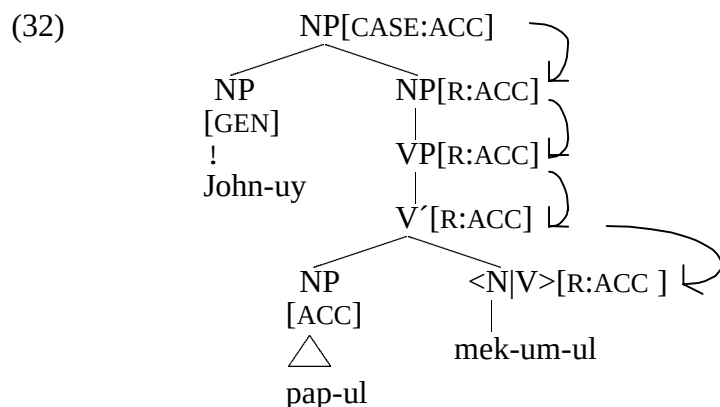
is not obvious how we could arrange things so that case markers could appear on such forms.

Response. There are two responses to this challenge that can be given, depending on whether the case markers in question are phrasal affixes or regular affixes.

First, while the DLC approach may not make direct appeal to a notion of phrasal affix in generating gerund forms, there is nothing in principle preventing phrasal affixes from being used in conjunction with a DLC account of GPs to handle various properties of such phrases in a given language. It happens to be the case that English GPs formed the initial empirical base in developing the DLC analysis. The *-ing* ending in such phrases is clearly a regular, lexical affix and not a phrasal one, a point on which both the PhrCon account and the DLC analysis agree, and given that the DLC account takes the *-ing* suffix to be the nominalizer here — that is, as really doing double duty in the language — there has been no reason, on the basis of English GPs, to be concerned with phrasal affixes in accounting for the basic facts about GPs up to this point.

Numerous works have been devoted to the analysis of phrasal or edge affixes, among them Anderson 1982, Zwicky 1987, Nevis 1985, Kanerva 1987, Yoon 1989, 1990, Miller 1991, Miller and Halpern 1992, and Lapointe 1990, 1992. These approaches differ somewhat among themselves; for example, some, like Yoon's, allow a phrasal affix to occur on the head of a phrase as well as on a phrase-marginal element, while others do not allow this. For concreteness, I will adopt Miller and Halpern's (1992) treatment in terms of EDGE features in GPSG. The basic idea is that an edge affix is controlled by the presence of an EDGE feature, which is itself determined by the presence of a semantically relevant feature occurring on a phrasal node. The semantically relevant feature can be thought of as "launching" the EDGE feature, which percolates down the tree structure on its left (alternatively, right) side in accordance with an Edge Feature Principle which Miller and Halpern formulate, landing ultimately on the leftmost (or rightmost) lexical item in the phrase, where the feature is realized morphologically.

On an edge feature account of phrasal affixes, then, case features in Korean would be the semantically relevant ones, and these would be marked on the NP in an NP-over-VP structure like (24). A case feature like [ACC] would then launch a right EDGE feature, say "[R:ACC]", and this EDGE feature would percolate down the right side of the tree to the rightmost lexical item (which also happens to be the head of the VP in Korean), where it would be morphologically realized. The situation would then be the one depicted in (32).



Such an account is exactly parallel to the one offered by Yoon within the PhrCon approach, except that the NP-over-VP structure of the DLC account is assumed rather than the dedicated phrasal affix nominalizer structure in (24). Hence, there is in principle

no impediment to the DLC account providing essentially the same analysis of phrasal affix case markers in these languages.

Second, for a language containing case markers that are regular lexical affixes, there is an equally simple account of the presence of such case markers on the DLC account. Case-marking is an external property of NPs, as it involves the ways in which NPs can combine with larger phrases. Hence, we expect it to be governed by the $\langle N|$ portion of DLCs. Since both regular Ns and gerunds are specified $\langle N|$, in a language which requires case-marking on gerunds all that we need to do is allow the morphological rules of the language to refer to that external category in adding the needed suffixes. Thus, for such a language, the requisite rules need to manipulate $\langle N|Y \rangle$, rather than simply $\langle N|N \rangle$ ($= N$), as schematized in (33). When $Y = N$, the case marker will be suffixed to a regular N, and when $Y = V$, it will be suffixed to a gerund form.⁹

(33) General form of morphological case-suffixing rules for languages with lexical case markers:

$$[\langle N|Y \rangle; \text{CASE}:\alpha] \longrightarrow \langle N|Y \rangle \text{ Af}[\text{CASE}:\alpha]$$

Hence, even for languages with lexical case markers we would still be able to accommodate the presence of such cases affixes on gerund forms.

3.2 Lack of plural markers. The second challenge is the flip side of the first one. Languages with dedicated nominalizers allow typical N affixes to attach to the morphologically derived form, but languages with double-duty nominalizers, like English and Spanish, do not. In particular, we need to insure that plural marking is disallowed on gerunds in these languages on the DLC account.

Response. As much recent work on the semantics of plurality has shown (cf. Link 1983, Ojeda 1993 and the numerous references cited there), plurality can be taken to be an *internal* property of Ns, on a par with the notions of count and mass to which it is related. Therefore, we should expect only those items which are internally $|N \rangle$ to allow markers indicating plurality. Because gerunds and regular Vs are $|V \rangle$ items, we should not expect them to occur with plural markers, and in general, they do not. (Vs can, of course, occur with plural *agreement* markers, but that involves a very different sort of construction.) Thus, the fact that English GPs with plural gerund forms (29b) are ungrammatical actually follows directly on the DLC analysis.

Furthermore, because this is a general property of these categories on the DLC approach, we should expect plural markers not to be able to occur with gerund forms across languages. That is, we should expect this property to apply regardless of whether the language has double-duty or dedicated nominalizers, and this appears to be correct. For instance, in Turkish, which has a dedicated gerund suffix *-mE*, it is not possible to pluralize the gerund form in a GP (34).

⁹ Something needs to be added to this account to prevent Y from being either A or P. In a language that is otherwise like Korean but with lexical case markers, this problem does not arise, since neither of these two other categories exist in Korean. In languages which have A and P, if the language does not have the asymmetrical DLCs $\langle N|A \rangle$ and $\langle N|P \rangle$, then the CASE rules in the language can still take the form in (33), since only $\langle N|N \rangle$'s (regular Ns) and $\langle N|V \rangle$'s (gerunds) can serve as inputs to the rule in such a language. It is only for languages which have As and Ps and also $\langle N|A \rangle$ or $\langle N|P \rangle$, undoubtedly a very small number at best, that we would need to add further restrictions on Y in (33).

(34) (Turkish dedicated nominalizer *-mE*)

- a. [(Ben-im) pahalî bir hediye al-ma-m] Ays3e-yi kor-ut-tu
 1.SG-GEN expensive one present buy-GER-1.SG Ayshe-ACC fear-CAUS-PAST
 'My buying an expensive present frightened Ayshe'
- b. * [(Ben-im) pahalî bir hediye al-ma-lar-îm] Ays3e-yi kor-ut-tu
 buy-GER-PLUR-1.SG

As a different sort of example, in Chichewa (and generally in the Bantu languages), there is a special class marker for the double-duty infinitive/gerund form, but there simply is no corresponding plural class marker, as there are in the case of the clearly singular classes.¹⁰ The DLC account therefore makes a more general prediction regarding the absence of plural markers with gerunds than the PhrCon approach does, and one which appears to be correct. We will return to this issue again in section 5.

3.3 Presence of clitic pronouns. The third problem involves the facts about Spanish clitics mentioned in note 8. In Spanish, which permits clitic pronouns to attach to finite Vs, such clitics also can attach to the gerund form heading a GP (35a), whereas this is not permitted in lexical nominalizations (35b).

(35) (after Yoon 1996a (11), (12))

- a. nuestro cantar-*las* le irrita
 our sing.INF-them him irritates
 'our singing them irritates him'
- b. *el cantar-*las* de Maria
 the sing.INF-them of Maria
 'Maria's songs them'

Again, the DLC account needs to provide an analysis of such forms.

¹⁰ It should be noted that the plural marker *-tul* in Korean can be attached to gerund forms as in (i). However, this is clearly an instance of the 'plural copy' construction (Kuh 1988, Lee 1991, Hong 1991, Kim 1994), illustrated in (ii) (= Lee 1991 example (1)).

- (i) % ai-tul-i [sensayngnim-uy chayk-ul ilk-um]-i(-tul) mwusepta
 child-PL-NOM [teacher-GEN book-ACC read-GER]-NOM-PL be.afraid
 'The children were afraid of [the teacher's reading the book]'
- (ii) ai-tul-i Tom-eykey(-tul) ppang-ul(-tul) manhi(-tul) cwuesseyo(-tul)
 child-PL-NOM Tom-DAT(-PL) bread-ACC(-PL) much(-PL) gave(-PL)
 'The children gave Tom a lot of bread'

Any of the parenthesized copies of the plural marker *-tul* in (ii) are optionally possible. These copies represent a kind of plural agreement with the subject of the clause; they can only occur when the subject is taken to be semantically plural (whether or not the subject is expressly marked with the plural marker). (For arguments that the subject trigger of plural copying needs to be thought of in semantic rather than syntactic terms, see Hong 1991.) In no way can the plural copies be thought of as expressing plurality of the element to which they are attached. This fact is clear in examples like (ii), where neither *Tom* nor the *V cwuesseyo* 'gave' are inherently plural. All of these facts hold as well when *-tul* is attached to a GP in Korean. Thus, in (i) the parenthesized *-tul* is optional, it can only occur because the subject of the larger S is plural, and it cannot mean that multiple readings of the book by the teacher have occurred. Hence, there is ample justification for excluding *-tul* in Korean from the domain covered by the generalization predicted by the DLC account of plural forms presented here.

Response. This problem has as simple a solution as the one for the plural marker case. Object clitic pronouns are VP-internal properties in Spanish, and so we expect them to be associated with $|V\rangle$. Hence, we expect that both regular Vs and gerunds should allow object clitic pronouns in this language, and as we have seen above, they do.

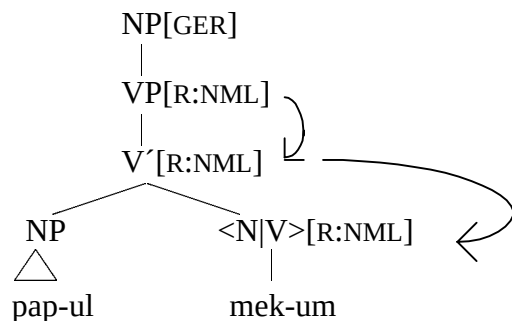
3.4 Coordination asymmetry. The DLC analysis assumes that the gerund marker in both dedicated and double-duty nominalizer cases is a nonnull affix. Consequently, it is not obvious that the DLC analysis can account for the coordination contrast in (30) vs. (31), given that the contrast appears to rest on the positing of a full affix in one case and a null affix requiring a specially marked constituent in the other.

Response. First, it is not immediately obvious that data like (30) and (31) should be taken as supporting the idea that GPs are formed in Korean by a full affix while they are formed in English by a $-\emptyset$ affix. The reason is that such coordination facts form some of the prime evidence distinguishing a lexical affix from a phrasal/edge affix. That is, lexical affixes must occur on the heads of each of the conjuncts in a coordinate structure, while phrasal affixes can occur either within each of the conjuncts or just once in the initial or final conjunct. (See Yoon 1989, 1990; Lapointe 1990, 1992; Miller 1991; we will return to these issues again in section 5 below.) As the discussion above makes clear, the *-ing* ending in English exhibits the properties of a lexical affix (30), but the *-um* ending in Korean exhibits the properties of a phrasal/edge affix (31). Therefore, rather than saying anything about the presence of a $-\emptyset$ vs. a nonnull affix, the facts in (30) and (31) can just as easily be interpreted as saying simply that we are dealing with a lexical affix on the one hand but with a phrasal/edge affix on the other. These facts thus do not immediately offer any particular support for positing a $-\emptyset$ affix in English.

Given that this is a reasonable interpretation of the data, it is important to show that the DLC approach can accommodate the fact that Korean *-um* and *-ki* produce $\langle N|V \rangle$ lexical items while acting as phrasal/edge affixes. In order to do this, we need to do two things: (i) we need to provide an account of nominalizing affixes which are themselves edge affixes, and (ii) we need to show how edge affix nominalizers behave in coordinate structures so as to result in the Korean facts in (31). It turns out that these tasks are relatively easy to accomplish if we adopt an EDGE feature analysis of phrasal affixes like the one discussed above.

Concerning task (i), so long as the relevant EDGE feature lands on a lexical item that can be an $\langle N|V \rangle$ item there is no difficulty here, since it is the dual category of the lexical head which determines the NP-over-VP structure of the GP; the presence of the EDGE feature simply determines the presence of the affix. This works out just fine in the case of Korean (36), since phrases are head-final in this language, and so the $[R:NML]$ EDGE feature ends up on the head, an item which can be an $\langle N|V \rangle$ item when *-um* is attached.

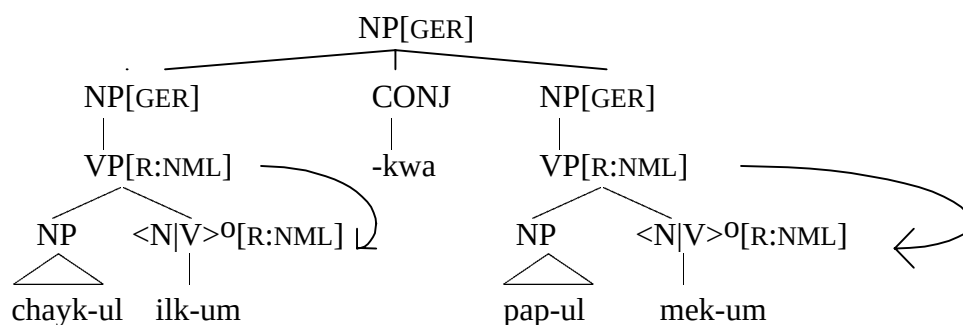
(36) Korean *-um* as an edge affix —



Turning to task (ii) — how to account for the coordination asymmetry between English and Korean in (30) and (31) — this issue appears to be a harder one to address, precisely because no one has looked at how coordination in general is supposed to work within the DLC approach. However, it turns out that, here too, we can account for the behavior of the Korean coordination examples in a straightforward way.

In (37) we have the structure for (31a), the one in which the nominalizer occurs in both conjuncts.

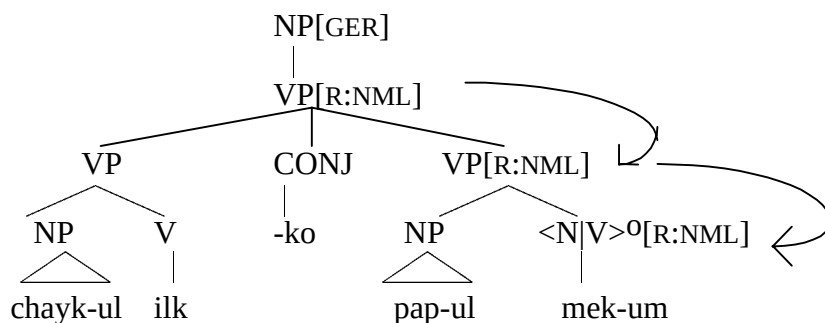
(37) Structure for (31a) $[[chayk-ul\ ilk]_{VP-um}]_{NP-kwa} [[pap-ul\ mek]_{VP-um}]_{NP}$



In this structure, the NP nodes at the top are conjoined, and each bears the [GER] feature that we have been assuming to be the semantically relevant feature for phrasal nominalizations involving edge affixes. The NPs in each of the conjuncts then has a VP for a head daughter, and the [GER] feature on each of these NPs launches its own [R:NML] feature. As a result, a nominalizing affix appears in each conjunct.

In (38) we have the structure for (31b), in which the nominalizer occurs only in the final conjunct.

(38) Structure for (31b) $[[[chayk-ul\ ilk]_{VP-ko} [pap-ul\ mek]_{VP}]_{VP-um}]_{NP}$



Here, the top NP node, marked [GER], immediately changes over to a VP, which is now marked [R:NML] as a result of the Edge Feature Principle of Miller and Halpern 1992. The VPs are then conjoined, but only the rightmost one can bear the [R:NML] feature, as a consequence of the account of EDGE features in Miller and Halpern 1992.¹¹ Hence,

¹¹ That account assumes that there are absolute, universally defined Linear Precedence statements ordering all [L:α] constituents first and all [R:α] constituents last among their sister constituents:

- (i) a. [L:α] < X
- b. X < [R:α]

Hence, if two sister constituents ever were to bear the same EDGE feature, they would both be competing for the rightmost (or leftmost) position, a situation that cannot occur. Hence, the VP conjuncts in (34)

there is a plain VP in the left conjunct, while the VP in the right conjunct bears [R:NML]-marking on all of its rightmost nodes, and it is lexically headed by an $\langle N|V \rangle$ item. This is just the result that we want.¹²

The coordination asymmetry between languages like English and Korean therefore turns out not to represent a serious challenge to the DLC account, once a suitable approach to phrasal affixes is adopted within the analysis

4. Theoretical Difficulties with the DLC Account

In addition to the analytic challenges dealt with in the preceding section, there are at least three potential theoretical problems with the DLC approach as well.

4.1 The same affix in both lexical and phrasal nominalizations. The first theoretical problem involves one of the main points which Yoon makes in both of his papers: the fact that in many languages, the same affix is used to mark both lexical and phrasal nominalizations. As we have seen above, the PhrCon account directly incorporates this as part of the analysis. In contrast, it would appear that the DLC analysis fails to account for this correlation in these languages, since it only deals with the phrasal type of nominalization and says nothing directly about the lexical type.¹³

Response. It turns out that the DLC analysis is really not at a disadvantage here. In languages which use the same affix for both kinds of nominalization, all that we need to do is have the relevant affix take a V base (i.e., a $\langle V|V \rangle$) and convert it into an $\langle N|Y \rangle$ output form in the morphology. When $Y = N$, we have the derivation for a lexical derived nominal based on this affix, and when $Y = V$, we have a gerund as output which will head a GP. In contrast, any language for which this correlation does not hold will simply have V being converted into $\langle N|V \rangle$ by the affix which creates the gerund form.¹⁴ This is not quite all of the story, of course, since a language which permits gerunds in the morphology must also have appropriate PS rules in the syntax to support the required NP-over-VP structures, but this is a kind of correlation between the morphology and the

cannot both be marked [R:NML].

¹² This analysis derives support from the fact that the conjunctive particles *-kwa* and *-ko* in these examples can only occur in the respective structures. That is, switching the conjunctions here leads to ungrammaticality. Within the DLC account, these clitic elements place the following restrictions on their left hosts:

- (i) a. *-kwa* takes an $|N \rangle$ constituent as left host
- b. *-ko* takes a $|V \rangle$ constituent as left host

These facts cannot be used as an argument for the DLC account over the PhrCon approach, however, since it is just as easy to state the restrictions on hosts within that analysis (i.e., *-kwa* takes an N^i host, and *-ko* takes a V^i host).

¹³ As an example of the problems that the DLC is supposed to encounter in this area, Yoon 1996b cites the case of the Korean suffix *-tap* 'like', which converts Ns into Vs. He notes, following earlier work by Shi 1995, that there are two versions of this suffix, a lexical one and a phrasal one. Yoon then notes that a DLC of these constructions would take the head marked by *-tap* in the phrasal case to be a $\langle V|N \rangle$, but it is unclear what we should then say about the lexical version of the affix.

As proposed immediately below in the text, one alternative on the DLC account would be to simply have the lexical version be a $\langle V|V \rangle$ and let the rule attaching *-tap* turn N's (i.e., $\langle N|N \rangle$ items) into $\langle V|Y \rangle$ items. However, this account assumes that a DLC approach to the phrasal version of *-tap* is the appropriate one to take. From the single example that Yoon presents, it is hard to tell; it seems just as plausible to say that *-tap* is a derivational suffix which has lexical and phrasal affix counterparts. In any case, more work will need to be done before we can conclude that a DLC account of these constructions is even the appropriate one here.

¹⁴ Again, depending on the language, something might need to be said to prevent Y from being A or P. See fn. 9 above.

syntax which is quite commonplace. After all, a language is not going to allow a word formation rule to create lexical derived Adj's if its syntax does not permit APs. Likewise, a language is not going to have a morphological rule creating gerund forms if the necessary syntactic rules to permit the NP-over-VP structure do not exist.

There is, of course, an important unresolved empirical issue that this discussion has not addressed. As noted earlier, Yoon is careful not to claim that all languages with phrasal nominalizations use the same affix for lexical derived nominals. This caution is undoubtedly a result of the fact that at present it is not known whether this universal generalization is correct. If it proved at some future point to be true, then that would be a fact that we would want to capture in our synchronic grammars. In the meantime, though, as pointed out above, the DLC approach is as capable of capturing the correlation when it does occur as the PhrCon analysis is.

4.2 The multiplicity of DLCs. The next problem has to do with the fact that languages exhibit different types of phrasal nominalizations, typically with somewhat different properties. Thus, Yoon 1996b (p.83) notes that English has two types of GP, often referred to as the POSS-ING and ACC-ING types in the generative literature. The first kind, which I have been referring to in the present work as a "GP", involves the nominalization of a VP, while the second kind appears to involve the nominalization of an IP. There is a similar split in Korean; one kind of nominalization (Yoon 1989's Type III) is a GP which involves a VP being nominalized, while the second kind (Type II) involves NOM-marked subjects, can include tensed Vs, and looks for all the world like a nominalized tensed IP. And according to Yoon, in Spanish CPs can apparently be nominalized as well as VPs and IPs. The single type of DLC posited for regular GPs will not directly account for nominalizations of IP or CP. New types of DLCs will thus be required to handle these various other kinds of phrases, leading to a proliferation in the number and kinds of DLCs allowed and hence to a weakening of that theory.

Response. In the passage in which he raises this objection, Yoon (1996b, p.83) actually suggests a reasonable DLC type of analysis for the non-VP nominalized phrases that he cites, basically the ones in (39).

(39) Under the DLC account —

- a. English ACC-ING: <N | INFL[-TNS]>
- b. Korean Type II: <N | INFL[α TNS]>
- c. Spanish CP-nom: <N | COMP[*que*]>

Nonetheless, he suggests that there are two problems with such an approach. First, under the Strong Lexicalist Hypothesis assumed by the DLC approach, appeal to an abstract functional node like INFL in the syntax is generally disallowed. Second, in Korean the INFL node actually corresponds to a bound affix, posing even greater concerns for lexical integrity.

However, neither of these problems is insurmountable, even within a Strong Lexical framework. While INFL and COMP can be highly abstract syntactic elements under a Principles and Parameters treatment, in English and in Spanish at least there are overt lexical items that can be argued to occur in these positions, thus providing concrete support for their existence. Furthermore, the bound tense affixes that can occur in Korean Type II nominalizations are phrasal/edge affixes, as Yoon 1990 clearly demonstrates. Hence, they are going to have some presence in the syntactic structure of any tensed phrase, either as a separate item (in the analysis of Yoon 1990) or as a feature (in an account like that of Miller and Halpern 1992). Thus, positing DLCs like those in (39), though perhaps not exactly those, would seem to be well within the realm of possibilities for a Strong Lexicalist approach like the DLC analysis.

It therefore appears that the real problem that these other kinds of nominalized phrases create for the DLC approach is the one that we started with, namely, that they demand a proliferation in the number and kind of DLC countenanced in that analysis. Given that the definition of a DLC in (2) permits only major lexical categories as the first and second parts, the addition of DLCs like those in (39) clearly represents an extension of the original proposal. The question is, How pernicious is this extension? The answer depends on what basic kinds of lexical categories one assumes in a non-DLC system. If IP and CP are the main kinds of functional phrases, it seems entirely natural that I and C would be included within the general framework of DLCs, at least to the extent that I and C would also be allowed as the second parts of asymmetrical DLCs.¹⁵ In that case, mixed category phrases headed by asymmetrical DLCs like those in (39) would be expected, and the extension would in fact be empirically motivated by the constructions which Yoon alludes to.

On the other hand, we can turn the question about proliferation around and ask, How would the PhrCon account handle these kinds of nominalizations? While the subcategorization for the *-um* affix in Korean in (22) permits nominalization of lexical Vs and full VPs, it does not permit nominalized IPs as it is stated, since $IP \bullet V^n$, for any n . Hence, we apparently must add the subcategorization $[IP[+TNS] \text{ —}]_{NP}$ to that of *-um*, *-ki* in Korean.¹⁶ Similar remarks hold of the other kinds of non-VP nominalized phrases as well, and so in addition to the subcategorizations for dedicated and zero-morph nominalizers for GPs, there must also be subcategorizations like those in (40).

- (40) Under the PhrCon account —
- a. English ACC-ING: $[IP[-TNS] \text{ —}]_{NP}$
 - b. Korean Type II: $[IP[\alpha TNS] \text{ —}]_{NP}$
 - c. Spanish CP-nom: $[CP[que] \text{ —}]_{NP}$

It therefore appears that essentially the same information has to be added to the PhrCon analysis in order to handle the non-VP nominalized phrases as needs to be added to the DLC account. The only difference is that in the PhrCon account, the added information is encoded in subcategorization frames for the phrasal affixes, while in the DLC analysis, the additional information involves new asymmetrical DLCs. Neither analysis appears to hold an advantage over, or be at a disadvantage to, the other along this dimension.

¹⁵ Assuming that the full range of categories includes N, V, A, P, I, and C, then (2a) in the definition of a DLC could be modified to read as follows:

(i) X and Y are any category.

This is not sufficient, though; it would allow the two new symmetrical DLCs, $\langle I | I \rangle$ and $\langle C | C \rangle$, that we want, but it would also allow an additional sixteen asymmetrical DLCs, namely all those in which I or C occurs with one of the major lexical categories. However, if we view I and C as extended functional heads, in a sense similar to that of Grimshaw 1991, 1997, then (a) the cases involving $\langle V | \rangle$ or $\langle V \rangle$ disappear, because they are subsumed under the definitions of I and C as extended heads of V, and (b) the remaining cases with N, A, or P as internal parts disappear, because in those cases there would be no internal V for the I or C to be an extended head of. This leaves just the six asymmetrical DLCs $\langle \{N, A, P\} | I \rangle$, $\langle \{N, A, P\} | C \rangle$, i.e., clauses which function externally as NPs, APs, or PPs, and this seems just the range of possibilities that we want here.

¹⁶ Yoon (1996a) proposes a different account of the Korean Type II phrases, but it only addresses the issue of NOM-marking on the subject of the phrase, and it does not treat the other properties which such phrases exhibit. This turns out to be a problem for the PhrCon account, a point to which I will return shortly.

4.3 Weakening of endocentricity. Perhaps the most serious problem with the DLC approach, according to Yoon, is that it weakens the strong notion of endocentricity that is typically assumed in work on syntax. Thus, according to Yoon, the DLC approach seeks "to maintain endocentricity and lexicalism simultaneously" (1996b, p.82), but at the same time the problems he presents that have just been discussed in sections 4.2 and 4.3, plus the fact that there are denominalized Vs in Japanese that appear to involve a mixture of N and V properties that cannot easily be packaged into a DLC of the sort defined above, suggest to him that a fuller analysis of the facts in terms of DLCs will lead to a serious breakdown in the usual understanding of endocentricity, on which much of our notions about syntactic structure are based.

Response. It is true that the DLC analysis involves a weakening of the notion of endocentricity usually assumed in one current syntactic framework. However, (i) there are several logically distinct parts to the notion of endocentricity that we need to keep separate, (ii) not all current syntactic frameworks maintain the full versions of these separate parts, and (iii) in any case, the DLC approach weakens only one of the parts and in a quite restricted way.

The logically distinct notions are these:

- (41) *Headedness* — A phrase has a head if, when you remove that item, you no longer have a phrase (null pro-form and discourse ellipsis contexts aside).
 - a. *Strong Headedness Condition* — All phrases are headed.
 - b. *Weak Headedness Condition* — Some phrases are headed.
- (42) *Property-sharing* — A phrase that is headed shares some/all of its grammatical properties with its head.
 - a. *Complete Property-sharing Condition* — All grammatical properties are shared.
 - b. *Partial Property-sharing Condition* — Some grammatical properties are shared.

Property-sharing (42), in one version or another, is the central idea behind endocentricity proper. Versions of X' phrase structure which have been adopted within the Principles and Parameters framework over the past decade or so have sought to maintain the strongest possible conditions, (41a) and (42a), i.e., all phrases are headed and complete property-sharing obtains. This view is what we might call *strict endocentricity*. However, not all current generative frameworks adopt this assumption. In LFG for example, not all phrases are headed, and so only Weak Headedness (41b) holds, while headed phrases involve (nearly) Complete Property-sharing (42a).¹⁷ GPSG, on the other hand, adopts Strong Headedness (41a) (since all phrases are headed) but assumes only the weakest version of Partial Property-sharing (42b). In fact, although this framework assumes that there is some feature-sharing between a phrasal node and its head daughter,

¹⁷ I have included the hedge "nearly" here for the following reason. As far as I am aware, setting aside the explicitly exocentric phrase types S and S', analyses within standard LFG (Bresnan 1982) that have been proposed for facts in particular languages have the property that all phrase-lexical head pairs share all morphosyntactic properties, so that Complete Property-sharing holds in those analyses. However, it does not appear that there is any principle which explicitly requires that under standard LFG assumptions. In particular, there appears to be nothing preventing the following situation. A feature ($\uparrow F$) = $\downarrow$ is introduced by an element attached to X' or XP. As a result, both X' and XP are marked for the feature F, but because there is no down-arrow constraint forcing the feature lower in the structure, the lexical head X^0 fails to be marked for the feature. In such a case, only Partial Property-sharing would hold. An example of this might be the feature DEFINITE introduced by a Det at the NP level; the feature would be specified on the immediately dominating NP node, but not on the lower N' and N^0 nodes in the structure. Hence, there seems to be some question as to the degree of completeness of property-sharing within this framework.

it is left entirely open what the exact feature-sharing relation might be, and so it permits the full range of possibilities, from strict identity between the two nodes to total mismatch. Such an assumption is in effect functionally equivalent to claiming that Property-sharing (42) simply does not hold in this framework. Indeed, it is precisely the looseness of these assumptions about property-sharing that lead to the problems alluded to earlier with Pullum's GPSG account of GPs.

Like GPSG, the DLC approach maintains Strong Headedness (41a) as well as Partial Property-sharing (42b), but it does so in a way that tries to maintain reasonably tight constraints on when property-sharing fails to occur. In particular, it allows lexical category information not to be shared between a mother node and a head daughter node, but only when the lexical head of the phrase is an appropriate asymmetrical DLC. In other cases, that is with regular phrases headed by symmetrical DLCs, strict endocentricity (Strong Headedness (41a) plus Complete Property-sharing (42a)) continues to hold.

Basically, this is the whole point of the DLC approach. The idea is to retain the notion of headedness while loosening the notion of property-sharing just enough to account for the properties of the usually encountered types of mixed category phrases, without allowing other, unwanted kinds, while at the same time maintaining strict endocentricity for standard sorts of phrases. The approach does this by (a) dividing each category into sets of external and internal properties and then (b) allowing the external property set of one category to be paired with the internal property set of any category, its own or one of the others. Hence, the phrase as a whole always has a lexical head, the only kinds of external properties that it can have form one of the sets of external properties that are allowed for categories in general in the language, and the only internal properties that it can have form one of the sets of internal properties for categories in general in the language.

The kind of weakening to Complete Property-sharing allowed in the DLC account thus appears to be the minimal amount required in order to accommodate the facts of mixed category phrases while still maintaining strict endocentricity for standard phrases (i.e., those headed by symmetrical DLCs). As far as I can tell, every analysis of GPs or other mixed category phrases based on transformational or Government-Binding approaches which tries to maintain strict endocentricity for those phrases either ends up in serious empirical trouble or has to bend the underlying theory in otherwise undesirable ways (see Lapointe (in preparation) for extensive discussion of this point). It thus seems reasonable to attempt to formulate an analysis which maintains most of the tenets of strict endocentricity (i.e., Strong Headedness (41a) plus Complete Property-sharing (42a)) for regular phrases headed by symmetrical DLCs, while loosening property-sharing just enough to permit mixed category phrases (Strong Headedness (41a) plus a constrained version of Partial Property-sharing (42b)) for phrases headed by asymmetrical DLCs.

Therefore, contrary to the concerns raised by Yoon, the adoption of the DLC approach does not lead to anything like a complete breakdown in our understanding of endocentricity — far from it, for as we have seen, strict endocentricity is loosened on this account in only one highly circumscribed part of syntactic theory, and then only in a tightly constrained manner.^{18,19}

¹⁸ The Japanese forms that Yoon mentions head phrases which have properties which do not directly parallel those of mixed category phrases that we typically find across languages (see Sells 1996 and Morimoto 1998 for recent discussions). It has never been the claim of the DLC approach that all cases of phrases with unusual mixtures of grammatical properties are to be handled by positing asymmetrical DLC heads for them. On the contrary, the assumption of the DLC account is that the use of asymmetrical DLCs is to be limited to those cases involving "standard" sorts of mixed category phrases. Hence, it seems reasonable to search for a non-DLC analysis for the Japanese constructions in question.

¹⁹ As a final objection to the DLC approach, Yoon (1996b) characterizes the importation of DLCs into

5. Problems with the PhrCon Account

We have now seen that, with the exception of the remaining issues involving the coordination asymmetry that need to be dealt with and to which we will return in the next section, all of the analytic and theoretical problems raised by the PhrCon analysis for the DLC account can be handled in a straightforward and satisfactory way. As noted earlier, though, there are a number of difficulties which arise in the PhrCon account itself. In this section we will consider six such problems.

5.1 Appropriateness of the zero-morph approach. From the start, it is not clear that the zero-derivation approach is appropriate for the double-duty type of phrasal nominalizer. In morphology, zero-derivation produces headless structures. This is the whole point behind English examples like the V *to grandstand* which has the regular past tense form *grandstanded* rather than the otherwise expected irregular form **grandstood*. The V *grandstand* comes from the N *grandstand* via zero-morph conversion; the resulting V form is headless, and in particular *stand* does not act as the head, and so its otherwise expected irregular past form *stood* is unavailable in the derived V form *grandstand*. Hence, the only possible form is the one derived from the regular past tense affixation rule, resulting in the form *grandstanded*.

The problem that this fact poses for the PhrCon analysis is just this. On the PhrCon analysis, the properties of affixation are supposed to be taken over directly from the morphology into the syntax. But as we have already seen, GPs (and mixed category phrases in general) are headed. Hence, we have an element which normally creates headless structures in the morphology producing headed structures in the syntax. This is not a welcome state of affairs on the PhrCon account.

One way around this problem would be to say that zero-derivation is different in the syntax than in the morphology, but there are two immediate problems that arise with this approach. (a) We lose the supposed parallelism between the kinds of affixation that apply in the two components, a parallelism that the PhrCon account seeks to maintain. (b) We need an explicit account of just how zero-derivation (and perhaps other types of affixation) is different in the two components, and at present there is none. Consequently, it is really not obvious from the start that this is the correct approach that we should take to the properties of gerund forms created using the double-duty affixes.

5.2 Classification of nominalizing affixes. A second problem with the PhrCon approach is that it conflates two potentially separate dimensions: (i) dedicated vs. double-duty nominalization and (ii) phrasal vs. lexical affixation. In particular, the PhrCon approach seems to identify dedicated nominalizers exclusively with phrasal affixation and double-duty nominalizers with lexical affixation.

However, there does not seem in principle to be anything preventing these two dimensions from varying independently from one another. After all, the first dimension is defined in terms of the function that the affix performs (converting an element into a nominal constituent of some sort), while the second dimension is defined in terms of the attachment properties of an element, and across languages there are few necessary correlations between particular functions and the ways those functions are expressed. Consequently, we should expect to find languages representing all four of the types

syntactic theory as an "exotic modification[...]" In light of the fact that it is possible to integrate asymmetrical DLCs together with the theory of standard categories in a coherent fashion suggests that they are less exotic than they might otherwise appear at first blush. On the other hand, it is not at all clear that the use of zero-morphs as phrasal nominalizers within the PhrCon account involves any less exotic a modification to grammatical theory, as observed directly below in section 5.1.

derived from crossing the categories in these two dimensions, and in fact we find at least three of the four.²⁰

- (43) Classification of languages with nominalizers of different types
(shading indicates language types predicted on the PhrCon approach)

	Phrasal affix	Lexical affix
Dedicated nominalizer	Korean, Turkish	W. Greenlandic
Double-duty nominalizer		English, Spanish, Latin

I have not yet been able to find a convincing case of a language with a double-duty nominalizer that is a phrasal affix, but we would in any case expect such a language to be fairly rare. One of the functions performed by a double-duty nominalizer is to serve as a nonfinite V form. Such forms generally tend to be expressed by lexical affixes, since they are often historically residual forms derived from more remote elements. So what we would need in order to fill the lower left cell in (43) is an infrequently occurring *phrasal* nonfinite V form which in addition does double duty as a nominalizer creating NP-over-VP GP structures, themselves a relative rarity among syntactic constructions.

On the other hand, though, the lack of hard cases of that type does not really matter. The existence of at least one language with a dedicated nominalizer that is also a lexical affix, the upper right corner of (43), is sufficient to show that we cannot maintain a strict correlation which requires dedicated nominalizer = phrasal affix and double-duty nominalizer = lexical affix. We will be looking in greater detail in section 5.4 at the gerund-forming affix in West Greenlandic, where we will see that it indeed has the characteristics appropriate for a language in this cell of (43). Therefore, it is reasonable to conclude that the assumption of the PhrCon account that there is a strict correlation between nominalizer type and affixation type is incorrect.

5.3 Treatment of phrasal affixes. While on the one hand the PhrCon analysis adopts an overly tight correlation between nominalizer type and affixation type, on the other it adopts an overly broad notion of what counts as a phrasal affix. The PhrCon account assumes that two kinds of affixes count as phrasal affixes. First, there are affixes (let us call them 'Class A') which can be argued to occur on phrase-marginal words rather than on the lexical heads of phrases; among these are English POSS 's, Korean tense markers, and Turkish nominal affixes. Second, there are affixes ('Class B') whose properties are determined at least partly on the basis of factors in the syntax, even though they are realized exclusively on the lexical heads of phrases. Class B includes all the remaining inflections not already belonging to Class A. Let us refer to the assumption that Classes A and B form a single category the 'Broad Phrasal Affix' approach.

However, just because some of an affix's properties are determined syntactically, it does not automatically follow that the affix should be viewed as a "phrasal affix" in the strict sense. An alternative view, based on work by Nevis 1985, Zwicky 1987, Lapointe 1990, 1991, 1995, Miller 1991, Miller and Halpern 1992, argues that Classes A and B do

²⁰ Steven intended to present certain arguments based on West Greenlandic (WG). The subsection on WG was incomplete, and the argument to be made is not straightforward. I have reduced the WG section below to the abstract idea of the argument to be made, pointing out why it is not straightforward. (Peter Sells)

not form a single category, as they are to be identified with the following largely disjoint set of characteristics.²¹

- (44) Attachment properties of phrasal affixes
 - a. show phrasal phonological properties
 - b. attach to phrase-marginal words
 - c. can be omitted from all but the first or last conjunct in a coordination (depending on whether they are attached to the left- or right-marginal words of phrases)
- (45) Attachment properties of lexical affixes
 - a. show lexical phonological properties
 - b. attach to the lexical head of a phrase
 - c. must occur in all conjuncts of a coordinate structure

On this analysis of the lexical/phrasal affix distinction, only Class A affixes are taken to be pure phrasal affixes, since only they exhibit the properties in (44). Class B affixes would be treated as involving inflectional markers which happen to be attached as lexical affixes. That is, the latter markers would be analyzed as elements whose morphosyntactic properties are determined (at least partly) by the syntax, but which nevertheless exhibit the lexical attachment properties in (45). Thus, on this type of account, inflections are not simply identified with one type of affixation but are instead divided between the two classes on the basis of their attachment properties — those which exhibit phrasal attachment appear in Class A, while those with lexical attachment properties belong to Class B. Let us refer to this alternative view of lexical vs. phrasal affixes as the 'Restricted Phrasal Affix' approach.

The first problem for the PhrCon account in adopting the Broad Phrasal Affix view is that its adoption creates difficulties for one of the empirical predictions made by the PhrCon approach. As we have already seen in section 3.2, the DLC approach makes a broader prediction than the PhrCon analysis with respect to plurality in GPs. It predicts, apparently correctly, that GPs can never be pluralized, whereas the PhrCon analysis predicts that GPs cannot be pluralized only in languages with double-duty nominalizers. The failure of the PhrCon account to make the full prediction here is due in part to its assumption about what counts as a phrasal affix. If all inflections are classified as phrasal affixes, then it would in principle be possible for a plural marker to attach to a gerund in a language where both the plural and gerund affixes were "phrasal". As we have seen, though, this is not what we find. Instead, plural markers are just as ungrammatical in languages like Turkish with dedicated *phrasal* nominalizers as they are in other types of languages. Hence, this is one area where the PhrCon approach fails to make a correct prediction, and this failure is due in part to the Broad Phrasal Affix view which it adopts.

The second problem that arises for the PhrCon approach is that while it adopts the Broad Phrasal Affix view, it actually needs to adopt something like the Restricted Phrasal Affix view in order to account for certain kinds of facts. To see this, consider the example of case suffixes. On basically any current syntactic framework, the morphosyntactic properties of these markers are determined at least in part by the syntax. So, given its acceptance of the Broad Phrasal Affix view, the PhrCon account would analyze case suffixes as phrasal affixes, belonging to Class B.

²¹ The sets of properties in (44) and (45) overlap when the lexical heads of phrases happen to be the marginal elements in their phrases.

Suppose now that we had a language with case suffixes which exhibited the cluster of properties in (45). The PhrCon approach would claim that properties (45a, b) follow from the actual morphological attachment of those suffixes to the lexical head of the various phrases. However, it would be hard pressed to account satisfactorily for property (45c). As phrasal affixes, these case markers should be attachable either (i) to all NPs in a coordinate NP structure, yielding as many instances of the suffixes as there are conjuncts, or (ii) to the root NP of the coordination, yielding a single occurrence of the suffix in the final conjunct, as we saw above in section 3.4. But a suffix exhibiting the properties in (45) does not allow this second possibility (ii), and there is no obvious way to rule it out if we assume that case suffixes of this type are phrasal under the Broad Phrasal Affix interpretation.

On the Restricted Phrasal Affix view, though, there is no problem accounting for such case suffixes. A case suffix of the sort we are considering has to be attached to the lexical head N of each NP conjunct. If it were not, either the head of that conjunct would not be a well-formed fully inflected syntactic word, or the morphosyntactic features of that NP would not allow it to combine with the other NPs in the coordination, or both. Since this appears to be the natural way to account for the requirement that these kinds of case suffixes have to occur in each conjunct in a coordinate NP, it would seem that the PhrCon approach actually needs to include the kind of distinction which the Restricted Phrasal Affix view adopts in distinguishing Class B affixes as lexical rather than phrasal.

It is important to point out that the kind of case suffixes that we have been discussing do not represent a minor, relatively infrequent type. On the contrary, they are quite ubiquitous. Most of the Indo-European languages which employ case suffixes, for instance, exhibit the attachment properties in (45).

As an illustration, consider Latin. In terms of (45a), although there are not many phonological alternations involving case forms in this language, several which appear to be thoroughly lexical apply to inflected N forms. For example, in the second conjugation, some Ns whose stems end in *r* use $\emptyset$ rather than the expected *-us* in the NOM with an epenthetic *e* breaking up any resulting *Cr* cluster (*agro*: 'field.DAT/ABL' but *ager* 'field.NOM' vs. **agrus*; *puero*: 'boy.DAT/ABL' but *puer* 'boy.NOM' vs. **puerus*). In the third conjugation, stems ending in coronal stops drop the stops before the NOM ending *-s* (*mi:lit-is* 'soldier-GEN' but *mi:le-s* < *mi:lit-s* 'soldier-NOM'; *cu:sto:d-is* 'guard-GEN' but *cu:sto:s* < *cu:sto:d-s* 'guard-NOM'; *ment-is* 'mind, soul-GEN' but *men-s* < *ment-s* 'mind.NOM'). Furthermore, various Ns lack one or another case form, and most fifth declension Ns lack plural forms altogether, while some have only NOM/ACC plurals, lacking the oblique case forms in the plural. None of these sorts of restricted phonological processes apply across words at the phrasal level, and affixes at that level (i.e., clitic elements) typically exhibit their own restrictions which leave lexical level affixes, including case suffixes, unaffected.²² Hence, there appears to be ample reason

²² For instance, the conjunctive enclitic *-que* attaches to the first word of the last conjunct in a coordinate structure, and it generally attaches to that word without regard to lexical class or phonological shape. There is, however, one restriction on the occurrence of *-que*: if the first word in the target conjunct is a monosyllabic Prep (with some exceptions — see Lewis and Short 1966), *-que* attaches to the following word. Thus we find cases like the following.

- (i) a. *bonae* *bellae-que*
 good.FEM.NOM.PL pretty.FEM.NOM.PL-CONJ
 'good and pretty'
- b. *ob* *ea:s-que* *re:s*
 on account of those.FEM.ACC.PL-CONJ thing.ACC.PL
 'and on account of those things'

This restriction makes sense in terms of phrase-level phonology. If at least some varieties of Latin

for saying that lexical, and not phrasal, phonological processes apply to case suffixes in Latin.

With regard to property (45b), a cursory investigation of even elementary Latin sentences is sufficient to make it clear that Latin case suffixes have to attach to lexical heads of phrases and not to phrase-marginal words.

Finally and most crucially, concerning (45c) Latin case suffixes must occur in each conjunct of a coordinate structure and cannot occur in only the first or last.

- (46) a. pocul-um et cra:te:r-a
 cup-NOM.SG and bowl-NOM.SG
 'cup and bowl'
 b.* pocul- et cra:te:r-a
 c.* pocul-um et cra:te:r-

Part of the reason for these facts is that a N stem in Latin cannot count as a fully inflected word-form in the syntax if it lacks suitable CASE-NUMBER inflections, regardless of the syntactic context in which it occurs. This is so much the better for the claim being defended here, though, since this generalization amounts to saying that the Latin case suffixes have to be attached to stems morphologically, i.e., that they have to be lexical and not phrasal affixes.

Case markers in Latin thus exhibit all the properties in (45) and hence need to be classified as lexical affixes, even though their morphosyntactic properties are determined phrasally, in the syntax. As argued above, in order for the PhrCon approach to handle the coordination properties of inflections like the Latin case markers, it is necessary for it to adopt something like the Restricted Phrasal Affix view, in which Class A and B affixes are treated separately.

5.4 Languages with lexical nominalizers and lexical CASE. On the Restricted Phrasal Affix view argued for above, the PhrCon approach would seem to make the following prediction.

- (47) We should not find a language with case markers in which:
 a. there is a nominalizer which creates gerund forms heading GPs,
 b. case markers can appear on gerund forms in GPs, and
 c. the case markers are lexical and not phrasal affixes.

The reasoning behind this prediction is clear. On the PhrCon account, nominalizations — whether dedicated or double-duty — are produced by affixation in the syntax, converting a VP into an NP. On this account, the lexical head of the whole construction is a V. However, we should then not expect lexical case markers, i.e., those which exhibit the properties in (45), to attach to the head in such constructions, since lexical case markers can only attach to Ns on the PhrCon approach. Hence, there should never be case markers on gerund forms in such a language.²³

required monosyllabic Preps to form a phonological word with the following major lexical item, and if the rule attaching *-que* required it to attach as a suffix to the first phonological word of the phrase, then the placement of *-que* would follow immediately. The important point to note, however, is that such restrictions are stated entirely in terms of phrasal phonological considerations. They have nothing to do with the lexical attachment of affixes, and more specifically, the case affixes in Latin never obey constraints like these.

²³ If in (47) we used the Broad Phrasal Affix view, the PhrCon account would still make the same prediction, but it would do so for a trivial reason: on the looser notion of phrasal affix, all case markers are assumed to be phrasal affixes, and so no language could have property (47c). However, it would then

Notice that this type of language is different from the type which Yoon uses to motivate the PhrCon account. In those languages (notably, Korean), both the nominalizer and the case suffixes are phrasal affixes on the view of phrasal affix outlined above, since such affixes in Korean and similar languages have the properties in (44) rather than those in (45).

Contrary to the prediction made by the PhrCon approach, though, it is relatively easy to find languages with just the properties listed in (a) - (c) in (47). Specifically, languages with lexical nominalizers which also have lexical case markers are prime candidates for this type. Two such languages are Latin and West Greenlandic.²⁴ Let us briefly consider the behavior of these languages with regard to (47).

5.4.1 Latin. In Latin, gerund forms are created by adding *-nd* onto what is traditionally called the imperfect stem, the one which is also used as the base form for the imperfect tenses, the present infinitive, and the present participle. An example is given in (48).

- (48) *artem [ve:ra ac falsa di:iudica-nd-i:] (De Or. ii.157)*
 art.ACC true.ACC.PL and false.ACC.PL distinguish-GER-GEN.SG
 'the art [of distinguishing true things from false things]'

The question that we need to ask about such examples is whether the phrases headed by gerund forms are true GPs in the sense intended here. The answer is clearly "yes." As standard Latin handbooks like Allen and Greenough 1903 and Hale and Buck 1966 show, such phrases can occur anywhere a NP can occur, except in subject and direct object positions where infinitives are used instead. Inside these phrases direct objects and other verbal complements take the same case endings they would otherwise have in tensed clauses, and adverbial as opposed to adjectival modifiers and negative particles can occur. Hence, these phrases appear to have just the kind of NP-over-VP structures of true GPs. Moreover, as (48) clearly shows, like any other "noun-like" item in Latin, gerund forms take CASE-NUMBER inflectional suffixes. The case suffixes used for gerunds are those for neuter Ns in the second declension class, so there is nothing particularly unusual about the inflections used here. Hence, it appears that Latin exhibits both property (a) and property (b) in (47). Finally, as was argued in the preceding section, Latin case markers are lexical and not phrasal affixes. It therefore seems reasonable to conclude that Latin gerunds stand as a counterexample to the claim made by the PhrCon account that languages with the properties in (47) should not exist.

It might be objected that the gerund construction in Latin is not the most solid of cases to present as a counterexample to this claim of the PhrCon approach. The weakness derives from the fact that gerunds were apparently not used a great deal in Latin. First, as already noted above, GPs in Latin were not used as the subjects or direct objects of containing clauses; GPs only occurred in oblique phrase contexts.²⁵ Hence, the construction is not nearly as regular and productive as GPs are in English or a number of other languages. Second, there was apparently a marked preference for the use of the gerundive construction in place of the straight gerund in classical Latin. The gerundive

not be clear how the PhrCon approach would analyze languages like Latin and West Greenlandic, which fill the upper right cell of (43), since the attachment properties of their case suffixes are thoroughly lexical. In light of the fact that, as argued in the preceding section, the PhrCon account needs to adopt the Restricted Phrasal Affix view in some form, we seem justified in using this stricter version of the lexical/phrasal affix distinction in (47).

²⁴ In an earlier draft of this paper, Steven had planned to include a section on the Finnish "fourth infinitive" (Toivonen 1995) as another instance of the cluster of properties in (47) [Peter Sells].

²⁵ Latin gerunds are listed in the handbooks as having an ACC case form but no NOM form. However, ACC-marked GPs only occur when they are governed by Preps which take ACC complements; they do not occur with Vs taking such complements.

is a kind of passive participle, formed by adding default first and second declension Adj agreement markers onto the same stem used for the gerund (i.e., the imperfect V stem + *nd*). The gerundive construction involves placing what is notionally the direct object NP in the CASE appropriate for the whole phrase, and then having the remaining gerundive phrase agree with that NP. An example is given in (49).

- (49) *cupidita:s* *bell-i:* *gere-nd-i:* (B.G. 1, 41, 1)
 desire.NOM.SG war-GEN.SG carry.on-GER-GEN.SG.NEUT
 'desire of carrying on war' (lit., 'desire of war being carried on')

Third, because of the above tendency, the gerund construction tended to be used primarily with intransitive V bases, or with transitive ones used intransitively. These three points taken together suggest that the gerund was a minor grammatical category in Latin that perhaps should be set aside.

There are two reasons for not dispensing with the Latin gerund so quickly, however. First, while the gerundive might have been preferred over the gerund with transitive V bases, the latter could nonetheless be used as an alternative to the former, even to the point of occasionally occurring in an adjacent phrase conjoined to a gerundive:

- (50) [*neque co:nsili-i: habe-nd-i:*] [*neque arm-a capie-nd-i:*] (B.G. 4, 14, 2)
 neither counsel-GEN have-GER-GEN nor arm-ACC.PL seize-GER-GEN
spati-o: dat-o:
 time-ABL.SG give-PASS.PART-ABL.SG
 'with time being given [neither to take counsel] [nor to seize arms]'
 (lit., '...neither for counsel being taken nor for seizing arms')

The construction in the first bracketed phrase is participial, with the notional object in the GEN indicating purpose, and the gerundive V form agreeing with the N. However, the construction in the second bracketed phrase clearly involves a plain gerund, since only the derived V form bears the GEN marker, and the accompanying N (*arma*) is in the ACC. If the second phrase had been rendered in the gerundive construction, it would have been *armo:rum capiendo:rum* lit., 'for arms being seized'. Thus, while gerundives might have been preferred to gerunds when the V stem was transitive, gerunds were hardly an unused derived form for such Vs.

Second, when gerunds were used, the phrases that they headed had all the properties described earlier. Hence, the grammar of Latin has to say something about why this construction has the properties that it has when it does occur. Since those properties are those expected under the DLC account — those of NP-over-VP structures lexically headed by <N|V> items — it seems entirely appropriate to say that Latin gerund phrases are indeed of this type.

Given these two reasons, we appear fully justified in setting aside the objection that the Latin GP construction should not be considered in the present context. Having done that, though, allows us to reach the conclusion that we drew before: Latin presents a counterexample to the claim of the PhrCon approach that no language should have the cluster of properties (a) - (c) in (47).

5.4.2 West Greenlandic. [Note, Peter Sells] Steven had planned to include a section on West Greenlandic (WG), but the argument remained incomplete at the time of his death, and I have omitted this section. The essential facts can be gleaned from Sadock 1994. WG has various nominalizers which are lexically attached, nominalize a VP, and take lexical case markers (see e.g., Sadock (1994, 221)). However, subsequent currently

unpublished work by Sadock has confirmed an aspect of his 1994 analysis, namely that the internal VP is dominated by N' when nominalized, and not directly by NP. Thus such nominalizations allow both adverbial and adjectival modifiers. This last aspect of these constructions constitutes the potential gap in the argument that Steven was trying to put together.

5.5 The treatment of Korean Type II phrases. Yoon (1996a) proposes that both Type II and Type III nominalizations in Korean can be derived from the same basic structure, that in (24) above. He notes (p.347) that

subjects can be licensed VP-internally (Yoon 1994a, 1994b). Thus, if the subject stays within VP, it will get NOM case, yielding a different type of phrasal nominalization, with NOM-ACC case array (Yoon's type II nominalizations). If it moves to SpDP, it will be assigned GEN, yielding type III nominalizations.

However, there is more to the distinction between Korean Type II and Type III nominalizations than just the difference in NP case arrays that occur in them. Lapointe and Nielsen 1996 presents the following table summarizing the differences between these two types of phrases.

(51) Differences between Korean Type II and Type III phrases (after Lapointe and Nielsen 1996, p.311)

	<u>Type II</u>	<u>Type III</u>
a. Allows S-Adv modifiers	yes	no
b. Case marking on internal subject	NOM	GEN
c. Allows tense elements	yes	no
d. Allows internal scrambling	yes	no

These facts, plus the areas of overlap between the two types of nominalized phrases, argue quite strongly that Type III phrases are internally VPs, while Type II phrases are internally IPs, as Lapointe and Nielsen observe. Hence, we cannot simply derive Type II phrases in Korean from the structure in (24), since as already noted, $IP \cdot V^n$ for any n , and so at least this claim made on behalf of the PhrCon analysis is incorrect.

All is not completely lost for the PhrCon analysis here, of course, since we can still assume, as was suggested in section 4.2 above, that the phrasal nominalizers in Korean are simply specified for attaching to either VP or IP[+TNS]. As also noted above, though, this analysis requires separate subcategorization frames and separate structures for the two types of nominalized phrases. Hence, there is no argument to be made in favor of the PhrCon approach and against the DLC account based on the claim that both types of Korean nominalized phrases are derived from the same syntactic structure on the PhrCon account, since that claim does not hold.

5.6 Intermediate-level nominalizations. There is a problem lurking in the PhrCon account of languages which use the same form for lexical and phrasal nominalization, mentioned briefly in passing in fn. 6 above. In the selectional frames posited in the PhrCon account for Korean and English in (22) and (25) above, repeated here as (52) and (53), the $n = 0$ case yields lexical derived nominals, and the $n = 2$ case results in maximal bar-level phrasal nominalizations, as we have already seen.

(52) (= (22) above)

Korean nominalizer: *-um* : $[V^n \text{ — }]_{N^n}$

(53) (= (25) above)

English nominalizer: $-\emptyset : [V[PR.PRT]]^n \text{ — }]_{N^n}$

Another possibility exists, though, namely, $n = 1$. This should form an intermediate bar-level GP, in which an N' immediately dominates a V' head. But N' phrases typically allow the presence of AP and relative clause modifiers through recursion of the N' node. Hence, it should be possible to find adjectival and relative clause modification of the gerund in such structures. However, such modification of the gerund, as opposed to VP-Adv modification, is not allowed in English or Korean, nor as Lapointe (to appear) argues, is this possible in Turkish or Chichewa. At least these languages apparently permit only maximal bar-level nominalized phrases. The problem for the PhrCon analysis is that it does not have an explanation for why languages like the ones just cited only have $n = 2$ phrasal nominalizations but not $n = 1$ type nominalizations.

In fairness to the PhrCon approach, it must be noted that this problem cannot be turned into an argument in favor of the DLC account. The reason is that the DLC approach faces a separate but related problem of its own involving intermediate bar-level nominalized phrases. Specifically, the DLC account as set forth in section 1 claims that the only kinds of GPs that can exist are those in which a maximal XP node immediately dominates a maximal YP head. Such a claim is consistent with the facts from the four languages cited above, which disallow AP and relative clause modification. However, there is at least one fairly well documented construction which allows some AP modification, namely the type of *infinito sostantivato* phrase in Italian which Zucchi (1993) refers to as the 'VP-infinitive NP' (henceforth, "VP-INF"), examples of which are given below.

(54) il suo mormorare parole dolci
 the his/her whisper.INF word.PL sweet.PL
 'his/her whispering sweet words'

(55) il suo continuo partire improvvisamente
 the his/her continual leave.INF suddenly
 • 'his/her continually leaving suddenly'

Zucchi argues convincingly that the structure of such nominalized phrases involves N' -over-VP structure. There are no NP-over-VP GPs in Italian.²⁶ The problem for the DLC approach is that (a) it does not permit intermediate-level GPs like the VP-INF type that are found in Italian, and (b) the expected NP-over-VP GP does not exist in the language. Hence, the DLC account is not without its own problems in this area.²⁷ Nonetheless, in

²⁶ There is another type of nominalized phrase in Italian, but as Zucchi argues, the structure of that nominalization involves an NP dominating a nonfinite S. In the terms discussed earlier, such a nominalization would have NP-over-IP structure and would have $\langle N|I[-TNS] \rangle$ as its lexical head.

²⁷ One way to try to deal with the problem for the DLC approach is simply to add a parameter that requires the change-over point to be at the intermediate level just in the case of asymmetrical DLCs. Thus, $\langle N|V \rangle$, without any marking, would be interpreted as saying the change-over point involves maximal bar-level phrases, whereas $\langle N|V|nonmax \rangle$ would indicate that the change-over point is at the nonmaximal, X' level. This predicts that the unmarked type of GP across languages should be the kind which involves maximal bar-level change-over, and that appears to be the case. Presumably a similar modification could be made to the PhrCon account. However, this general approach is really just a technical patch and does not represent any deep insight into solving the problem.

It is worth noting in passing that while Zucchi claims that the internal phrase in the VP-INF type of GP is a full VP, there is really very little evidence to support that claim, as opposed to saying that the phrase is just V' , and so it remains an open issue just what bar-level the internal phrase needs to have.

terms of identifying difficulties with the PhrCon approach, there is no question that the absence of intermediate-level GPs in the well-documented languages mentioned above represents a legitimate problem which the PhrCon account faces.

6. Conclusions

As described in detail in sections 3, 4, and 5, all of the objections to the DLC account of nominalized phrases raised by the PhrCon analysis can be met in simple and natural ways without requiring any substantive modifications to the theory of DLCs itself, so long as we have a workable theory of phrasal affixes that can be used along with the DLC approach. On the other hand, despite the impressive array of facts about nominalized phrases which the PhrCon account can cover, that analysis suffers from its own serious drawbacks, as I have argued in section 5. In addition, the problems with the PhrCon analysis noted in that section can be taken as arguments in support of the DLC account, since the latter handles these issues in a completely straightforward way. It therefore appears that the DLC approach, and not the PhrCon account, is the more attractive of these two alternatives.

It is important to emphasize what I have *not* shown here. In particular, I have not demonstrated that it is not possible to have an account of NP-over-VP GPs in which at least some affixes apply to whole phrasal units. Indeed, in various previous works I have argued for an account of phrasal affixes in which those affixes act as independent units in the syntax. So an account which distinguishes lexical and phrasal affixes along the lines in (44) and (45) and in which (i) phrasal affixes attach directly to phrases in the syntax, but (ii) lexical affixes attach independently from syntactic processes, would have most of the features of the account presented here. What I have shown, though, is that an approach in which (a) double-duty nominalizers are generated via zero-morphs in the syntax, (b) the Broad Phrasal Affix view is adopted, and (c) dedicated nominalizers are identified with phrasal affixes while double-duty nominalizers are identified with lexical affixes faces serious difficulties. It must be left for future research to try to distinguish among the various possibilities that remain for treating phrasal affixes as features or as distinct constituents in the syntax.

Appendix

There remain a few additional points that are not critical to the main points of the paper, but which should nevertheless be considered, however briefly, in a thorough comparison of the DLC and PhrCon approaches.

A.1 A further potential theoretical problem with the DLC account. Yoon raises another issue, which we might refer to as "the inspection of the morphology problem", at two points in his 1996b discussion. It is perhaps worth citing these passages in their entirety:

Thus, by examining the morphological (or morphosyntactic) make-up of the lexical head, one ought to be able to tell what its distributional properties will be. If the head is a <N|V> DLC, one must find an exponent of this duality somewhere. The primary candidate of this exponence in English is the *-ing* suffix. But we cannot say that its presence is enough to guarantee the duality. This is because the nominalizing affix may also be used in lexical nominalizations, to derive nouns, or <N|N>. Thus, inspection of the morphology will not tell us whether we are looking at a run of the mill derived noun or one of these exceptional verb-nouns. (1996b, 82).

...You are looking at the same affix and need to figure out which phrasal "level" is being nominalized. The inspection of the morphology of the DLC is of no help again. (1996b, 83).

However, it is quite unclear what the challenge posed by this problem really is. The objection raised in these passages would seem to hold equally well of the $-\emptyset$ affix in English and the *-um* and *-ki* affixes in Korean which the PhrCon analysis posits, since on that account, all of these other affixes are also capable of serving as phrasal or lexical nominalizers, and just inspecting the morphology of these items is not going to tell us which type we may be dealing with in any specific situation.

The situation seems to be the following. Inspection of the morphology, on either the DLC or the PhrCon approaches, is going to tell us (a) that there is an affix attaching to a V-type element at some bar level, (b) either that the affix creates an $\langle N|V \rangle$ item (DLC account) or that it turns a VP into an NP (PhrCon account), and (c) the same affix creates lexical Ns from Vs, in those languages where this is the case (on both accounts and by the same rules, as noted above). While the morphology does not directly tell us in (b) on the DLC account that the $\langle N|V \rangle$ heads a GP, the rest of the grammar certainly does, since the correlation between having an $\langle N|V \rangle$ lexical head and being an NP-over-VP structure for a GP is explicitly built into the grammar on the DLC analysis (cf. the discussion in section 1 again). True, determining whether an affix is a phrasal or lexical nominalizer requires more than inspection of the morphology — we have to look at the syntax and its interactions with the morphology as well — but there is no reason why we shouldn't be able to look at this information, given that we are interested in determining what the syntactic properties of phrases headed by these items are. After all, we should be able to use whatever parts of the grammar we need in order to determine the grammatical properties of some (type of) item that we are interested in.

Furthermore, while the passages quoted from Yoon 1996b above seem to imply that on the PhrCon account all we need to do is inspect the morphology to determine the properties of the phrases headed by phrasal nominalizers, this implication is not correct. On the PhrCon analysis, the affix is attached to a phrase in the syntax, and at the same time it is realized on the head of that phrase in the morphology. Hence, even on the PhrCon account we really need to inspect both the syntax and the morphology when we determine what the syntactic properties of the phrasal nominalizer is in a given language. Along this dimension, then, it would seem that the DLC and PhrCon analyses are on a par, and the inspection-of-the-morphology objection falls wide of the mark.

A.2 An additional problem with the PhrCon account. A further problem with the PhrCon approach, which Yoon himself notes (1996a, fn.18), is that Det's are allowed in Spanish GPs (cf. (A1)), while they are disallowed in English GPs (A2).

(A1) (= Yoon 1996a (16))

El cantar La Traviata de Maria
the sing.INF L.T. of Maria
'Maria's singing La Traviata'

(A2) (= Yoon 1996a, fn.18, (i), (ii))

- a. *John's the singing the song
- b. *PRO the singing the song

Because the PhrCon analysis adopts Abney's (1987) DP hypothesis, Yoon is forced to follow Abney in extending a "doubly-filled COMP" account to the English GP cases.

When SPEC DP is filled, as it would be in (ii.a,b), D cannot contain an overt lexical item but instead can only contain a null AGR element. Spanish, on the other hand, would simply not be restricted in this way, so that an overt D can (and in general must) occur when SPEC DP is filled.

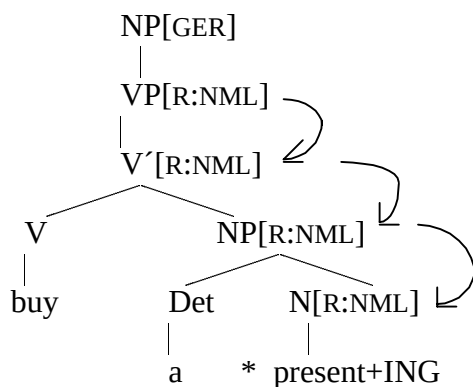
There is no need to import a condition like the variable doubly-filled COMP constraint into the DLC approach, however. In Spanish the D appears to the left of the head N and the POSS *de*-PP appears on the right, so there is no problem in general allowing both to occur. In English, only the DET or an NP[POSS], but not both, can optionally occur in the same position at the front of regular NPs, while only the NP[POSS] option is possible in GPs. The difference between English and Spanish in this regard would therefore appear to be a language-particular fact that can be captured quite easily by positing distinct PS rules for the two languages:

- (A3) a. Spanish NPs: NP $\rightarrow$ DET N' (PP[POSS;*de*])
 b. Spanish GPs: NP $\rightarrow$ DET VP (PP[POSS;*de*])
- (A4) a. English NPs: NP $\rightarrow$ (DET / NP[POSS]) N'
 b. English GPs: NP $\rightarrow$ (NP[POSS]) VP

The rules in Spanish are thus completely parallel to one another, differing only in the head position. In English, on the other hand, the rules are not quite parallel, in that the gerund rule in (A4b) simply does not allow the DET option permitted in the regular NP rule (A4a). Given the dual option permitted in the SPEC NP position in regular English NPs, it is not terribly surprising that English allows a less complex set of possibilities in the marked GP rule, and it is to be expected that this would be one area where languages would differ from one to the next.

A.3 Further comments on EDGE features. If a language like English had a gerund affix that was an edge marker (let us call it "-ING"), and if the relevant EDGE feature were again [R:NML], we would obtain the ungrammatical result in (A5) (cf. (32)).

(A5) *-ING* as an edge affix in English —



The problem here is that the EDGE feature percolates downward onto the rightmost lexical item, which in this case happens to be the head N of the direct object NP, an item which cannot be a gerund (as a gerund ending, -ING turns Vs, not Ns, into <N|V> items). Note that the problem that arises here is not dependent on the choice of [R:NML] as the EDGE feature. While [L:NML] would work in this particular case, percolating downward onto the leftmost element, which here happens to be the V, in other cases that feature would end up landing on a range of items that can precede the main V in a VP, including

Adv's, nontensed Aux's, and the negative particle *not*, and these items are no more capable of having gerund forms than Ns are. Hence, using a left EDGE feature does not solve the problem.

It appears then that the DLC account, together with a reasonable analysis of edge affixes, leads to the following prediction.

(A6) *Prediction.* The only languages with phrasal nominalizations as edge affixes are those in which lexical heads occur at the same margin as the marking of the EDGE feature.

At present I am not aware of any counterexamples to this prediction, but it is an interesting question to determine whether such counterexamples may in fact exist.

However, the discussion here leads naturally to the following speculation. It would appear that we need to distinguish two types of edge affixes. One type does not specifically have an effect on the morphological, syntactic, or semantic properties of the word to which it attaches; it simply registers some morphosyntactic property of the whole phrase. An example of this type would be the English POSS marker 's. The other type imposes conditions on its base, requiring the base to belong to and/or change to a specific category. Examples of this would be the Korean nominalizing suffixes *-um* and *-ki*. These requirements are naturally imposed on the lexical head of the phrase in question, and because the affixes we are examining are phrasal affixes, these sorts of markers will only occur when the head serving as the affix's base occurs at the appropriate phrase-margin. It thus seems plausible that the prediction in (A6) could be strengthened to the following:

- (A7) If an edge affix imposes restrictions on its base, then
- a. the base will be the lexical head of the phrase containing the semantically relevant feature that launches the EDGE feature for the affix, and
 - b. heads of that phrase type (potentially, heads of phrases in general) will occur on the same phrase margin that the edge affix occurs on.

Further research will be needed to determine whether such a constraint is in fact on the right track.

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**No Way to Avoid the Garden-Path:
The Case of Polish Ambiguous BY-Phrases in Passives¹.**

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This paper investigates the processing of *by*-phrases in Polish passive constructions, which are locally ambiguous between agentive and causative interpretations, as illustrated in 1 and 2, respectively:

- (1) Czerwone jabłka były zerwane przez wujka.
Red apples-Nom were picked by (the) uncle-Acc.
Red apples were picked by the uncle.
- (2) Czerwone jabłka były zerwane przez wujka nieuwagę.
Red apples-Nom were picked because-of (the) uncle's-Gen negligence-Acc.
Red apples were picked because of the uncle's negligence.

The relevant fact here is that both phrases: “by the uncle” and “because of the uncle’s” have the same phonological representation in Polish. The sentence in (1) causes no ambiguity, as the *by*-phrase is assigned the agentive interpretation. The sentence in (2), however, causes a temporal ambiguity as the *by*-phrase is initially taken to carry the agentive meaning. The experiment reported in this paper examined the processing of such sentences and was designed to test two hypothesis about sentence processing: the Garden-Path Theory (Frazier, 1978, 1987, Frazier and Fodor 1978, Frazier and Clifton, 1997, de Vincenzi 1991 and others) and the Referential Model (Crain and Steedman, 1985).

I argue that the parsing of *by*-phrases in Polish passives is syntactically based and predicted by the Garden-Path model, as shown in the first part of the experiment, where causative *by*-phrases were judged difficult sentence-finally but not sentence-initially. In the second part of the experiment, disambiguating contexts were presented to test the validity of the Referential Model. The results from this part also suggest that the initial parsing of passive *by*-phrases is solely based on structural information and seems unaffected by context.

¹ I would like to thank Lyn Frazier for helpful comments and discussion of this work.

This paper is organized as follows: in section 1, the Garden-Path model of sentence processing is introduced. In section 2, the syntactic analysis of Polish passives with *by*-phrases is presented. Section 3 describes the experiment and its results, and section 4 contains the concluding remarks.

1. The Garden-Path Model of Sentence Processing.

The Garden-Path Model (Frazier, 1978, 1987, Frazier and Fodor, 1978, Frazier and Clifton, 1997, and others) is a serial model, in which the initial analysis of an utterance is based on structural information, i.e. each perceived word or two are incorporated into a structural representation of a sentence, taking into account the structure already assigned to preceding words. The initial analysis can be abandoned if proved incorrect but the reanalysis is costly.

The crucial claim of this model is a set of universal and innate parsing principles, which determine the preferred syntactic analysis of ambiguous sentences. Minimal Attachment does not permit the parser to create any potentially unnecessary nodes; Late Closure requires that new items be attached into a phrase or clause most currently processed, if grammatically possible. Another important parsing principle stated by de Vincenzi (1991), the Minimal Chain Principle, demands that chain members be postulated at the earliest grammatically possible point.

In 1996, Frazier and Clifton proposed a new parsing principle, which explained the attachment preferences not accounted for by Late Closure, Minimal Attachment, and Minimal Chain. The Construal Principle associates the “nonprimary phrases and relations” (adverbial phrases, relative clauses, adjunct predicates) into the Current Thematic Processing Domain, which is the extended projection of the last theta-assigner. Within this domain, the attachment site of nonprimary phrases is going to vary from example to example, as it will be determined by various structural and nonstructural factors.

In general, the structural parsing principles guide the parser to pursue the simplest structure possible, unless there is evidence otherwise. These principles are claimed to be innate and universal. This makes important implications for the processing of ambiguous sentences. The initial parsing decisions are argued to be affected by the structural principles alone. I assume the prosodic representation (and commas) are part of the input to the parser. However, discourse is not.

A sentence is syntactically ambiguous when it can be assigned different syntactic structures, which usually yields differences in meaning. In the case of temporal ambiguity, the attachment site and identity of a constituent is locally uncertain at some point in a sentence. Structural principles, such as Minimal Attachment and Late Closure, account for preferences in resolving such local ambiguities and offer an explanation as to why the minimal analysis are available earlier than the nonminimal ones. The locally ambiguous *by*-phrases in Polish passives prove the universal nature of these structure-building principles.

2. Syntax of By-Phrases in Polish Passives.

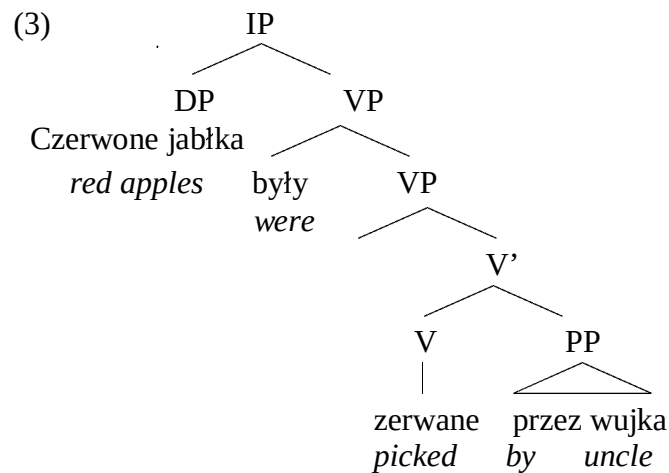
2.1 Sentence-Final By-Phrases.

The interplay of morphological case and phrase structure decisions influence the parsing of sentences with agentive and causative *by*-phrases. I want to argue that the temporal ambiguity in a sentence with the causative *by*-phrase, which is initially taken to carry the agentive meaning, is due to the processor assigning it wrong syntactic structure, namely the structure appropriate for a sentence with the agentive *by*-phrase.

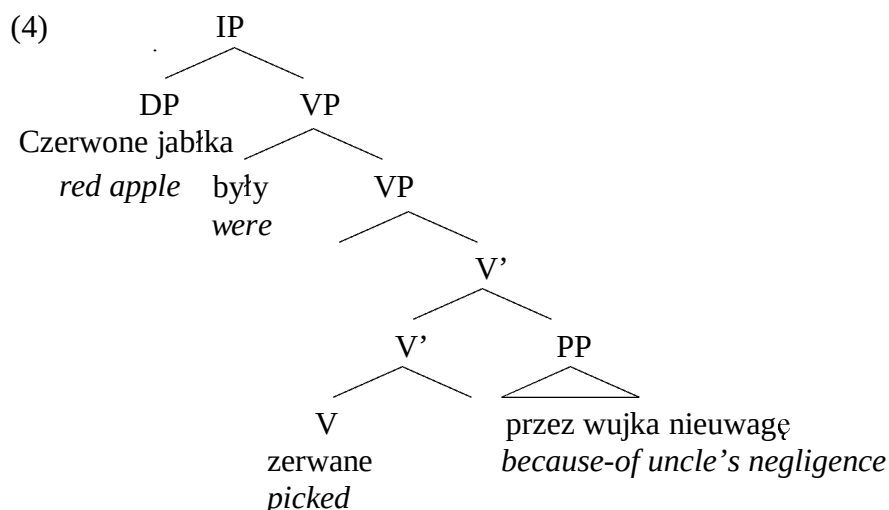
The distinction between the two *by*-phrases in sentences in (1) and (2) is expressed by the following differences:

- the types of constituents: the agentive *by*-phrase is an optional argument (or a quasi-argument) licensed by the passive verb *zerwane* ‘picked;’ the causative *by*-phrase is an adjunct;
- phrase structures: the agentive *by*-phrase (as an argument of the verb) is in the complement of the verb position; the causative *by*-phrase is attached higher in the structure.

The S-Structure representations for a sentence with an agentive prepositional phrase (1) and a causative one (2) are shown in (3) and (4), respectively:



‘Red apples were picked by the uncle.’



‘Red apples were picked because of the uncle’s negligence.’

The evidence for the higher attachment of the causative *by*-phrase comes from sentences where both *by*-phrases co-occur; in such cases the agentive *by*-phrase must come first before the causative one, otherwise the sentence is marginally (if at all) acceptable, e.g.:

- (5) Czerwone jabłka były zerwane przez wujka przez nieuwagę.
Red apples were picked by the uncle because of negligence.
- (6) ??Czerwone jabłka były zerwane przez nieuwagę przez wujka.
Red apples were picked because of negligence by the uncle.

In the Garden-Path model, the initial syntactic analysis of an utterance is based on structural information. As each word is perceived it gets incorporated into a structural representation of a sentence, taking into account the structure already assigned to preceding words. Therefore, for a sentence like that in (2), as the perceiver hits the head of the prepositional phrase ‘przez’ *by*, the Late Closure strategy will favor the attachment to the lowest possible phrase in the already existing tree. Hence the *by*-phrase is incorporated into the structure in the verb’s complement position, to which the agentive theta-role is assigned. Once the perceiver gets to the disambiguating word ‘nieuwagę’ *negligence*, which cannot bear the agentive theta-role, a revision of the analysis will be required, in which the *by*-phrase will be adjoined to a higher position in the structure.

The temporal ambiguity in passive sentences with the causative *by*-phrase could also be explained within the Referential Model (Crain and Steedman, 1985). According to the principle of “Priori Plausibility,” the expected interpretation is based on the world knowledge, frequency of occurrence, or the universe of discourse. Therefore, in a passive sentence with a prepositional *by*-phrase (like 2), the agentive reading of the *by*-phrase would be favored, as it is frequent in the passive constructions. However, this model would predict that the causative reading should be readily available in disambiguating contexts, and this we do not find as I will show in the second part of my experiment.

2.2 Sentence-Initial By-Phrases.

Another interesting aspect of the passive structures like (1) and (2) is that when the prepositional phrases are sentence initial, the ambiguity is reversed: the sentence with the agentive *by*-phrase becomes temporarily ambiguous, and the sentence with the causative *by*-phrase is no longer ambiguous:

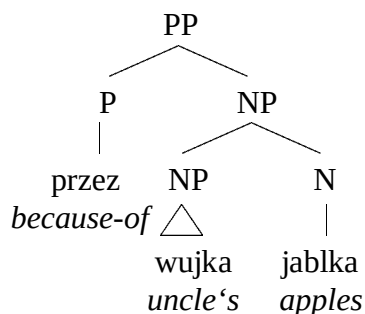
- (7) Przez wujka czerwone jabłka były zerwane.
By the uncle red apples were picked.
- (8) Przez wujka nieuwagę czerwone jabłka były zerwane.
Because of the uncle's negligence the red apples were picked.

What is ambiguous in (7)? The word 'wujka' *uncle* is ambiguous between Accusative and Genitive. The next constituent – 'czerwone jabłka' *red apples* is ambiguous between Nominative and Accusative. So the possible sequences are:

- (i) Genitive-Accusative
 przez wujka czerwone jabłka...
by (the) uncle's –Gen red apples-Acc
 'Because of the uncle's red apples...'
- (ii) Accusative-Nominative
 przez wujka czerwone jabłka...
by (the) uncle –Acc red apples-Nom
 'By the uncle, red apples (were)...'

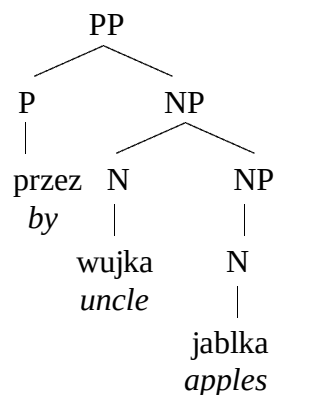
The initial analysis chosen is that in (i), which in a sentence like that in (7) is the wrong interpretation. Why is that analysis chosen? The Garden-Path model can account for this using the Minimal Attachment Principle, which disfavors creating any potentially unnecessary nodes, and the Late Closure Principle, which favors the attachment of new items into a phrase most currently processed, if grammatically possible. At 'wujka' *uncle/uncle's* both possible cases (Acc and Gen) are temporarily retained. When the next two words are processed – 'czerwone jabłka' *red apples*, which can be either in Nom. or Acc., Late Closure chooses the Gen-Acc sequence, as it prefers to incorporate the new words into an already existing node. The choice of Acc. – Nom. would require an addition of a new node. The structure representations of the sequences in (i) and (ii) are illustrated in (9) and (10), respectively:

(9)



Genitive – Accusative

(10)



Accusative – Nominative

Hence, these two principles predict and account for the temporal ambiguity in (6), as the Genitive-Accusative sequence is initially chosen.

That a sentence like that in (8) is not ambiguous is also expected in this model. The first two NPs are in Gen-Acc sequence, which is the right analysis for this causative *by*-phrase. The next words that come, 'czerwone jabłka' *red apples*, are not grammatically permitted to be added to the already existing node. Hence, a new node is created.

In my experiment, I tested the processing of such temporally ambiguous causative *by*-phrases sentence-finally and agentive *by*-phrases sentence-initially. The first part was designed to capture the difficulties with processing the nonminimal analysis, the second part was intended to show that the initial analysis is based on structural information and is not influenced by the context.

3. The Experiment.

3.1 Participants.

Nine native Polish speakers currently living in Amherst, Northampton, and Chicago participated in the experiment. All were born and raised in different parts of Poland. Their age ranged between 21 and 35.

3.2 Stimuli and Procedure.

In the first part of the experiment, I constructed 24 pairs of passive sentences: 12 pairs consisted of one sentence-final agentive *by*-phrase like that in (1) and one sentence-final causative *by*-phrase like that in (2), repeated below as (11) and (12), respectively:

- (11) Czerwone jabłka były zerwane przez wujka.
Red apples were picked by the uncle.

- (12) Czerwone jabłka były zerwane przez wujka nieuwagę.
Red apples were picked because of the uncle's negligence.

Each of the other 12 pairs consisted of one sentence-initial agentive *by*-phrase like that in (7), and one sentence-initial causative *by*-phrase like that in (8), repeated below as (13) and (14), respectively:

- (13) Przez wujka czerwone jabłka były zerwane.
By the uncle red apples were picked.
- (14) Przez wujka nieuwagę czerwone jabłka były zerwane.
Because of the uncle's negligence the red apples were picked.

Except for the prepositional phrase, the sentences were identical. I constructed two lists of 12 pairs of sentences; each list consisted of 6 agentive-causative pairs with the final PP, 6 with the initial PP and 24 filler sentences of different syntactic types, insuring that initial and final *by*-phrase pairs of a given sentence were in separate lists. The participants were asked to read each pair of sentences and state which of the two was more difficult to understand. They marked a box next to the more difficult sentence. One list is presented as Appendix 1.

What I expected to find is that the subjects would mark as more difficult the final causative *by*-phrases and the initial agentive *by*-phrases. These predictions are based on the hypothesis about the different syntactic structure for agentive and causative *by*-phrases in passive sentences in Polish, as well as the interplay of morphological case in assigning phrase structure, which are accounted for by the garden-path theory.

In the second part of the experiment, I wanted to determine whether preceding context influences the initial processing preferences. In the first part, I showed that ambiguous *by*-phrases in passives were initially interpreted as agentive rather than causative sentence-finally. However, these sentences were presented in isolation. It is claimed within the Referential Model, that discourse context could have an immediate effect on processing. I want to argue that for these structures the initial parsing is purely syntactic despite the context.

I constructed disambiguating contexts for 6 final causative *by*-phrases in passives, which in isolation were temporarily misanalysed as agentive (see appendix 2). In each context, the agentive reading was repressed and, in most of the cases, the implicature as to the cause was made to enforce the causative reading.. I asked the participants to read these short passages, in which the passive sentence, which also was the last sentence in that paragraph, was underlined. After reading each passage, they were asked to state whether the underlined sentence was difficult to comprehend. If they found the sentence difficult, they were supposed to check a box next to that sentence. Here is a sample context for the sentence in (2):

- (15) *John's uncle, who owns an orchard, believes that red apples should not be picked directly from the trees. The uncle lets them be gathered only when they have already fallen to the ground. All day long the uncle spends in the orchard and makes sure that nobody picks the red apples. One day, however, as the uncle engaged in a long chat with a neighbor, some rascal played a trick on him and picked all the red apples from the trees. In the afternoon, when John came back from school, he found out that the red apples were picked because of the uncle's negligence.*

The second part of the experiment consisted of 7 paragraphs; 4 of them had the causative *by*-phrase and were structured to block the agentive reading, the other 2 paragraphs enforced the agentive reading and contained the agentive *by*-phrase and the remaining paragraph was a filler with a different syntactic structure being tested.

What I expected to find was that the participants would still find the causative *by*-phrases difficult to comprehend even in disambiguating contexts, as the initial processing preference is syntactically based.

3.3 Results.

Table 1 shows the results of the two-part experiment on Polish passive sentences with agentive and causative *by*-phrases, in isolation and in context; the digits indicate the number of sentences marked as difficult. For each type of a sentence in isolation there were 54 sentences (6 of each kind % 9 participants); for the sentences in context, there were 18 sentences with an agentive *by*-phrase sentence-finally (2 on each list % 9 participants), and 36 sentences with a causative *by*-phrase sentence-finally (4 on each list % 9 participants).

(14) Table 1. Percentage of sentences with *by*-phrases marked as difficult.

Passive Sentences:	In isolation: sentence-final	In isolation: sentence-initial	In context: sentence-final
with an agentive <i>by</i> -phrase	7/54 (12.96%)	51/54 (94.45%)	0/18 (0%)
with a causative <i>by</i> -phrase	47/54 (87.04%)	3/54 (5.55%)	30/36 (83.33%)

The participants found the causative *by*-phrases more difficult than the agentive ones in the sentence final position for sentences in isolation (87.04%). The results look similar for the sentences in contexts: 83.33% of the sentences with a causative *by*-phrase sentence finally were found difficult. For the sentences with the prepositional phrases in the initial position, the ones with agentive *by*-phrases were found more difficult than the ones with a causative PP (94.45%).

4. Conclusions.

The results of this experiment accord with the prediction of the Garden-Path model that the nonminimal analyses are more difficult to process than the minimal ones. It was argued that there are different syntactic structure for agentive and causative *by*-phrases in passive sentences in Polish². As the initial syntactic analysis of an utterance is based on structural information, the processing of temporally ambiguous causative *by*-phrases sentence-finally is more costly, for it requires revisions of already assigned structures. Furthermore, the interplay of morphological case in assigning phrase structure causes a temporal ambiguity with agentive *by*-phrases sentence-initially, an outcome

² This is a first look at the problem as, to my knowledge, there is no previous work done on parsing Polish.

predicted by the Minimal Attachment and Late Closure principles. Finally, the second part of the experiment confirmed the assumption that the initial syntactic analysis is based on structural information, as the ambiguous sentences were not influenced by disambiguating contexts.

Appendix 1

A sample list of the experimental materials for sentences in isolation. Each of the 2 lists consisted of 6 pairs with initial and 6 pairs with final agentive and causative PPs. Initial and final *by*-phrases of a given sentence were in separate lists. Each list also contained 24 filler sentences.

- (1) a) Czerwone jabłka były zerwane przez wujka.
Red apples were picked by the uncle.
b) Czerwone jabłka były zerwane przez wujka nieuwagę.
Red apples were picked because of the uncle's negligence.
- (2) a) Przez mojego brata stary samochód nie był pomalowany.
By my brother the old car was not painted.
b) Przez mojego brata lenistwo stary samochód nie był pomalowany.
Because of my brother's sloth the old car was not painted.
- (3) a) Drzewa nie były ścięte przez leśniczego.
The trees were not felled by the forester.
b) Drzewa nie były ścięte przez leśniczego interwencję.
The trees were not felled because of the forester's intervention.
- (4) a) Przez piekarza czekoladowy tort był zjedzony.
By the baker the chocolate cake was eaten.
b) Przez piekarza łakomstwo czekoladowy tort był zjedzony.
Because of the baker's gluttony the chocolate cake was eaten.
- (5) a) Nowy zeszyt był podarty przez ucznia.
A new notebook was torn up by the schoolboy.
b) Nowy zeszyt był podarty przez ucznia złośliwość.
A new notebook was torn up because of the schoolboy's malice.
- (6) a) Przez sąsiada mieszkanie było posprzątane.
By the neighbor the apartment was cleaned.
b) Przez sąsiada uczynność mieszkanie było posprzątane.
Because of the neighbor's kindness the apartment was cleaned.
- (7) a) Diamenty nie były skradzione przez złodzieja.
Diamonds were not stolen by a thief.
b) Diamenty nie były skradzione przez złodzieja niezręczność.
Diamonds were not stolen because of the thief's clumsiness.

- (8) a) Przez biednego rybaka łódź była zatopiona.
By the poor fisherman the boat was sunk.
 b) Przez biednego rybaka niedopatrzenie łódź była zatopiona.
Because of the poor fisherman's oversight the boat was sunk.
- (9) a) Zabytkowy wazon był rozbity przez kolekcjonera.
An ancient vase was broken by the collector.
 b) Zabytkowy wazon był rozbity przez kolekcjonera bezmyślność.
An ancient vase was broken because of the collector's recklessness.
- (10) a) Przez mechanika brudne narzędzia były porozrzucane.
By the mechanic the dirty tools were scattered.
 b) Przez mechanika niechlujstwo brudne narzędzia były porozrzucane.
Because of the mechanic's slovenliness the dirty tools were scattered.
- (11) a) Obiad był przypalony przez łakomczucha.
Dinner was burned by a glutton.
 b) Obiad był przypalony przez łakomczucha niecierpliwość.
The dinner was burned because of the glutton's impatience.
- (12) a) Przez słynnego malarza kiepski obraz był wystawiony.
By a famous painter a good-for-nothing painting was exhibited.
 b) Przez słynnego malarza wstawiennictwo kiepski obraz był wystawiony.
Because of the famous painter's intercession a good-for-nothing painting was exhibited.

Appendix 2

A sample list of the experimental materials for sentences in contexts. Each of the two lists consisted of seven paragraphs: four with sentence final causative *by*-phrase, two with sentence final agentive *by*-phrase, and one filler.

- (1) Janka wujek, który ma sad z jabłkami, uważa że czerwone jabłka nie powinny być zrywane z drzew. Wujek pozwala je zbierać tylko wtedy gdy one spadną już na ziemię. Całe dnie wujek przebywa w sadzie i pilnuje żeby nikt nie zrywał czerwonych jabłek. Pewnego dnia, gdy wujek wdał się w długą pogawędkę z sasiadem, jakiś psotnik spletał mu figla i pozrywał wszystkie czerwone jabłka z drzew. Po południu, kiedy Janek wrócił ze szkoły dowiedział się, że czerwone jabłka były zerwane przez wujka nieuważnie.

John's uncle, who owns an orchard, believes that red apples should not be picked directly from trees. The uncle lets them be gathered only when they have already fallen to the ground. All days long the uncle spends in the orchard and makes sure that nobody picks the red apples. One day, as the uncle engaged in a long chat with a neighbor, some rascal played a trick on him and picked all the red apples from the trees. In the afternoon, when John came back from school, he found out that the red apples were picked because of the uncle's negligence.

- (2) Pewien rybak, Waldek Wiosło, był tak biedny że cały jego majątek stanowiła jedna stara łódź. Żona rybaka, która miała już dość życia w biedzie, wpadła na pomysł, że jej mąż mógłby potajemnie zatopić starą łódź, a za pieniądze z ubezpieczenia kupić nową. Waldkowi Wiosło ten pomysł bardzo się spodobał, więc postanowił w nocy niepostrzeżenie wslizgnąć się do portu, eby wykonać ich plan. Kiedy Wiosło dotarł do portu, był tak przejęty swym przedsięwzięciem, że nie zauważył przyglądającego mu się nocnego stróża. Nazajutrz wszyscy wiedzieli, że łódź była zatopiona przez biednego rybaka.

A fisherman, Valdek Oar, was so poor that all his property consisted of one old boat. The fisherman's wife had enough of living in poverty, so she got an idea. She thought her husband could secretly sink the old boat and with the insurance money buy a new one. Valdek Oar liked that idea a lot, so he decided to sneak into the harbor at night to execute their plan. When Oar reached the harbor, he was so excited by his undertaking that he didn't notice a watchman observing him. The next day everybody found out that the boat was sunk by the poor fisherman.

- (3) Pewnego dnia pani nauczycielka poprosiła piekarza, żeby przyszedł do szkoły i upiekł czekoladowy tort dla dzieci. Pani nauczycielka prosiła go, żeby pilnował żeby dzieci nie wchodziły do kuchni, bo dzieci często próbują wykraść słodczyce przed obiadem. Gdy piekarz uporał się już ze swoją pracą, zauważył że drzwi do spiżarni były otwarte. A że bardzo lubił ogórki, zaszył się w spiżarni i, zapominając o całym świecie, opróżniał słoik za słoikiem. Przy obiedzie dzieci się śmiały, że czekoladowy tort był zjedzony przez piekarza łakomstwo

One day the teacher asked a baker to come to school and bake a chocolate cake for the children. She asked him to make sure that the children don't go into the kitchen, as they often try to steal sweets before dinner. When the baker was done with his work, he noticed that the door to the pantry was opened. And as he loved pickles, he hid himself in the pantry and emptied one jar after another, forgetting about the whole world. During the dinner the children were laughing that, the chocolate cake was eaten because of the baker's gluttony.

- (4) Alfons Pędzel był słynnym malarzem, choć nie miał własnej galerii. Któregoś dnia przyjechała do niego siostrzenica, która rozpoczynała dopiero karierę malarską. Poprosiła więc wujka o rekomendacje, jako że chciała by jej nowy obraz był wystawiony na pokazie. Alfons Pędzel nie wahał się pomóc swej siostrzenicy, mimo że nie miał czasu obejrzyć jej dzieła. Nazajutrz wszystkie gazety głosiły, że kiepski obraz był wystawiony przez słynnego malarza wstawiennictwo.

Alfons Brush was a famous painter, although he didn't have his own gallery. One day, his niece, who was just beginning her painting career, came to visit him. She asked her uncle for recommendations, as she wanted her new painting to be shown at an exhibition. Alfons Brush didn't hesitate to help his niece, even though he didn't have time to see her work. The next day all the headlines announced that a good-for-nothing painting was exhibited because of the famous painter's intercession.

- (5) W pewnym mieście mieszkał kolekcjoner zabytków Alfons Urna, który niestety był bardzo niezdarny, cecha nader nieporządna u kolekcjonera. Gdy przysłało mu pewnego razu bardzo cenny zabytkowy wazon, pani Urna ostrzegała swojego męża żeby był nadzwyczaj ostrożny. Niestety, pan Urna potknął się o dywan kiedy niósł ten wazon do gabloty i wazon wypadł mu z rąk. Wstydząc się bardzo pan Urna skłamał przed swoją żoną, że jakiś łobuz włamał się do jego sklepika i zbił ten wazon. Pani Urna dobrze jednak wiedziała, że zabytkowy wazon był rozbity przez kolekcjonera.

In a certain town, there lived an antique collector Alfons Urn, who, unfortunately, was very clumsy, a feature very undesirable for a collector. One day, when Mr. Urn was sent a parcel with a very valuable ancient vase, Mrs. Urn warned him to be extra careful. Long behold, Mr. Urn slipped on a rug when he was carrying the vase to the cabinet and the vase fell out of his hands. To ashamed to admit the truth, Mr. Urn told his wife that some rascal broke into his store and broke the vase. But Mrs. Urn knew very well that the ancient vase was broken by the collector.

- (6) Pewien uczeń bardzo nie lubił chodzić do szkoły. Zbliżał się koniec wakacji i jego siostra, Gracjela, chciała mu dokuczyć. Przy obiedzie położyła więc na stole zeszyt, oznajmiając "to jest twój nowy zeszyt do szkoły." Uczeń tak się zezłościł że wybiegł na zewnątrz i rzucił ten zeszyt swojemu psu. Tego wieczoru Gracjela poskarżyła się mamie, że nowy zeszyt był podarty przez ucznia złośliwość.

A schoolboy detested going to school. The end of vacation was approaching and his sister, Grace, wanted to annoy him. So during the dinner, she placed a notebook on the table saying "This is your new notebook for school." The schoolboy got so mad that he ran outside and threw the notebook to his dog. That evening Grace complained to her mother that a new notebook was torn up because of the schoolboy's malice.

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Integrating Lexical and Formal Semantics: Genitives, Relational Nouns, and Type-shifting¹

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1. Theoretical Background and Issues.

In this paper we discuss the analysis of expressions such as *John's team*, *John's brother*, *John's favorite movie*, *Mary's favorite chair*, *Mary's former mansion*. Before introducing the concrete problems, we briefly describe our theoretical perspective.

Our theoretical concern is the integration of formal semantics and lexical semantics, especially but not exclusively in the traditions of Montague Grammar and the Moscow School (Apresjan (1994), Mel'čuk (1982), Padučeva (1996)), respectively. We have proposed

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(Borschev and Partee 1998) to modify the Moscow school approach and represent lexical information in the form of sets of meaning postulates, which may or may not exhaust the meaning of the given lexical item. We believe this use of meaning postulates is consistent with actual Moscow school practice, and it makes it possible to integrate lexical semantics with the compositional “semantics of syntax” given by formal semantics. If the formal semantic interpretation of a sentence is given as a formula of intensional logic in which lexical items are primitives, and lexical semantics as a set of meaning postulates for these lexical items, then their integration can be seen as the drawing of entailments from these sources. This approach is in principle extendable to the integration of semantic interpretation with contextual and other information as well.

So we semantically represent a sentence or a text as a *theory* consisting of different sorts of formulas, i.e. different sorts of axioms and their entailments. By “theory” here, we do not mean the metalevel linguistic theory, but the set of axioms from various sources plus the consequences that can be drawn from these axioms, which together constitute the interpretation of such a sentence in a given context. Such a theory (see Borschev 1996) characterizes the class of all models that are consistent with the content of the given text, or of the text together with certain aspects of its context, if the theory includes axioms representing contextual information. The most general structure (features and constraints) of such models have to represent what the Moscow School calls “naivnaja kartina mira” ‘the naive picture of the world’, and what formal semanticists, following Bach (1986) and Link (1983), call Natural Language Metaphysics or Ontology.

This general scheme, particularly the principles governing interactions among axioms from different sources, has to be investigated with concrete linguistic material. On our model-theoretic perspective, all of the “axioms” from all of the different sources jointly constrain the possible models, and their joint effects may account for phenomena ranging from ambiguity reduction to meaning-shift phenomena such as “coercion”. On this view, cooccurrence restrictions reflect the sometimes incompatible demands that different elements may make on the interpretation of the whole. Ambiguities are decreased when not all of the possible variants provide a consistent (or sufficiently plausible) interpretation. Inconsistency, which should in principle always result in “anomaly” judgments, may lead instead to type shifting or other meaning shifts, the complexities of which are one of the main concerns of this paper. It will probably turn out that the mechanism of axiom interaction is rather complicated, and may include modifications (shifts) in some axioms in the context of the others.

We do not pretend to have an articulated view of the nature of all the different sorts of axioms that may play a role in the “theory” of a text, but we will illustrate some of the possibilities for a few of them.

2. The problem of the genitive “relation”.

The substantive topic to which we are bringing our theoretical concerns is a family of puzzles concerning the interpretation of the English genitive construction with relational and non-relational nouns (“John’s father” vs. “John’s team”). The same or very similar problems arise in corresponding constructions in many other languages, and related problems arise with

the English verb *have* and its lexical and constructional counterparts in other languages (Freeze 1992, Jensen and Vikner 1996, Schafer 1995).

Our starting point is the following data from Partee 1983/1997:

- (1) (a) John's team
 - (b) A team of John's
 - (c) That team is John's
- (2) (a) John's brother
 - (b) A brother of John's
 - (c) (#) That brother is John's
- (3) (a) John's favorite movie
 - (b) A favorite movie of John's
 - (c) (#) That favorite movie is John's

Informally, a unified interpretation of genitive phrase “John's” that applies to all of these cases is that the genitive phrase always expresses one argument of a relation. But the relation can come from any of three sources: (i) the context², as in (1) (“plays for”, “owns”, “is a fan of”, etc.); this happens when the noun is a plain 1-place predicate; (ii) an inherently relational noun like “brother”; (iii) an inherently relational adjective like *favorite*. The puzzles for analysis are these: can (and should) examples (1a) and (2a) be given a uniform analysis, and if so, how? Or does the genitive construction combine differently with plain and relational nouns, and if so, are these difference predictable from some general principles?

In Section 3 we describe two proposals, one from Partee (1983/1997) and the other from Jensen and Vikner (1994), and outline their differences. In Section 4 we examine the behavior of the adjective *favorite* and other adjectives in the light of alternative approaches to type multiplicity and coercion. In Section 5 we bring the issues of Sections 3 and 4 together and consider the interaction of lexicon, compositional interpretation rules, and context in order to try to find a way to decide between the alternatives. In the end we argue in favor of a modified version of Jensen and Vikner’s proposal, with open questions remaining about how the operative principles should be formulated.

3. Two theories of genitives.

The analysis of Partee (1983/1997) posits an ambiguity in the construction, with the common noun phrase supplying the relation if it is relational, and with the construction

² It may turn out to be better to split this first case into two distinct cases, one being a default preference of the “genitive” (perhaps better referred to as “possessive” in English, since this is not a true genitive case) construction itself for a relation in the family of “owns”, “possesses”, “controls”. But for the time being we are subsuming this case under the case of “contextually given” relations.

supplying a “free relation variable” if the common noun phrase is not relational. Jensen and Vikner (1994) present, within the framework of Pustejovsky (1993), an alternative proposal according to which the genitive must always combine with a relational common noun (phrase), coercing a one-place predicate noun to a two-place relational meaning (“team” to an appropriate sense of “team-of”).

3.1. Partee (1983/1997): Non-uniform genitive, Type multiplicity: “free R” with CN, “inherent R” with TCN.

A summary of syntax and semantics of the analysis of genitives of Partee 1983/1997 is presented in (4) below. In the formulas in (4), **R** is a variable over two-place relations and **P** is a variable over one-place predicates. The λ -operator is an “abstraction” operator (see, for instance, Partee, ter Meulen, and Wall 1990). The ι -operator is a definite description operator which applies to an open sentence to produce a term which denotes the unique entity which satisfies the open sentence, if there is one and only such entity, and otherwise fails to denote anything.

The rules below may be understood as embedded in a fragment of English similar to that of Montague (1973), enriched with some of the kinds of type multiplicity and type-shifting argued for in Partee (1987). The categories CN and TCN are both to be understood as common noun phrases; CN, the normal category of common noun (phrase), is of type $\langle e, t \rangle$, a one-place predicate; examples are *team*, *movie*, *dog*. TCN (“transitive common noun”) is a non-standard name for a common noun phrase understood as denoting a two-place relation, type $\langle e, \langle e, t \rangle \rangle$; examples are *brother*, *teacher*, *favorite movie*. A determiner (DET) combines with a common noun phrase to make an NP; here we consider only NP’s of type *e*. There will be two distinct semantic types of DET which will select for CN’s and TCN’s respectively.

- (4) (a) **Predicative genitive** (*is John’s*): a one-place predicate, free **R** only.
Translation of $John's_{t/e}$ = $\lambda x[R_i(\text{John})(x)]$ (= $R_i(\text{John})$)
Translation of $Fido \text{ is } John's_{t/e}$ = $\lambda x[R_i(\text{John})(x)](\text{Fido})$ = $R_i(\text{John})(\text{Fido})$
- (b) **Postnominal genitive** (*team of John’s*, *teacher of John’s*): combines with CN or TCN to make a CN; free or inherent **R**.
 (i) free **R**: $\lambda P \lambda x[P(x) \ \& \ R_i(\text{John})(x)]$
team of John’s: $\lambda x[\text{team}(x) \ \& \ R_i(\text{John})(x)]$
 (ii) inherent **R**: $\lambda R[\lambda x[R(\text{John})(x)]]$ or equivalently, $\lambda R[R(\text{John})]$
teacher of John’s: $\lambda x[\text{teacher}(\text{John})(x)]$

(c) **Prenominal genitive** (*John's team*, *John's teacher*) is an ambiguous DET: combines with CN or TCN to make an NP; free or inherent **R**; interpretation is function composition of implicit *the* with interpretation of postnominal genitive, free or inherent.

Translation of “inherent R” [*John's*]_{DET} = $\lambda R[\iota z[R(\text{John})(z)]]$

This one combines with TCN, which provides the relation.

John's teacher: $\iota z[\text{teacher}(\text{John})(z)]$

Translation of “free R” [*John's*]_{DET} = $\lambda P[\iota z[P(z) \ \& \ R_i(\text{John})(z)]]$

This one combines with CN, “fills in” the “free **R**”.

John's team: $\iota z[\text{team}(z) \ \& \ R_i(\text{John})(z)]$

Our assumption about the relation between semantics and pragmatics is that in order for a speaker to felicitously use a sentence whose translation contains a “free **R**”, the speaker must have in mind a particular value for the variable, and the speaker must believe that the context provides enough clues to enable the hearer to identify the value of the variable that the speaker intends. Partee (1983/1997) assumes that there are no absolute constraints imposed by the genitive construction on the possible values of **R**.

3.2. Jensen and Vikner (1994): “Uniform” genitive, type coercion of CN to TCN.

Jensen and Vikner (1994) (henceforth J&V) offer an interesting alternative proposal in the spirit of Pustejovsky (1993) which they describe as a uniform treatment of the genitive. Their analysis corresponds to the “inherent **R**” case of Partee (1983/1997); their claim is that the genitive always requires a relational common noun phrase to combine with. Their analysis is given in (5).

- (5) (a) **Postnominal genitive**: $\lambda R[R(\text{John})]$
 (b) **Prenominal genitive**: Composition of | **the** | with $\lambda R[R(\text{John})]$

Their proposal makes crucial use of the notion of *coercion*: the genitive construction demands a relational common noun phrase to combine with, and any non-relational noun must be *coerced* to a relational reading in order to combine with the genitive. Some nouns are inherently relational (*height*, *manager*); for them no coercion is needed. Some nouns are one-place predicates but with a lexically given (“default”) associated relation (Pustejovsky (1993), so that coercion by a genitive normally gives a unique relational interpretation unless strong context overrides (*paper*, *idea*, *car*, *nose*, *chair*); these, together with the inherently relational nouns, yield “lexical interpretations” of the genitive.

For example, the lexical entry for a functional artifact term like *chair*, according to Pustejovsky, includes in its “Qualia structure” a specification of its intended use: *to sit in*. Then the natural relational reading for *chair* that is available through a lexical type-shift is something like:

- (6) $\lambda y \lambda x[\text{chair}(x) \ \& \ \text{sits-in}(x)(y)]$

Remaining nouns are one-place predicates with no lexically given associated relation;

the use of the genitive construction with them requires contextual support to force a meaning-shift outside the lexicon, in an unspecified “pragmatic component”, whose effect seems to be basically the composition of the noun meaning with what we have been calling a “free R” meaning, resulting in a meaning like “team-of” etc. Such coercions are called “pragmatic interpretations” of the genitives, and these can also be forced by a sufficiently strong context for the nouns which normally get lexical interpretations of the genitive. An example of the latter is a reading of *John’s parents* which may be used when John is a school teacher, meaning “the parents who are parents of the children in John’s class”.

3.2.1. “Semantic vs pragmatic” genitive.

One would welcome the possibility of a uniform treatment of genitives, and other work on type-shifting supports the idea of a grammatical construction causing coercion of the type of a lexical item. At the end of their Section 2, J&V say that they are giving a uniform interpretation to the genitive construction and “charging the lexicon with the task of providing a relational interpretation of all nouns”. But J&V’s analysis does not actually constitute a uniform treatment of the genitive, since J&V do not claim to have given a treatment of what they call the “pragmatic interpretations,” but leave them to some other component. Their “uniform interpretation” claim was only meant to apply to what they see as the “purely semantic” cases (C. Vikner, p.c.)

3.2.2. Alternative version of Jensen and Vikner (1994).

Our own preference would be for a version of J&V’s analysis in which the genitive construction uniformly demands a 2-place predicate, and if it finds a one-place argument, that argument must be coerced into a 2-place one by whatever means are available and “natural”, sometimes lexical, sometimes pragmatic. J&V (p.c.) suggest potential agreement with this version; some of our differences may be theoretical differences concerning what the semantics should “produce” as “output” in the cases of the “pragmatic” readings. (Our answer: an interpretation that includes a free relation variable in it.) In that case, we could indeed describe their analysis as involving a uniform genitive that always requires a relational argument, and triggers coercion of its argument if necessary.

3.3. Summary of differences between Partee 1983 and modified Jensen and Vikner 1994.

J&V have just one postnominal genitive, the one of category CN/TCN above, so that *of John’s* will have the same interpretation whether it occurs in *team of John’s*, *chair of John’s*, or in *friend of John’s*:

$$(7) \quad \lambda R[\lambda x[R(\text{John})(x)]]$$

Partee (1983) has that interpretation when the genitive combines with an inherently relational TCN like *teacher* or *favorite movie*, but has another interpretation, of category CN/CN, for genitives combining with non-relational CNs like *team* or *chair*, and on this reading, the genitive itself introduces a free relation variable:

(8) $\lambda P \lambda x [P(x) \ \& \ R_i(\text{John})(x)]$

We can see the difference in the two analyses in part as a difference in where to draw the line between what comes from the dictionary and what comes from the context³. Let's consider three kinds of cases and the different two-way classification that the two approaches impose on them.

A. Agreed on “inherently relational” nouns like *friend*, *mother*, *teacher*. The two analyses treat these alike: in *John's teacher*, John ends up filling an argument role in the interpretation of the TCN *teacher*.

B. The disputed “middle case”: one-place nouns (CNs) for which the lexicon provides information that supports a possible shift to a related relational reading.

(9) *chair of Mary's*:

- a. Jensen and Vikner: *of Mary's*: $\lambda R [\lambda x [R(\text{Mary})(x)]]$
 (shifted) *chair*: $\lambda y [\lambda x [\text{chair}(x) \ \& \ \text{is-sat-in-by}(y)(x)]]$
chair of Mary's: $\lambda x [\text{chair}(x) \ \& \ \text{is-sat-in-by}(\text{Mary})(x)]$
- b. Partee(1983): *of Mary's*: $\lambda P \lambda x [P(x) \ \& \ R_i(\text{Mary})(x)]$
 (non-shifted) *chair*: **chair**
chair of Mary's: $\lambda x [\text{chair}(x) \ \& \ R_i(\text{Mary})(x)]$

Jensen and Vikner make this use of the genitive the same as with relational nouns, shifting (“expanding”) the CN to a TCN by lexical coercion. Partee treats this case as a “free R” or “pragmatic” case; the choice of lexical item is seen as just one of many contextual influences on the selection of the relevant “free” relation.

C. Agreed on “pragmatic” or “free R” cases: one-place nouns (CNs) with no special lexical basis for a coerced shift: *Mary's sky*, *Mary's team*

We are agreed on the role of the context in these cases, although in Section 5.3. below it will emerge that the difference in how the “free R” is brought into the construction is important in ways that argue for J&V's analysis.

³ In Section 5.3. it will emerge that another difference is also important. Within the cases in which we are agreed that the relation comes from the context, there is still a difference in “where” the free relation variable is located – within the meaning of the genitive phrase, or within the “expanded” meaning of the common noun phrase.

4. Theories of *favorite* and adjective types.

Trying to decide between the two theories of the genitive leads to interesting questions about the meaning and "valency" of the adjective *favorite* (and the similar but not identical Russian *lyubimyj*). Different hypotheses about *favorite* favor different theories about the genitive and lead to suggested modifications of both accounts. We will not settle on a "correct" analysis but explore the kinds of possible explanations that are made available by our view of meanings as "theories" that draw on interacting "axioms" from multiple sources. More generally, we see the study of the interactions of compositional and lexical semantics as a test bed for the adequacy of separate hypotheses about each.

4.1. Partee 1983: non-uniform *favorite* with simple 'likes best'

On the analysis of Partee (1983), *favorite* can combine with either a TCN or a CN, always resulting in a TCN. The basic meaning appears to be the one that combines with a plain CN, the other is derivable by what is probably a general type-shift rule.

- (10) (a) $|[favorite_1]_{TCN/CN}| = \lambda P[\lambda y[\lambda x[P(x) \ \& \ y \text{ likes } x \text{ best out of } P]]]$
 (b) $|[favorite_2]_{TCN/TCN}| = \lambda R[\lambda y[\lambda x[R(y)(x) \ \& \ favorite_1'(R(y))(x)]]]$

The effect of these two interpretations is that *Mary's favorite movie*, with CN *movie*, will pick out the movie that Mary likes best out of all movies, whereas *Mary's favorite teacher*, with TCN *teacher*, will pick out the teacher that Mary likes best out of all of Mary's teachers.

4.2. Non-uniform *favorite* with added relational parameter

It seems⁴ that there is another semantically obligatory parameter in the meaning of *favorite*, one which would be expressed overtly in expressions with "likes" as an *as*-phrase:

- (11) Which teacher does Mary like best as a teacher/ as a person/ as a ping-pong partner?

This in turn suggests a possible empirical difference between the predictions of the two approaches to the genitive, to which we will turn in Sections 5.1 and 5.2.

First consider the missing parameter in combination with a TCN. We think that *Mary's favorite teacher* normally means "teacher of Mary's that Mary likes best as a teacher out of all of her teachers", with the same relation showing up in all three places. I.e., with a TCN, we use its inherent *R* to supply the missing parameter. So the revised meaning of "favorite + TCN" would be:

- (12) $|[favorite_2]_{TCN/TCN}| = \lambda R[\lambda y[\lambda x[R(y)(x) \ \& \ y \text{ likes } x \text{ as an } R \text{ better than any other } z]]]$

⁴ Here we draw on discussions with Elena Paducheva and Ekaterina Rakhilina. The status of this additional parameter needs further investigation; it may not be as obligatory as the domain argument required by *best* (best out of what set?), and it may not be as crucial to the debate as we at first thought.

such that $(R(y))(x)]]]$

And what about “favorite + CN”? For a first hypothesis, let’s suppose that “Mary’s favorite violinist” means the violinist that Mary likes best as a violinist. This means that with a plain CN we use its inherent **P** to fix the missing parameter. Then the definition of Partee’s TCN/CN version of *favorite* would be revised as follows:

- (13) $[[\textit{favorite}_1]_{\text{TCN/CN}}] = \lambda P[\lambda y[\lambda x[P(x) \ \& \ y \text{ likes } x \text{ better as a } P \text{ than any other } z \text{ such that } P(z)]]]$

4.3. “Possible Jensen and Vikner” analysis: uniform *favorite* with coercion.

Favorite may be the only adjective⁵ which obligatorily produces a TCN output. It was not clear which of its types on the Partee 1983 analysis should be considered basic. Probably its more marked type, TCN/CN, should be the basic lexical type for *favorite*, a marked sort of adjective, with its more unmarked type TCN/TCN derived as a natural alternative. The Bittner and Hale constraint discussed below would in fact require this choice.

For J&V it would be reasonable to exclude the type TCN/CN altogether, require all adjectives to be endocentric (i.e. of some type X/X), and let *favorite* trigger coercion of the CN that it applies to form a TCN. We will therefore assume that J&V would prefer to have just one meaning for *favorite*, of type TCN/TCN, just as they favor a uniform treatment of the genitive.

4.4 Coercion analysis: effects on analysis of other adjectives and type-shifting.

First we review some observations about *new* from Partee (1983/1997); then we will look at an alternative view of them suggested by the coercion analysis.

The analysis of such inherently relational adjectives as *favorite* suggests taking a second look at traditionally CN/CN adjectives like *new*. We can distinguish four separate (but related) types for *new*.

- (14) (a) $[\textit{new}_1]_{t/e}$: “hasn’t existed long” (*a new movie*)
 (b) $[\textit{new}_2]_{\text{CN/CN}}$: “hasn’t been a CN long” (*a new movie star*)
 (c) $[\textit{new}_3]_{\text{TCN/TCN}}$: “hasn’t been TCN-of long” (*my new friend*)
 (d) $[\textit{new}_4]_{\text{TCN/CN}}$: “hasn’t been (free) R_i -of long” (*John’s new car is an old car.*)

The TCN/CN version, *new*₄, is definable from the TCN/TCN version and a free **R** as shown in (21):

⁵ Roger Schwarzschild (pers. comm.) suggests that *personal*, as used in *my personal desk*, *his own personal airplane*, *the President’s personal barber*, etc. may have the same semantic type(s) as *favorite*.

$$(15) \quad new_4' = \lambda P[\lambda y[\lambda x[P(x) \ \& \ new_3'(R)(y)(x)]]]$$

The coercion idea of Jensen and Vikner suggests the possibility of eliminating the TCN/CN version of *new* altogether and accounting for it via coercion of the noun instead; this would be desirable insofar as CN/CN and TCN/TCN are both natural types (endocentric modifiers), and TCN/CN a marked type which should be used, if at all, only for lexically basic meanings like the meaning of *favorite*.

In the example of (14d), then, the genitive would force the whole CN *new car* to become TCN, and the adjective and noun would then most naturally be construed as TCN/TCN and TCN respectively.

We can then suggest some natural generalizations about adjective meanings and adjective meaning-shifts.

(16) (a) **Basic types** for adjectives: t/e ($e \rightarrow t$) and CN/CN ($((e \rightarrow t) \rightarrow (e \rightarrow t))$).

(b) **Natural shifts:**

(i) from t/e: by conjunction only.

t/e to CN/CN: $\lambda P \lambda x[P(x) \ \& \ ADJ_1(x)]$

t/e to TCN/TCN: $\lambda R[\lambda y[\lambda x[R(y)(x) \ \& \ ADJ_1'(x)]]]$

(ii) from CN/CN

to t/e: $ADJ_2(x) = ADJ_1(\text{entity}')(x)$

to TCN/TCN: $ADJ_3(R)(y)(x) = ADJ_1'(R(y))(x)$

Some more general hypotheses and issues concerning type-shifting principles include the following:

(17) **Type-shifting principles and hypotheses.**

(a) The functor category normally coerces a shift in its argument(s) rather than the reverse. (This is just a tentative hypothesis at this point. It may be just one “default” factor competing with others such as the dominance of the marked, the dominance of closed-class over open-class items, and the dominance of grammatical constructions over lexical meanings.)

(b) Bittner and Hale’s constraint. Bittner and Hale (1995) propose the following constraint, which is consistent with all analyses that we know of and which we endorse:

Semantic type-shifting operations are required to be *type-range preserving* in the sense that they cannot create any new combinations of a syntactic category with a semantic type. That is, a type-shifting operator of type $\langle \mathbf{a}, \mathbf{b} \rangle$ can apply to a constituent of type $\mathbf{a}$ and syntactic category $\mathbf{C}$, only if there are constituents of category $\mathbf{C}$ whose *basic meaning* is of type $\mathbf{b}$. (Bittner and Hale 1995, p.102)

(c) A functor category can influence the content as well as the type of its arguments; we return to this point in Section 5 when we discuss differences in the effects of *favorite* and the genitive.

As an illustration of the principle suggested in (17a), we consider the differences between the demands of the simple determiner *a*, which requires a plain one-place CN-type argument⁶, and the genitive, which forces a relational reading.

- (18) (a) a new mother
(b) Mary's new mother

The indefinite article in (18a) forces an interpretation of *new mother* as a plain CN, giving the reading “person who has not been a mother for long”, i.e. a woman who has recently given birth to her first child. The genitive *Mary's* in (18b), on the other hand, forces a relational interpretation of *new mother*, which results in the pragmatically unusual reading “person who has not been in the *mother-of* relation to Mary for very long”. A suitable context for (18b) could be one in which Mary was an orphan who has recently been adopted. In both cases, the determiner strongly selects for the corresponding type of common noun phrases, coercing a shift of the common noun phrase interpretation if necessary.

5. Nouns, genitive and *favorite*: compositional semantics, lexical semantics, and context.

5.1. In favor of J&V genitive and “Possible J&V” *favorite*: Uniform types and coercion.

Initially it seems that *favorite* might provide an argument for (our version of) J&V's treatment of genitive over Partee (1983), assuming our version of what J&V would/should say about *favorite*. For consider the case where the genitive combines with a complex CN(P) like *favorite teacher* or *favorite chair* or *former favorite teacher*, etc.

First consider *Mary's favorite chair*. On Partee's analysis, when we combine *favorite* (TCN/CN) with *chair* (CN), *chair* doesn't shift. *Favorite* introduces a relation itself, making *favorite chair* relational (a TCN-phrase). Then we apply the “argument-genitive”, the one that combines with a TCN. The resulting interpretation is:

- (19) $\iota x[\text{chair}'(x) \text{ and Mary likes } x \text{ as a chair better than any other chair.}]$

On J&V's analysis, *chair* has to shift in order to combine with *favorite*, so presumably in the default case the “sit-in” relation will be activated by *favorite* just as it is activated for “Mary's chair”. So J&V will have the relation, not the property, in the result.

- (20) $\iota x[\text{chair}'(x) \text{ and Mary likes } x \text{ as a chair to sit in better than any other chair that Mary sits in.}]$

⁶ An exception may be the behavior of weak determiners occurring in the complement of *have*, as discussed in Landman and Partee (1984) and Jensen and Vikner (1996).

So the different views about the role of lexical coercion lead to different predictions in this case. Partee's analysis says that Mary's favorite chair is the chair Mary likes best as a chair; what it means to like something "as a chair" is not further specified, and would have to be considered a non-linguistic matter. J&V's analysis, on the other hand, if they do indeed want a uniform type for *favorite*, makes *chair* shift for *favorite* in the same way it shifts for the genitive. They would then predict that the same relational senses that arise with genitives would also arise with *favorite*: the lexical default case would be that it's her favorite chair to sit in, and if we are in a context where Mary's chair is the one she photographs, her favorite chair would be the one that she most likes to photograph.

5.2. Against. *Mary's movie* and *Mary's favorite movie*.

But on second look, it does not seem right after all to treat *favorite* uniformly as TCN/TCN with the same kind of coercion of a CN argument as occurs with the genitive. The reason for not wanting to coerce the CN to a TCN comes from examples like (21a) and (21b).

- (21) (a) *Mary's favorite movie*
 (b) *Mary's movie*.

Example (21a) has a very clear meaning that hardly seems context-dependent at all. It would take a very strong context to get it to mean anything other than simply "the movie Mary likes best", with its domain parameter understood simply as the set of all movies, or all movies in some contextually delimited set. No particular relation between Mary and movies is suggested or required; *movie* does not seem to be coerced to any TCN reading.

But *Mary's movie* is quite a different matter: There is no most obvious lexical relation that would trigger lexical coercion, but the possibilities would include such things as "acted in", "directed", "rented from the video store", "reviewed for the local paper", etc.

The main difference between the two cases is that there need be no shift to any such relation in interpreting *Mary's favorite movie*. It may happen, e.g. if we replace the "neutral" name *Mary* by the name of a known director, actor, movie critic, etc., (as in *Fellini's favorite movie*), that contextual knowledge might indeed favor a shift from simply "likes best as a movie (to watch) out of the set of all movies" to "liked best (to direct?) out of the set of all of his (directed by him) movies". But even in such a case the shift is not required; *Fellini's favorite movie* can also simply mean the movie he liked best, which need not be one of "his" movies.

At this point we seem to be left with two possibilities. If the J&V coercion analysis is to be maintained, we need more fine-grained coercion principles that could involve different sorts of CN-to-TCN shifts for different coercing functors. *Favorite* would coerce a CN to a relation that specifically concerns a manner of evaluating, while the genitive would coerce a CN to a different class of relations which we would need to try to specify more closely. Or, as we were initially inclined to think, *favorite* doesn't coerce a CN at all, and really does have a TCN/CN reading as well as a TCN/TCN reading, the two readings related to one another

in a systematic way that shouldn't make the posited polysemy too "costly".

5.3. An argument in favor: “Mary’s former mansion.”

A new argument in favor of J&V’s coercion approach can be constructed from examples like (22).⁷

(22) *Mary’s former mansion*

Assume that *mansion* is basically a 1-place noun. We know that *former* can modify either 1-place nouns (*former monastery*, *former dancer*) or 2-place nouns (*former wife*, *former friend*). In the latter case, *former* acts as a TCN/TCN, modifying the relation expressed by the TCN; it gets this meaning via the type-shift described in (16bii).

A *former mansion*, if *mansion* is 1-place, is something that was once a mansion and no longer is – it has fallen into ruin, or been badly damaged by a bomb, or converted into an apartment house, or some other such change. And there is a possible reading of *Mary’s former mansion* which fits that sense of *former mansion*: this thing is still Mary’s, but no longer a mansion.

The problem is that that is not the only interpretation of *Mary’s former mansion*, and in fact in the absence of strong contextual support it is by far not the most likely reading. The easier-to-get reading implies that it is no longer Mary’s mansion, though it may well still be a mansion (it need not be; that is unspecified on this reading) – with a free relation *R* in “Mary’s mansion”, whose likely value might be “owns” or “occupies”. What makes this fact a problem for the analysis of Partee 1983 is that on that analysis, without any coercion, the free relation variable is introduced by the genitive *Mary’s*, after *former* has been combined with *mansion*: the constituents that combine are *Mary’s* and *former mansion*. *Mansion* stays 1-place, and therefore we get only one reading for *former mansion*.

On J&V’s coercion analysis, *Mary’s* insists on having a 2-place relation as the interpretation of *former mansion*. In principle, there are three ways that *former mansion* could be derived as a TCN. (i) Leave *mansion* as a plain CN and *former* as a CN/CN, first deriving *former mansion* by function-argument application as a CN and subsequently shifting (“expanding”) it to a TCN, filling in a relation such as “owns” or “lives in” as a “free *R*” in the shifted meaning. This would give the same “wrong” result as the Partee 1983 approach, requiring the “former mansion” to no longer be a mansion. (ii) Leave *mansion* as a plain CN but shift *former* to a TCN/CN, with a “free *R*” incorporated into the meaning of *former* analogously to the TCN/CN meaning of *new* given above in (14d). But it was argued in the

⁷ We are grateful to Norvin Richards, who implicitly produced this argument when he asked us how our analysis would handle *John’s biggest team* or *John’s biggest book*; the answer turned out to be that our analysis would give the wrong results, while J&V’s analysis could handle it correctly. We have changed the example to *Mary’s former mansion*, because the issues are the same and the data seem particularly clear in that case.

discussion of (14d) that on the J&V approach, we could probably eliminate the possibility of shifting an adjective into the “marked” type TCN/CN, so this option would probably not be available in an optimal type-shifting theory. (iii) Shift *mansion* to a TCN, with incorporated “free **R**”, and shift *former* to a TCN/TCN according to the “natural” shifting principle given above in (16bii).

It would seem plausible that the most “natural” way to achieve a relational reading of *former mansion* is the third alternative above. On that alternative, we look for a relation *mansion-of* and apply *former* to that. This gives us the more natural reading, in which we do not deny that the entity is still a mansion, but only that it is still Mary’s mansion.

It is not yet entirely clear what principles support the claim just made that the meaning shift given in (iii) is a more natural way to get a 2-place reading for *former mansion* than that given in (i), which results in the less likely reading. Unless we can identify principles that predict a preference for the third derivation over the first without appealing to differences in pragmatic preference for one outcome over the other, we have not fully explained how the coercion approach produces the right result. But it is clear that the Partee 1983 analysis produces only the wrong result, and the J&V analysis can at least produce both the right and the wrong result, and it seems plausible that further research may be able to show how it actually favors the right result.

5.4. Conclusions.

Before the discovery of the argument in Section 5.3., our main arguments against J&V’s analysis were as follows. They claimed to have a uniform analysis of all the genitives; but (a) it wasn’t really uniform because they also had “pragmatic cases” corresponding to a subset of Partee’s “free **R**” cases, and (b) if they analyzed genitives by coercion they should probably also analyze *favorite* by coercion and get rid of the “marked” TCN/CN type Partee 1983 assigned to it; but, as argued in Section 5.2., *favorite* doesn’t evoke the same relational senses as the genitive so coercion doesn’t work uniformly in any case.

As for point (a), J&V (personal communication) have agreed, as noted earlier, that not all uses of the genitive are to be subsumed under a single uniform analysis. Both we and J&V have some non-lexically driven cases, where the context has to provide the relation. And then the main difference is where and how that contextually supplied relation enters the construction. In Partee 1983, Partee’s “free **R**” comes in with the genitive construction, as part of the meaning of *John’s*, when its argument is a 1-place CN. On J&V’s analysis that free **R** shows up in the derived TCN that is produced by coercion from the CN. That difference was not emphasized in Sections 3 and 4, but in the end has emerged as a very important one. It is on that issue that the kind of example adduced in Section 5.3 apparently provides a crucial argument in favor of J&V’s position and against the position of Partee 1983.

As for point (b), J&V are prepared to hold (personal communication) that coercion needn’t be uniform – the coercing functor can care about more than just the type of its argument, and the difference between *favorite* and the genitive should be taken as grounds for adopting more fine-grained coercion principles. On a Pustejovskian analysis, this might

mean preferences for different qualia roles. In the case of the genitive versus *favorite*, it seems that the genitive favors relations that are (inverses of, in our representations) functions from objects to people (perhaps with a special preference for “ownership” or “control”-like relations), whereas *favorite* favors relations which suggest some use or functional role or other relation which would provide a basis for evaluating one item as better than another. Further investigation may show how to sharpen these differences and make them follow from the semantic content of the possessive construction and the meaning of *favorite*; such investigation will be an important part of further examination of the interaction of formal semantics, lexical semantics, and context. As foreshadowed in hypothesis (17c) above, we are now prepared to agree that it is not just logical types that the functor cares about.

These conclusions support J&V’s contention that the coercion approach works better than the Partee 83 approach. It remains to explain the relation among the still non-uniform genitives, a study which may be best embedded in a typological context and in combination with studies of uses of the verb *have* (Jensen and Vikner 1996). Even more urgently, it remains to be explained how coercion works and how structural, lexical, and contextual information interacts in determining what shifts and how. It is clearly not enough to assume that type requirements by themselves induce a “most natural” meaning shift: even if one posits that both *favorite* and the genitive require a TCN, that does not by itself determine what relational meaning a plain CN will shift to. It appears there is interaction among “axioms” from multiple sources, lexical, grammatical, and contextual, in ways which require further investigation of the linguistic and non-linguistic principles involved.

This effort will undoubtedly require integrated study of lexical semantics, formal semantics, and pragmatics, and the principles of interaction (in both language production and language perception) among the different components of grammar and the different information sources which influence preferences among grammatically allowable possibilities.

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Children Want *Only* a Right-Conservative Determiner

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O. Introduction

By the age of preschool, normally developing children know the basic ways that syntax constrains meaning in their target grammar. Aside from the effects of delays in lexical acquisition, or of delays in the acquisition of marked constructions (e.g. in English, the long passive), what nonadultlike comprehension performance may be observed in preschool children can be attributed to difficulties they have in consistently applying certain semantic interpretive procedures under certain conditions, not to incomplete acquisition of the syntactic principles that interact with the assignment of meaning. For example, children know the adult syntax of DPs such as *the second green ball*, but under experimental conditions they may have trouble applying the semantic interpretive procedures required to understand the meaning of such DPs in the same way that adults do (Matthei 1982, Hamburger and Crain 1984). With regard to anaphora, preschoolers show virtually no errors in applying the syntactic constraints on the bound variable interpretation of pronouns and reflexives. However, they may often comprehend a third person pronoun in a nonadultlike manner when a special interpretive procedure of the grammar that licenses apparent violations of Principle B potentially plays a role in determining the pronoun's antecedent (Chien and Wexler 1990, Grodzinsky and Reinhart 1993). In general, preschool children also show adultlike knowledge of the way syntax constrains the semantic interpretation of sentences containing simple determiners like *every* (see Philip 1995 and references cited), and can even show perfectly adultlike performance with such sentences under especially favorable experimental conditions (Crain et al. 1996). What problems children have comprehending determiner universal quantifiers under natural experimental conditions seem due to a difficulty consistently applying the semantic interpretive procedures appropriate for such universal quantifiers—and a consequent mis-application of the semantic interpretive procedures appropriate for adverbial universal quantifiers such as *always*—but do not seem due to incomplete knowledge of the syntactic principles involved (Philip 1997). On the other hand, when syntax has nothing to say about grammatical meaning, children can have a great deal of trouble performing like adults. For example, even by the age of preschool they seem to have a poor understanding how

contrastive stress affects the meaning of a sentence for adults (Tavakolian 1974, McDaniel and Maxfield 1994).

Given this general dissociation of syntactic and semantic development, child language can provide evidence unavailable in adult intuitions as to the syntactic or semantic nature of a given phenomena of adult linguistic performance. Evidence that children have a difficulty comprehending a given sentence type in an adultlike manner is *prima facie* evidence that special semantic properties play a major role in determining its meaning in adult grammar.

In this paper, child comprehension performance will be used as a means of disentangling syntax from semantics in the case of the focus operator that is realized in English as *only* (henceforth ONLY). I will present an experimental study of Norwegian preschool children's understanding of sentences containing the Norwegian realization of ONLY, i.e. *bare*, which in adult Norwegian has the same syntactic and semantic properties as English *only*. I will argue that this psycholinguistic evidence from child language provides answers to two competence-theoretical questions about ONLY in sentences such as (1).

- (1) a. *Only the cat is holding a flag.*
b. *The cat is holding only a flag.*

In (1a), the nominal constituent *the cat* must be focused, whether or not this focusing is phonologically signaled by contrastive stress, and ONLY must associate with this focused constituent. Thus, (1a) cannot have the meaning paraphrased in (2b); it can only have the meaning paraphrased in (2a). Similarly, in (1b) ONLY can only associate with the focused constituent *a flag* and (1b) can only have the meaning paraphrased in (2b).

- (2) a. If anybody is holding a flag, it is the cat who is holding a flag.
b. If anything is being held by the cat, it is a flag that is being held by the cat.

The first theoretical question, then, is whether it is the syntax or the semantics of ONLY that requires it to associate with a focused nominal expression immediately to the right of it in contexts such as (1). According to Rooth (1985:128), it is the semantic properties of ONLY, together with a general pragmatic rule prohibiting tautological assertions, that forces (1a-b) to have the meanings paraphrased in (2a-b), respectively. According to others (e.g. Jackendoff 1972), it is a syntactic restriction on the scope of ONLY (e.g. defined in terms of c-command) that is responsible these facts. These two competing approaches to an analysis of ONLY in adult grammars make different predictions for child language, given the general dissociation of syntactic and semantic development that is observed in children. A syntactic account predicts that preschool children will have no great difficulty comprehending sentences such as (1) in a fully adult-like manner, since, by the age of preschool, children will have fully acquired knowledge of the basic ways in which syntax constrains meaning in their target grammar. A semantic account, on the other hand, would be consistent with an observation of nonadultlike child comprehension of sentences such as (1) under natural experimental conditions, since children may have difficulty consistently applying the special semantic interpretive procedures activated by ONLY. This would be especially true of Rooth's specific proposal since it makes crucial reference to a pragmatic rule prohibiting tautological

assertions. Such discourse-related principles of adult grammar are generally mastered quite late in the development of a first language.

The second theoretical question concerns the syntactic category of *ONLY* in sentences like (1). Is it a determiner-like expression, i.e. an expression of type DP/DP, or is it rather an adverb of some special sort—one that can adjoin to a DP as well as a VP, i.e. a cross-categorial modifier. As we will see in the next section, there is considerable evidence from adult linguistic intuitions about grammaticality and meaning that *ONLY* is a determiner-like expression in contexts such as (1). However, there also appears to be a strong semantic reason for supposing that it cannot possibly be an expression of this syntactic category in any context, and therefore must be some kind of adverb. The problem is that *ONLY* in (1) does not appear to conform to the Principle of Conservativity. This can be seen from the fact that the truth or falsity of (3a) does not entail the truth or falsity of (3b). (For example, as a description of a situation in which a cat and a dog were each holding a flag, (3a) would be false but (3b) would be true.)

- (3) a. *Only the cat is holding a flag.*
 b. *Only the cat is a cat that is holding a flag.*

This is a problem for the hypothesis that *ONLY* in such contexts is a determiner-like expression because there appears to be a semantic universal that determiners and determiner-like expressions must obey the Principle of Conservativity.¹ For example, the simple determiner *every* and the determiner-like expression *all* do exhibit conservativity, as shown by the fact that (4a) is true if and only if (4b) is true and by the fact that (4c) is true if and only if (4d) is true.

- (4) a. *Every cat is holding a flag.*
 b. *Every cat is a cat that is holding a flag.*
 c. *All the cats are holding a flag.*
 d. *All the cats are cats that are holding a flag.*

However, as we will see in section 2, the semantic universal evidenced in facts such as (4) actually is obeyed by *ONLY* when this universal is revised in accordance with a more fine-grained definition of the Principle of Conservativity. This will allow us to maintain the hypothesis that *ONLY* in contexts such as (1) is indeed a determiner-like expression in the adult grammar.

I will argue below that children's comprehension of sentences such as (1) provides additional, indirect, motivation for this revised definition of the semantic universal applying to determiners and determiner-like expressions, and additional, indirect, motivation for the hypothesis that *ONLY* is a determiner-like expression in such contexts.

¹ The one other possible exception to this generalization is *many* under a proportional reading. However, this conceivably can be accounted for by analyzing *many* as an adjective (cf. *The many wives of Henry VIII*).

1. Determiner-like ONLY

There are several good reasons for supposing that ONLY in contexts such as (1) above does form a DP with the nominal expression right-adjacent of it. First, as already noted, in such contexts ONLY is not free to associate with any focused constituent in the sentence; rather, it can only associate with a right-adjacent focused DP. Thus, (5a) can only have the focus structure in (5c), yielding a meaning paraphrasable as (5f). It cannot have the focus structures in (5d) or (5e), which would yield meanings paraphrasable as (5j) and (5k), respectively. Likewise, (5b) can only have a focus structure in which *a flag* is focused, yielding a meaning paraphrasable as (5j). In sharp contrast, when ONLY is an adverb, as in (5g), it can freely associate with any focused DP to the right of it. For example, (5g) can have the focus structure in (5h), yielding a meaning paraphrasable as (5j), or it can have the focus structure in (5i), yielding a meaning paraphrasable as (5k). The fact, then, that ONLY in contexts such as (1) or (5a-b) does not have this freedom of association with focus is evidence that ONLY is not an adverb in such contexts.

- (5)
- a. *Only the cat gave a flag to a dog.*
 - b. *The cat gave only a flag to a dog.*
 - c. [Only [the cat]_F gave a flag to a dog]
 - d. *[Only the cat gave [a flag]_F to a dog]
 - e. *[Only the cat gave a flag to [the dog]_F]
 - f. If anybody gave a flag to a dog, it was the cat that gave a flag to a dog.
 - g. *The cat only gave a flag to a dog.*
 - h. [The cat only gave [a flag]_F to a dog]
 - i. [The cat only gave a flag to [a dog]_F]
 - j. If the cat gave anything to a dog, it was a flag that it gave to a dog.
 - k. If the cat gave a flag to anybody, it was a dog that it gave a flag to.

Another piece of evidence that ONLY is a determiner-like expression in sentences such as (1) and (5a-b), rather than an adverb, is that in (1b) and (5b) it intervenes between the verb and its direct object. This is a position that adverbs cannot normally occupy in English, as seen by (6). On the other hand, it is a position that ONLY very easily could occupy if it forms a DP with the nominal expression immediately to the right of it.

- (6)
- a. *The cat is holding the flag firmly.*
 - b. **The cat is holding firmly the flag.*

A third argument for the determiner-hood of ONLY in contexts such as (1) and (5a-b) is its scopal interaction with other operators. For example, the sentence in (7a) is ambiguous for many English speakers between the two meanings loosely paraphrased in (7b) and (7c). In contrast, (7d), which contains adverb ONLY, does not exhibit this ambiguity; the only meaning it has is that paraphrased as (7c). Following Rooth (1985:83[10]), the ambiguity of (7a) can be accounted for straightforwardly via QR if the string *only a flag* is a DP. For the reading in (7b), [only a flag]_{DP} is LF-moved to an A-bar position having scope over *required*; for the reading in (7c), [only a flag]_{DP} is moved to an A-bar position under the scope of *required*. By the same set of assumptions, the absence of ambiguity in the case of (7d) follows

from the fact that adverbs do not undergo QR. Thus, the fact that ONLY in contexts such as (1) and (5a-b) has a property that adverbial ONLY lacks is evidence that it is not an adverb, but rather a determiner-like expression in such contexts.

- (7) a. *The cat is required to hold only a flag.*
 b. It is only a flag that the cat is required to hold.
 c. It is required that the cat not hold anything except a flag.
 d. *The cat is required to only hold a flag.*

A fourth reason for supposing that ONLY forms a DP with the nominal expression right-adjacent to it in sentences such as (1) and (5a-b) is the observation that in other contexts it appears to be a simple determiner, i.e. an expression of type $\langle\langle s, \langle e, t \rangle \rangle, \langle\langle s, \langle e, t \rangle \rangle, t \rangle\rangle$. Given that conjoined expressions must be of the same syntactic category, and that *all* in (8b) is a simple determiner, it must be that *only* in (8a) is a simple determiner as well. Moreover, both *only* and *all* seem to occur as simple determiners in (8b) and (8c). If it is possible for ONLY to be a simple determiner, then why should it not also be possible for it to be a determiner-like expression?

- (8) a. *All and only cats hunt mice for fun.*
 b. *All cats hunt mice for fun.*
 c. *Only cats hunt mice for fun.*

Finally, the determiner-like syntax of ONLY in sentences such as (1) and (5a-b) is revealed by number of movement tests of constituency. For example, just as the determiner *the* cannot be stranded in the relativization in (9b), and just as determiner-like expression *all* cannot be stranded in the relativization in (9d), similarly ONLY cannot be stranded in the relativization in (9f).

- (9) a. I know [[the cats]_i that Oscar hates t_i]
 b. *I know [[cats]_i that Oscar hates the t_i]
 c. I know [[all the cats]_i that Oscar hates t_i]
 d. *I know [[the cats]_i that Oscar hates all t_i]
 e. I know [[only the cats]_i that Oscar hates t_i]
 f. *I know [[the cats]_i that Oscar hates only t_i]

The evidence reviewed in (5)-(9) argues strongly that ONLY can combine with a nominal expression to form a DP, i.e. that it is what I have been calling a determiner-like expression. In (8), we even saw evidence that ONLY can occur as a simple determiner, i.e. as an expression of type DP/NP (in Montagovian terms, NP/N)—unless we are willing to suppose that *all* is not a simple determiner in contexts such as (8b). However, what of sentences such as (10a), and traffic directional DPs such as (10b)?

- (10) a. *Only Maine declared a state of emergency.*
 b. *Left Turn Only*

The DP right-adjacent to ONLY in (10a) is a proper name. In English proper names generally cannot be further specified by any operator. In (10b), ONLY is post-positional, a very unusual position for a determiner in English (not, incidentally, in Norwegian). However, the fact that ONLY may occur in such unusual syntactic positions is no more argument that it cannot **also** occur as a determiner-like expression than is the observation that it can also occur as an adverb.² Moreover, ONLY is not the only English determiner that can occur in a non-canonical DP specifier position, as evidenced by (11).

- (11) a. *All Maine was covered by 6 inches of ice.*
 b. *Five dollars each.*

The only significant piece of counter-evidence I am aware of to the hypothesis that ONLY can be a determiner-like expression is the observation that a constituent formed with ONLY does not have the full distribution of a DP in that it does not easily occur within another DP, as exemplified in (12a).³ In contrast, a determiner such as *every* may freely occur in such a context, as shown by (12b).

- (12) a. *?The entrance to only the Santa Monica freeway was blocked off.*
 b. *The entrance to every freeway was blocked off.*

However, the apparent ill-formedness of (12a) may be due to a difficulty retrieving the presuppositional content of ONLY in such an embedded context. As will be reviewed below, ONLY establishes a presupposition that the proposition expressed by the clause it is a part of is true. This may be difficult to do when the proposition in question is expressed by a nominalization. Consider that for a felicitous reading of (12a) one must first ‘unpack’ the event denoted by *entrance*, construct from this the proposition that one may enter the Santa Monica freeway by a certain route, and then determine that this proposition is part of the common ground. This may simply be too much processing for short term memory in most cases. That is, the processing required may go beyond what grammatical semantic interpretation is build to handle, such that non-grammatical cognition must be invoked to assign meaning to (12a). In contrast, the presupposition established by *every* in (12b) is simply

² ONLY may also occur as an adjective, as in (i), or as a sentential operator, as in (ii) and (iii). (iii) is a spontaneous comment by a Dutch four-year-old that I once observed during an experiment on the acquisition of pronominal anaphora. The child was discussing a picture showing a mother looking at a little girl and was responding to the input *Hier hebben we een moeder en een meisje. Ziet de moeder haar?* ‘Here we have a mother and a little girl. Does the mother see her?’

(i) *This sentence is not the only instance of adjectival ONLY.*
 (ii) *You may go to the fields or down the lane, only don’t go into Mr. McGregor’s garden.*
 (iii) *Nee...Alleen de moeder kijkt wel boos naar het meisje.*
 ‘No...But the mother is looking pretty angrily at the little girl.’

Rooth (1985) seems to have overlooked cases such as (ii) and (iii), which support his claim that ONLY is fundamentally a sentential operator.

³ This example is starred as ungrammatical in Rooth (1985:93), but I find it only marginally ill-formed.

the presupposition that some freeways exist. For (12b) to be felicitous, it is not necessary to ‘unpack’ the proposition that one may enter these different freeways by different routes. In short, evidence of the sort represented by (12a) is a weak argument that ONLY may not be a determiner-like expression, since there are alternative explanations of the oddity of such sentences that make no reference to syntactic properties of ONLY.

In conclusion, the evidence that ONLY can be a determiner-like expression in certain contexts is fairly overwhelming. If this were all there were to say about the matter, nobody would even think of suggesting otherwise. However, there is another matter to consider, namely the Principle of Conservativity.

2. The Semantic Universal Governing Determiner-like Expressions

When the Principle of Conservativity was first introduced into the linguistics literature, it was presented in such a manner as to suggest that it was a defining characteristic of determiners and determiner-like expressions (Barwise and Cooper 1981, Keenan and Stavi 1986, van Benthem 1986). It has since been observed, however, that this basic semantic principle of UG applies to quantificational expressions of many other syntactic types as well. The Japanese universal quantifier *minna* ‘all’, for example, obeys the Principle of Conservativity in exactly the same way as does English *every*, but syntactically *minna* is an adverb (Fukushima 1991). The same can be said of the Dutch universal quantifier *allemaal* ‘all’, which cannot form a DP with a nominal constituent right-adjacent to it, as seen in (13b) and (13c).

- (13) a. *De katten houden allemaal en vlag vast.*
 The cats hold all a flag fast
 ‘The cats are all holding a flag’
 b. **Allemaal de katten houden en vlag vast.*
 c. **Allemaal katten houden en vlag vast.*

Reciprocal expressions are conservative quantifiers as well (Dalrymple et al. 1995), yet, as Dalrymple et al. (1994) point out, in many grammars they are verbal affixes (e.g. the Bantu family) or adverbs (e.g. the Romance family), not determiners or determiner-like expressions. Japanese has both a reciprocal verbal affix, *-au* (lit. ‘meet’), and a reciprocal adverb, *otagai ni*. Catalan has both a reciprocal adverb, *l’un a l’altre*, and reciprocal syntactic clitics, *es* (3rd pers.), *ens* (1st pers), etc. (homophonous for all persons with the plural reflexive clitics). Even in English, *each other* is not a determiner or a determiner-like expression—it cannot compose with another nominal expression to form a DP—yet it exhibits the same conservativity that is observed with universal quantifiers like *all* or *every*, as shown by (14). (To appreciate the point of (14), one must hold constant the reference of *the cats*.)

- (14) $\llbracket \text{The cats like each other} \rrbracket = 1$ iff $\llbracket \text{The cats are the cats that like each other} \rrbracket = 1$

Moreover, every grammar has adverbs like *always*, which can be seen to be just as conservative as any determiner when it is recognized that the set they live on is denoted by

a (possibly tacit) adverbial clause, e.g. an *if*-clause or a *when*-clause (Schwarzschild 1989, de Swart 1991).

Observations such as these suggest that an important generalization is being missed when attention is restricted to the conservativity of determiners and determiner-like expressions. Nonetheless, the fact that expressions of several different syntactic categories can be conservative does not invalidate the empirical claim of Barwise and Cooper (1981) that if a natural language expression is a determiner, then it must conform to the Principle of Conservativity. Extending Barwise and Cooper's claim to determiner-like expressions as well, the semantic universal in question may be described as (15), where α is either a determiner or a determiner-like expression, A and B are the denotations of the two logical arguments of α , and ... is the syntactic position of the NP that denotes A, when α is a determiner, or of the DP whose NP denotes A, when α is a determiner-like expression. (B is the denotation of the VP that $[\alpha \dots]_{DP}$ composes with syntactically to form a sentence.)

$$(15) \quad [\alpha \dots]_{DP} \rightarrow ([\alpha](A,B) \leftrightarrow [\alpha](A, A \cap B))$$

As noted in the discussion of (4) above, Barwise and Cooper's claim to describe a very basic semantic principle of UG does appear to be correct in some sense. However, it remains unclear exactly what types of expressions this principle applies to and exactly what the best formal description of it should be. If (15) is taken as the correct description of this principle, then ONLY cannot be a determiner or a determiner-like expression (by *modus tollens*). Consequently, it might be proposed that ONLY has the syntax of a determiner-like expression, but semantically is something else. This move severely undermines another basic semantic enterprise, however, namely the effort to provide a semantic description of natural language that conforms to the Fregean Principle of Compositionality. If an expression can compose syntactically with a nominal expression to form a DP, but this DP does not behave semantically like a DP in that it is not subject to (15), then such an expression violates the basic principle that the meaning of a complex expression is a function of the meanings of its constituent expressions and the rules of composition. This is also the fundamental problem with the hypothesis that ONLY is a special kind of adverb that is able to modify a DP as well as a VP. If it is able to compose with a DP, then syntactically it is not an adverb, in which case how can it nonetheless be an adverb semantically so as not to be subject to (15)? Alternatively, (15) might be revised as (16), so that it only applies to simple determiners and not to determiner-like expressions. (This is more in line with what Barwise and Cooper actually proposed.⁴)

$$(16) \quad [\alpha]_{Det} \rightarrow ([\alpha](A,B) \leftrightarrow [\alpha](A, A \cap B))$$

⁴ "We know of no counterexamples in the world's languages to the...requirement [that] every natural language contains basic expressions, (called determiners) whose semantic function is to assign to common noun denotations (i.e. sets) A a quantifier that lives on A." (p. 179). Barwise and Cooper define the live-on relation as follows: "In a model $M = \langle E, [] \rangle$, a quantifier Q lives on a set $A \subseteq E$ if Q is a set of subsets of E with the property that for any $X \subseteq E$, $X \in Q$ iff $(X \cap A) \in Q$ " (p. 178).

This would eliminate the problem posed by ONLY—assuming the evidence in (8) that ONLY may also occur as a simple determiner can also somehow be explained away. Given (16), determiner-like expressions, such as *only* in (1) and (5a-b), or *all* in (4c), would no more be subject to the semantic universal in question than would adverbs such as *minna*, *allemaal*, or *always*, or than would reciprocals such as *each other* or proper names such as *John*. However, when revised as (16), Barwise and Cooper's claim is in danger of reducing to an un insightful description. It cannot be related to the syntactic fact that simple determiners compose with nominal expressions to form DPs, since determiner-like expressions do this as well.⁵ But then it cannot be straightforwardly derived from the Principle of Compositionality and offers no suggestion about why it should exist in the first place as a part of UG. In contrast, the description of this semantic universal in (15), which covers all expressions that compose with nominal expressions to form a DP, sheds some light on its reason d'être. (15) is the claim that, in accordance with the Principle of Compositionality, quantifiers that compose syntactically with nominal expressions must live on the set denoted by the common noun at the core of these nominal expressions.

Recently, an alternative solution to the problem posed by determiner-like ONLY has been suggested by de Mey (1991). De Mey points out that while ONLY in a context such as (17a) does not live on the set denoted by the nominal expression it composes with, it does live on the set denoted by its second argument, i.e. the VP that the DP which it forms composes with. This is shown by the fact that the truth or falsity of (17a) entails the truth or falsity of (17b), and vice versa.

- (17) a. *Only the cat is holding a flag.*
 b. *Only the cat that is holding a flag is holding a flag.*

This observation, and related considerations, lead de Mey to propose that the traditional definition of the Principle of Conservativity is inaccurate and that more a fine-grained analysis reveals there actually to be two different kinds of conservativity in natural language, 'right-conservativity', which may be formally described as in (18a), and 'left-conservativity', which may be formally described as in (18b). (In (18), α is an expression of any syntactic category.)

- (18) a. An expression α is right-conservative iff $\llbracket \alpha \rrbracket(A, B) \leftrightarrow \llbracket \alpha \rrbracket(A, A \cap B)$
 b. An expression α is left-conservative iff $\llbracket \alpha \rrbracket(A, B) \leftrightarrow \llbracket \alpha \rrbracket(A \cap B, B)$

Given (18), a determiner such as *every* can be seen to be right-conservative, while determiner-like ONLY can be seen to be left-conservative. This allows us to revise Barwise and Cooper's semantic universal as (19), which retains the insightfulness of (15) while applying as much to determiner-like ONLY as to determiner *every* or determiner-like *all*.

⁵ Granted that simple determiners and determiner-like expressions compose with expressions of different logical types, why should the semantic universal in question be sensitive to this difference between simple determiners and determiner-like expressions but insensitive to the more globally significant fact that they both yield expressions of the same logical type and hence compose with other expressions to form sentences in the same way?

$$(19) \quad [\alpha \dots]_{DP} \rightarrow (([\alpha](A,B) \leftrightarrow [\alpha](A, A \cap B)) \vee ([\alpha](A,B) \leftrightarrow [\alpha](A \cap B, B)))$$

Simply put, what (19) says is that if an expression composes with anything to form a DP—which DP in turn composes with a VP to form a sentence—then either it must be right-conservative and live on the denotation of the expression it composes with to form a DP, or it must be left-conservative and live on the set denoted by the VP that this DP composes with to form a sentence.⁶

Given the formulation in (19) of Barwise and Cooper’s semantic universal, we may suppose, following Rooth (1985), that in adult English, and in principle all adult grammars, ONLY is a cross-categorical family of syntactically distinct lexicalizations that all share the same basic meaning⁷. The semantic universal in (19) applies to the determiner and determiner-like members of this family, but not to other lexical realizations of ONLY such as adverb ONLY.

3. The Meaning of Determiner ONLY

In this section I will review what I will be taking the semantics of determiner-like ONLY to consist in and discuss in greater detail the two competing hypotheses about what underlies the requirement that determiner-like ONLY associate with a focused DP right-adjacent to it. (Henceforth I will call this later property of determiner-like ONLY its “focus association requirement”.)

First, following Rooth (1985:120-121), we may represent the core meaning of the ONLY family as (20), where **a** is an expression of type *t*, i.e. a proposition, and *C* is a context variable restricting the domain of universal quantification. (20) may be thought of as a formal description of a substantive universal from which adverb ONLY and determiner-like ONLY derive during the process of first language acquisition.

$$(20) \quad \frac{\forall P[C(P) \ \& \ \downarrow P \rightarrow P = \uparrow \mathbf{a}]}{\text{assertion}} \quad \& \quad \frac{\mathbf{a}}{\text{conventional implicature}}$$

Following Horn (1969), the meaning of ONLY is taken to consist of both an assertion and a presupposition (specifically, a conventional implicature), as indicated in (20). Thus, a sentence such as *Only the cat is holding a flag*, does not assert that the cat in question is holding a flag. However, it is infelicitous unless the listener and speaker already believe this to be the case. This aspect of the meaning of ONLY will be relevant when considering the experimental conditions under which a sentence containing ONLY may be felicitously tested.

⁶ Of course, things are a bit more complicated when a DP is contained in a VP, e.g. as the object of a verb; it must QR out of this VP in order to compose with it.

⁷ This does not make ONLY particularly remarkable. The same can be said of *all* and *each*, both of which occur as adverbs as well as determiners (cf. Dowty and Brodie 1984). Likewise, *and* and *or* are cross-categorical families of expressions of different logical types.

Abstracting away from this presuppositional content, the translation of the determiner-like member of the ONLY family into an appropriately extended intentional logic is represented as in (21) in Rooth's (1985) analysis. R is an operator that sets the value of C as $[[DP]]_F$, the focus semantic value (Rooth's "p-set") of the focused DP right-adjacent to ONLY.⁸

$$(21) \quad [\text{only DP}]_{DP} \Rightarrow \lambda Q [R (C, [[DP]]_F, \forall P [C(P) \ \& \ \downarrow P \rightarrow P = \uparrow DP'(Q)])]$$

Given (21), the IL translation of (22a) may be represented as (22b). Because of the way the interpretation of R is defined (Rooth 1985:59), and the way focus semantic value is defined (Rooth 1985:14), for (22a) the context variable C will be the set of alternative propositions represented in (22c), i.e. the set of propositions that there is a flag that somebody is holding, one member of which is the proposition that the cat in question is holding a flag. Thus, the meaning of (22a) may be paraphrased as (22d).

- (22) a. *Only the cat is holding a flag.*
 b. $R (C, [[\text{the cat}]]_F, \forall P [C(P) \ \& \ \downarrow P \rightarrow P = \exists! x \exists y [\text{cat}'(x) \ \& \ \text{flag}'(y) \ \& \ \text{hold}'(x,y)]])$
 c. $\{ \exists y [\text{flag}'(y) \ \& \ \uparrow \text{hold}'(x,y)] \mid x \in E \}$
 d. If all relevant propositions are the proposition that somebody is holding a flag, then they are the proposition that the cat is holding a flag.

Note that, under this analysis, semantics does not determine which alternative propositions are pragmatically relevant. In the case of assigning a truth value to (22a), semantics does not specify what subset of the universe E referred to in (22c) is under consideration, and hence does not directly determine what alternative propositions will be included in C.

Turning to the focus association requirement of determiner-like ONLY, recall that one view is that this requirement is determined by syntax. However such a proposal is formulated, what it boils down to is the claim that the focus association requirement follows from the circumstance that the semantic interpretive rules lexically specified for determiner-like ONLY can only apply to a certain syntactic configuration at LF and no meaning at all can be assigned if the DP right-adjacent to determiner-like ONLY is not taken as its first logical argument. The alternative view is that the focus association requirement is built into the semantics of determiner-like ONLY, with no direct reference made to its syntax. For example, in the analysis of Rooth (1985), the focus association requirement follows from the interaction of the semantics of determiner-like ONLY with a pragmatic prohibition against tautological

⁸ In Rooth's analysis, the focus semantic value of any constituent is recursively determined on the basis of the focus semantic value of the focused expression contained in it. In Rooth (1985), R simply identifies this as the value of C. In Rooth (1991), however, R is revised so that it merely constrains the value of C to be a subset of the focus semantic value of the focused constituent. This revision shifts to pragmatics even more of the job of actually determining the value of C than it had under the account in Rooth (1985). Grammar constrains what may be taken to be the pragmatically relevant domain of quantification for ONLY, but it does not actually determine this domain.

assertions. Under this analysis, because of the way that R is interpreted locally,⁹ if the DP right-adjacent to ONLY in a sentence such as (22a) were not focused, then the restrictor operator R would define C as a singleton set of propositions whose only member was the proposition that the cat in question was holding a flag. This, of course, would be identical to the proposition presupposed by this sentence. Thus, with the DP right-adjacent to ONLY not focused, the complete meaning of both (22a) would be ‘If all relevant propositions are the proposition that the cat is holding a flag, then the cat is holding a flag (assertion) and the cat is holding a flag (conventional implicature)’. Clearly, an utterance with such a meaning would be highly infelicitous. Not only would the assertion itself be tautological, it would assert the same proposition that it presupposed.

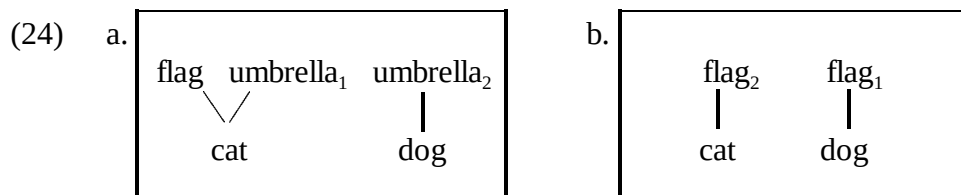
4. Predictions About Children’s Comprehension of Determiner-like ONLY

As noted in the introduction, the prediction of syntactic accounts of the focus association requirement of determiner-like ONLY is that children will not ever disobey this requirement, because they know and obey their syntax, and that whatever nonadultlike performance they show with sentences containing determiner-like ONLY will be due to non-grammatical factors. In contrast, if it is observed that children systematically fail to apply the focus association requirement under ordinary circumstances of language use, this will constitute evidence that it is semantic properties of determiner-like ONLY that determine the focus association requirement, since children have a general difficulty mastering the application of complex semantic interpretive procedures.

In the previous section it was noted that under Rooth’s analysis of the meaning of ONLY pragmatic restriction of the domain of quantification of ONLY is not determined by grammar. This might seem to offer a possible non-grammatical account of nonadultlike child comprehension of *only*-sentences, should such performance be observed. Given the general delay in the development of pragmatic competence, it may be that, quite generally, children defined relevance rather differently from the way adults do. If so, this could affect the way children comprehend ONLY. Suppose that in determining the truth value of the sentence in (22a) above, a child took E in (22c) to include more individuals, or less individuals, than an adult would take it to include. This would make the truth conditions of (22a) assigned by the child different from those assigned by an adult. However, there is a lower bound to the range of possible variance from adult pragmatic performance here: the child could not define the relevant domain of quantification in such a way that C contained no alternative propositions at all of the type that an adult would consider relevant, for this would simply be inconsistent with the semantics of ONLY. In the case of (22a), then, repeated for convenience in (23a), any child correctly applying the syntactic and semantic rules of her target adult grammar would have to take as relevant at least one proposition that some individual other than the cat in question was holding a flag. Thus, if it were observed that a child consistently did not find a sentence such as (23a) to be true of a situation such as schematically represented in (24a) and false of a situation such as (24b), or consistently did not find (23b) to be true of (24b) and false of (24a), this nonadultlike performance could not be attributed to nonadultlike determination of pragmatic restriction.

⁹ This is the syntactic aspect of Rooth’s analysis of the focus association requirement.

- (23) a. *Only the cat is holding a flag.*
 b. *The cat is holding only a flag.*



Rather, such comprehension performance would seem to indicate that the child was not applying the adult grammatical requirement that determiner-like *ONLY* associate with the focused DP right-adjacent to it. Thus, whether correct or not, the hypothesis that children pragmatically restrict the domain of quantification in a nonadultlike manner with *only*-sentences cannot in principle account for apparent violations of the focus association requirement of determiner-like *ONLY*.

There is another pragmatics-related hypothesis to consider, should apparent violations of the focus association requirement be observed with children. Suppose that Rooth's semantic account of this requirement is correct. Is it not perhaps possible that children are generally unaware of the pragmatic inappropriateness of tautological assertions? If so, they might freely violate the focus-association requirement of determiner-like *ONLY*. For such a child, however, a sentence containing determiner-like *ONLY* would be necessarily true. Not only does such a possibility seem highly implausible, it makes a prediction which we will see later is quite false. It predicts that some children will sometimes find both sentences in (23) to be true of both of the situations schematically represented in (24).¹⁰ Since this simply does not happen in experimental contexts to any significant extent with any attentive child, we may dispense with this hypothesis at this point.

There is yet another pragmatics-related hypothesis to be considered, should apparent violations of the focus association requirement be observed with children. Suppose Rooth's analysis of this requirement is correct and it is not the case that children are generally unaware of the pragmatic inappropriateness of tautological assertions, but it is the case that children often find it difficult to apply such discourse-related principles, especially when they must be invoked in determining the truth value of a sentence. If so, a sentence containing determiner-like *ONLY* may cause the same kind of processing overload that has been hypothesized to be responsible for children's apparent delay in the acquisition of Principle B (Grodzinsky and Reinhart 1993). That is, due to a shortage of working memory, the semantic interpretive procedure for determiner-like *ONLY*, which crucially relies on a calculation of the pragmatic well-formedness of the sentence containing it, may often breakdown. In the case of such a

¹⁰ Such behavior observed in an otherwise normally developing child subject could just as easily be indicating the confounding effects of a strong yes-response bias due to such factors as inattention or failure to master the experimental task, or possibly it could indicate the effects of delayed lexical acquisition of *ONLY* in the case of the very young. When running a child language experiment, one generally does come across one or two subjects of this sort; however, they generally respond this way consistently throughout the entire experiment, or throughout a large portion of it, and thus can easily be identified by control conditions or probe questions and excluded from the study on the basis of independent criteria.

breakdown, a ‘guessing’ strategy would be adopted as to which DP in the sentence was focused and associated with ONLY. Let us call this the “Pragmatic Processing Problem Hypothesis”, and note that it makes a testable prediction. According to this hypothesis, a child may oscillate between (i) correctly applying the adult truth conditions of (23a) to (23a) and (ii) incorrectly applying the adult truth conditions of (23b) to (23a). Likewise, for such a child (23b) would alternately be assigned the meaning adults assign to it and the meaning adults assign to (23a). A child for whom the hypothesized processing overload always occurred when attempting to process a sentence containing determiner-like ONLY would correctly find (23a) true of (24a) and false of (24b) roughly half the time, but would incorrectly find (23a) false of (24a) and true of (24b) the rest of the time, and likewise with respect to (23b). Exactly this response pattern would not be found with all children, though. Different children would apply the ‘guessing strategy’ at different frequencies, since the maturation of language-dedicated working memory is a function of age, experience, and genetic predisposition. Thus, the Pragmatic Processing Problem Hypothesis makes no predictions about individual performance. However, it does make a testable prediction for groups of children. It predicts that some children will, to varying degrees, show the predicted response pattern some of the time both for sentences such as (23a) and for sentences such as (23b). This prediction would be falsified if, for example, the predicted response pattern was observed for one of these sentence types but not the other.

5. Norwegian Child Language Experiment

The experiment examined Norwegian children’s comprehension of sentence such as (25a) and (26a), which have the s-structures shown in (25b) and (26b), respectively. Tokens of these two sentence types were always presented with the focused DP right-adjacent to *bare* contrastively stressed, as indicated by capitalization in (25) and (26).

- (25) a. *Holder bare KATTEN et vlag?*
 hold-Pres only cat-the a flag
 ‘Is only the cat holding a flag?’
 b. [holder_F [bare [katten]_F]_{DP} t₁ et vlag]
- (26) a. *Holder katten bare et VLAG?*
 hold-Pres cat-the only a flag
 ‘Is the cat holding only a flag?’
 b. [holder_F katten t₁ [bare [et vlag]_F]_{DP}]

5.1. Subjects

25 children participated in the study. One additional child who was interviewed was excluded from the study for consistently responding “yes” throughout the entire experiment. All the children were monolingual native speakers of Norwegian attending one or another of two preschools in the city of Bergen, Norway. There were approximately as many boys as girls. Ages ranged from 4;5 to 6;9, and the mean age was 6;0. In addition, two monolingual adult native speakers participated as a control group.

5.2. Procedure, Design, and Materials

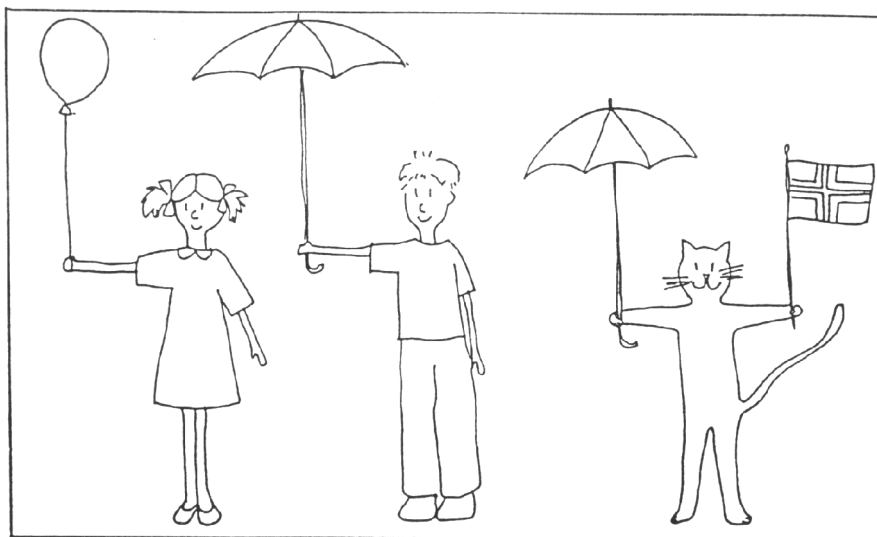
Each child was interviewed individually in a single 15-minute experimental session by two experimenters, who were also adult native speakers of Norwegian, in a quiet area of the preschool the child was attending. The experiment employed a ‘guessing game’ truth-value judgement paradigm. For the child, the principal task was to examine pictures, listen to guesses made about them by someone who could not see them, and indicate whether or not the guesses were correct. One experimenter sat opposite the child and played the role of the ‘guesser’. Another experimenter, the ‘helper’, sat with the child and manipulated the pictures about which the guesser made guesses. The child played the role of the ‘judge’. The pictures were hidden from the guesser at all times throughout the experiment, and the backs of each picture, where four guesses about it were written, were hidden from the child at all times. Each guess was the target input sentence of a trial of one or another test condition, or it was a filler item. The guesses were always yes/no questions with clearly enunciated contrastive stress on the grammatically focused constituent. Presenting the target input sentence as a yes/no question made it easy for the child to plan and execute a response indicating her judgement as to the truth or falsity of the guess, and it made it clear what this judgement was (“yes” child response => child finds target input sentence to be true; “no” child response => child finds target input sentence to be false). For each trial of a test condition, just before presentation of the target input sentence (the guess), the experimenter playing the role of the helper told the guesser what objects were depicted in the picture, pointing out each one to the child as it was mentioned. In one crucial case, the picture showed two objects of the same type. Before making the first guess, the guesser always asked the child how many of these objects there were. In this manner, the context-setting linguistic input—which was described to the child as ‘hints’ for the guesser—served to call to the child’s attention the fact that all the objects depicted in the picture were relevant for determining the truth or falsity of each guess. Note, in particular, that since the child herself answered the *how many* question—and it was always correctly answered—it seems likely that she was aware that both of these objects were relevant for determining the truth or falsity of the guesser’s guess.

There were four different guesses for each of the ten pictures used in the experiment. For four of these pictures, all four guesses were filler items. For the other six pictures, three of the guesses were the target input sentences for trials of three different test conditions, and the fourth guess was a filler item. For all pictures, two of the four guesses were correct for an adult, and two were incorrect. The pictures were presented in a single fixed, pseudo-random, order. Within each block of four guesses for a single a picture, the ordering of correct and incorrect guesses (for an adult) were counterbalanced, so that a trial of a test condition eliciting an adult “yes” response occurred as often before as after a trial of an test condition eliciting an adult “no” response.

There were six different test conditions, S1, S2, S3, O1, O2, and O3. For each test condition, there were three different trials, varying the objects referred to by the target input sentences but holding constant the predicate. Trials of three of the test conditions were always presented together as consecutive guesses about different aspects of the same picture. For three of the test conditions, one picture type was used; for the other three another picture type was used. For example, one trial each of the S1, S2, and S3 conditions were presented

as shown in (27), and one trial each of the O1, O2, and O3 conditions were presented as shown in (28). In (27) and (28), the target input sentence of each test condition is indicated by a label in parentheses, and the child is always shown giving an adult-grammatical response. Keep in mind also that the helper is always addressing the guesser, not the child.

(27) S1, S2, and S3 Conditions



Helper: *Well, we have a boy, a girl, and a cat,
and there's a balloon, a flag, and some umbrellas.*

Guesser: *How many umbrellas are there?*

Child: *Two.*

Helper: *Okay. Ready? What's your first guess?*

Guesser: *Hmm. Let's see. Is only the BOY holding an umbrella? (S1)*

Child: *No. The cat has an umbrella too.*

Helper: *Too bad. Wanna guess again?*

Guesser: *Hmm. Let's see. Is only the GIRL holding a balloon? (S2)*

Child: *Yes.*

Helper: *Good guess. Wanna try again?*

Guesser: *Hmm. Let's see. Is only the CAT holding a flag? (S3)*

Child: *Yes.*

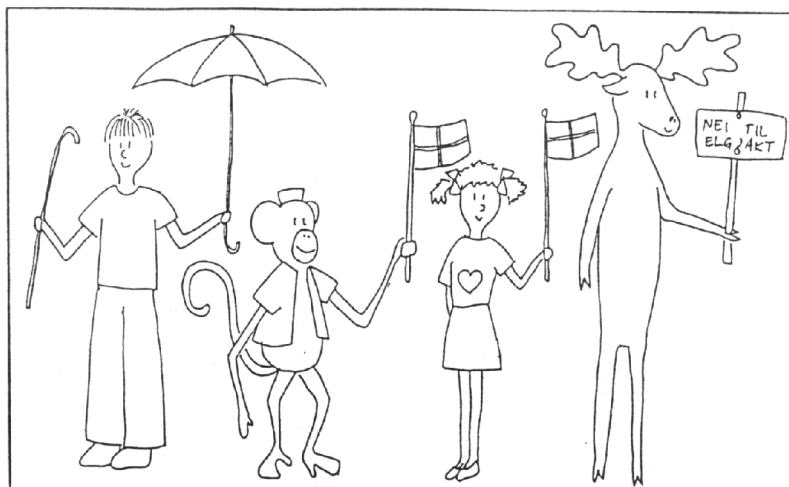
Helper: *Another good guess. Wanna try one more?*

Guesser: *Okay. Let's see. Is the balloon red? (filler)*

Child: *No. It's green.*

Helper: *Okay. Let's get another picture.*

(28) O1, O2, and O3 Conditions



Helper: *Well, we have a boy, a girl, a monkey, and an elk,
and there's a sign, a stick, an umbrella, and some flags.*

Guesser: *How many flags are there?*

Child: *Two.*

Helper: *Okay. Ready? What's your first guess?*

Guesser: *Hmm. Let's see. Is the elk holding only a SIGN? (O1)*

Child: *Yes.*

Helper: *Good guess. Wanna guess again?*

Guesser: *Hmm. Let's see. Is the boy holding only an UMBRELLA? (O2)*

Child: *No. He's also holding a stick.*

Helper: *Too bad. Wanna try again?*

Guesser: *Hmm. Let's see. Is the monkey holding only a FLAG? (O3)*

Child: *Yes.*

Helper: *Another good guess. Wanna try one more?*

Guesser: *Okay. Let's see. Is the umbrella blue? (filler)*

Child: *No. It's red.*

Helper: *Okay. Let's get another picture.*

Note that the materials were designed in such a way that if the child understood the target input sentences of the first two test conditions in an adultlike manner, then immediately prior to being presented with the target input sentence of the third test condition she would have observed both a situation which falsified a sentence of the same type and a situation which verified a sentence of the same type. This has bearing on the claim of Crain et al. (1996) that children find a sentence "infelicitous" unless they have first been shown a situation that satisfies, and a situation that falsifies, the truth conditions of this test sentence

under an adult reading of it. While the mode of presenting trials of the test conditions in this experiment does not quite satisfy Crain et al.'s so-called "conditions of plausible assent and dissent", it comes so close to doing so that it seems unlikely that any effects of the sort hypothesized by Crain et al. would confound performance. In any case, Crain et al.'s methodology applied by others has failed to replicate their findings both with respect to sentences containing determiner universal quantifiers (Brinkmann and Drozd 1996) and with respect to sentences containing determiner-like ONLY (Drozd, to appear), so it is unclear how strong the effects in question are.

Note also that, as regards infelicity effects, the target input sentences were always clearly felicitous for an adult under the experimental conditions tested. This is simply because the pictures always visually represented the proposition presupposed by ONLY in the guesser's guess and the guessing game context made it clear that the entire contents of a given picture was relevant for determining the correctness of a guess about this picture. Moreover, since the guesser made incorrect guesses as often as correct ones, the experiment gave the impression that the target input sentences were genuine guesses. While one may speculate, following Crain et al. (1996), that children's appreciation of the felicity of sentences is radically different from that of adults—a supposition which faces a rather large discontinuity problem, incidentally—the null hypothesis, it seems to me, is that children generally find sentences perfectly felicitous when presented under conditions in which adults find them felicitous.

5.3. Results

An ANOVA comparing the performance of the younger half of the sample with that of the older half showed there to be no main or interactive effects of age. The average percentages of "No" responses of the children under the 6 test conditions, and of the 2 adults in the control group, are shown in Table 1 (standard error in parentheses). Findings of nonadultlike child performance are boldfaced.

Table 1.

Percentages of "No" Responses Under Test Conditions

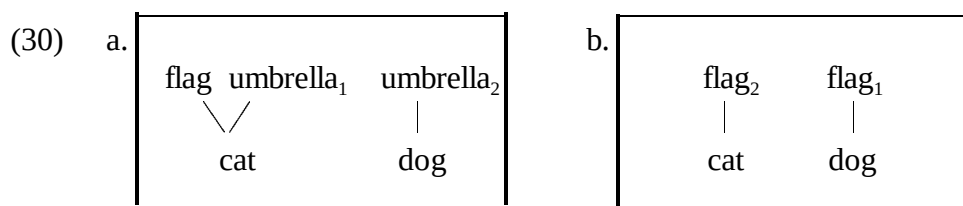
	S1	S2	S3	O1	O2	O3
2 Adults	100%	0%	0%	0%	100%	0%
25 Children	7% (3)	0%	88% (5)	0%	91% (5)	4% (4)

6. Discussion

The results bear out some predictions, and disconfirm others, but they also bring some surprises. First, as regards the first theoretical question, the results strongly suggest that a syntactic account of the focus association requirement of determiner-like ONLY is inferior

to a semantic account of this grammatical requirement. Contrary to the prediction of syntactic accounts, but consistent with semantic accounts, the children violated the focus association requirement of determiner-like ONLY in a big way. They behaved as if they had ‘inverted’ the truth conditions of sentences such as (29a) and (29b) under the S1, S2, and S3 conditions, responding “yes” rather than “no” virtually all the time when questions such as (29a) was asked of situations such as (30b) and responding “no”, rather than “yes”, most of the time when questions such as (29a) were asked of situations such as (30a).¹¹ (The children’s performance under the S2 condition is consistent with this pattern as well, since either type of sentence is true under this condition.)

- (29) a. *Is only the cat holding a flag?*
 b. *Is the cat holding only a flag?*
 c. *Is the cat only holding a flag?*



This finding replicates a finding of previous studies of determiner-like ONLY in child English (Crain et al. 1992) and in child Dutch (van Beek 1997, Drozd (to appear)). Using specially designed experimental conditions, Crain et al. (1996) obtained different results with a small sample of English speaking children. They reported completely adultlike performance with sentences such as (29a). However, as already noted, Drozd (to appear) was unable to replicate this for Dutch children when using the same contrived experimental conditions. Moreover, even if the effect reported in Crain et al. (1996) is real, it only underscores the children’s general inability to perform like adults under experimental conditions that are more ecologically valid. Thus, I conclude that the sum of the psycholinguistic evidence from child language constitutes a strong argument that it is not syntax, but rather, semantics that is responsible for the focus association requirement of determiner-like ONLY in adult grammars.

A second finding of this experiment, which distinguishes it from previous studies reporting nonadultlike child comprehension of *only*-sentences, is that the children showed highly adultlike comprehension of sentences such as (29b).¹² This finding is very problematic

¹¹ Although probe questions were not asked, many children spontaneously explained why, in their judgement, the guesser’s guesses were wrong. In each case that this happened for the S3 condition, the child’s explanation revealed that she had taken a sentence such as (29a) to have the meaning an adult would assign to a sentence such as (29b). For example, for the trial of the S3 condition represented in (27), those children who offered explanations of why they found the guess to be incorrect always made reference to the fact that the cat in was also holding an umbrella.

¹² Both Crain et al. (1992) and van Beek (1997) found that some children behaved as if they consistently assigned the adult truth conditions of sentences such as (29a) to sentences such as (29b) as well as to sentences such as (29a). I have no explanation of this. However, it is interesting to note that in a pilot

for Pragmatic Processing Problem Hypothesis discussed in section 4 above. Contrary to the one testable prediction of this hypothesis, the children did not show any sign of uncertainty as to the truth conditions of sentences such as (29b), apparently assigning adult readings virtually all of the time.

The fact that the children performed so well with sentences such as (29b), but so poorly with sentences such as (29a), shows that it is not really accurate to describe their comprehension performance as consisting in an “inversion” of the truth conditions of sentences such as (29a) and (29b). Rather, it looks more as though they are simply treating determiner-like ONLY as an adverb. That is, it looks as though they were assigning to sentences such as (29a) and (29b) the syntax of sentences such as (29c). Note that when its object DP is contrastively stressed, (29c) is true and false of exactly the same situations as (29b). What I would like to suggest, then, is that what appears to be going on here is exactly what is going on: preschool children prefer not to analyze determiner-like ONLY as a determiner-like expression; they prefer to analyze it as an adverb. I further suggest that this preference follows directly from the correct observation that ONLY is not right-conservative and the erroneous supposition that if a quantificational expression is determiner-like it ought to be right-conservative. In other words, children are inclined to take (15) in section 2 above as the correct description of the semantic universal discovered by Barwise and Cooper (1981), when actually the correct description is (19). Note that since ONLY also does occur as an adverb—e.g. as in (29c) and its analog in Norwegian and Dutch—and since the focus association requirement of determiner-like ONLY is not syntactically encoded, this speculative hypothesis is fully consistent with a Strong Continuity view of syntactic development (which I assume is correct). Note also that since many adult linguists draw essentially the same conclusion about determiner-like ONLY, the child’s inclination to reject the determiner-hood of ONLY in sentences such as (29a-b) shows no great discontinuity with adult cognition.

When I describe children as “preferring” to analyze ONLY as an adverb, and as being “inclined” to take (15) rather than (19) as the correct statement of Barwise and Cooper’s semantic universal, I am, of course, speaking metaphorically. As to their preference for adverbs, what I am claiming is that their grammar **allows** them to analyze ONLY as an adverb in sentences such as (29a-b), not that it requires them to do so, and that under ecologically

study involving 9 English-speaking children (mean age 5;7) Roberts (1993) found that the children she tested who showed this nonadultlike performance shifted to highly adultlike comprehension of *only*-sentences when the focused constituent right-adjacent to ONLY was contrastively stressed, as was the case in this experiment. In contrast, the children Roberts tested who showed the response pattern observed in this experiment did not change their way of understanding *only*-sentences when the grammatically focused constituent was contrastively stressed. Van Beek (1997) reports another experimental finding that may have bearing on this other form of nonadultlike comprehension of determiner-like ONLY that has been observed with children. In her Dutch experiment, van Beek found that a large number of her adult control subjects behaved as if they found that Dutch sentences syntactically analogous to (29c) could have the truth conditions of sentences syntactically analogous to (29a). This is not a possible focus association for adverb ONLY in adult English, but if it is a possibility allowed by UG, then children acquiring English who analyze determiner-like ONLY as an adverb might well allow such focus associations. Dutch children showing this other form of nonadultlike comprehension of determiner-like ONLY would simply be analyzing it as an adverb and then allowing it the same focus association freedom that is allowed adverb ONLY in their target adult grammar.

valid experimental conditions this is what they will tend to do. Thus, an observation that children can be made to understand determiner-like ONLY in a fully adultlike manner under special experimental conditions would not be evidence against my claim. If anything, it would be evidence in support of it. Note also that this “Adverb Hypothesis” for child language has been previously proposed as part of an account of children’s nonadultlike comprehension of sentences containing determiner universal quantifiers like *every* (Philip 1995) and as a general phenomenon in child language (Roeper and deVilliers 1991).

Since I am hypothesizing a structural ambiguity in child grammar that does not exist in the target adult grammar, it might be objected that my hypothesis gives rise to a learnability problem. I don’t agree. Positive evidence will tell the child that, contrary to her adverbial analysis, a sentence such as (29a) is always true of situations such as (30a), and negative semantic evidence will tell her that (29a) is always false of situations such as (30b).¹³ Since Gold (1967), it has always been assumed that positive evidence corrects false initial hypotheses, and it is also standardly assumed that this may occur in an indirect manner as well (e.g. Chomsky 1981). As regards negative semantic evidence, only a very casual reading of the negative evidence literature would lead one to make the completely unsubstantiated claim that it is not available in the input to the child. Evidence that even direct negative semantic evidence does occur in the child’s input was first noted by Brown and Hanlon (1970:47-48) and numerous subsequent studies have confirmed this finding. While a number of studies have shown that direct and indirect negative evidence as to the grammaticality of surface forms is not available to the child, this well-established fact is completely irrelevant to the question of whether or not direct or indirect negative evidence as to the **meanings** of surface forms is available to the child.

As to children’s tendency to conform to the formulation in (15) of Barwise and Cooper’s semantic universal, rather than to the formulation in (19), what I am suggesting is that (15) describes an earlier avatar of an emerging, innately specified, semantic universal that eventually becomes what (19) describes. I adopt here the nativist connectionist position of Elman et al. (1997). In other words, children do not have to choose between the principle described by (15) and that described by (19); rather, they initially adopt the principle described by (15), rather than that described by (19), because the principle described by (15) is what later becomes the principle described by (19).

Finally, turning to the second theoretical question that I believe is addressed by the experimental evidence from child language presented in this paper, my argument is as follows: Given that the tendency to conform to the formulation in (15) of Barwise and Cooper’s semantic universal is what underlies children’s tendency to show nonadultlike comprehension of sentences such as (29a), the fact that they show this nonadultlike comprehension is evidence that ONLY is a determiner-like expression in such contexts in the adult grammar, since otherwise the children would have had no cause to comprehend such sentences any differently from the way adults do. In other words, knowing that syntactically ONLY behaves

¹³ Positive evidence can do this as well. Consider sentences such as *It’s not the case that only the cat is holding a flag in (30b)*. For adults, this sentence is true (therefore, by definition, it is positive semantic evidence); for the child analyzing ONLY as an adverb it would be false.

like a determiner-like expression in contexts such as (29a), children prefer to analyze as an adverb instead, by analog with ONLY in contexts such as (29c), in order that their grammar may conform to (15). The little logicians do not want in their grammars determiner-like expressions that are not right-conservative.

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Accent Insertion in Fukuoka Japanese¹

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1. Introduction

In the dialects of Japanese spoken in the city of Fukuoka, there are two ways in which the prosodic phonology of nouns differs from that of verbs (and adjectives). First, verbs have an obligatory pitch accent, while nouns may be accented or unaccented. These dialects thus differ from dialects such as Tôkyô (McCawley 1968; Poser 1984), in which a word of any category may be either accented or unaccented, as well as from dialects such as Miyakonojô (Hirayama 1943; Haraguchi 1977), in which no lexical items, regardless of category, contrast for accentedness.

The second difference between nouns and other lexical words in Fukuoka is in the phonology of accent location. In (accented) nouns, the location of the accent is lexically contrastive. However, the accent in verbs has a fixed location: it must appear on the penultimate syllable. The Fukuoka dialects are therefore different from those such as Kagoshima (Hirayama 1960; Haraguchi 1977), in which accent location is fixed for accented words of all categories.

In both of these aspects of the prosodic phonology of Fukuoka Japanese, not only do nouns and other lexical words behave differently, but in fact nouns are seen to have a greater degree of phonological freedom than other words. This paper gives an account for why, in Fukuoka Japanese and a number of other languages, nouns have special phonological privilege: The universal constraint set contains noun-faithfulness constraints, that is, domain-

¹This paper is part of ongoing research on noun faithfulness, and many people have given me valuable feedback on aspects of this research. Special thanks to Teruhiro Hayata and Tomoyuki Kubo for providing me with a great deal of information on the phonology of Fukuoka dialects, and to Tomoyuki Kubo, John McCarthy, Lisa Selkirk, members of the UMass Phonology Reading Group, attendees at a Kyushu University linguistics colloquium, and participants at the UMass Linguistics 25th Reunion Poster Session for comments and discussion. Errors and inadequacies are of course my responsibility. This research was partially supported by NSF grant SBR-9420424.

specific (positional) faithfulness constraints for which the relevant domain is the category *noun*. In a language where noun-faithfulness constraints are ranked high in the hierarchy, nouns can license contrasts even when other words can not.

The proposal is developed as follows. Section 2 gives an overview of the phonology of accent in Fukuoka Japanese. Section 3 outlines the theory of noun faithfulness. Sections 4 and 5 present noun faithfulness-based analyses of accentedness and accent location respectively. Finally, conclusions and implications are discussed in Section 6.

2. Overview: Accent in Fukuoka Japanese

The intonational system of Fukuoka Japanese, as described by Hayata (1985), is in many ways similar to that of Tôkyô (McCawley 1968; Poser 1984; Pierrehumbert & Beckman 1988). A phonological phrase generally begins on a low pitch but quickly attains a high pitch, presumably due to a phrasal high (H) tone, as has been proposed for Tôkyô (Pierrehumbert & Beckman 1988). This high pitch extends to the end of the phonological phrase, unless a pitch accent, which is realized as an abrupt fall from high to low (H*+L), is present. As noted above, in Fukuoka dialects the presence or absence of a pitch accent is phonologically contrastive for nouns, but not for other lexical words.

The following examples demonstrate that Fukuoka nouns can be accented or unaccented.

(1) *Unaccented nouns*

- | | |
|---------------------|-------------|
| (a) atama | 'head' |
| (b) tentaibooenkyoo | 'telescope' |

(2) *Accented nouns*

- | | |
|------------|--------|
| (a) inóti | 'life' |
| (b) óokami | 'wolf' |

Unaccented nouns surface without a pitch accent even when spoken in isolation. This fact indicates that there is no requirement on any level of the prosodic hierarchy above the word (such as phonological phrase, intonational phrase, or utterance) such that it must contain a pitch accent.

Furthermore, even the location of the accent is lexically contrastive for nouns. For example, form (2a) has its accent on the second syllable, while form (2b) has its accent on the initial syllable.

On the other hand, verbs and adjectives are much more restricted with respect to the phonology of accent. Words belonging to these categories (henceforth called "verbs" for

simplicity) obligatorily surface with a pitch accent.²

- | | | |
|-----|---------------------|---------------------|
| (3) | /kak-/ _V | 'to write' |
| | (a) káku | 'writes' |
| | (b) káita | 'wrote' |
| | (c) kakán | 'doesn't write' |
| (4) | /aka-/ _A | 'red' |
| | (a) akáka~akái | '(is) red' |
| | (b) akakátta | 'was red' |
| | (c) akakaróo | '(is) probably red' |

As the examples in (3) and (4) show, not only is an accent obligatorily present in verbs, but its location is also fixed. The accent always appears on the (head of the syllable containing the) penultimate mora.

Previous analyses of accent in Fukuoka (Hayata 1985; Kubo 1989) attempt to account for these two dimensions of predictability in verbs by proposing a complex accent-insertion rule such as the following.

- (5) *Penultimate accent insertion rule* (from Hayata 1985:21):

In a phonological phrase that ends in a VP and has no other accent, insert an accent on the syllable containing the penultimate mora.

This rule is complex in the sense that it both *inserts* an accent and *fixes* its position as part of the same process.

However, this kind of rule seems problematic. First, "a phonological phrase that ends in a VP" is arguably not a unit that the phonology can utilize. According to the prosodic-structure theory of the syntax-phonology interface (e.g., Selkirk 1986, 1995), detailed information about syntax is not available to the phonology, which has access only to prosodic structure, not to syntactic structure per se. While prosodic structure is itself formed with some influence from the syntax (for example, the edge of a phonological phrase may correspond to the edge of a maximal projection in the syntax), it does not include specifically

²There are a small number of exceptions to this statement. First, it is a property of WH-questions in Fukuoka dialects that there be no accents between the WH-word and the complementizer with which it is associated (Hayata 1985; Kubo 1989, 1992; Smith in progress). That is, in WH-questions, not only are verbs not accented, but even the underlying accents in accented nouns disappear.

- | | | |
|-----|---------------------------------------|------------------------------|
| (i) | Dare-ga Kyooto iku [Ø _C]? | 'Who's going to Kyoto?' |
| | who-NOM Kyoto go | cf. Kyóoto 'Kyoto'; íku 'go' |

Second, Kubo (1992) identifies a few special modal contexts in which verbs may surface unaccented.

syntactic information, such as the category of a maximal projection. Therefore, the phonology can not recognize that a group of words forms a VP.

Second, the rule shown in (5) collapses into one insertion process the two aspects of the accent phonology of verbs that are obligatory in Fukuoka: the *presence* of accent and the *location* of accent. However, an examination of other dialects of Japanese reveals that these are properties that are independently regulated.³ For example, Tōkyō is like Fukuoka in that the location of accent in verbs is fixed. However, in that dialect the presence of accent in verbs is not mandatory; accented verbs and unaccented verbs are lexically contrastive.

For these reasons, then, it seems advisable to avoid using a complex insertion rule such as (5) and instead to attempt to treat the phonology of accent in Fukuoka with an analysis that (a) makes reference only to categories that are motivated in other work on the syntax-phonology interface and (b) allows the presence and location of accent to be regulated separately. The noun faithfulness-based analysis outlined in Sections 4 and 5 below meets these criteria. First, however, Section 3 introduces and motivates the theory of noun faithfulness.

3. Noun faithfulness

In the original conception of Optimality Theory (OT; Prince & Smolensky 1993), the presence or absence of a particular phonological contrast in a language is derived from the interaction of markedness and (general) faithfulness constraints. Markedness constraints (**M**) serve to ban a particular structure (or feature) from output forms, and faithfulness constraints (**F**) require the input specification for a particular structure to be maintained in the output. When the ranking of markedness and faithfulness constraints relevant to a certain structure is **M**>>**F** (**M** dominating **F**), then the structure will not appear in any output forms, so the language can have no phonological contrast involving that structure. On the other hand, with the opposite ranking, **F**>>**M**, faithfulness takes precedence and the input specifications for the structure in question are maintained in output forms. That is, inputs specified for the structure correspond to outputs that have the structure, and inputs not specified for the structure correspond to outputs that do not have the structure. In this case, the language does have a phonological contrast for the structure in question.

However, not all languages permit a phonological contrast to appear freely in all positions. Sometimes a contrast is restricted to certain salient domains within a language. The theory of positional (or domain-specific) faithfulness (PF) has been proposed by Beckman (1998) to explain why positions of greater salience, either phonetically or psycholinguistically, sometimes license more phonological contrasts than other positions in the same language. Salient domains licensing such contrasts that have been discussed in the literature include stressed syllables (Alderete 1995); syllable onsets or [+release] consonants (Lombardi 1996, Padgett 1995; cf. Steriade 1997); roots, as opposed to affixes (McCarthy & Prince 1995); and root-initial syllables (Beckman 1995, 1998).

³Frellesvig (1994) refers to these two properties as 'commutative accent' and 'permutative accent' respectively.

The analysis put forth for such cases is that each of these salient domains is associated with a family of faithfulness constraints that is relevant only to that domain. In a language where one such domain-specific faithfulness constraint is ranked so as to be active in the language, there will be a phonological contrast whose occurrence is limited to that particular domain (see 6f)).

(6) *Typology of possible rankings*

• **M** highest ranked

- (a) **M** >> **F** >> **PF** No contrast in the language
 (b) **M** >> **PF** >> **F** No contrast in the language

• **F** dominates **M**

- (c) **F** >> **M** >> **PF** Contrast throughout the language
 (d) **F** >> **PF** >> **M** Contrast throughout the language
 (e) **PF** >> **F** >> **M** Contrast throughout the language

• **M** dominates **F**, but **PF** dominates **M**

- (f) **PF** >> **M** >> **F** Contrast in privileged position P only

This paper makes the case that in Fukuoka Japanese, nouns license phonological contrasts that are not possible for words of other categories. In fact, this phenomenon is not unique to Fukuoka; there are a number of languages in which nouns are phonologically privileged. For example, in Spanish, nouns contrast for location of stress, but verbs do not (Harris 1969). In Arabic, nouns have more possible stem shapes than verbs have (McCarthy & Prince 1990). In Sinhala, verb-stem final vowels are deleted in certain contexts, but noun-stem final vowels are not (Feinstein 1979; Keer 1996).

These patterns can be accounted for if the theory of positional faithfulness is extended so that the list of salient domains that permit domain-specific faithfulness constraints includes the lexical category *noun*. In other words, the universal constraint hierarchy includes noun-faithfulness constraints (**NF**), faithfulness constraints that are relevant only to nouns (see also Smith 1997, 1998ab). Following the general schema for positional faithfulness as shown in (6), when a language has the ranking **NF**>>**M**>>**F**, nouns will be able to license a contrast that other categories can not.

Beckman (1998) proposes that the positions or domains that license special faithfulness constraints can be only those that are phonetically or grammatically salient. There is some evidence that, by this criterion, the inclusion of nouns in the set of domains that have special faithfulness constraints is justified: nouns have been shown to have greater psycholinguistic salience than verbs (Goldin-Meadow et al. 1976; Huttenlocher & Lui 1979; Gentner 1982; see Smith 1997 for a review of this evidence).

The next two sections of this paper argue that each of the cases of phonological privilege for nouns found in Fukuoka Japanese can be accounted for as a noun-faithfulness effect, with a **NF**>>**M**>>**F** constraint ranking.

(10) *Accents are obligatory for verbs*

/tabeta/ _V	HEADEDNESS >>	DEP(ACC)
a. tabeta	*!	
 b. tabéta		*

Unlike verbs, nouns are permitted to surface without an accent. As outlined in Section 3 above, a contrast is restricted to a privileged domain when the relevant constraints are ranked as in (6f), **PF** >> **M** >> **F**. By this logic, the high-ranking constraint that allows nouns to surface without a pitch accent is the noun-faithfulness constraint DEP(ACCENT)_N, a DEP(ACCENT) constraint that is relevant only to a word of category *noun*.

(11) DEP(ACCENT)_N In nouns, output accents have input correspondents

With this constraint ranked above HEADEDNESS, unaccented nouns are permitted to surface unchanged, as in (12). However, because verbs are not subject to DEP(ACCENT)_N, the highest-ranked constraint that is relevant for them is HEADEDNESS. Therefore, as shown in (13), the new ranking still correctly requires verbs to surface with a pitch accent.

(12) *Nouns resist accent insertion*

/atama/ _N	DEP(ACC) _N >>	HDNESS >>	DEP(ACC)
 a. atama		*	
b. atáma	*!		*

(13) *Verbs are not affected by noun-faithfulness constraints*

/tabeta/ _V	DEP(ACC) _N >>	HDNESS >>	DEP(ACC)
a. tabeta		*!	
 b. tabéta			*

In summary, verbs are obligatorily accented because the markedness constraint HEADEDNESS dominates DEP(ACCENT), the general faithfulness constraint against accent insertion. However, the noun-specific faithfulness constraint DEP(ACCENT)_N dominates HEADEDNESS. As a result, for nouns, it is better to surface faithfully with no accent, violating HEADEDNESS, than to insert an accent, which would cause a violation of undominated DEP(ACCENT)_N.

5. **On accent location**

The second respect in which nouns exhibit privileged behavior in Fukuoka Japanese is in the location of the pitch accent within a word. As demonstrated in (2)-(4), nouns (that

are accented) contrast phonologically for the location of their accent, but verb accents are always penultimate. Again, this case of contrast possibility for nouns alone can be analyzed as a noun-faithfulness effect with a **NF** >> **M** >> **F** ranking.

Predictable penultimate accent can be analyzed, as in Prince & Smolensky (1993), as the result of the interaction of two markedness constraints.

(14) ALIGN-R Every accent falls at the right edge of some prosodic word

(15) NONFINAL(μ) There is no accent on the final mora

The ranking NONFINAL(μ) >> ALIGN-R demands that any pitch accent surface as far to the right as possible without landing on the final mora. That is, this ranking requires accent to be penultimate.

Of course, in order for the markedness constraints to enforce penultimate accent in output forms, they must dominate whatever faithfulness constraints would act to maintain the location of an input accent. These faithfulness constraints might take the form of a "NOFLOP" constraint, which requires the preservation of underlying autosegmental links. Or, they might be more like featural IDENT constraints (McCarthy & Prince 1995), requiring that an output segment have the same status, in this case "accented" or "unaccented", as its input correspondent. In the present discussion, the faithfulness constraints that are responsible for demanding the preservation of the location of input accents will simply be encapsulated with the label FAITHLOC(ACCENT). Whatever their specific formulation, these are the constraints that must be dominated by the markedness constraints NONFINAL(μ) >> ALIGN-R in order to produce default penultimate accent. This ranking and its effects are shown in (16).⁵

(16) *Accents are penultimate*⁶

/tábeta/ _v	NONFIN >>	ALIGN-R >>	FAITHLOC
a. tábeta		**!	
 b. tabéta		*	*
c. tabetá	*!		*

Once again, however, nouns behave differently from other words. Noun accents are not required to be penultimate. In fact, the location of accent for nouns is lexically contrastive. This pattern can be accounted for if the noun-specific faithfulness constraint

⁵In the following discussion, FAITHLOC violations are assumed to be categorical rather than gradient. This arbitrary choice does not affect candidate selection.

⁶When the penultimate mora is not the head of its syllable, the accent shifts one mora to the left, to the mora that is the head of the syllable containing the penultimate mora: tát.ta 'stood'. This suggests that there is a constraint requiring accents to fall on syllable heads, which is undominated in Fukuoka (and, in fact, in many other dialects of Japanese as well).

FAITHLOC(ACCENT)_N, which requires that nouns maintain their input accent location, dominates ALIGN-R. As a result, the pressure to have the accent fall as close to the right edge as possible can not cause nouns to be unfaithful to their input accent location.

Like other constraints in the hierarchy, noun-faithfulness constraints can be dominated. They are dominated in languages where nouns do not show special behavior, for example. And even in Fukuoka Japanese, there is evidence that the relatively high ranking constraint FAITHLOC(ACCENT)_N is itself dominated. Specifically, for older speakers of the Hakata (central/eastern Fukuoka city) dialect as described by Hayata (1985), nouns can not be accented on a final light syllable. This means that the constraint NONFINAL(μ), invoked above to explain why verb accents are penultimate rather than final, outranks even FAITHLOC(ACCENT)_N and is therefore obeyed even by nouns.⁷

The ranking of the four constraints relevant for accent location is thus as follows: NONFINAL(μ) >> FAITHLOC(ACCENT)_N >> ALIGN-R >> FAITHLOC(ACCENT). That this ranking allows underlying noun accents (other than on the final mora) to surface unchanged is shown in (17). That this more comprehensive ranking still makes the right predictions for verbs is demonstrated in (18); again, the reason why accent location is fixed in verbs but not in nouns is because the higher-ranked FAITHLOC(ACCENT)_N is not relevant for verbs, leaving their accent location to be decided by ALIGN-R.

(17) *Nouns maintain underlying accent position*

/óokami/ _N	NONFIN >>	FAITHLC _N >>	ALIGN-R >>	FAITHLC
 a. óokami			***	
b. ookámi		*!	*	*

(18) *Verbs are unaffected by noun-faithfulness constraints*

/tábeta/ _V	NONFIN >>	FAITHLC _N >>	ALIGN-R >>	FAITHLC
a. tábeta			***!	
 b. tabéta			*	*

To summarize the analysis of accent-location facts in Fukuoka Japanese: Undominated NONFINAL(μ) ensures that no word, of any category, can have an accent on the final mora. The ranking of ALIGN-R over FAITHLOC(ACCENT) means that in general, any input accent location is disregarded in favor of a right-edge (penultimate, because it can not be final) location. However, the ranking of noun-specific FAITHLOC(ACCENT)_N above ALIGN-R means that, again with the exception of an accent on the final mora, input accents surface unchanged

⁷Hayata (1985) observes that younger speakers appear not to have this restriction. Presumably there has been a diachronic change, involving among other things a reranking of FAITHLOC(ACCENT)_N above NONFINAL(μ).

for nouns. Just as for the analysis of accentedness presented in Section 4, in the present analysis of accent location, a **NF** >> **M** >> **F** ranking accounts for why nouns exhibit a phonological contrast that other lexical words do not.

6. Conclusion

This paper has shown that in Fukuoka Japanese, as in a number of other languages, nouns license phonological contrasts that words of other lexical categories do not. The distinct phonological phenomena of accentedness and accent location in Fukuoka both show greater privilege for nouns than for other words.

The analysis presented here hinges on the proposal that the universal set of constraints contains faithfulness constraints that are specific to nouns. This theory of noun faithfulness is an extension of the theory of positional faithfulness (Beckman 1998); specifically, it is proposed that the set of salient domains that have specific faithfulness constraints includes the category *noun*. This proposal has some support in the form of evidence that nouns have greater psycholinguistic salience than words of other categories.

One attractive consequence of Optimality Theory (Prince & Smolensky 1993) is that, because all constraints are held to be present in all languages (although with different rankings), strong typological predictions are made whenever new constraints are proposed. In this case, the proposal that there are specific faithfulness constraints for nouns, but not for other categories, predicts that there can exist a language in which all categories have a particular contrast, languages in which no categories have a particular contrast, and languages in which only nouns have a particular contrast. However, a language in which verbs license a contrast that nouns do not is predicted *not* to exist. An apparent counterexample to this prediction, the Tucanoan language Tuyuca (Barnes 1996), has been reanalyzed in a way compatible with the theory of noun faithfulness (Smith 1997, 1998b). The question of whether all apparent cases of verb-specific contrast can be eliminated is the subject of current research.

In any case, with the inclusion of noun-faithfulness constraints in the grammar, there is a way to formally derive the greater phonological freedom that nouns show in Fukuoka Japanese and other languages, linking this freedom to nouns' special cognitive salience.

Appendix: Some representative verb forms (from Hayata 1985)

	/tat-/ 'to stand'	/tabe-/ 'to eat'		
(a)	ta.tán	ta.bén	-an	(negative imperfective)
(b)	tát.ta	ta.bé.ta	-ta	(perfective)
(c)	tát.te	ta.bé.te	-te	(perfective continuative)
(d)	ta.tóo	ta.byóo	-oo	(stem conjectural)
(e)	tá.tu	ta.bé.ru	-ru	(imperfective)
(f)	tá.ti	tá.be	-i	(imperfective continuative)
(g)	tá.te	ta.bé.re	-re	(imperative)
(h)	ta.ti.mée	ta.be.mée	-i-mee	(negative conjectural)
(i)	tat.ta.róo	ta.be.ta.róo	-ta-roo	(perfective conjectural)
(j)	ta.tan.zyát.ta	ta.ben.zyát.ta	-an-zyar-ta	(negative perfective)

Note: There are two forms with antepenultimate accents described by Hayata (1985): tátta-ra/tabéta-ra (perfective conditional) and tátu-na/tabéru-na (negative imperative). These forms seem to be related to the perfective and imperfective forms, respectively, by high-ranking output-output faithfulness constraints (Burzio 1994; Benua 1998).

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Person and Point of View in Navajo Direct Discourse Complements*

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0. Introduction

This paper reports on preliminary investigation into the properties of a construction in Navajo known as the *direct discourse complement*. My ultimate goals are to learn more about the syntax of sentential complements in general, and to gain insight into how the syntax of Navajo, which has very rich verbal morphology, differs from languages with more impoverished morphology. In this paper, I report on some aspects of direct discourse complements which are not predicted by most theories of direct and indirect discourse, and I speculate on the nature of the parameters of variation in this area.

1. Navajo Direct Discourse Complements

Previous studies (Schauber 1979, Willie 1989) have shown that Navajo verbs of speech take a phrase which appears to be a complement, but which resembles direct discourse in its treatment of person agreement. For example, one way to say “Bill says (that) he bought a car” uses first person agreement in the embedded clause, as shown in (1)¹.

- (1) Jáan chidí naháʔnii' ní. S19²
J car 3sgO.Perf.1sgS.buy 3.say
'John_i says he_i bought a car.'
(Lit: 'John says I bought a car')

This construction is not limited to embedded first person. The sentences in 2 can also have this direct discourse reading.³

* I am grateful to the participants in the Navajo Language Academy workshop during the summer of 1998 for advice, comments, and judgements.

¹ First person agreement is marked by the prefix sh- before the verb stem. In verbs like *naháʔnii'*, this prefix has elided by phonological rule.

² I indicate sources of data as follows: S22 = Schauber 1979, p. 22; W.89.22 = Willie 1989, p. 22; Data with no reference come from my field notes.

³ Schauber reports examples of this construction with various derivatives of *ní* 'say' and also with *nizin* 'think, want'. I have found that judgements are solid only with *ní*, but I don't know what causes judgements to vary.

- (2) a. Jáan Mary chidí nahidííłnih yíłní. S24
 J M car 3sgO.Imperf.2sgS.buy 3sgIO.3sgS.say
 'John told Mary to buy a car.'
 (Lit: John told Mary you buy a car')
- b. Jáan chidí nahidííłnih shíłní. S24
 J car 3sgO.Imperf.2sgS.buy 1sgIO.3sgS.say
 John told me to buy a car.
 (Lit: 'John told me you buy a car')
- c. Jáan Mary chidí neidiyoołnih yó'ní S24
 J M car 3sgO.F.3sgS.buy 3.of.3sgS.say
 John expects Mary to buy a car.
 (Lit: 'John says of Mary she will buy a car')
- d. Jáan chidí nahizhdoolnih shó'ní S24 J
 car 3sgO.D.4sgS.buy⁴ 1.of.3sgS.say
 John expects me to buy a car.
 (Lit: 'John says of me that guy will buy a car.')
- e. Jáan chidí nahizhdoolnih nó'ní S25
 J car 3sgO.F.4sgS.buy 2.of.3sgS.say
 John expects you to buy a car.
 (Lit: John says of you that guy will buy a car.)

The sentences in (2) are ambiguous. Under the 'direct discourse' reading, the Subject agreement features on the embedded verb are evaluated with respect to the reported speech act, as in English direct discourse. These sentences can also have an indirect discourse reading, in which the embedded subject prefix refers to the speaker of the sentence, who I will refer to as the *Utterer*.

So far, it appears that these sentences are simply ambiguous between a direct and indirect discourse interpretation. However, when we look at embedded third person, we find that this simple account cannot be completely correct. When both matrix and embedded verb are third person, the "indirect discourse" reading is not possible. Thus, in (3)a, the two pronouns must be disjoint. In order to express the coreferent reading, either the embedded subject must be first person, or both subjects must be fourth person.

- (3) a. ndoolnish ní W89.511
 F.3sgS.work 3sgS.say
 'He_i says he_{*i/j} will work'
- b. ndeeshnish ní W89.508
 F.1sgS.work 3sgS.say
 'He_i says he_i will work'
 OR 'He says I will work'

⁴ The Navajo 4th person is used for a nonspeaker nonhearer who has high discourse prominence, or is not to be directly referred to due to politeness, taboo, etc.

- c. nizhdoolnish jini
 4sgS.F.work 4sgS.say
 'He_i says he_i will work'

W89.511

In fact, this construction has a number of properties that show that a simple analysis in terms of direct discourse is insufficient. For starters, the complement sentence does not have to be a report of the Subject's actual words. For example, the discourse in (4) is fine:

(4) Bill says to me:

"Bossy deeshłoh."
 Bossy 3sgO.F.1sgS.rope
 'I will rope Bossy'

3hrs. later, I say to Mary:

"Bil béégashii deeshłoh ní"
 B cow 3sgO.F.1sgS.rope
 'Billi says hei will rope a cow'
 (Lit: Bill says I will rope a cow.)

Thus, even where a first person embedded subject is coreferent with a matrix third person subject, the construction shows properties of indirect discourse. I will show below that these properties appear to divide into two types.

2. Diagnostics for indirect and direct discourse

2.1 Standard Diagnostics

The chart in (5) shows the standard syntactic diagnostics for direct vs. indirect discourse. I have no data on tense concordance, since Navajo generally marks temporal relations with Aspect instead. The Navajo construction meets the other two criteria for direct discourse: these complements cannot have a complementizer, and they exhibit person switch.

(5)

Indirect Discourse	Direct Discourse
can have complementizer <i>Mary says that she will win.</i>	no complementizer <i>Mary says "(*that) I will win."</i>
concordance of person <i>She_i says that she_i will win.</i>	person switch <i>She_i says "I_i will win."</i>
concordance of tense <i>She said that she was winning</i>	tense switch <i>She said "I am winning"</i>

(6) a. **No complementizer**

Kii chidí naháłnii' (*íígí) ní.

K car 3.1.P.buy(comp) 3.say

Kii_i says (*that) he_i bought a car.

LIT: Kii_i says that I_i bought a car.

b. **Person switch:**

Kii chidí naháłnii' ní.

K car 3.1.P.buy 3.say

Kii_i says he_i bought a car.

LIT: Kii says I bought a car

2.2 **Further diagnostics**

Once we go beyond these basic diagnostics, the picture changes. In English direct discourse, the embedded clause or quote forms a new domain for all domain-oriented phenomena. In addition to person and tense, this includes extraction, speech act modifiers, deictic terms, temporal modifiers, interpretations de re, and evaluative predicates. In English direct discourse, all of these must be evaluated relative to the subject of the speech act verb, whereas in indirect discourse they are evaluated relative to the speaker of the discourse.

(7)

Indirect Discourse	Direct Discourse
not island for movement <i>Who_i did she say that she likes t_i?</i>	island <i>*Who_i did she say "I like t_i"</i>
no speech act modifiers <i>*She said that boy, was she tired.</i>	speech act modifiers <i>She said "Boy, am I tired"</i>
Deictic terms take speaker POV <i>Mary said that she wanted this book.</i> (this = near speaker)	Deictic terms take subject POV <i>Mary said "I want this book"</i> (this = near Mary)

Temporal mods take speaker POV <i>Bill said he will arrive tomorrow</i> (tomorrow = day after speech act)	Temporal mods. take subject POV <i>Bill said "I will come tomorrow"</i> (tomorrow = day after saying)
De re interpretations ok <i>Oedipus said his mother is pretty</i> (ok even if O doesn't know his wife is his mother)	De re interpretations impossible <i>Oedipus said "My mother is pretty"</i> (ok only if O knows she's his mother)
Evaluative preds take speaker POV <i>Mary said she loves that idiot</i> (speaker thinks he's an idiot)	Evaluative preds take subject POV <i>Mary said "I love that idiot"</i> (Mary thinks he's an idiot)

2.2.1 Direct discourse complements are not islands

First, as Schaubert (1979) has shown, direct discourse complements are not islands for extraction. (8)a is a well-formed question with (8)b as the response.

- (8) a. Háadilá_i Kii Mary [**t_i**] dínílnish yíłní
 where.at K M 2sgS.work 3sgIO.3sgS.say
 ‘Where did Kii tell Mary to work?’
 LIT: ‘Where did Kii say to Mary you work?’
- b. Kii Mary Kinłání-di dínílnish yíłní
 K M Flagstaff-at 2sgS.work 3sg.IO.3sg.S.work
 ‘Kii told Mary to work in Flagstaff’
 LIT: ‘Kii told Mary you work in Flagstaff’

2.2.2 Direct discourse complements do not allow speech act modifiers

Like English indirect discourse, Navajo direct discourse complements do not allow speech act modifiers:

- (9) * Mary tséyi’ hózhóní ya’ ní
 M canyon area.beautiful isn’t.it 3.say
 ‘Mary says (that) the canyon is beautiful isn’t it’

2.2.3 Deictic terms in direct discourse complements take speaker POV

Deictic terms such as demonstrative pronouns or determiners within a direct discourse complement are interpreted from the point of view of the Utterer, not from the point of view of the Subject. Thus, the discourse in (10) is well-formed.

- (10) Kii and I are standing by a tree which has axemarks in it, and Kii says to me:

Díí tsin yítséél
 this.here tree 3o.1s.chopped
 I chopped this tree here.

The next day, I'm in the house talking to you, and I point out the window at the tree and say:

Kii nléí tsin yítséél ní
 Kii that.yonder tree chop say
 ‘Kii says he chopped that tree over there.’
 (Lit: Kill says I chopped that tree over there)

2.2.4 Temporal modifiers in direct discourse complements take speaker POV

The behavior of temporal modifiers is like that of demonstratives: such terms within a direct discourse complement are interpreted from the point of view of the Utterer, so the discourse in (11) is well-formed.

- (11) On Wednesday, I talk with Kii, and Kii says:

Damóo Kínlání-góó deeshá.

Sunday Flagstaff-to 1s.go

I am going to Flagstaff on Sunday.

On Saturday, I talk to you, and I say:

Kii yiskáago Kínlání-góó deeshá ní

K tomorrow Flagstaff-to 1.go say

LIT: Kii said I am going to Flagstaff tomorrow

‘Kii says he is going to Flagstaff tomorrow.’

2.2.5 De re interpretations can occur within direct discourse complements

De re interpretations are possible within direct discourse complements, as they are in English indirect discourse. Thus, the discourses in (12) are both well-formed.

- (12) a. Kii does not know that Hastiin Begay is a singer. He says to me:

Hastiin Begay tseebíídiin binááhai

Mr. Begay eighty his-years

‘Mr. Begay is eighty years old’

Later, at a ceremony at which Hastiin Begay is singing, I say to you:

Kii hataalii tseebíídiin binááhai ní

Kii singer eighty his-years say

LIT: Kii said the singer is 80 years old.

- b. Kii does not know that Hastiin Begay is a singer. He says to me:

Hastiin Begay Tóta’di bidááh níyá

Mr. Begay Farmington-at 3sg-toward Perf.1sgS.go

‘I went to meet Mr. Begay in Farmington’

Later, at a ceremony at which Hastiin Begay is singing, I say to you:

Kii hataalii Tóta’di bidááh níyá ní

K singer Farmington-at 3sg-toward Perf.1sgS.go 3sgS.say

‘Kii said he went to meet the singer in Farmington’

LIT: ‘Kii said I went to meet the singer in Farmington’

2.2.6 Evaluative terms in direct discourse complements take Utterer POV

So far, I have looked at two types of evaluative terms within direct discourse complements: epithets and descriptive adjectives. Both can be interpreted from Utterer point of view.

Epithets which reflect the Utterer's evaluation of the referent but not the Subject's evaluation are permitted in direct discourse complements. The following sequence of discourses is well-formed:

(13) epithets:

Kii thinks his uncle is wise and wonderful. His uncle has recently had a streak of misfortune. I think Kii's uncle is an idiot, but Kii doesn't know that. He says:

Shidá'í t'óó shil baa hojoobá'í.

1-uncle 1.feel sorry for
'I feel sorry for my uncle'

You know I think Kii's uncle is an idiot. I say to you:

Kii diigisii t'óó shil baa hojoobá'í ní.

K idiot 1.feel-sorry-for
LIT: Kii says I feel sorry for the idiot
'Kii says he feels sorry for the idiot'

Similarly, descriptive adjectives within direct discourse complements may reflect an evaluation made by the Utterer but not by the Subject, as in the following well-formed discourse:

(14) descriptive adjectives:

Mary is colorblind. We are at a party where everyone has brought flowers, and she says to me:

Díí ch'ilátah hozhóón ntá

this flower 1.brought
I brought this flower.

Later, I say to you:

Mary ch'ilátah hozhóón litso ntá ní

Mary flower yellow 1sg.P.bring say
'Mary says she brought the yellow flower'

2.3 Summary

We have seen that the diagnostics for direct vs. indirect discourse show that Navajo direct discourse complements behave like direct discourse in some ways, and like indirect discourse in others. The properties of agreement and complementizers pattern with direct discourse: there is no complementizer, and agreement "switches", like it does in English direct discourse. All other properties pattern with indirect discourse. Most of the properties that pattern with indirect discourse are semantic, in contrast to the syntactic properties of agreement and complementizers. However, the direct discourse complements pattern like indirect discourse in not being islands for question formation, and this is usually taken to be a syntactic property.

2.4 Speculation

The goals of this paper are primarily descriptive, but some comments can be made about potential directions toward an analysis and additional data needed.

These data challenge the assumption that the propositional argument of a verb of saying must be evaluated with respect either to the matrix discourse representation (indirect discourse) or to the speech situation (direct discourse). The Navajo case apparently involves a propositional complement in which some things are evaluated as in indirect discourse while others are evaluated as in direct discourse. An interesting generalization emerges if we look a bit farther, at another type of speech reporting. The construction known as *represented speech* or *free indirect style* (See Banfield 1982) also involves a split between grammatical tense and agreement vs. deictic and evaluative expressions, but the split turns out to be the opposite of the one found in Navajo Direct Discourse Complements.

Banfield examines examples like those in (15):

15. reported speech:

a. ***"Why then should he be sitting in the bathroom? Was he asleep? Dead? Passed out? Was he in the bathroom now, or half an hour ago?"*** (Lowry, *Under the Volcano*, p.145)

b. ***"Why couldn't she have workmen for friends rather than the silly boys she danced with and came to Sunday night supper?"*** (Mansfield 'The Garden Party' p.287)

In (15a), both agreement and tense are evaluated with respect to the matrix discourse. That is, the passage describes a man sitting in the bathroom, and is a report of what he is thinking. The pronoun is third person, and the tense is past, because the man is other than the narrator, and the time of the situation is prior to the time of the matrix discourse or narrative. The temporal adverbs *now* and *half an hour ago*, on the other hand, are evaluated with respect to the speech act being reported. The man wonders if he is in the bathroom at the time he's wondering, or was there half an hour before the wondering time.

Suppose we call cases of evaluation with respect to the matrix discourse *external* evaluation, and evaluation with respect to the reported speech act *internal* evaluation. In standard indirect discourse, all evaluation is external.⁵

The Navajo case shows that features do not necessarily pattern together: Syntactic features can receive an internal evaluation while deictic and evaluative terms receive an external interpretation. The Reported Speech narrative style fills out the paradigm: syntactic features receive an external evaluation while deictic and evaluative terms receive an internal evaluation.

(16)

	person	perspectival evaluation
indirect discourse	external	external
direct discourse	internal	internal
Navajo Direct Discourse Complement	internal	external
reported speech	external	internal

While the correct account of these phenomena is not obvious, it is clear that person and tense features can act independently of deictic and evaluative terms.

One possible account of the Navajo data would make use of the proposal of Jelinek (1984) and Willie (1991) that agreement morphemes in Navajo are arguments, the verb forms the entire projection of the basic sentence (the “maximal verb-sentence”, in Willie’s terms), and other phrases are adjuncts. Under this assumption, we might say that the verb is in a direct discourse form, but all other phrases are outside the scope of this direct discourse. Such an analysis would predict that the verb in this construction should be an actual quote, and should not include anything that is evaluated externally. These predictions could be tested by looking at examples in which the verb has been changed from what was originally said, and by looking at other prefixes in the verbal complex for which the internal/external distinction is relevant.

The precise form that such an analysis should take is not immediately obvious, due to the behavior of person-marking prefixes which appear on constituents other than the verb. For example, the possessive prefix reflects the same internal evaluation as the verb: (17) can have a reading in which the first person possessor is the subject of the sentence (Bill):

⁵ The sequence of tense phenomenon can be thought of as a case of indirect discourse in which tense receives an “internal” evaluation. For example, in one reading of ‘*Mary said she was happy*’, the embedded past is interpreted as prior to the time of saying (the internal reading) while in the other reading, the embedded past is interpreted as prior to the matrix discourse (the external reading).

- (17) Bil shimá ndoolnish ní
 F. 1sg-mother3sgS.work 3sgS.say
 'Bill_i said his_i mother will work'
 (LIT: Bill says my mother will work)

If all phrases other than the verb are adjoined, the *shimá* is an adjunct. Given the reading here, it must be adjoined somewhere within the scope of the direct discourse, yet it is not an exact quote.

Finally, it is possible that Navajo person marking is somehow different from its English counterparts. Perhaps there is simply a parameter whereby pronominal features in some languages can be indexed to an embedded discourse rather than just to the matrix discourse. Willie (1989) proposes that the coindexing in Direct Discourse Complements is determined in terms of either pragmatic roles or argument positions. This idea is extended to coindexing in all Navajo constructions in Willie (1991). This means that pronouns in Navajo never behave like bound variables. Willie shows that embedded third person cannot be coreferent with the matrix subject:

- (18) ndoolnish ní
 F.3sgS.work 3sgS.say
 'He_i says he_{*i/j} will work'

To explore this possibility further, it will be important to examine the behavior of third person pronouns in other environments where there is a contrast between a deictic and a bound variable interpretation, such as ellipsis constructions.

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Patterns of Floating Tone Association in Bafut *

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0. Introduction

In the associative NP in many tone languages, the associative morpheme (henceforth AM) is marked at times by a floating tone.¹ In output forms, the patterns of realization of these tonal morphemes differ in very interesting ways. Generally, the low tonal morpheme surfaces as a floating tone causing following high tones to downstep. A H tonal morpheme, on the other hand, associates to a Tone Bearing Unit (TBU). In some languages (e.g. Bafut) the host TBU is the final syllable of the first noun of the associative NP (N1) while in others (e.g. Gwari) it is the first syllable of the second noun of the associative NP (N2). In very peculiar cases (e.g. in Makaa) the host TBU is found at times in N1 and at times in N2. What determines the different patterns of realization of the tonal associative morpheme is a significant question for phonological theory.

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¹ In the phonological literature (see Kenstowicz 1994) the term floating tone is used in three distinct ways: (a). a grammatical morpheme whose lexical entry consists only of a tonal specification, without any inherent segmental material; (b). an underlying tone which is part of certain lexical morphemes but does not usually associate with any of these morphemes; (c). in derivational models, a tone which was linked at one stage but is delinked by some phonological rule.

In this paper, except otherwise indicated, the expression ‘floating tone’ refers to the definition in (c).

In this paper I intend to propose an analysis that will both generate and explain the range of patterns of floating tone association in the associative NP. Focusing on Bafut¹ I argue that four principal conditions regulate the realization of the tonal associative morphemes. These conditions are:

- a. A condition requiring the obligatory presence of some phonological reflex of grammatical morphemes in surface representations;
- b. A requirement for the identity of a tone that is linked to the initial syllable of a prosodic word to be preserved;
- c. The need to maintain the linear order of input segments in surface representations;
- d. A ban on certain tone and register sequences within a prosodic word.

The paper concludes with the observation that the account developed for Bafut can be extended to explain other patterns of floating tone association in related Bantu languages and to resolve complex processes in Bantu tonology.

This paper is organized as follows. In section 1, I present a brief overview of the theoretical framework adopted for the study. Section 2 presents the tone system of Bafut as background information. Section 3 analyses the syntactic structure of the associative NP in Bafut and describes the manner in which the constituents of this NP are organized into an autonomous prosodic structure. In section 4 it is shown that the H associative morpheme is realized on N1 and not N2 because of the need to preserve the identity of a tone that is linked to the initial syllable of a prosodic word (henceforth pwd) and also because of a requirement to maintain the linear order of input segments in surface representations. Section 5 examines the realization of the L associative tonal morpheme demonstrating that it surfaces as a floating tone in order to satisfy (maximally) wellformedness conditions on the pwd. Section 6 concludes the paper.

1. Theoretical Background

The theoretical framework employed for this study is Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993a). In Optimality Theory (henceforth OT) emphasis is not on the derivational sequence by which an input is transformed into a surface form, but rather on a set of violable constraints which determine the wellformedness of output forms. OT consists of the following components: a set of violable constraints, ranked on a language particular basis, against which the wellformedness of output candidates is evaluated; a function, Gen, which associates an input form with a potentially infinite set of output candidates; and a function, Eval, which assesses output candidates and orders them according to how well they satisfy the constraint system of the language in question. The actually occurring output form is that candidate which best satisfies the constraint system (i.e. passes the highest ranked constraint(s)).

¹ Bafut is a non-narrow Grassfields Bantu Language spoken in the North West Province of the Republic of Cameroon by about 85,000 people.

Departing slightly from earlier work in OT, I will adopt the Positional Faithfulness Theory outlined in Beckman (1998), and the model of tone representation proposed by Snider (1988, 1990).

1.1. Positional Faithfulness

Positional Faithfulness Theory (Beckman 1998) identifies privileged linguistic positions which play a central role in the phonological systems of the world's languages. These positions include: Root-initial syllables, Stressed syllables, Syllable onsets and Roots. These are positions which enjoy some perceptual advantage in the processing system via either psycholinguistic or phonetic prominence. Positional privilege is manifested in three distinct, but closely related, patterns of phonological asymmetry, namely;

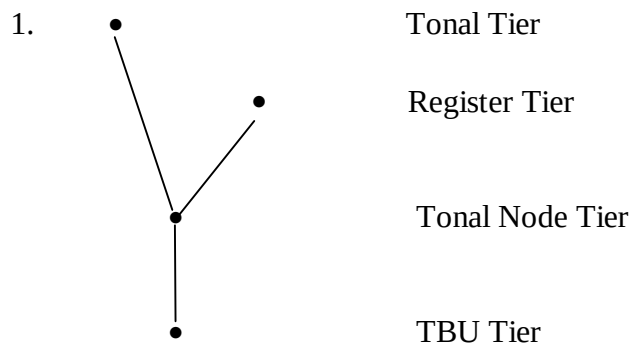
- a. Positional maintenance of contrasts which are neutralized elsewhere,
- b. Positional triggering of phonological processes,
- c. Positional resistance to processes which apply elsewhere.

According to the theory, each of these phonological asymmetries arises from a single pattern of constraint interaction in Optimality Theoretic Grammar; one in which Positional Faithfulness constraints crucially dominate Context-free Faithfulness and Markedness constraints.

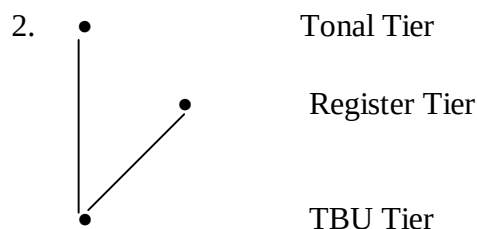
This study adopts the notion of 'patterns of phonological asymmetries' and demonstrates that tones which are linked to the initial syllable of a pwd resist processes that apply to tones elsewhere in the pwd.

1.2. Model of Tone Representation

In the analysis, I will assume a simplified version of Snider's (1988, 1990) model of tone representation generally referred to in the literature as the Register Tier Model. In broad terms, the model recognizes a tonal (or Modal) Tier and a Register Tier. Features from both tiers are associated with structural nodes on a Tonal Node Tier which is in turn associated with a TBU tier.



To Simplify the discussion, I will make use of the Tonal Tier and the Register Tier, both of which are directly associated to the TBU Tier.



According to this representation, a TBU is realized within a certain register which is defined as the “frequency band internal to the speaker’s range which determines the highest and lowest frequency within which tones can be realized at a given point in an utterance” (Clements 1990:59).

The register Tier Model generally recognizes two distinct registers – High (h) and Low (l). I will, however, depart slightly from this and assume, following a suggestion from Lisa Selkirk, a potentially finite number of registers. Specifically, I will assume that there is a frequency range which the speaker can manipulate to realize different tones. Within this range, there is an upper, a middle and a lower limit within which the three distinct tones of Bafut – H, M, and L – are realized (respectively).

3.

R	H
A	
N	M
G	
E	L

The entire range can be shifted up and down one level at a time. We will call this frequency range the register and assume that the difference between one level and the next has a phonetic value of 1 degree.²

2. Bafut Tone System

In this section I present a brief overview of the tone system of Bafut. The presentation is essentially descriptive. However, detailed explanations will be provided for tonal phenomena that relate to the discussion on the floating tone association in subsequent sections. In such explanations the notion of a prosodic word will be assumed pending a more detailed discussion in section 3.2.

Bafut has three level (register) phonemic tones; H (high), M (mid) and L (low). In addition to the three phonemic tones there is a downstepped high tone (^lH) and a raised L which are different from the phonemic mid tone. The data in (4) illustrates the phonemic contrast between the three level tones.

² The idea of multiple register levels has the advantage that it can provide a satisfactory treatment of the cumulative nature of register shifts such as in downdrift and in cases of multiple downstep.

4.	H	M	L
	baá'	bāā	bàà
	'measure of oil'	'question particle'	'type of tree'
	kaá'	kāā	àkàà
	'crab'	'negative particle'	'oath'
	bũʔú	àbũʔũ	àbũʔù
	'chimpanzee'	'baton'	'slave'

In a language with a three-way tone contrast, the following 9 tone patterns are possible on disyllabic roots:

- | | | |
|----------|--------|--------|
| 5 a. H H | e. M M | i. L H |
| b. H M | f. M L | |
| c. H L | g. L L | |
| d. M H | h. L M | |

Eight of these patterns occur on disyllabic noun roots in Bafut as illustrated in (6).

- | | | | |
|------------|---------------|------------|-------------------------------|
| 6 a. títá' | 'pepper' | e. bāʔā | 'bowl (made out of calabash)' |
| b. fa1ā | 'father' | f. nĩ-yĩyè | 'praying mantis' |
| c. mánè | 'step sister' | g. ɲ-gòʔò | 'stone' |
| d. à-kĩkúɲ | 'owl' | h. à-kwèʔē | 'cough' |

The only pattern that does not occur is the LH pattern. Its absence is accounted for in 2.1 below.

2.1. High Tone Lowering

The absence of the LH pattern in the examples in (6) is attributed to the fact that a high tone is generally lowered to mid after a low in the language (see Mfonyam 1989). This general lowering shows up in nouns with a high tone root and a low tone prefix. For instance, if a low tone prefix is affixed to the high tone roots in column I below, the root high tone is lowered to mid as in column II:

- | | | |
|----|---------|---------------------|
| 7. | I | II |
| | ø-títá' | bĩ-títā 'pepper(s)' |
| | ø-luʔú | bĩ-lũʔũ 'spoon(s)' |
| | ø-lĩɲǎ | bĩ-lĩɲǎ 'horse(s)' |

Assuming, (see further evidence in section 3.2.), that the domain of H lowering is the prosodic word, I propose the following markedness constraint to account for the absence of the LH sequence in Bafut:

8. $*(...L_{Ri} H_{Ri}...)_{pwd}$

A LH tone sequence in the same register is banned within a prosodic word.

The examples in (6) and the constraint in (8), as pointed out above, indicate that Bafut generally avoids having a sequence of a L tone followed by a H tone in the same register within a pwd. As the examples show, this offending sequence is avoided by lowering the following H tones to M. It is however obvious that there are many alternative ways of avoiding the LH sequence. One alternative would be to simply delete either the initial L or the following H. This would, however, result in a toneless syllable in surface representation.

Another alternative way of avoiding the LH sequence would be to raise the initial L to H or M so that the words surface with either a HH or MH sequence. This alternative seems quite natural as examples of words with HH or MH tonal sequences are attested in the language alongside tonal processes which change input L tones to M and H. The fact that the initial L in the words in (6) is not raised to M or H suggests to me that the initial syllable of a pwd (the syllable to which the L is linked) is a privileged position; a position that resists tonal processes which would otherwise apply elsewhere in the pwd. We return to this important observation in more detail in sections 4 and 5 where we discuss floating tone association. For the time being, let us assume that the initial L does not raise to M or H because of a condition which requires the faithful realization of input segments found in certain positions of a word. Let us call this condition for now simply as the Positional Faithfulness Condition (PFC).

2.2. H, ¹H and M Contrast

The phonetic contrast among high, downstepped high and mid tones is illustrated in the following constructions. Compare the tones on the nouns in isolation with the patterns observed when the nouns are used in N2 position in the associative construction. The diacritic ¹ before a syllable/morpheme represents downstep of a following H as in the (b) examples in (10), (11), (12) and (13).

- | | | | |
|---------|---------|------|--------------|
| 9. fórǎ | ‘mouse’ | luʔú | ‘spoon’ |
| sǐŋ | ‘bird’ | buʔú | ‘chimpanzee’ |
| lǐŋǎ | ‘horse’ | tɔʔɔ | ‘tin’ |

- 10 a. kó fórǎ ‘catch a mouse’
 b. sǐŋ ¹fórǎ ‘a mouse’s bird’
 c. sǐŋ bǐ-fōrǎ ‘mice’s bird’

- In their citation forms (9) the nouns all bear high tones. In context, when preceded by a H-tone verb the noun retains its basic H tone. In N2 position the basic tone of the noun however changes depending on the tone which precedes it. In the (b) examples the N2 noun is preceded by another noun with an identical tone pattern. In this context the H on N2 is downstepped. In the (c) examples the N2 class prefix³ bears a low-tone and in this case the H on N2 lowers to level of M. Bafut therefore has two types of H tone lowering; (a) ¹H which is just slightly lower (about 1/2 step) than a normal H and (b) M which is one step lower than H. Two questions arise: (a) what triggers lowering in both cases, (b) why does the H lower to M in one case but to a level higher than M in the other? To answer the first question, information from the structures in which both processes occur suggests that both are triggered by a preceding L tone. However, whereas the L which triggers downstep is floating, that which triggers H lowering to M is linked to a TBU. (Henceforth I use ‘H lowering’ to distinguish lowering to M from downstep). To have a clearer picture of the status of the conditioning L tones, compare the underlying representations of the associative NPs in column I to their corresponding surface forms in column II below:

- The associative NP has an associative vowel (AssV) which is a pre-prefix (Pref₁) of N2. In the underlying representations, V represents the associative vowel slot. The features of this vowel, as well as evidence for its presence will be presented in section 4. In both (a) and (b) the associative vowel is deleted in the output representation but their underlying low tones are retained as floating tones. In (a) the floating L triggers downstep of the following H but in (b) it does not due to the intervening linked L on the prefix bǎ-. Lowering of the following H to M in (b) is rather caused by the linked L. The important

³ See section 4 for an outline of the noun class prefixes in Bafut.

point to note here is that lowering of the target H to either downstep or M is triggered by a preceding L tone.

Based on this, one may suggest, by way of an answer to the second question that the reason why the target H lowers to M in one case but to a level higher than M in the other follows from the fact that the status of the trigger is different (floating in downstep but linked in H lowering). This suggestion invites another question, namely; what is so special about the linked versus floating status of a L tone that one triggers downstep while the other triggers H lowering? This question is particularly interesting as it puts to question previous accounts of downstep in Bantu tonology. Scholars of Bantu tonology have often assumed, without explaining why, that downstep is triggered by a floating tone (as opposed to a linked tone). The proposal that I intend to develop in this paper (see section 4) considers the position of the affected H within the pwd to be the crucial factor in determining whether the target H is downstepped or lowered to M. I will however put aside a detailed discussion of this issue for the time being. Suffice it to note here that the difference between downstep and H lowering is due, not to the status of the triggering L tone, but to the position of the affected H tone within a pwd.

2.3. Phonetic Raising

Bafut also has a phonetic raised low tone $\uparrow L$ which contrasts phonetically with ordinary low tones. The following examples show the phonetic difference between L and $\uparrow L$.

- | | |
|--|-------------------------------|
| 15 a. à-là?à ‘wound’ | c. nĩ-bò?ò ‘pumpkin’ |
| b. $\uparrow$ à-lā?ā ‘village/country’ | d. n $\uparrow$ ĩ-bō?ō ‘fear’ |

The occurrence of the raised L tone is restricted to noun class prefixes of non-low root nouns. The data suggests that Bafut has a tonal assimilation process in which a non-low tone raises preceding L tones. This raising can be explained phonetically in terms of anticipatory articulation. While articulating the initial syllable bearing the L, the relevant organs of speech (in this case the larynx) start anticipating the articulation of the non-low tone in the next syllable. As a result, the initial L is raised. The L cannot however raise as high as the level of M or H for two reasons. First, at the outset of the articulation of the initial syllable the configuration of the larynx was not set for the production of a M or H tone. Secondly, raising to M or H would affect the identity of a tone that is linked to the initial syllable of a pwd; an issue which we return to in more detail in section 4.

2.4. Contour Tones

There is a very limited number of contour tones in Bafut and their occurrence is very restricted. The only contour tone pattern allowed is the falling pattern. This pattern arises from a combination of an intonational boundary tone and the underlying tone of the

final syllable of an utterance.⁴ Because of this limited distribution we will not treat contour tones as part of the tonal inventory of Bafut.

Having presented a broad overview of the tone system of Bafut as background information the next section examines the structure of the associative NP. The discussion in this section will contribute to an understanding of what determines the constituent on which the floating associative tone is realized

3. The Structure of the Bafut Associative NP

3.1. Morphosyntactic Structure

The associative NP in Bafut is made up basically of two nouns: N1 (the head of the phrase) and N2 (the dependent noun). The dependent noun comprises a root and two prefixes: Pref₁ and Pref₂. What I call Pref₁ here is the element that is traditionally referred to in the literature as the associative morpheme. The form of this prefix (i.e. Pref₁) is determined by the noun class of the Head noun (N1). Thus, for example, in an associative NP in which the Head noun is a class 2 noun with the class prefix *bɪ-* the form of Pref₁ is *bɪ*. For a class 5 noun with the prefix *nɪ-* the form of Pref₁ is *nɪ*. For some noun classes Pref₁ is marked by a floating tone. Class 1 nouns with a zero prefix and class 9 nouns with a homorganic nasal prefix employ a low floating tone. Classes 3, 7 and 8 nouns with a vowel prefix and class 10 nouns with a homorganic nasal consonant use a high floating tone. The examples below illustrate the linear order of the constituents that make up the associative NP. Subscript numbers on N1 represent the noun class. For our present purposes the floating tonal associative morpheme is represented as occupying the same syntactic position as the segmental associative morpheme (i.e. Pref₁). In output forms these tonal morphemes are realized on N1 as will be shown in section 4.

- | | |
|--|--|
| 16 a. ø-fórɔ́ ₁ ̀-ɲ-kàà
mouse Pref ₁ +Pref ₂ +monkey
'The monkey's mouse' | f. à-bàʔà ₇ ́-n-dā
door Pref ₁ +Pref ₂ +house
'The door of the house' |
| b. bɪ-fōrɔ́ ₂ bɪ-ɲ-káá
mice Pref ₁ +Pref ₂ +monkey
'The monkey's mice' | g. ɪ-bàʔà ₈ ́-n-dā
doors Pref ₁ +Pref ₂ +house
'The doors of the house' |
| c. ɪ-bòʔò ₃ ́-m-ú
mushroom Pref ₁ +Pref ₂ +child
'The child's mushroom' | h. m-bà ₉ ̀-m-àŋgyè
meat Pref ₁ +Pref ₂ +woman
'The woman's meat' |

⁴ The existence of intonational phrase boundary tones in Bafut is argued for in Tamanji (1998a). In this manuscript, it is argued that the declarative mood in Bafut is marked by a floating L tone which generally associates to the underlying tone of the final syllable of the sentence giving rise to a falling contour tone.

d. nĩ-ŋgðð̃₅ nĩ-ŋ-kaá'
 plantain Pref₁+Pref₂+monkey
 'The monkey's banana'

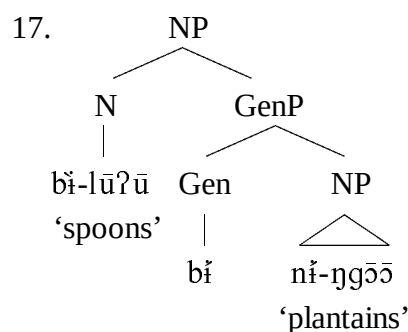
i. ñ-dā₁₀ ´-m-àŋgyè
 house Pref₁+Pref₂+woman
 'The woman's house'

e. mĩ-lùʔù̃₆ mĩ-n-dĩmó'
 drink Pref₁+Pref₂+friend
 'A friend's drink'

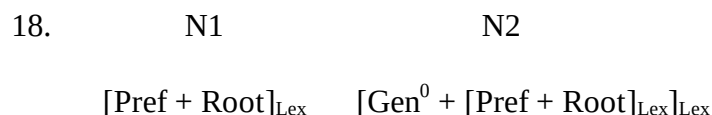
j. fĩ-dzð̃₁₉ fĩ-b-ə'
 star Pref₁+Pref₂+people
 'The people's star'

In these examples Pref₁ marks agreement between N1 and N2 and establishes an associative relation between the two nouns. The inner prefix (Pref₂), on the other hand, is the nominal prefix denoting the morphological class of N2.

For the purpose of this study, I will adopt the traditional analysis of the associative NP as comprising a head noun modified by a genitive phrase (GenP). As such the Bafut associative NP would be assigned the structure below:



The constituents of the associative NP can be organized into the simplified morphosyntactic structure in (18).



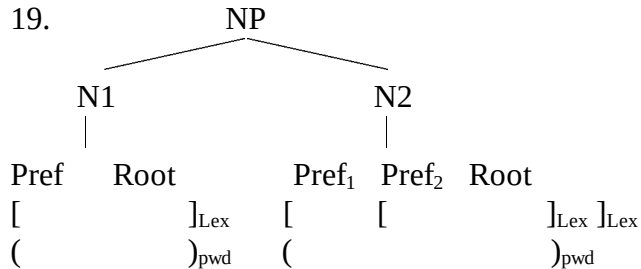
For ease of exposition and reference, I will henceforth refer to Gen⁰ as Pref₁ and to the noun class prefix of N2 as Pref₂. In the section that follows I show how this morphosyntactic structure is organized into a prosodic structure.

3.2. The Prosodic Structure of the Associative NP

Having determined the morphosyntactic structure of the associative NP, we are now in a position to examine the manner in which the constituents that make up this NP are organized into prosodic units. I will propose a prosodic structure for the associative NP and then, using tone rules which are sensitive to prosodic domains as a basis for argumentation, demonstrate that the edges of the lexical word established in the preceding

section partially coincide with the edges of the prosodic domains which the tone rules are sensitive to.

The associative NP in Bafut is organized into the following prosodic structure (Square brackets mark morphosyntactic units while parenthesis mark prosodic categories)



As the structure shows, the prefix + root of N1 form a pwd while Pref₁ and prefix + root of N2 make up another pwd. Evidence for this organization derives from two tonal processes; namely, H tone lowering and H tone spreading.

In high tone lowering, as discussed earlier in section 2, a L lowers following Hs to M. For instance, if a low-tone prefix is affixed to a high-tone noun root, the root H is lowered to M.

- 20 a. ø-sĩŋ ‘bird’
 b. bĩ-sĩŋ ‘birds’

This lowering is however restricted to the lexical/morphosyntactic word domain as we notice from the ungrammaticality of (21b) compared to the wellformedness of (21a) that the influence of the initial L on N1 does not extend to the H on Pref₁ of N2.

- 21 a. bĩ-sĩŋ bĩ-ŋ-káá’
 birds Pref₁-Pref₂- monkey
 ‘A monkey’s birds’
 b. * bĩ-sĩŋ bĩ ŋkāā

Failure to lower the H on Pref₁ cannot be attributed to the distance separating the trigger (the L on the prefix of N1) from the target (the H on Pref₁). Evidence from the verbal complex shows that the distance (i.e. the fact that the H on Pref₁ is separated from the L by a H linked to a separate morpheme) is not the main impediment. The linear order of elements in the verbal complex is the following:

22. Tense - Aspect - Negation - Verb

Tense, Aspect, and Negation are independent morphemes (as opposed to bound morphemes) as witnessed by the fact that adverbs can readily be inserted in between them. In a construction containing a low-tone tense morpheme, a high-tone aspect morpheme

and a high-tone verb, the low tone on the tense morpheme lowers all the following high tones. Compare the tones on the aspect morpheme and the verb in (22a) with those in (22b) in which a low tone on the tense morpheme now follows the high tones.

- 22 a. káŋ kya' títá!
 Asp harvest pepper
 'Continue harvesting pepper!'
- b. mē kǐ kāŋ kyā títá
 I P1 Asp harvest pepper
 'I was harvesting pepper'

In this example the trigger (L on the tense morpheme) is separated from each of the target high tones by at least a morpheme boundary yet all the following high tones are lowered to mid.⁵ I recognize the fact that conditions in the verbal complex may be totally different from those in the noun phrase but the H lowering in these examples seems to be strong corroborative evidence against the claim that in (21a) the H on Pref₁ fails to lower because it is separated from the trigger by a morpheme boundary. It is most likely that H tone lowering in (21a) is blocked by something else other than distance.

Another example in which a H on Pref₁ is immediately preceded by a L on the noun will strengthen the claim that H lowering is not blocked by the distance separating trigger from target. Consider the example below in which Pref₁ follows a low-tone noun root.

23. bǐ-bàà bǐ ŋkáá'
 type of tree Pref₁ monkey
 'The monkey's tree'

The immediately preceding L on the final syllable of 'tree' still fails to lower the H on Pref₁. Therefore failure to lower the H on Pref₁ in (21a) must be attributed to a factor other than the distance between trigger and target.

My hypothesis is that lowering the H on Pref₁ is blocked by the fact that the trigger (L on N1) and the target (H on Pref₁) are in separate prosodic domains. More simply put, the H on Pref₁ does not lower in spite of the presence of the preceding L on N1 because it is

⁵ It is hard to account for multiple lowering in this example. In a case where such lowering occurs in a single lexical element, one could account for it by assuming there is a single H which is multiply linked. However, it is hard to extend this to cases like (30b) where each of the morphemes has an independent tone. It is possible to claim that lowering the second H is attributable to a condition against a MH sequence. This is, however, not very plausible given the presence of words with this sequence in the language. As a temporary analysis, I will first assume that the tense morpheme, the aspect marker and the verb belong in the same pwd. Having lowered the range (register) within which the first H is realized, it is hard to reset (raise) it within the same pwd. This suggests a constraint in the language which disallows multiple changes of register within the same pwd. Just how many times the register can be changed and in what direction is an issue to be studied closely.

associated to a different pwd. This gives us reason to argue that in the associative NP N1 and Pref₁ are in separate prosodic words.

Before we conclude the discussion on the prosodic organization of the associative NP, we need to establish whether the morphemes which form each of the nouns (N1 and N2) constitute a prosodic unit or not. Up to this point, we have shown that the boundary between N1 and N2 is the boundary of a prosodic domain. Thus the last syllable of N1 coincides with the right edge of the first prosodic unit while the left edge of Pref₁ coincides with the left edge of the second prosodic unit. What we have not yet shown is whether the morphemes to the left of the boundary (Pref + Root) on the one hand and those to the right (Pref₁ + Pref₂ + Root) constitute prosodic units. Deciding on the status of the morphemes that make up N1 (the morphemes to the left of the boundary) is straightforward. The fact that the influence of a L on the prefix extends into the root (a prefix L tone lowers a root H) as in examples (7) and (21) indicates that the prefix and root form a pwd. A difficulty concerns the status of Pref₁. Above in section 3.1, this morpheme was analyzed as a combination of an agreement morpheme and an associative vowel which forms a unit (lexical word) with N2. The question then is whether treating it as a pre-prefix attached to N2 predicts that it forms a prosodic unit with the prefix and root of N2. Evidence from H tone spreading shows that this is indeed the case.

High tones in Bafut generally spread onto following syllables. In the associative NP the high tone on Pref₁ spreads onto the prefix (Pref₂) and root of the following noun. This is illustrated below.

- 24 a. / mĩ-ntsù mĩ-fĩ-təḡ/ -----> [mĩntsù mĩfĩtəḡ]
 mouths Pref₁+Pref₂+calabash ‘openings of calabash’
- b. / nĩ-ŋgòḡ nĩ-ŋ-kàà/ -----> [nĩŋgòḡ nĩŋkàà]
 banana Pref₁+Pref₂+monkey ‘monkey’s banana’
- c. / mĩ-ntsù mĩ-ə-sàŋ/ -----> [mĩntsù mĩsàŋ]
 mouths Pref₁+Pref₂+moon ‘faces of the moon’

In these examples the H on Pref₁ spreads onto Pref₂ and the root affecting both M and L tones. Notice that H spreading does not occur within a lexical word such as mánè ‘step sister’. I assume that spreading is limited to derived environments. Why it occurs in the first place is difficult to say given that the morphemes to which the H spreads all have independent tones. I will simply point out here that it could be the case that L and M tones are generally marked in Bafut and so whenever conditions permit, a H spreads and replaces the L or M tone. This is however an issue requiring further investigation. For the time being, the point of interest to this discussion is the observation that a H on Pref₁ spreads onto prefix and root of N2. Given that tonal processes are sensitive to prosodic boundaries, the nature of high tone spreading in the examples above shows that there is no such boundary between Pref₁ and Pref₂ + Root. Therefore, the three morphemes Pref₁ + Pref₂ + Root are in the same prosodic word. We can therefore conclude that the

associative NP comprises two prosodic words N1 = Prefix + Root and N2 = Pref₁ + Pref₂ + Root.

The organization of the morphosyntactic structure into the prosodic structure in (19) and the evidence that led to this phrasing is corroborated by similar facts in genetically related languages.

In Kom, Hyman (pc) reports that though the language commonly spreads a lexical tone to a following grammatical element, in the associative NP, the tone of the final syllable of N1 does not spread onto the following AM.

- 25 a. m̀ə-táim m̀ə fĩ-kà?
 fruits AM tree
 ‘fruits of a tree’

- b. *m̀ə-táim m̀ə fĩ-kà?

Failure of the H on the final syllable of ‘fruits’ to spread to the AM is attributed to the fact that N1 and the AM are in different prosodic words. Based on this property of tone spreading in Kom Hyman proposes that in the associative NP the AM and N2 constitute a clitic group as schematized in (26).

26. ((m̀ətáim)_{pwd}(m̀ə fĩkàʔ)_{pwd})_{p-phrase}

Similar facts are reported in Bamilike-Dschang (Hyman 1985) though the prosodic organization is different from that in Kom and Bafut. The examples from Kom strengthen our claim for Bafut that the morphosyntactic structure of the associative NP is generally organized into an independent prosodic structure.

Having established the morphosyntactic and prosodic structures of the Bafut associative NP, in the next section I show that the surface realization of the tonal associative morphemes is, to a large extent, influenced by the prosodic organization of the associative NP.

4. Patterns of Floating Tone Association

In section 3.1 we discussed the linear order of constituents that make up the associative NP. In this construction, the form of Pref₁ is determined by the morphological class of N1.

27. Noun Class	Associative Tone
1	(L) ⁶
2	bǎ
3	(H)

⁶ Floating tones are enclosed within brackets to distinguish them from linked tones.

5	nĩ
6	mĩ
7	(H)
8	(H)
9	(L)
10	(H)
19	fĩ

Classes 2, 5, 6 and 9 nouns take the prefixes bĩ-, nĩ-, mĩ- and fĩ- respectively. These class markers are segmentally identical to Pref₁ (the agreement/associative morpheme). Classes 1, 3, 7, 8, 9 and 10 nouns take the prefixes ø-, ĩ-, à-, ĩ-, N- and N- respectively. When a noun from any of these classes is used as the head of the associative NP (i.e. in N1 position) Pref₁ in this case is marked simply by a floating tone. One may wonder why Pref₁ has segmental content when the head noun is a class 2, 5, 6 or 19 noun but is simply tonal when the head noun is from another class. My hypothesis is that underlyingly Pref₁ has segmental content irrespective of the class to which the head noun belongs. In every case this segmental prefix is identical in form to the prefix of the head noun. This implies that in cases where the head noun is from classes 1, 3, 7, 8, 9 or 10 Pref₁ is underlyingly a vowel or a nasal consonant since the head nouns from these classes have vowel or nasal prefixes (vowel for classes 1, 3, 7, and 8 and nasal for classes 9 and 10). In the output representation, the vowel or nasal consonant marking Pref₁ is deleted by the general Bantu vowel deletion rule (see Lovins 1971a) but their underlying tones are retained as floating tones. The examples below illustrate this vowel/nasal deletion process:

- 28 a. / ĭ-bòʔò ĭ-m-ū / ⇔ ĭbòʔó mū
 Pref-mushroom Pref1-Pref2-child 'child's mushroom'
- b. / à-bàʔà á-bĩ-tāā / ⇔ àbàʔá bĩtāā
 Pref-door Pref1-Pref2-fathers 'fathers's door'
- c. / n̄-bà m̄-ø-bílíbá / ⇔ n̄bá bílíbá
 Pref-meat Pref1-Pref2-smith 'the smith's meat'
- d. / n̄-tāʔā n̄-ø-sĩŋ / ⇔ n̄tāʔā !sĩŋ
 Pref-hill Pref1-Pref2-bird 'a hill full of birds.'

In the output forms, the patterns of association of the floating tones (i.e. the tones derived from the deletion of the segmental material of Pref₁) differ depending on whether the tone is H or L. If the tone is H, it associates to the final syllable of N1 delinking the underlying tone of this syllable. This is illustrated in (45).

29. I

II

- a. /ĩ-bòʔò₃ (H) múŋkhĩ / ⇔ [ĩbòʔó múŋkhĩ]
 mushroom Pref₁ child 'a child's mushroom'
- b. /à-bàʔà₇ (H) àlòò/ ⇔ [àbàʔá lòò]
 door Pref₁ dry season 'door of dry season'
- c. /ĩ-sò₃ (H) māŋgyē / ⇔ [ĩsó māŋgyē]
 hoes Pref₁ of twin mother 'twin mother's hoes'
- d. /mbū₁₀ (H) tākòbè/ ⇔ [mbú tākòbè]
 dogs Pref₁ plantain 'dogs of plantains'
 (species of dogs)

If the associative tone is L, on the other hand, it remains floating and instead provokes downstep in following H tones as illustrated in (30).

30. I

II

- a. /fórə₁ (L) mĩ-wúrə / -----> [fórə 'mĩwúrə]
 rat Pref₁ oil 'rat of oil (rat that feeds on oil)'
- b. /n-tām₉ (L) fórə / -----> [ntām 'fórə]
 shoe Pref₁ rat 'rat's shoe'

The focus of this paper is explaining why the floating H consistently associates to the final syllable of N1 and not say to the initial syllable of N2 (its pwd of origin) and why the floating L fails to associate to a TBU. In order to provide a comprehensive analysis of these tonal phenomena, this paper will need to address the following questions.

- Why the associative tones do not delete along with the segmental content of Pref₁;
- What determines the TBU to which the floating H associates;
- Why the associative H tone systematically delinks input tones of the host TBU to which it associates and why it does not lower to M when preceded by a L as other Hs.
- Why the associative L surfaces as a floating tone and why it causes following H tones to downstep instead of lowering to M as L tones do elsewhere in the language.

Let us begin with the prerequisite question why the associative tones fail to delete along with the segmental material of Pref₁.

4.1. Why Associative Tones Resist Deletion

To answer the first question regarding the obligatory projection of the floating tonal morphemes in the output, one could adopt one of two constraints proposed in the literature to capture similar facts. Akinlabi (1995) for instance proposes the constraint *Parse Assoc-H* to account for the realization of a high tonal morpheme in Etsako and Bini. Although this constraint adequately handles the specific cases of Etsako and Bini, it is too restrictive as it excludes cases like those of Bafut where the associative morpheme for some noun classes is a low floating tone. A more general constraint that includes all possible tone levels would be more appropriate. A possible candidate is *MaxTone* which ensures that an input tone has an output correspondent. Though quite general, *MaxTone* is not the ideal constraint to use in the case of associative tones as it tends to treat lexical and grammatical tones alike. Associative tones and lexical tones differ in many respects. Whereas an associative tone is part of a grammatical morpheme, a lexical tone is not. Secondly, as Akinlabi (1995:229) argues, whereas the domain of lexical tones is just a mora to which it is underlyingly linked, the domain of a grammatical tone is a prosodic word. These differences suggest that a theory of constraints needs to recognize the distinction between lexical and associative tones and also to explain why grammatical tones are favored over lexical tones.

My hypothesis is that the associative tones fail to delete along with the segmental content of Pref₁ because they are the only reflex of a grammatical morpheme remaining. Pref₁ which comprises a vowel and the associative tone is a grammatical morpheme marking agreement and association between N1 and N2. When the vowel deletes, the tone is the only reflex of this grammatical morpheme that remains. Were the tone to delete along with the vowel, the associative NP would surface without a grammatical morpheme marking agreement/association between the two nouns. It is therefore plausible to claim that the grammar of Bafut requires the obligatory presence of some phonological reflex of a grammatical morpheme in output representation.

Independent motivation for this view (i.e. the view that the grammar requires the presence of a grammatical morpheme in output representation) derives from vowel deletion. Bafut generally disallows a sequence of two vowels across morpheme boundary.

When this offending sequence arises, the general tendency is to delete the second vowel. in the sequence. This is illustrated below:

31a. / àtū + àlā?ā / ⇔ [àtúlā?ā]

b. / má + ĩlhĩ / ⇔ [málhĩ]
 big ant ‘mother ant’

However, when the second vowel in the sequence is a grammatical morpheme, the first vowel is deleted while the second (the grammatical morpheme) is retained. In the examples below, the grammatical morpheme (Focus Marker) which is the second vowel in the tautosyllabic vowel sequence is preserved while the first is deleted. The tautosyllabic vowel sequence is underlined.

- 32 a. / mə kǐ tǔʔù á ɲkǐ / ⇨ [mə kǐ tǔʔ á ɲkǐ]
 I P2 fetch Foc water ‘I fetched **water**’
- b. / Sùù kǐ bíʔǐ á ɲlòŋ / ⇨ [Sùù kǐ bíʔ á ɲlòŋ]
 Suh P2 carry Foc radio ‘Suh carried a **Radio**’

It is interesting to ask, at this point, why the focus marker resists deletion while in the associative NP, the associative vowel, which is equally a grammatical morpheme, gets deleted in similar contexts. I propose that the reason why the associative vowel deletes but the focus vowel does not is attributable to a difference in the syntactic positions of the two. Whereas the focus vowel occupies the initial position of a syntactic phrase (a Focus Phrase), the associative vowel does not. One may therefore make the general claim that the initial position of a syntactic phrase, just like that of a pwd, is more resistant to phonological processes than any other position.

In order to capture the fact that the associative tones (grammatical morphemes) fail to delete along with the segmental material of Pref₁, I propose the following constraint which is, in essence, an adaptation from earlier work by Samek-Lodovici ((1992).

33. MORPH.REAL

A grammatical morpheme must be given phonological expression in output representation.(Samek-Lodovici 1992. Also Selkirk 1997 and Gnanadessikan1997).

In this paper, expressing a morpheme phonologically means that the morpheme must be demonstrably present in output or show up by virtue of secondary effects on neighboring segments. The constraint in (33) requires the H and L associative tones to show up (in one form or the other) in the output representation since they are reflexes of a grammatical morpheme that marks agreement/association between N1 and N2.⁷

4.2. Realization of Floating H on N1

We now turn to the crucial question why the floating H associative tone is realized exclusively on N1 despite the fact that it originates from a segment that is in the pwd containing N2. We noted earlier with regard to H tone lowering and H tone spreading (section 3.1) that a H tone or its effects do not extend beyond a morphosyntactic word. This suggests that there is a general tendency to preserve a H tone within the morphosyntactic word to which it is underlyingly associated. Let us assume that this is so because of a constraint in the grammar of Bafut which tends to ‘keep’ a H tone within its morphosyntactic word of origin. This constraint is formalized in (34) below.

⁷ It is also necessary to ensure that in the grammar of Bafut agreement/association is expressed tonally rather than by blocking the segmental (vowel) deletion process. I will not discuss this in detail in this paper but simply note that ranking both MORPH.REAL and a constraint against tautosyllabic vowels above a faithfulness constraint which favors deletion will take care of this.

34. *No Move(T)*

Movement of a tone out of its morphosyntactic word is banned.

To return to the question of the realization of the associative H, one wonders then why it associates to N1 and not to N2 where it would have remained within its morphosyntactic word of origin (recall from the discussion above that the associative tones result from the deletion of a vowel that forms a morphosyntactic word with the prefix and root of N2). The explanation which I develop in this paper hinges crucially on the notion of positional faithfulness (Beckman 1998). If the associative H were to be preserved in its morphosyntactic word of origin, one of three things would result; namely,

- a. It may associate to the initial syllable of the pwd which, in this case, is Pref₂ (N2 prefix);
- b. It may associate to a syllable of N2 other than the initial syllable;
- c. It could remain a floating tone.

Let us examine each of these options in turn and see why the associative H ‘rejects’ them.

4.2.1. Association to Initial Syllable of N2

If the associative H associates to the initial syllable of N2, this will give rise to a contour tone or result in the substitution of the input tone of this syllable. The fact that it does not associate to the initial syllable of the pwd causing either of these effects suggests to me that the initial syllable of the pwd is a privileged position of the pwd; a position that is resistant to tonal processes that would otherwise apply elsewhere in the pwd. This position therefore resists a tonal process that would change its input tonal features. Put another way, the grammar of Bafut requires that the identity of an input tone that is linked to the initial syllable of a pwd be preserved.

Independent motivation for the claim that there is need to preserve the identity of a tone that is associated to the initial syllable of a pwd derives from H tone lowering discussed earlier in section 2. Recall from examples like these in (35) below that a L on a nominal prefix lowers a root H to M.

- 35a. ø-sĩŋ ’bird’
- b. bĩ-sĩŋ ’birds’

I proposed that this lowering occurs to avoid a LH tonal register sequence in the same pwd. The question then arose why the initial L could not be raised to M or H since raising would equally avoid the offending LH sequence. As suggested, raising does not occur because this would affect the identity of a tone that is linked to the initial syllable of a pwd.

Based on the above, it is plausible to make the general claim that in the grammar of Bafut there is the need to preserve the identity of a tone that is linked to the initial syllable of a pwd. The associative H therefore fails to associate to the initial syllable of N2 due to this requirement which we capture formally in the constraint in (36).

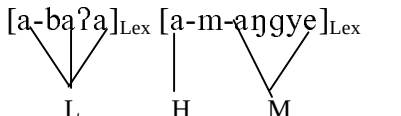
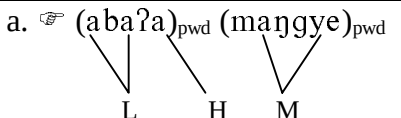
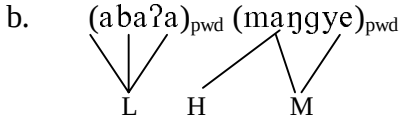
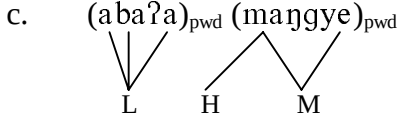
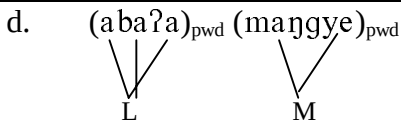
36. *Ident-Tone* $\sigma 1$

An output segment in the initial position of a pwd is associated with the same specification for tonal features as its input correspondent.

The interaction between this constraint and that which tends to ‘keep’ a tone within its pwd is illustrated in Tableau I below.

Tableau I

MORPH.REAL, *Ident-Tone* $\sigma 1$ >> *No Move(T)*

	MORPH.REAL	Ident-Tone $\sigma 1$	No Move(T)
a. 			*
b. 		*!	
c. 		*!	
d. 	*!		*

The optimal candidate (a) satisfies the high ranked *MORPH.REAL* and *Ident-Tone* $\sigma 1$ since the grammatical associative tone is realized but not on the initial syllable of a pwd. The identity of the input tone of the initial syllable of the pwd is therefore preserved. This candidate violates *No Move(T)* since the floating H is not maintained within its morphosyntactic word. *No Move(T)* is however low ranked and as such its violation has no effect on the optimality of candidate (a). The runners up (b) and (c) are ruled out by *Ident-Tone* $\sigma 1$. In these candidates the grammatical morpheme is realized but is associated to the initial syllable of a pwd thereby affecting the identity of the input tone of this syllable. Candidate (d) incurs a fatal violation of *MORPH.REAL* since the grammatical associative H deletes along with the segmental content of Pref₁.

4.2.2. Association to Second or Third Syllable

The second option, if the associative H tone were to remain in its morphosyntactic word, would be for it to associate to the second or third syllable of the pwd. To do this it will either have to undergo some form of metathesis⁸ or skip over input tones linked to the prefix and root of N2 against constraints on Linearity (McCarthy and Prince 1995) and/or the Wellformedness Condition on phonological representations (Goldsmith 1976). The associative H does not metathesize or skip over linked tones suggesting the existence of a condition on linearity which requires segments in input representation to be consistent with the precedence structure of the input correspondent. This condition is captured in the following constraint which is an adaptation of McCarthy and Prince's (1993:371) *LINEARITY* constraint:

37. *LINEARITY* (Tone)

Tones in output representation are consistent with the precedence structure of the corresponding input form.

LINEARITY interacts with the constraint requiring tones to remain within their morphosyntactic words of origin in the manner illustrated in the Tableau II below.

Tableau II: *MORPH.REAL*, *LINEARITY* >> *No Move(T)*

	MORPH.REAL	LINEARITY	No Move(T)
a.			*
b.		*!	
c.	*!		*

In the optimal candidate (a) the grammatical associative H is realized on the final syllable of N1. *MORPH.REAL* and *LINEARITY* are satisfied since the associative H associates to a TBU and does not skip over linked tones. This candidate incurs only a violation of the low ranked *No Move(T)*. Candidate (b) satisfies the low ranked *No Move(T)* but at the expense of the higher ranked *LINEARITY*. In candidate (c), the grammatical associative H is deleted along with the segmental content of Pref₁. This incurs a fatal violation of *MORPH.REAL*.

⁸ It is interesting to note that segmental metathesis as a phonological process is not, to the best of my knowledge, attested anywhere in the phonology of Bafut.

4.2.3. A Surface Floating H

The third option, were the associative H to remain within its morphosyntactic word of origin, would be for it to surface as a floating tone. It, however, does not; an indication of the presence of a constraint in the grammar of Bafut which disfavors floating H tones in output representations. This constraint is formalized in (38).

38. *FLOAT (H)

A floating H tone is banned in output representation.

The interaction between this constraint and *No Move(T)* is illustrated in Tableau III.

Tableau III: *MORPH.REAL*, **FLOAT(H)* >> *No Move(T)*

$[a-ba?a]_{Lex}$ $[a-m-aŋgye]_{Lex}$ 	MORPH.REAL	*FLOAT(H)	No Move(T)
a.			*
b.		*!	
c.	*!		*

The optimal candidate (a) satisfies both *MORPH.REAL* and **FLOAT(H)* incurring only a violation of the low ranked *No Move(T)*. Candidate (b) is ruled out by **FLOAT(H)* since the associative H does not attach to a TBU but remains floating. Candidate (c) is ruled out by *MORPH.REAL* as the grammatical morpheme (the associative H) is deleted along with the segmental content of Pref₁.

Thus far, we have provided an explanation for why the associative H moves out of its morphosyntactic word of origin and associates to the final syllable of N1. Before we round off this discussion regarding the realization of the associative H, let us address a related question: why the associative H systematically delinks the input tone of the syllable to which it attaches and why it fails to lower to M when preceded by a L. First, why it delinks input tones.

Recall from the relevant illustrations above that any time the floating associative H associates to the final syllable of N1, it delinks the input tone of this syllable. Some examples are given below:

- 39 a. / à-bà?à₇ (H) àlòò / ⇒ [àbà?á lòò]
 door Pref₁ dry season ‘door of dry season’

- b. /ĩ-sō₃ (H) māŋgyē / ⇒ [ĩsō māŋgyē]
 hoes Pref₁ of twin mother 'twin mother's hoes'
- c. /à-kwè?ē₇ (H) múŋkhî / ⇒ [à-kwè?é múŋkhî]
 cough Pref₁ child 'a child's cough'

One would have expected it to associate to the input tone of the host syllable giving rise to a complex/contour tone. The behavior of the floating associative H vis-à-vis the tone of the host syllable leads me to claim that contour tones are marked in the language. One could capture this fact using the general **Contour* constraint but facts relating to the tone system of Bafut indicate that this would be inappropriate. In section 2 of this paper, it was pointed out that Bafut allows contour tones, though in very restricted contexts: only falling contour tones and exceptionally at utterance final position. The occurrence of only falling contours and in very restricted contexts shows that contour tones are generally marked in the language. However, the total absence of a rising contour indicates that rising contours are more marked than falling contours. To account for the fact that the associative H systematically delinks tones of host syllables, we can therefore, posit the following constraint which militates against rising contours:

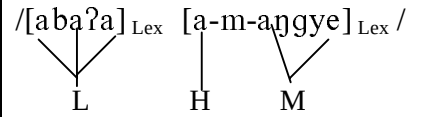
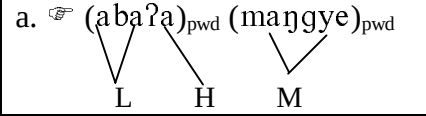
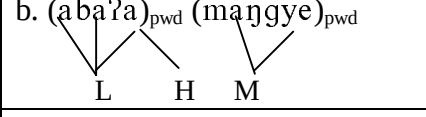
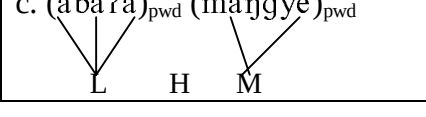
40. **RISE*

Rising contours are marked.⁹

The associative H therefore delinks the underlying tone of the host TBU in order to avoid violating the high ranked **Rise*. We discern from this that the grammar of Bafut would rather express a grammatical morpheme (the floating associative H) and avoid having a rising contour at the same time than preserving an input lexical tone in output representation. Therefore *MORPH.REAL* and **Rise* are ranked above *Ident:Tone* in the grammar. This constraint interaction is illustrated in Tableau VI

⁹ In a contour markedness hierarchy in Bafut **Rise* is ranked above **Fall*.

Tableau IV: *MORPH.REAL*, **RISE* >> *Ident:Tone*

	MORPH.REAL	*RISE	Ident:Tone
a.  a. [☞] (abaʔa) _{pwd} (maŋgye) _{pwd}			*
b.  b. (abaʔa) _{pwd} (maŋgye) _{pwd}		*!	
c.  c. (abaʔa) _{pwd} (maŋgye) _{pwd}	*!		

Candidate (a) satisfies both *MORPH.REAL* and **Rise* incurring only a violation of the low ranked *Ident:Tone*. Candidate (b) fatally violates **Rise* while (c) is ruled out by *MORPH.REAL*.

Let us now answer the second part of the question: why the associative H does not lower to M in the context of a preceding L. We have observed in the various illustrations presented above, that when the associative H docks onto the final syllable of a N1 and is preceded by a L tone, the H fails to lower to M. Some examples are repeated below for convenience.

- 41a. /ĩ-bòʔò (H) múŋkhĩ/ → [ĩbòʔó múŋkhî]
 mushroom Pref₁ child ‘a child's mushroom’
- b. /à-bàʔà₇ (H) àlòò/ → [àbàʔá lòò]
 door Pref₁ dry season ‘door of dry season’
- c. /ĩ-sō (H) māŋgyē/ → [ĩsó māŋgyē]
 hoes Pref₁ of twin mother ‘twin mother's hoes’
- d. /à-kwèʔē₇ (H) múŋkhî/ → [à-kwèʔé múŋkhî]
 cough Pref₁ child ‘a child's cough’

Failure of the associative H to lower in these examples is surprising given the general H tone lowering process discussed in section 2.1 in which a L tone lowers a following H to M. If the H tone lowering rule is fairly general in Bafut, and in other Bantu languages (See van der Hulst and Snider 1992), but fails to apply only in these contexts involving the associative H, then failure to apply must be attributable to a characteristic specific to the associative tone. My hypothesis is that failure to lower is due to the grammatical status of the associative H. Along these lines, I propose a faithfulness

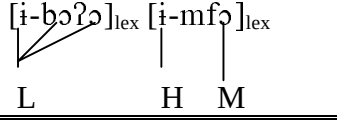
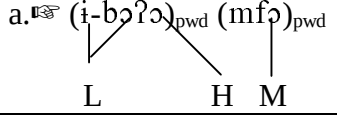
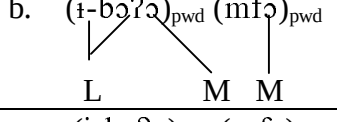
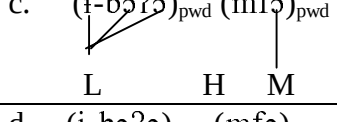
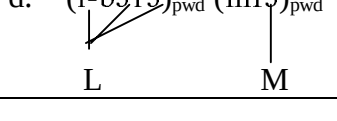
constraint, closely related to *MORPH.REAL* which requires the identity of input grammatical tones to be preserved in output representations.

42. *Ident:Tone_G*

The identity of an input grammatical tone is preserved in output representations.

Ident:Tone_G and *MORPH.REAL* are ranked above $*(\dots L_{Ri}H_{Ri}\dots)$ which militates against having the LH tone register sequence in output representations as illustrated below:

Tableau V: *MORPH.REAL*, *Ident:Tone_G* >> $*(\dots L_{Ri}H_{Ri}\dots)$

	<i>MORPH.REAL</i>	<i>Ident:Tone_G</i>	$*(\dots L_{Ri}H_{Ri}\dots)$
a. 			*
b. 		*!	
c. 	*!		
d. 	*!		

The winning candidate (a) satisfies the high ranked *MORPH.REAL* and *Ident:Tone_G* incurring only a violation of the low ranked $*(\dots L_{Ri}H_{Ri}\dots)$. The runner up (b) incurs a fatal violation of *Ident:Tone_G* since the associative H has lowered to M (thereby changing the identity of an input grammatical tone). Candidates (c) and (d) are ruled out by *MORPH.REAL* since the associative H is not expressed phonologically.

To summarize the discussion thus far, we have shown, in section 3, that the associative NP in Bafut contains two pwds: one comprising the lexical N1 and the other comprising an agreement/associative morpheme plus N2. In this structure, a floating associative H tone is realized on the final syllable of N1 as a consequence of four high ranked constraints. Concretely, the associative H resists deletion because it is the only reflex of a grammatical morpheme remaining (after deletion of an associative vowel/nasal) and the grammar of Bafut requires the obligatory presence of some phonological reflex of a grammatical morpheme in output representation. This phonological reflex of the grammatical morpheme (i.e. the floating associative H) has the option of remaining within its morphosyntactic word of origin where it can associate to the initial, medial or final syllable of the pwd. It, however, prefers to move out of its morphosyntactic word and associate to the final syllable of N1 in order not to affect the identity of the input tone of the initial syllable of the pwd, change the precedence order of input segments in the output representation or surface as a floating tone. To complete the picture of the patterns of

floating tone association in Bafut, in the next section, we examine the realization of the L associative tone.

4.3. Why Floating L Fails to Associate to a TBU

In the introduction to this section, it was pointed out that a H floating associative tone always associates to a TBU in output but a L does not. The fact that the L remains floating is rather surprising given the undominated *MORPH.REAL* constraint in the language. In this section I intend to show that by remaining floating, the L does not violate *MORPH.REAL* and that the difference in the patterns of behavior of H and L in this situation can be accounted for by assuming two ways of giving a tonal grammatical morpheme phonological expression in output.¹⁰ I will also address the related question why the floating associative L provokes downstep in following H tones whereas other L (linked) tones lower following H tones to M.

As observed in section 4.1, the overriding condition which regulates the realization of floating tones in the grammar of Bafut is the requirement that grammatical morphemes be given phonological expression in output. This condition was formalized in the *MORPH.REAL* constraint. Both H and L associative tones are grammatical morphemes which, according to *MORPH.REAL*, must be given phonological expression in output representation. The associative H satisfies this requirement by associating to a TBU. In so doing, it delinks the input tone of the host syllable violating a faithfulness constraint (*Max:Tone*) which favors the realization of input tones in output representation. The ideal would have been for it to remain floating since, in this way, no input tone will be delinked. However, a floating H tone, unlike a L, cannot transfer any of its properties onto an adjacent tone. Therefore, if the associative H were to remain floating, it would not be given phonological expression in the output representation since its presence cannot be felt. It is therefore obliged to associate to a TBU with the attendant effects (delinking of the input tone of the host syllable). The associative L, on the other hand, can achieve phonological expression by transferring some of its properties onto adjacent tones without delinking an input tone. This transfer of properties is via downstep. In downstep, the floating L transfers its register (low) to the following H tone such that the latter remains a H tone but is realized within a lower register. This way, the associative L tone ensures that it is given phonological expression in output since its presence (i.e. its effect on the following H tone) is felt in the output representation. The associative L satisfies *MORPH.REAL* through downstep and can therefore remain floating. We conclude therefore that the associative L tone can remain floating because it has an alternative means of satisfying *MORPH.REAL*. The associative H, on the other hand, lacks this alternative means and cannot therefore remain floating.

Given this observation, how do the constraints developed so far capture the facts? I suggest that *MORPH.REAL* accounts for both patterns of realization; the H associates to

¹⁰ This section builds on suggestions from Larry M. Hyman, Scott Myers and John McCarthy.

a TBU in order to be expressed and the L remains floating provoking downstep as another way of achieving phonological expression. The technical reason why the H cannot achieve phonological expression by remaining floating and affecting neighboring tones as a consequence is because **FLOAT(H)* is high ranked in the grammar of Bafut. **FLOAT(L)* on the other hand is low ranked and as such the associative L can surface as a floating tone.

The interaction between *MORPH.REAL* and the markedness constraints against floating tones will account for why the associative H associates to a TBU but the L remains floating. Before we illustrate the interaction between these constraints let us address the last issue relating to the effect of the floating L on neighboring tones.

4.3.1. The Why of Downstep

The floating L tone affects adjacent tones by provoking downstep of following H tones. The question we are interested in is why this L tone does not lower the following H to M. This question arises because, as we have noted in previous sections of the paper (see section 2 for example), L tones generally lower following H tones to M. Recall from the discussion in section 2 that Bafut disallows a LH tonal register sequence in the same pwd and so when a L tone nominal prefix is attached to a H tone root, the general tendency is to lower the following H to M in order to avoid the offending sequence. A few examples are repeated here for convenience.

- 43 a. $\emptyset$ -lĩŋɔ̃ bĩ-lĩŋɔ̃ ‘horse(s)’
 b. $\emptyset$ -fóřĩ bĩ-fóřĩ ‘rat(s)’
 c. $\emptyset$ -tɔʔɔ̃ bĩ-tɔʔɔ̃ ‘tin(s)’

In the associative NP, when the associative L precedes a H tone, the latter is downstepped but not lowered to M.

- 44 a. /fóřɔ̃₁ (L) mĩ-wúřɔ̃ / -----> [fóřɔ̃ ¹mĩwúřɔ̃]
 rat Pref₁ oil ‘rat of oil (rat that feeds on oil)’
 b. /n̄-tām₉ (L) fóřɔ̃ / -----> [ntām ¹fóřɔ̃]
 shoe Pref₁ rat ‘rat's shoe’

One would have logically expected, following from the behavior of the L and H tones on the examples in (43), that the associative L in (44) would equally lower the following H to M. Contrary to expectations, this does not happen. The explanation for this follows from the notion of positional faithfulness developed in section 4.1. When the associative vowel/nasal deletes, the initial syllable of N2 becomes the initial syllable of the pwd. This initial syllable which bears the H tone is in a privileged position which resists processes that would otherwise apply elsewhere in the pwd. If the associative L were to lower the H tone of this syllable to M it would change the identity of a tone that is linked to the initial syllable of the pwd in violation of *Ident-Tone* σ^1 . In order to avoid a violation of this high ranked constraint, the associative L rather downsteps a following H. In

downstep, the identity of the H tone per se is not affected. It remains a H tone and what changes is simply its register; the downstepped H is realized within a lower register.

Having resolved the issue of why the associative L downsteps following H tones instead of lowering them to M, we can now illustrate the interaction between the constraints that regulate the realization of the associative L tone. The relevant constraints are: *MORPH.REAL*, *Ident-Tone* σ^1 , $*(...L_{Ri}H_{Ri}...)$, and $*Float(L)$. The interaction between these constraints is illustrated in the Tableau below.

Tableau VI: *MORPH.REAL*, *Ident-Tone* σ^1 , $*(...L_{Ri}H_{Ri}...)$ >> $*Float(L)$

$/[m-bu]_{Lex}[m-\emptyset-fori]_{Lex}/$ L M L H	<i>MORPH.REAL</i> L	<i>Ident-Tone</i> σ^1	$*(...L_{Ri}H_{Ri}...)$	$*Float(L)$
a. $\textcircled{S}$ (m-bu) _{pwd} (fori) _{pwd} L M L !H				*
b. (m-bu) _{pwd} (fori) _{pwd} L M L M		*!		*
c. (m-bu) _{pwd} (fori) _{pwd} L M L H		*!	*	
d. (m-bu) _{pwd} (fori) _{pwd} L M H	*!			

The winning candidate (a) satisfies the high ranked constraints *MORPH.REAL*, *Ident-Tone* σ^1 and $*(...L_{Ri}H_{Ri}...)_{pwd}$ incurring only a violation of the low ranked $*Float(L)$. In this candidate, the associative L remains floating and provokes downstep in the following H tone. This way, it satisfies *MORPH.REAL* since the grammatical morpheme is given phonological expression. It also satisfies *Ident-Tone* σ^1 since the identity of the H on the initial syllable of the pwd is not affected. At the same time $*(...L_{Ri}H_{Ri}...)_{pwd}$ is satisfied since the register of the H tone is changed. Candidate (b) violates the high ranked *Ident-Tone* σ^1 since the H on the initial syllable of the pwd has been lowered to M (thereby changing the identity of the input H). Candidate (c) is ruled out by both *Ident-Tone* σ^1 and $*(...L_{Ri}H_{Ri}...)_{pwd}$ since the associative L attaches directly to the following H changing the identity of the tone of the initial syllable of a pwd and producing a LH tonal register sequence. Candidate (d) incurs a fatal violation of *MORPH.REAL*. In this candidate, the associative L is deleted and as such the associative NP surfaces without the phonological reflex of the grammatical morpheme.

5. Conclusion

This paper set out to analyze the patterns of floating tone association in the associative NP in Bafut with a view to establishing the conditions that regulate the surface realization of floating associative tones. Concretely, the paper addressed the following issues:

- a. Why associative tones do not delete along with the segmental content of an agreement/associative morpheme;
- b. What determines the TBU to which a floating associative H attaches;
- c. Why an associative H tone systematically delinks input tones of the host TBU to which it associates;
- d. Why an associative L surfaces as a floating tone and why it causes following H tones to downstep instead of lowering them to M as L tones do elsewhere in the language.

The analysis revealed that the overriding condition which regulates the surface realization of both H and L associative tones is a requirement in the grammar of Bafut for the phonological reflex of a grammatical morpheme to be present in output representations. Because the H and L associative tones constitute the only phonological reflex of a grammatical morpheme left after a segmental deletion process, they must surface in one form or the other in the output representation in order to satisfy this requirement. The associative L therefore surfaces as a floating tone showing up via secondary effects (downstep) on adjacent tones. This is technically possible because a constraint militating against L floating tones in the language is low ranked. The associative H tone, on the other hand, obligatorily associates to a TBU because it cannot show up via secondary effects on adjacent tones and a similar constraint disfavoring H floating tones is high ranked. Both associative tones cannot associate to the initial syllable of their morphosyntactic words of origin because of positional faithfulness conditions. Specific in the case of Bafut is a condition which requires the identity of a tone that is linked to the initial syllable of a pwd to be preserved. Because of this condition and because of the need to preserve the input precedence order of segments in the output, the associative H is obliged to move out of its pwd and associate to the final syllable of N1 delinking the input tone of this syllable in order to satisfy a constraint against rising contour tones.

In all, the analysis demonstrates that some tonal processes in the grammar of Bafut are sensitive to prosodic domains. This boosts arguments already advanced in the literature which favor considering prosodic domains in the analyses of tonal phenomena in Bantu languages. Hyman (1985) and Myers and Troi (1996) have demonstrated the promise that this approach holds in the analysis of Kom, Bamilike Dschang and Chichewa. The analysis in this paper, which combines positional faithfulness conditions and prosodic domains, is yet another step towards seeking solutions to some of the complex tonal phenomena in Bantu tonology.

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Resolution of Scope Ambiguities in *How many* Questions

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1. Introduction

Theories of sentence comprehension study how perceivers understand sentences. One productive method has been to examine the strategies that comprehenders use in order to resolve ambiguity. This paper investigates the resolution of scope ambiguity in questions, that is, resolution of the ambiguity that arises when the *wh*-constituent interacts with other quantificational elements in the sentence. While scope ambiguity resolution in declarative sentences has recently received some attention in the psycholinguistic literature (e.g., Kurtzman & MacDonald (1993), Tunstall (1997)), this phenomenon, so far, has not been studied for questions. We will focus on the case of ambiguous *how many* questions that contain a universally quantified subject.

The two main contributions of this paper are the following. First, scope preferences in questions will be shown to be problematic for any economy-based approach to the processing of meaning, as indicated by the results of French and English questionnaire studies.

Second, a model will be developed in which these scope preferences are determined by the interaction with context. While incremental context interactive models have been claimed to induce immediate resolution of structural ambiguity (Crain & Steedman (1985), Altmann & Steedman (1988) and others), I will argue that the interaction with context can also be a reason to delay such ambiguity resolution. Evidence for this claim will be provided by a self-paced reading study in English.

The structure of this paper is as follows. In section 2, I present the phenomenon of scope interaction in *how many* questions. In section 3, I lay out the basic assumptions on the

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parsing model that I will use. I then go on, in section 4, to propose a first hypothesis for scope ambiguity resolution in *how many* questions. This hypothesis is based on the assumption that the parser obeys some economy principle when constructing an LF representation of a sentence. The questionnaire studies in French and English, presented in section 5, provide strong evidence against the hypothesis. In section 6, a proposal is developed in which scope resolution derives from the interaction with context; and its hypothesis is tested in a self-paced reading study in English, in section 7.

2. Ambiguous *How many* Questions

In this section, I present the empirical facts about ambiguous *how many* questions. In a question, a particular interpretation is revealed by the answer that it requires in a given context. *How many* questions that contain a universally quantified subject allow for at least two interpretations. Let me illustrate this fact with a concrete example. Imagine the scenario described in (1).

- (1) For the last semantics assignment, the students had to answer five questions out of seven and for each question a different paper had to be read. Thus, every student read (at least) five papers. Obviously, the students ended up reading different papers. Only two papers had been read by everybody.

In the context of the situation described above, the question in (2) allows for two possible answers, namely (2a) and (2b).

- (2) How many papers did every student read for this last assignment?
 a. Answer 1: Five papers
 b. Answer 2: Two papers.

The question in (2) is a case of scope interaction between *n-many papers* and the subject quantifier *every student*. The two possible interpretations are given in (3a) and (3b).

- (3) How many papers did every student read for this last assignment?
 a. For which n : $\forall x \text{ student}(x) \Rightarrow \exists Y \text{ papers}(Y) \ \& \ \text{card}(Y) = n \ \& \ \text{read}(Y)(x)$
 ‘For which number n : every student read n -many papers.’ (Answer: Five papers)
 b. For which n : $\exists Y \text{ papers}(Y) \ \& \ \text{card}(Y) = n \ \& \ \forall x \text{ student}(x) \Rightarrow \text{read}(Y)(x)$
 ‘For which number n : there is a set of n -many papers that was read by every student.’ (Answer: Two papers)

In what follows, I will assume a semantics for questions along the lines of Hamblin (1971) and Karttunen (1977), where the denotation of a question is the set of propositions which constitute (true) answers to that question. This approach requires a question operator Q in C^0 that turns a proposition into a set of propositions. I will follow Cresti (1995), by decomposing *how many N* into a *what n* part and a *n-many N* part. The latter can then be reconstructed into the position in which it gets interpreted while the former takes matrix

scope as required by the question meaning. Two reconstruction sites for *n-many* *N* allow to postulate the two LF representations stated in (4a) and (4b).

- (4) a. **many-downstairs** (every > many)

LF1: $[_{CP} \text{How}_n [_{C^0} [_{IP} \text{every student}_i [[\text{t}_n\text{-many papers}]_j [_{VP} \text{t}_i \text{read t}_j]]]]]$

- b. **many-upstairs** (many > every)

LF2: $[_{CP} \text{How}_n [_{C^0} [[\text{t}_n\text{-many papers}]_j [_{IP} \text{every student}_i [_{VP} \text{t}_i \text{read t}_j]]]]]]$

We will refer to the reading represented in (4a) as the *many-downstairs* interpretation because $[\text{t}_n\text{-many papers}]$ is interpreted below the quantified subject, whereas the one in (4b) will be referred to as the *many-upstairs* interpretation. The downstairs reading in (4a) requires the ‘Five papers’-answer, while the upstairs reading requires the ‘Two papers’-answer, as can be seen from the corresponding paraphrases in (3a) and (3b).

After having illustrated the case of an ambiguous *how many* question, let me turn to a *how many* construction that does not display this ambiguity. French has a corresponding split construction, in which only *combien* (‘how many’) is fronted. This construction only allows for a *many-downstairs* interpretation. The question in (5) requires the ‘Five papers’-answer in the scenario described above.

- (5) **Combien** tous les étudiants ont-ils lu **de livres**?
How many all the students did-they read **of books**?

- a. ✓ Answer 1: Five papers
 b. * Answer 2: Two papers

The French non-split counterpart behaves like the English construction in that it is ambiguous and allows for both answers, as illustrated in (5').

- (5') **Combien de livres** tous les étudiants ont-ils lu ?
How many of books all the students did-they read?

- a. ✓ Answer 1: Five papers
 b. ✓ Answer 2: Two papers

French thus presents the case where two different constructions can be used to express the same interpretation (the *many-downstairs* interpretation). While the split construction can only be used to express that particular reading, the non-split construction is ambiguous. I will argue, in section 4, that this configuration can be expected to have consequences for the strategies employed by the parser. Before doing so, in the following section, I turn to the underlying assumptions on the processing model adopted in this paper.

3. Assumptions on the Processing Model

Let me begin by laying out the basic assumptions on the parsing model that will be used here. In what follows, it will be assumed that, in order to compute an interpretation resulting from a particular scope configuration, the parser needs to build the corresponding LF representation. Therefore, when the scopal elements are not in the appropriate configuration at Surface Structure, the parser has to build the structural representation that can feed semantic interpretation. I will assume that the LF representation is computed along with the Surface Structure as the incoming words are perceived.

For the case of lexical ambiguity, it has been claimed that the parser can access all the different meanings of a particular lexical entry first and then choose the most appropriate meaning according to a number of principles. By contrast, for scope ambiguity, I will assume that ambiguity resolution does not require the comparison of several interpretations. Instead, I will propose that the different interpretations are calculated serially. The ambiguity being of structural nature, it will require the calculation of several LFs.¹

The model of quantifier scope resolution presented here differs from the one proposed in Kurtzman & MacDonald (1993), where it is claimed that an analogy with lexical ambiguity resolution can in fact be made. In their model, alternative interpretations are initially considered in parallel. The single interpretation that best satisfies the scope principles is then selected.

Similarly, Crain & Steedman (1985) and Altmann & Steedman (1988) assume a model in which the different possible interpretations of a sentence are calculated in parallel. Their main claim is that structural ambiguity can be resolved early through incremental calculation of the interpretation and immediate consultation of the context. At the point of ambiguity, the reading is chosen that has less unsupported presuppositions with respect to the context (following their 'Principle of Parsimony'). Parallelism is claimed to be necessary, since such a decision can only be taken if several readings are compared. In their view, then, there is no absolute way to decide whether a sentence is the only possible or best continuation in a context.

As I will show below, in section 6, my proposal will share with this latter model the assumption that incremental calculation of meaning and early consultation of the context can play a role in the resolution of ambiguity, and in particular of scope ambiguity. However, I will propose that scope resolution in questions does not require comparison of all possible interpretations. Assuming a serial context interactive model as a possible alternative, I will argue that in certain cases the context can determine whether a reading is possible or not, without the need to compare different interpretations.

¹ Note that this approach has certain problems that cannot be addressed here. Notably, a serial account predicts that, if the construction of one LF is successful, there should be no reason to build more than one LF representation. Nevertheless, ambiguity can in fact be perceived. The alternative approach, in which all possible LFs are calculated in parallel, however, cannot explain why we do not always perceive ambiguity.

4. Attempting an Economy-based Approach

This section constitutes a first attempt to state a hypothesis about the order in which several LF representations are associated with an ambiguous *how many* question.

Following standard assumptions, the parser will be conceived as a mechanism that obeys principles of economy (cf. the Minimal Attachment Principle, Late Closure (Frazier, 1978), Recency (Gibson, 1991), Simplicity (Gorrell, 1995), the Minimal Chain Principle (De Vincenzi, 1991), and many others). Under such a perspective, it is reasonable to assume that the parser first chooses to construct the LF that requires minimal cost (e.g., the Principle of Scope Interpretation (Tunstall, 1997) and the Minimal Lowering Principle (Frazier, 1997)). In particular, I will define the following cost function to make such a proposal explicit. Let us assume that the cost of an LF in which the quantifiers have been permuted is higher than that of the LF where the order of such elements is preserved (e.g., $\text{cost}(Q_1Q_2)=0 < \text{cost}(Q_2Q_1)=2$). According to such a cost function, we expect the LF assigned first to respect the order of the quantificational elements in which they appear at Surface Structure. This idea is formulated in the Economy Hypothesis in (6).

(6) Economy Hypothesis

When processing a *how many* question, the parser first computes LF2, because it has less cost than LF1 (according to the cost function defined above).

Following this hypothesis, we expect the *many*-upstairs reading to be the preferred interpretation. For clarification, the two LFs are repeated in (7a) and (7b).

- (7) a. *many*-downstairs (every > many)
 LF1: $[_{CP} \text{How}_n [_{C^0} [_{IP} \text{every student}_i [[t_n \text{-many papers}]_j [_{VP} t_i \text{read } t_j]]]]]$
- b. *many*-upstairs (many > every)
 LF2: $[_{CP} \text{How}_n [_{C^0} [_{IP} [t_n \text{-many papers}]_j [_{IP} \text{every student}_i [_{VP} t_i \text{read } t_j]]]]]]$

In what follows, I want to argue that, in the French case, the preference for the upstairs reading is expected to be even stronger. Because French allows for two constructions that differ with respect to their possible scope configurations, a particular version of the Blocking Principle (cf. Aronoff (1976)) can be argued to apply. Before proposing a second hypothesis, let me briefly introduce this principle and show how it applies to the French data.

The Blocking Principle has been claimed to hold in the lexicon (i.e., certain words do not exist because other words with identical semantics do). Williams (1997) proposes that this principle can also be extended to other levels of the grammar, in particular to syntax. Williams (1997) interprets Aronoff's (1976) principle in the following way: "if two forms exist (in syntax or morphology), they must have different meanings" (p.578). Similarly, in psycholinguistics, there has been an attempt to use the Blocking Principle to account for certain attachment preferences. Frazier & Clifton (1997) explain the different relative clause attachment preferences in English and Spanish with a Gricean version of this principle.

It is possible to extend the Gricean version of the Blocking Principle to the French data in the following way. The existence of the unambiguous split construction should ‘block’ the ambiguous non-split construction from receiving the downstairs interpretation. In fact, this configuration disconfirms Williams’ initial proposal. His proposal predicts that the non-split construction should not allow for ambiguity at all. The unambiguous split construction should prevent the non-split construction from receiving the downstairs interpretation. A Gricean version of this principle can however apply: we expect the non-split construction to be used more often to express the upstairs reading than the downstairs reading. Consequently, the parser should prefer to assign the upstairs reading to the non split construction. This hypothesis is stated in (8).

(8) **Blocking Hypothesis**

In French, the split question is unambiguously used to express the *many*-downstairs reading. Assuming a Gricean version of the Blocking Principle, we expect the non split question to be used in production to express the *many*-upstairs reading, and correspondingly expect perceivers to favor that reading in comprehension.

Both hypotheses, (6) and (8), predict a preference for the *many*-upstairs interpretation. To test these two hypotheses, I carried out two questionnaire studies in English and in French. The preferred interpretation of a *how many* question was determined with the help of the answers that participants chose in particular contexts. These questionnaire studies are presented in the following section.²

5. Experiment I: French and English Questionnaire Studies

5.1. Method

Participants read twelve stories followed by a question. The eight experimental stories were designed to equally support both interpretations and were followed by a *how many* question. Participants were asked to write down the first answer that came to mind. They were also encouraged to indicate other correct answers when possible. In the French questionnaires, the split/non-split nature of the question was manipulated. In the English questionnaires, the partitive/ non-partitive nature of the *how many*-phrase was manipulated.

(9) Example:

Three friends went to the last Music Festival in Montreal. Altogether, each of them saw ten movies. When comparing what they had seen at the end, they realized that there were four movies that they all had seen.

How many (of the) movies did everybody see at the Movie Festival in Montreal?

² For reasons of space, the experiments presented in this paper cannot be described in all details. The rather succinct description of the experiments, however, contains all the information relevant to the argumentation in this paper.

5.2. Participants

32 UMass undergraduate students and 32 undergraduate students from the Université Paris 8 participated in this experiment. The UMass undergraduate students received extra course credit for it; the French students completed the experiment as part of a classroom exercise.

5.3. Results

The results disconfirm the prediction of the hypotheses (6) and (8), as can be seen in Tables 1 and 2.³ Both, in English and French, the questions were answered more often with a downstairs interpretation than with an upstairs interpretation. No significant difference was found between partitive and non-partitive questions nor between split and non-split questions. Some of the questions were answered with a cumulative answer (the total number of sets mentioned in the previous discourse).

T-test results: in French, there was a highly significant preference by subject ($t_1(31) = 9.67$, $p < .0001$) and by item ($t_2(7) = 11.88$), $p < .0001$). In English, there was a significant preference by subject ($t_1(31) = 2.75$, $p < .007$), but not by item ($t_2(11) = 1.59$, $p < .15$). However, seven out of the eight English stories had a significant preference for the downstairs interpretation (sign test: $p < .035$).

Table 1
Number of answers (French)

	Upstairs	Downstairs	Cumulative	Total
Split	5	105	12	126
Non split	9 (+4)	107 (+1)	12	128
Total	14 (5.5%)	212 (83.5%)	24	254

Table 2
Number of answers (English)

	Upstairs	Downstairs	Cumulative	Total
Non partitive	46 (+1)	74 (+4)	7(+1)	127
Partitive	50 (+1)	74	3	127
Total	94 (37.8%)	148(58.3%)	10	254

³ In Tables 1 and 2, the numbers in parentheses indicate second choice-answers.

5.4. Discussion

The two questionnaire studies provide evidence against the Economy Hypothesis. The results suggest, in English and in French, that the first LF computed is not LF2, the LF that has less cost, but rather LF1.⁴ Furthermore, the French questionnaire study provides evidence against the Blocking Hypothesis. The preference for a downstairs interpretation in a French non-split construction is as strong as in a split construction, contrary to expectation.

Before turning to an alternative hypothesis, in section 6, let me point out that this result is unexpected under the current theories on the processing of meaning, in particular, under the Immediate Interpretation Principle widely adopted in on-line interactive approaches (cf. Marslen-Wilson & Tyler (1980), Crain and Steedman (1985), Altman & Steedman (1988) and others). In these approaches, the interpretation of an utterance is computed immediately and in an incremental fashion. Extensive experimental evidence has shown that the processor commits to a particular word meaning at the earliest point possible and that this has immediate consequences for the representation of the input. Furthermore, in such models, the processing of an utterance is claimed to always be conducted with immediate reference to the discourse context in which it occurs. Crain and Steedman (1985), for example, argue that “the primary responsibility for the resolution of local syntactic ambiguities in natural language rests not with structural mechanisms, but rather with immediate, almost word-by-word interaction with semantics and reference to the context.” (p.321)

Note, however, that the Immediate Interpretation Principle predicts a preference for the upstairs interpretation of a *how many* question. Immediate Interpretation has as a consequence that each incoming word is interpreted immediately and is therefore integrated into the LF representation as soon as possible. We thus predict that the parser should first attempt to construct LF2. The constituent *n-many N* should be interpreted and integrated into the LF as soon as it is encountered. Hence, the parser is committed to the upstairs interpretation as soon as the *how many* phrase has been processed. For clarification, the two LFs are repeated again in (10a) and (10b).

- (10) a. *many-downstairs* (every > many)
 LF1: [_{CP} How_n [_C⁰ [_{IP} every student_i [_j [_{t_n} -many papers]_j [_{VP} t_i read t_j]]]]]
- b. *many-upstairs* (many > every)
 LF2: [_{CP} How_n [_C⁰ [_{IP} [_j [_{t_n} -many papers]_j [_{IP} every student_i [_{VP} t_i read t_j]]]]]]]

In the next section, I present a model, in which interaction with context can also be a reason to delay the interpretation and LF-integration of a constituent. As a consequence, the more ‘economic’ LF1 does not necessarily have to be the first LF constructed by the parser.

⁴ These results are challenging for the current scope resolution and LF-principles used in the psycholinguistic literature (cf. Kurtzman & Mac Donald 1993, Tunstall 1997), which cannot account for this preference. Although these theories do not claim to have an account for questions, a unified analysis of quantifier scope resolution in declaratives and questions would be desirable.

6. Scope Ambiguity Resolution determined by the Interaction with Context

In what follows, I will adopt a model in which the parser can access information from the discourse context. Similarly to what is proposed in Crain & Steedman (1985) and Altmann & Steedman (1988), I will assume that resolution of local structural ambiguities depends on the interaction with semantics and reference to context.

A discourse model can be represented as a conversational record (cf. Stalnaker 1969). As already described in Karttunen (1970), it can be viewed as a file that consists of records of all the individuals mentioned in the text, and for each individual of a record that contains its properties. In particular, I will assume, following Heim (1982), that indefinites introduce new discourse referents into the representation, while definites and pronouns have to refer back to antecedents introduced earlier into the discourse. Furthermore, I will claim that *wh*-phrases also require an antecedent in the discourse. In the particular case of a *how many* phrase, the search for its antecedent-set in the discourse is done in order to determine its cardinality.

In the previous section, I concluded that the Immediate Interpretation Principle commits the parser to the upstairs interpretation, as soon as the *how many* constituent has been encountered. This is a consequence of the fact that incoming elements are, under the Immediate Interpretation Principle, interpreted and integrated into the LF as soon as possible. Nevertheless, I want to argue here, that, within a context interactive model, immediate access to context can as well be a reason to delay the decision to integrate a particular element into the LF representation. I want to claim that, under a slightly different formulation, the Immediate Interpretation Principle is in fact not incompatible with the preference to interpret a *how many* question with a downstairs interpretation.

Let me now illustrate for the particular case of a *how many* phrase, how information from the context can delay its integration into the LF-representation. The lexical information from this constituent triggers the parser to search for a set in the discourse (an antecedent for *n-many N*). Immediate Interpretation predicts that this search should be done as soon as possible, that is, as soon as the constituent has been processed. The *wh*-phrase by itself, however, does not necessarily have enough descriptive content to allow the parser to choose a particular antecedent from the discourse. If there is more than one possible antecedent in the discourse, the parser cannot choose the appropriate antecedent for *n-many N*. Only if the context contains a unique salient antecedent, the search can be successful and an interpretation can be assigned immediately to the constituent. We can conclude that only particular contexts allow *wh*-phrases to be interpreted immediately. I will take 'assigning an interpretation to a constituent' to mean 'successfully integrating it into the LF representation'.

If there are several possible antecedents in the discourse, the parser cannot integrate *n-many N* into the LF representation immediately. I will assume that the constituent is, at that point, put in a stack. It remains in the stack until there is enough information available to choose its appropriate antecedent. Only then can it be integrated into the LF representation. A hypothesis for the scope resolution in *how many* questions is formulated in (11).

(11) Context Dependency Hypothesis

How many N triggers the search for an antecedent-set in the discourse. A context that provides more than one possible antecedent for *n-many N* delays its incorporation into the LF representation.

There is a parallelism with the discourse conditions that pronouns/definite descriptions require for their antecedents.⁵ For illustration, consider the following examples, taken from Heim (1982).

(12) John has a cat and a dog. ?Its name is Felix

(13) John has a cat and a dog. ?The pets name is Felix

Heim (1982) shows that the use of an anaphoric element is only acceptable, if it is clear which of the discourse referents in the context it refers to. In (12) and (13), there are two equally possible antecedents for the pronoun *it* and the definite description *the pet*. The lack of enough descriptive content makes it impossible to find the appropriate antecedent. Similarly, Kadmon (1987) proposes a general uniqueness condition on definite descriptions and pronouns. These are only felicitous if they have a unique salient antecedent in the context. I assume here that *wh*-phrases are anaphoric, and therefore they also obey the uniqueness condition. They can only be interpreted felicitously if there is a unique salient antecedent in the discourse context.

The Context Dependency Hypothesis makes the following predictions. If a context contains a single antecedent for *n-many N*, the parser should commit to the upstairs interpretation immediately. Under this condition, we expect a preference to answer the question with an upstairs interpretation. This prediction is not incompatible with the results of the Experiment I. In the questionnaire studies, the stories preceding the questions were designed to equally support both interpretations. None of the sets mentioned in the discourse was particularly salient.

If a context contains more than one salient antecedent for *n-many N*, we predict that this constituent should not be immediately incorporated into the LF representation. Therefore, the parser does not commit to the upstairs interpretation immediately. We predict that questions should receive less upstairs answers than in contexts that contain a unique salient antecedent. We expect, furthermore, this delay in interpretation to be reflected in the reading times of the question. There should be a difference in processing load at the point at which *n-many N* is integrated into the LF representation. Presumably, once the verb has been encountered, enough information is available to take this decision. At that point, we expect higher reading times than in contexts that contain a unique salient antecedent.

In order to test the predictions of the Context Dependency Hypothesis, I conducted a self-paced reading study in English, in which participants had to read questions on a computer screen preceded by a context. The self-paced method allowed to measure the

⁵ These conditions are discussed in Heim (1982) and Kadmon (1987).

processing load of the different regions of the question and to determine whether a difference in context affected the reading times. The experiment is described in the following section.

7. Experiment II: Self-paced reading study in English

7.1. Method

Participants read sixty-six stories on a computer screen followed by a question or continuation sentence (self-paced method). Participants used a response key to indicate when they had finished reading the portion of text presented on the screen. Once the whole story was read, it disappeared from the screen. Each of the twelve experimental stories was followed by a *how many* question, which was presented region by region. The regions disappeared when the participant pulled the response key to indicate that s(he) had finished reading, and the following region appeared. The question was divided into five presentation regions: How many N / Quantifier / Verb (+ Particle) / Modifier 1/ Modifier 2. Once participants finished reading, the question disappeared from the screen and they were asked to choose one of the two answers presented on the screen (upstairs and downstairs answer), by pulling the corresponding trigger.

The presence/absence of a unique salient antecedent in the context was manipulated. Condition 1 presented the same stories from Experiment I, which supported both interpretations equally. Condition 2 presented the stories from Experiment I, but minimally changed. These supported the upstairs interpretation. One or two sentences were added to the original stories, in order to increase the salience of the set corresponding to the upstairs interpretation. This was done by involving the set in an additional event. The salience of the downstairs information was reduced by using a vague cardinality (*different, several, some*). Six stories presented the upstairs information before the downstairs information, the other six stories presented the downstairs information before the upstairs information. An example is given below.

(14) Condition 1

In December, the chef distributed some of his recipes to his students. There was one recipe that everybody received, the "Chilled Terrine with Pistachios and Caper Mustard". Altogether, each of them received four different recipes.

(15) Condition 2

In December, the chef distributed some of his recipes to his students. There was one recipe that everybody received, the "Chilled Terrine with Pistachios and Caper Mustard". That was his special recipe. He wanted to make sure that everybody would be able to try it out.

(16) Question following the context

How many recipes/ did every student/ receive from/ the chef/ in December?

7.2. Participants

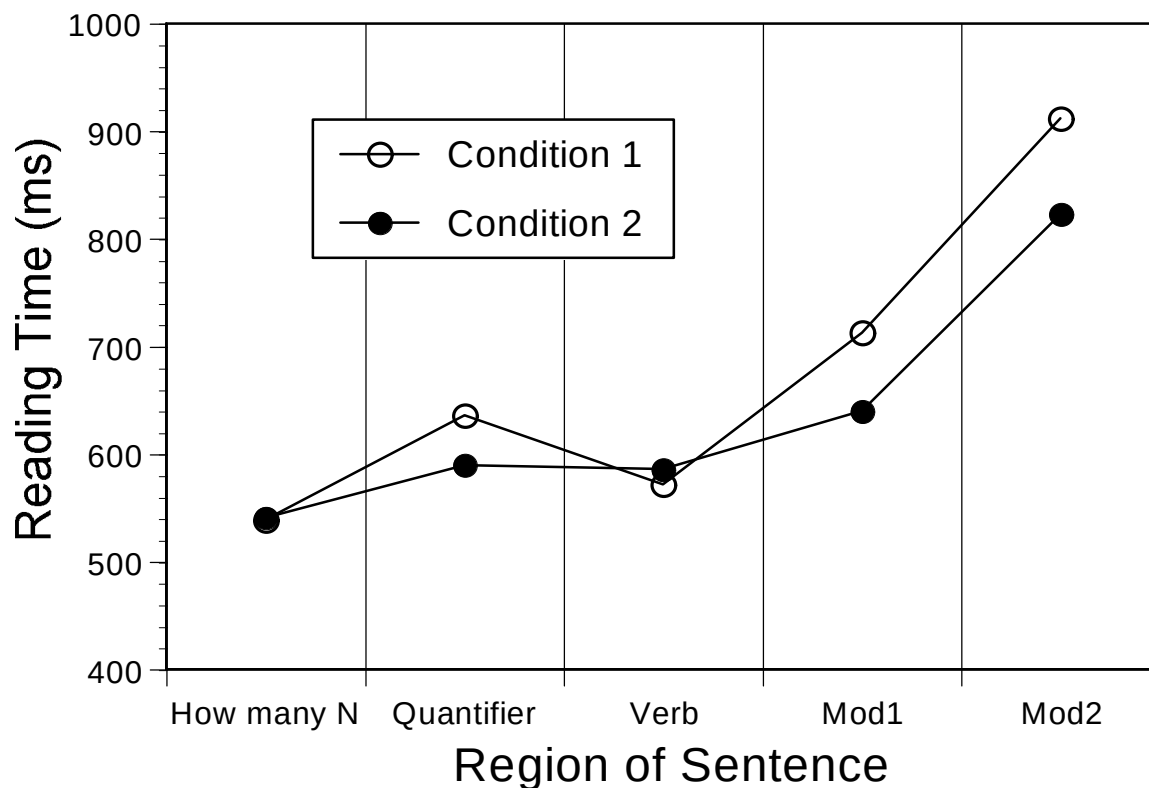
44 UMass undergraduate students participated in this experiment and received extra course credit for it.

7.3. Results

As predicted by the Context Dependency Hypothesis, in condition 1, participants were significantly slower in the last two regions (following the verb); the results were significant by subject, $F_1(43)=5.01$, $p<.03$, and nearly significant by item, $F_2(11) = 4.58$, $p<.06$. Figure 1 presents the reading times for both conditions associated with each of the five regions.

Condition 1 received significantly more downstairs answers than condition 2. There were 66% downstairs answers in condition 1 and only 47% downstairs answers in condition 2 ($F_1(43) = 10.13$, $p<.003$, $F_2(11)= 7.73$, $p<.02$).

Figure 1



7.4. Discussion

The results of this experiment provide evidence that context affects the processing of a *how many* question. They indicate that immediate access to context does not require the parser to resolve ambiguity as soon as possible. The delay in the resolution of scope ambiguity is reflected in the fact that participants are significantly slower in reading the last two regions when the context does not provide a unique salient antecedent. Hence, immediate access to context can also be a reason to delay this ambiguity resolution. Immediate access to context does not have as a consequence that the parser necessarily commits to the upstairs interpretation immediately.

The fact that participants were also slower in the second region in condition 1 (but not significantly slower: $F_1(43)=3.06$, $p<.09$, $F_2(11)=1.42$, $p.3$) could be argued to support an alternative hypothesis, namely that the contexts in condition 2 induced a general lower processing load for the whole question. Since these only support the upstairs information, one could claim that the following question is generally 'easier' to process. However, if some general difficulty of the context in condition 1 slowed reading in both region 2 and region 4 for certain items, then one would expect reading time to correlate across items between region 2 and 4. No correlation was found (Pearson $r = 0.079$). We can conclude that contexts with a unique salient antecedent did not necessarily have as a consequence a general lower processing load, but that only the last two regions of the question (following the verb) were affected in a significant way.

This experiment has allowed to determine that context can delay the resolution of quantifier scope ambiguity. Nevertheless, an open question still remains, namely, why delaying the interpretation of *n-many N* has as a consequence that the downstairs interpretation is preferred. This preference does not follow directly from the delay. It can however be argued that, under economy, the parser conforms to a structure preservation principle. Hence, in the case in which ambiguity resolution is delayed, there should be a preference to not give up the structure that has been successfully build up to that point. It follows that there should be a preference to construct the LF corresponding to the downstairs interpretation under these conditions.

8. Conclusion

The experimental results presented in this paper confirm that there is a preference to interpret a *how many* question with a *many*-downstairs interpretation when the preceding context supports the upstairs and the downstairs interpretations equally.

These results disconfirm the Economy Hypothesis formulated in section 4, since the preferred interpretation does not correspond to the more economic LF representation. These results are also unexpected under the current assumptions on the processing of meaning. Immediate Interpretation, a principle which has been widely adopted in on-line interactive approaches, does not seem to make the correct predictions. Under the current view of Immediate Interpretation, the parser should commit to the upstairs interpretation very early in the sentence. Therefore, the downstairs reading should be a very difficult reading.

The main point of this paper has been to show that, once context is taken into consideration, these results are in fact not incompatible with Immediate Interpretation. I have proposed a model in which scope ambiguity resolution is determined by the interaction with context. An important feature of this model is that the interaction with context can also be a reason to delay ambiguity resolution. Crucially, then, immediate access to context does not necessarily commit the parser to the upstairs interpretation. Only contexts that provide a single salient antecedent have this consequence.

The preference for the downstairs interpretation has been shown to be even more surprising in the case of French. A Gricean version of the Blocking Hypothesis predicts, for the non-split construction, a preference for the upstairs interpretation. However, the experimental results indicate that both split and non-split constructions received a preference for the downstairs interpretation. The effects of the Blocking Principle must be overridden by the requirements that context imposes on the interpretation of a *how many* question.

That context plays an important role in the resolution of ambiguity is a well known fact. The experimental results presented here have shown that this is also clearly the case for quantifier scope ambiguity in questions. In particular, I have claimed, that different contexts can directly affect how a question is processed. I conclude that a better understanding of the processing of quantifiers can only be reached if serious consideration is given to the contexts in which these appear.

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