Max-Planck-Institut für Psycholinguistik

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1999

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Preface

The year 1999 was marked by a number of successes for the Institute, but above all by the award of the Spinoza Prize, the highest Dutch science prize, to Anne Cutler, Director of the Comprehension Group. The three million guilder budget that comes with the prize will allow Anne not only to pursue her main (and quite obviously successful) line of research further, but also to pursue other areas in more detail, such as the study of how infants parse the speech stream. Her research group will consequently expand.

Another stroke of good fortune for the Institute has been the decision by an expert committee installed by the Dutch Ministry of Education, Culture and Science (OC&W) and the Netherlands Organization for Scientific Research (NWO) to locate the main national centre for cognitive brain imaging in Nijmegen. It has been named the F. C. Donders Centre for Cognitive Neuroimaging, and is headed by Peter Hagoort, until recently a staff member of the Institute. The Institute and the Max Planck Society have contributed substantially to the Centre, both financially and in expertise, and will be a partner in the enterprise. The support of the President, Hubert Markl, and the Vice-President, Klaus Hahlbrock, of the Max Planck Society has been essential, and is gratefully acknowledged. Pim Levelt and the staff of the neurocognition group at the Institute have played an important role in bringing this to fruition. We look forward to close collaboration with other national and international partners in the study of how language is processed in the brain.

Other successes for the Institute include no fewer than three prizes received by Jürgen Bohnemeyer for his dissertation, and a record number of externally funded grants, including some to the Technical Group, which has achieved prominence as a centre of excellence in various aspects of linguistic computing.

The main institutional change over the year has been the appointment of a new Fachbeirat or Scientific Council. The members are:

K. Bock, U. of Illinois, Urbana	H. Kamp, U. Stuttgart
H. Clark, Stanford U.	J. Lucy, U. of Chicago
N. Evans, U. of Melbourne	J. Miller, Northeastern U., Boston
K. Forster, U. of Arizona, Tucson	J. Schumann, UCLA
B. de Gelder, U. Brabant	D. Slobin, U. of California, Berkeley
E. de Haan, U. Utrecht	

The names of the outgoing scientific council are listed on the following page. We took the opportunity of thanking them in the preface to the last report, but since they have been offering us constructive advice through 1999, we do so again. Dan Slobin, Kay Bock, Lyn Frazier, Paul Kay, Jakob Korf, Ewald Lang, Joanne Miller, Detlev Ploog, Jeroen Raaijmakers, John Schumann, and Heinz Wässle have all been deeply engaged with the research of the Institute, and have helped us judge our own progress and encouraged new lines of research oyer many years. We are deeply grateful to them. Any research institution relies heavily on external advice and stimulation, which we also receive from our many distinguished visitors.

The Institute continues to operate its project-driven form of research, so that the projects described in the report that follows cross-cut the main research groups (dedicated to language production, comprehension, acquisition, language and cognition, and neurocognition). For the constitution of those groups, current staff-lists, and much further background information, the reader is directed to our web pages (http://www.mpi.nl), where prior Annual Reports can also be obtained.

Stephen C. Levinson

Nijmegen, March 28, 2000

Organization of the Institute in 1999

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E. Lang	H. Wässle

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PROJECT DESCRIPTIONS

1 PHONOLOGICAL STRUCTURE IN COMPREHENSION

The Phonological Structure in Comprehension project investigates the ways in which the processing of spoken language input is constrained by the phonological structure of the input language. One line of research concerns infants' acquisition of native phonology; in 1999 this was not the most active component of the project, but activity is shortly due to rise sharply: An expanded infant speech perception laboratory is currently being set up under the direction of new project member Swingley, and the new Ph.D. project of Dietrich is beginning in this area. Further research reported below concerns the role of phonological structure in the processing of segmental structure and in the recognition of spoken words.

1.1 The development of native phonological structure

1.1.1 Speech input to a prelinguistic infant

Van de Weijer extended his analyses of the corpus of language input to a prelinguistic infant (see Annual Report 1998). The two existing orthographic and phonological versions of the transcriptions were complemented with a version in which each word was tagged with its syntactic category (noun, verb, adverb, adjective, etc.). A comparison of the three addressee conditions that are included in the corpus (infant-directed, child-directed and adult-directed) revealed differences in the distribution of the categories. Some of these differences were predictable (e.g., a relatively high proportion of the use of proper nouns in the infant-directed speech, and a relatively low proportion of conjunctions), but not all of them. For instance, the percentages of nouns were about equal in the infant- and the adult-directed speech (9.34% and 9.50% respectively) but slightly higher in the speech directed to the older child (10.96%). This

pattern is quite remarkable and suggests that the adults adapted their speech to the linguistic stage of the children: They used relatively many concrete content words to the older child, something they did not yet do when addressing the infant.

A second issue that was investigated further was the use of phonotactic constraints for the recognition of word boundaries. For this purpose, the sound combinations across word boundaries were compared with those occurring within words (at syllable boundaries). The results of this analysis revealed two things. First, in the infant-directed speech, there was significantly less overlap in the combinations of sounds within and between words. Second, the average ratio of the relative frequencies of the combinations within and between words was significantly higher in the infant-directed speech than in the other two conditions. Taken together, these findings indicate that phonotactic regularities yield a more accurate location of the word boundaries in the infant-directed speech than in the other two speech conditions.

1.1.2 Infants' word recognition in fluent speech

In collaboration with Jusczyk and Johnson (Johns Hopkins U., Baltimore), Cutler began a new series of head-turning experiments with 9-month-old English-learning infants. In the first study, the infants were familiarized with pairs of monosyllabic words (two of *rush, lop, rack, win),* and then tested either on new items or on the familiarized words preceded by a minimal context. The context could be either a single phoneme (e.g., for *rush: thrush, prush, drush* etc.) or a syllable (e.g., for *rush: hethrush, niprush, shodrush* etc.). The infants preferred to listen to the familiarised words (rather than the new items) when the contexts were syllabic but not when the single-phoneme contexts were used, suggesting that they could segment the words from the former contexts but not from the latter.

This result is in accord with the findings from adult listening studies which have motivated the Possible Word Constraint (see Annual Report 1996, 1997). Adult listeners also find it more difficult to detect a known word in a single-consonant context than in a syllabic context. The new results with infants suggest a possible link between initial vocabulary acquisition and speech segmentation procedures in adulthood.

1.2   The role of phonological structure in segmental processing

1.2.1   Non-native perception of English phonemes

For any language, the phonemic repertoire of a non-native listener may differ from that of a native listener. As a result, non-native listeners may be less reliable in processing phonemes of the language in question. This in turn may lead to the activation of spurious lexical competitors that would not feature in the native listener's set of candidate words. As a first step in investigating the effect of inaccurate phoneme perception on word recognition, Cooper ran a preliminary study exploring Dutch listeners' perception of American English phonemes.

Dutch listeners heard a subset of English CV and VC syllables, embedded in multispeaker babble at seven different signal-to-noise ratios. Identifying either the vowel or the consonant, listeners responded by clicking on the word that contained the appropriate sound on a computer screen.

Phoneme confusion matrices were derived, indicating how often phoneme X was perceived given phoneme Y. As expected, Dutch listeners tended to respond *ld* (bet) given *lee/* (cat), since *lxl* does not occur in Dutch. Other highly confusable phonemes were the vowels *ltd* (cut), *hi* (caught) and *ld* (hot). The experiment is currently being run with all possible CV and VC syllables at three different signal to noise ratios.

The confusion matrices of Dutch and American listeners will be compared and used to predict performance differences between native and non-native listeners in word recognition tasks. A vowel confusion matrix has also been generated for Australian listeners and will be used to investigate the set of candidate words for speakers of a different dialect, who have inexact perception of American English phonemes but who probably have a vocabulary size more comparable to that of American English listeners. This may allow assessment of the separate contributions of phoneme confusion and vocabulary size effects in natives' and non-natives' candidate set structure.

1.2.2   The perception of epenthetic stops

Warner and Weber investigated the perception of epenthetic stops (i.e., [p] in *hemd* [hempt] "shirt" or *something* [sAmpthrj]). They presented listeners with non-words containing nasal-obstruent sequences with an environment for epenthesis. The speaker did not intentionally produce epenthetic stops. Warner and Weber found that listeners often perceive

epenthetic stops as real versions of the stop (in both phoneme monitoring and dictation tasks), and that they are more likely to do so if the presence of the epenthetic stop would not violate a phonotactic constraint of the language. (Listeners respond more often to epenthetic [p] in an *lmM* cluster, where /mpt/ is a possible cluster of the language, than in a word-final /mk/ cluster, since /mpk/ is not possible word-finally). Warner and Weber also found that reaction times to epenthetic stops are slower than to stops which were intended by the speaker, indicating a difference in processing. Finally, they found that epenthetic stops are less often reported in the dictation task than the phoneme monitoring task, indicating that additional processing time helps listeners to recover the intended segment string. This research thus addressed several factors regarding how listeners parse the variability typical of connected speech.

1.2.3 The phonological status of epenthetic schwa in Dutch

In previous perceptual studies, van Donselaar, Kuijpers and Cutler (see Annual Reports 1996 and 1998) showed that Dutch words produced with and without epenthetic schwa have a single lexical representation, namely the form without epenthetic schwa. The absence of the epenthetic schwa from the lexical representation could imply that schwa epenthesis is a phonological process via which a phonological segment is inserted into the lexical form. Alternatively, however, the epenthesis might simply be an artifact of the timing of articulatory gestures. Articulatory Phonology (Browman and Goldstein 1990, 1992) states that no gestures are added between the lexical representation and the surface form; apparent epenthesis results when adjacent gestures are separated in time, leaving a period with no gestural specifications, which sounds like a schwa (a "targetless schwa").

To decide between these accounts, Warner and Cutler, with Mücke (U. Cologne) and Jongman (U. Kansas), investigated the articulation of /l/ and epenthetic schwa in Dutch words such as *film* ([film, filəm]). Warner et al. collected articulograph data on the position of the tongue during words such as *film* (with and without epenthesis) and *Willem* (underlying schwa). /l/ in Dutch is dark in coda position and light in onset position, and these allophones of /l/ should have different tongue positions. The data showed that the lowering gesture of the tongue dorsum and body is greater, and the tongue tip raising gesture smaller, in [film] (no epenthesis) than in [filəm] or *Willem.* Furthermore, there was no difference between the /l/ in [filəm] and *Willem.* These results match differences between English dark

and light *IV* (Sproat and Fujimura 1993). Thus, *IM* before epenthetic schwa is a light /I/, just as /I/ before underlying schwa is. /I/ in words produced without epenthesis, however, is dark. Since this alternation is conditioned by syllable structure, the epenthetic schwa must be present in the phonological representation, and cannot be a "targetless schwa." Warner et al. conclude that Articulatory Phonology must allow for insertion of gestures.

1.3 Phonological structure in word recognition

1.3.1 Suprasegmental structure in word recognition

Otake (Dokkyo U.) and Cutler carried out a series of experiments investigating the perception of suprasegmental structure in a non-native dialect. The experiments followed Cutler and Otake's earlier study of the perception of Tokyo Japanese pitch-accent distinctions by native speakers of Japanese (see Annual Report 1996, 1997), which showed that listeners from the Tokyo Japanese pitch accent area drew on pitch-accent information early in spoken-word recognition. In this follow-up work the same Tokyo Japanese speech materials were presented to listeners from two areas of Japan where accentless varieties of Japanese are spoken. In the first experiment, listeners judged from which of two words, differing in accentual structure, isolated syllables had been extracted. Both accentless groups were, overall, as successful at this task as Tokyo Japanese speakers had been, but their response patterns differed from that of the Tokyo Japanese, for instance in that a strong bias towards H (high) judgements found in the Tokyo Japanese responses was significantly weakened in the accentless groups' responses. In a second experiment listeners heard word fragments and guessed what the words were; their guesses were scored for correctness of accent pattern. In this task, the speakers from the accentless areas again performed significantly better than chance, but their responses showed less sensitivity to the information in the input, and greater bias towards vocabulary distribution frequencies, than had been the case with the Tokyo Japanese listeners. The results suggest that experience with a local accentless dialect affects the processing of accent for word recognition in Tokyo Japanese, even for listeners with extensive exposure to Tokyo Japanese.

1.3.2 Rhythmic categories in lexical activation

Cutler and Otake also undertook a study of the role of the mora in the recognition of spoken words in Japanese. Previous studies have shown

that Japanese listeners are sensitive to the moraic structure of speech, and find it easier to manipulate or respond to morae than phonemes. The new study further examined moraic processing via four word reconstruction experiments, in which Japanese listeners heard three- or four-mora nonwords which could be changed into real words by substitution of a single mora. In a first experiment listeners had to change the first mora of the nonword, in a second experiment they altered the final mora, in a third experiment they changed the second mora and in the fourth experiment either the second or third mora. All morae had CV (consonant-vowel) structure, and three types of substitution were compared: substitution preserving the consonant but altering the vowel (e.g., *kimera* or *kamere* for respectively the first and last mora of the word *kamera,* which has three morae: ka-me-ra), substitution preserving the vowel but altering the consonant *(namera, kamena),* or substitution preserving neither *{nimera, kamene).* In all four experiments, responses were significantly faster and more accurate when either segment was preserved than when neither was preserved. In initial position, there was no difference between C- and V-preserving substitutions, but in all other positions, preservation of the consonant led to faster and more accurate responses than preservation of the vowel.

These results confirm that spoken word recognition in Japanese is sensitive to vocabulary structure and similarity (inter alia at a submoraic level) between words, and suggest that the role of the mora in spoken-word recognition is not to act as an intermediate level of classification in the initial process of word candidate activation. In a subsequent lexical decision study using the nonword materials of all four word reconstruction experiments, correct rejection response time was highly sensitive to the point (segment position) at which the nonword deviated from all existing Japanese words: the earlier the deviation, the more rapidly the nonword could be rejected. The activation of Japanese words does not differ in this respect from word activation in other languages. The role of the mora in word recognition may thus be more appropriately sought in constraints on the competition process, in the same way as Norris, McQueen, Cutler and Butterfield (1997) have modeled the role of stress units in word recognition in stress languages. The results are consistent with proposals made by McQueen, Otake and Cutler on the basis of segmentation experiments in Japanese (see Annual Report 1996).

1.3.3 Phonotactic constraints in non-native listening

Weber began an investigation of the effects of phonotactic constraints of a listener's native language on segmentation when listening to a non-native language. McQueen has shown that listeners use phonotactic constraints in segmenting continuous speech (Annual Report 1995). Weber investigated how differences between phonotactic constraints of the native and non-native language affect listeners' segmentation. Native German listeners spotted real English words embedded in English nonsense sequences. In one condition, English phonotactic constraints indicated that there was a syllable boundary at the beginning of the real word, but German phonotactic constraints did not (e.g., *lunch* in /garflAntf/, since /Jl/ is a possible onset in German but not in English). In another condition, German would have a syllable boundary at the beginning of the real word, but English would not (e.g., *lunch* in /moisIAntf/, since /si/ is a possible onset in English but not in German). In a third condition, the real word was aligned with a syllable boundary for both languages (e.g., *lunch* in /pumlAntf/), and in a fourth condition, the word was not aligned with a syllable boundary for either language (e.g., *lunch* in /pruklAntJT). The listeners spotted the embedded word most quickly when both languages indicated a syllable boundary, rather quickly when only German indicated a boundary, rather slowly when only English indicated a boundary, and most slowly when neither language did. These results suggest that listeners use information from phonotactic constraints of both their native and non-native languages in segmenting speech, but make more use of the native language information.

2 SPOKEN WORD RECOGNITION

Researchers in this project are continuing to explore the process by which listeners recognize the words of spoken language. A central issue in 1999 has been the mapping of the speech signal onto the mental lexicon. Part of this work has been concerned directly with the recognition of words, and has been addressing the effects on lexical access of variations in the speech signal (2.1). The other part of this work has been concerned with the perception of speech sounds; several aspects of the word recognition process have been examined using tasks which require phonemic decisions (2.2).

The first Ph.D. dissertation from the project appeared this year. Van der Lugt successfully completed his thesis, which was on the role of transitional probability information in the segmentation of continuous speech, and on the tolerance of the lexical access process to mismatching consonantal information in the speech signal (see Annual Reports 1996-98). A new staff member, Dahan, and a new Ph.D. student, Salverda, have recently joined the project. They will both be tracking participants' eye movements to objects in visual scenes in order to assess lexical activation during spoken word recognition.

2.1   Lexical access in a competition model

The framework around which research in the project is organized is the Shortlist model of spoken word recognition (see Annual Reports 1994-1998). Word recognition is based on the activation of lexical hypotheses which match the speech signal, followed by competition among those hypotheses. What, however, constitutes a necessary and/or sufficient match between the signal and stored lexical knowledge for a lexical hypothesis to be activated? Priming experiments in Spanish (2.1.1) and

phoneme monitoring experiments in English (2.1.2) have addressed this issue. These studies show that the lexical access process is sensitive to suprasegmental as well as segmental information. Related research has examined whether the lexical access process is sensitive to subsegmental information (2.1.3). All of these studies draw attention to the fact that the input to Shortlist (the prelexical level), currently a string of discrete phonemes, is inadequate. Smits, Warner, McQueen, and Cutler have therefore begun the task of improving the account of prelexical processing in Shortlist. They presented 19 listeners with all 2,294 diphones of Dutch, gated at six points during the diphone, and asked the listeners to identify the two sounds. This produced a large database of information on the likelihood that a listener will identify a speech signal as containing a given sound at a particular point in time. This data will be used to make the prelexical level of Shortlist sensitive to time-varying probabilistic information about speech sounds. Related research has confirmed the utility of a probabilistic input to the word recognition process (2.1.4).

2.1.1   Vocalic and consonantal mismatch

With Sebastian-Galles and Soto (U. Barcelona), Cutler investigated via cross-modal priming experiments the role of segmental information in the activation of spoken Spanish words, and compared the results with earlier work on suprasegmental information (see Annual Report 1997). Listeners heard neutral sentences ending with word fragments (e.g., *princf-,* the beginning of *'principe* "prince" or of *prin'cipio* "principle"), and made lexical decisions on letter strings presented at fragment offset. Responses were compared for fragment primes which fully matched the spoken form of the initial portion of target words, versus primes which mismatched in a single vowel or consonant, versus control primes. Fully matching primes always facilitated lexical decision responses, in comparison to the control condition, while mismatching primes always produced inhibition. The strength of the contribution of vowel and consonant information was equivalent, and did not differ from the contribution of stress information in the earlier study. Further, the effect of consonant mismatches was independent of the number of features altered. The results support a model of spoken word recognition involving automatic activation of word forms and sensitivity to all relevant acoustic information, segmental or suprasegmental.

2.1.2   Vocalic and metrical mismatch

How tolerant is the lexical access process to mismatching vocalic information in the speech signal? McQueen and Connine (SUNY Binghamton) used the phoneme monitoring task to ask whether a word form is activated when the spoken input mismatches with that word by one vowel. English listeners were asked to detect the final consonants in nonwords which were based on real English words. In the segmental-mismatch condition, the nonwords were made by changing vowels in the primary-stressed syllables of WeakStrongWeak (WSW) words (e.g., *sufficient* -> *su'ffocient)* or of SS words *('yogurt* -> *'yagurt).* The target phonemes ([t] in these examples) were detected faster in the segmental-mismatch nonwords than in control nonwords. This advantage is due to the activation of the base words, and thus suggests that words are activated even when the listener hears nonwords mismatching with those words on the vowel in their primary-stressed syllable.

Metrical-mismatch nonwords tested whether vowel mismatches involving metrical changes (changes from full to reduced vowels, *or* the reverse) are also tolerated. When the schwa in the first syllable of WSW words was changed to a full vowel and given primary stress (e.g., *sufficient* -> *'sufficient),* phoneme monitoring latencies were faster (again for the final [t]) than in control nonwords. However, when the first vowel of SS words was reduced to schwa and primary stress was shifted to the second syllable (e.g., *'yogurt* -> *ys'gurt,* phoneme monitoring times for the final consonants were no faster than in control nonwords. In other words, there was evidence of lexical activation when schwas were changed to full vowels, but not when full vowels were changed to schwa. Metrical mismatch therefore appears to be tolerated in the lexical access process only when the vowel in the normally-stressed syllable remains intact.

2.1.3   Subsegmental variation

Van Alphen has been testing in her dissertation project whether lexical access is influenced by subsegmental variation. She examined the variability in Voice Onset Time (VOT) of the Dutch voiced plosives /b/ and *161.* A small production experiment was carried out to establish the extent of natural variation in VOT for both plosives. The results showed that the amount of prevoicing (negative VOT) of both *Ibl* and *161* varies considerably in natural speech and is thus a suitable type of subsegmental variation to be studied.

Listeners were therefore asked to rate the initial phoneme of several high frequency (HF) words, low frequency (LF) words and nonwords (NW) on a scale from 1 (poor exemplar) to 7 (good exemplar). The items started with a /b/ or /d/, varying from zero periods to 18 periods of prevoicing. The outcome of this rating task was used to guide the construction of three versions of each voiced plosive: a normal amount of prevoicing (6 periods); too much prevoicing (12 periods); and too little prevoicing (zero periods). These three types of plosive were used in an associative priming experiment.

Subjects were asked to perform a lexical decision task on visual targets that were preceded by an auditory prime. There were four conditions. In the first three conditions, the prime was related to the target (e.g., *bloem* "flower", *ROOS* "rose"); the primes in these conditions differed only in the amount of prevoicing of the initial voiced plosive (zero, 6 or 12 periods). In the fourth condition, the prime was unrelated to the target (e.g., *baan* "job", *ROOS).* The primes were either HF or LF words. The results showed a significant priming effect: Lexical decisions were faster after related primes than after unrelated primes. The size of the priming effect was not influenced by the amount of prevoicing, and there was no interaction with word frequency. These results suggest that subsegmental variation such as differences in the VOT of voiced plosives does not influence lexical access.

2.1.4 Fuzzy prelexical representations

Smits conducted a theoretical study investigating the relative merits of "crisp" and "fuzzy" prelexical processes in spoken word recognition. A crisp prelexical level transforms the incoming speech signal into a string of discrete units (e.g., phonemes), which is then fed into the lexicon. A fuzzy prelexical level transforms the input into a set of phoneme probability functions which are fed into the lexicon. An analysis based on a highly simplified but plausible definition of a speech production-perception system showed that utterances will occur which are correctly recognized by the fuzzy system but are misrecognized by the crisp system. Reverse cases are however also predicted to occur. Nevertheless, the fuzzy system is predicted to produce superior performance on the average, simply because the former situation will occur more often than the latter. These theoretical observations were confirmed by Monte-Carlo simulations. The simulations showed furthermore that the difference in error rates for crisp and fuzzy systems can become very large when the scale of the

artificial language and the production-perception system approaches realistic proportions. This study therefore shows that, as in the revision of Shortlist currently under development, it is beneficial for a spoken word recognition system to employ a fuzzy rather than a crisp prelexical level, even though this comes at the cost of increased complexity.

2.2   Phonemic decision making

In this half of the project, research has been examining several different aspects of spoken word recognition; all these lines of research employ tasks which require listeners to make decisions about speech sounds. Studies include an analysis of the processing of Dutch inflections during lexical access (2.2.1), and a test of the claim in Shortlist that there is no feedback from lexical to prelexical levels (2.2.2). Investigations of the inter-dependencies in the identification of vowels and neighboring consonants (2.2.3) and of the perception of simple sounds (2.2.4) contribute to our understanding of the prelexical level of processing.

2.2.1   Morphology in categorization

Mauth continued her dissertation research on the processing of inflectional morphology. She examined whether preceding sentential context can influence the perception of the Dutch verbal 3rd person singular marker -t. Listeners were presented with two sentence types:

(1) Vraag jij of Jan morgen gaat/gaak?

   "Are you asking whether Jan leaves tomorrow?"

(2) Zie jij nog wel eens een plaat/plaak?

   "Do you see a record now and then?"

The final consonant in each sentence was a stop that varied along a place of articulation continuum from [t] to [k]. The [k] endpoints always formed nonwords. Sentences like (1) and (2) were compared with matched control sentences ending with [t]- and [k]-final nonwords (e.g., *snaat/snaak).* Listeners were required to categorize the final consonants. The main questions were whether there would be a bias towards [t] responses in (1) and (2) relative to the control, and, if so, whether the bias would be stronger for sentences ending with [t]-final verbs (1) than for those ending with [t]-final nouns (2). Is listeners' perception influenced by the fact that in the verb the final consonant constitutes an inflectional morpheme which is predictable from the context? If so, this would indicate the operation of a morphological decomposition process. Results indeed showed that the

bias towards [t] responses was greater in the verbal context than in the nominal context.

Two other conditions were tested. The verbs and nouns at the end of the sentences were replaced by nonwords which had a real noun embedded within them (e.g., *via* "custard" + t = *vlaat):*

(3) Vraag jij of Jan morgen vlaat/vlaak?

   "Are you asking whether Jan custards tomorrow?"

(4) Zie jij nog wel eens een vlaat/vlaak?

   "Do you see a custards now and then?"

Would listeners be more willing to label an ambiguous sound as [t] when, on the basis of the context, as in (3), they could decompose the last nonword into two meaningful (if implausible) units than when, in a context like (4), this decomposition wouldn't make any sense? There was no difference in categorization performance in either context between the nonwords with embedded nouns and the control nonwords. The results suggest that morphological decomposition influences phoneme identification only when the resulting parse is a structure which already exists in the language.

2.2.2 The Merge model

A central assumption of Shortlist is that there is no feedback from the lexical to the prelexical level. The empirical evidence on feedback has come from tasks requiring phonemic decisions. The Merge model of phonemic decision making has therefore been developed to account for these data (see Annual Reports 1994-1998). Merge should be seen as an addition to Shortlist; Merge includes components required for explicit phonemic decision making beyond those required for word recognition. The key assumptions made in Merge about word recognition are therefore identical to those in Shortlist. In particular, recognition is based on lexical competition in both models, and in neither model is there feedback. Phonemic decisions in Merge are based on the integration of information from the prelexical and lexical levels, at dedicated decision units. Merge will be presented in a target article in Behavioral and Brain Sciences (Norris, McQueen, & Cutler, 2000).

The success of Merge depends on its ability to account for the available evidence on phonemic decision making. One recent challenge to the model comes from Samuel (1997). American English listeners categorized

a /b/-/d/ continuum prior to adaptation, and then again during an adaptation phase in which they heard multiple repetitions of five different words. The words produced reliable adaptation: there were more /b/ decisions when each adapting word contained a /6/ (and no /b/'s) than when each word contained a /b/ (and no /d/'s). Crucially, when the adapting phonemes in the words were replaced with signal-correlated noise, such that the phonemic restoration illusion was induced (listeners could hear the noise-replaced phonemes), there was again adaptation. If the adaptation process had a prelexical locus, and the adaptation with the restored phonemes were due to lexical information, these data would suggest that there was feedback, contrary to Merge. McQueen, Cutler and Norn's (MRC Cognition and Brain Sciences Unit, Cambridge) therefore attempted to replicate these findings. Dutch listeners, like American listeners, produced a reliable adaptation effect with the original words. But when the adapting phonemes were replaced with noise, no adaptation was observed, even though there was robust phonemic restoration. These results suggest that the adaptation effect observed with noise-replaced phonemes in the American study did not depend on the phonemic restoration illusion, and thus not on lexical involvement. The Dutch results are consistent with Merge, in which the lexicon can influence phonemic decisions (and hence the restoration illusion), but, because there is no feedback from lexical to prelexical levels, cannot induce acoustic-phonetic adaptation.

2.2.3 Processing dependencies

Smits continued his analysis of how the categorization of a phoneme depends on the acoustical and phonological properties of surrounding phonemes (see Annual Report 1998). Research reported last year on fricative-vowel categorization showed (a) that in naturally spoken tokens of the syllables /si, sy, jI, Jy/ the frequency of fricative resonances were highly dependent on the rounding of the following vowel, and (b) that when listeners categorized a synthetic two-dimensional fricative-vowel continuum, their fricative decisions were dependent on their vowel decisions. A quantitative method was formulated which predicts for various patterns of coarticulation what type of processing dependency is likely to be used by a pattern recognizer. The method allows the position, orientation, and steepness of one phoneme boundary to depend on the perceived value of a neighboring phoneme. Application of this method to the production data led to the prediction that the steepness of the /s/-/J/

boundary in listeners' fricative categorizations would depend on the perceived vowel. To test this prediction, the HICAT model of Hierarchical CATegorization was fit to the categorization data. In agreement with the prediction, it was found that listeners had used strategies in which the steepness of the fricative categorization boundary depended on the perceived vowel.

2.2.4 Strategies in sound categorization

In collaboration with Jongman and Sereno (U. Kansas), Smits started a research project investigating the fundamental mechanisms by which phonemes are categorized. The first phase of the project was restricted to the categorization of static, context-independent non-speech sounds, and tested whether listeners use a boundary-based, prototype-based, distribution-based, or exemplar-based strategy in the categorization of sounds. Inharmonic complex tones filtered by a formant-like resonance were used as stimuli. Two categories A and B were represented by Gaussian probability density functions (pdf's) with identical variance but different means. Four experimental conditions were created by orthogonally varying the distance between the means and the overlap of the two classes. The boundary-based hypothesis assumes that listeners base their categorizations only on the midpoint between the pdf means. In the prototype-based hypothesis the distance between the means is also used, while in the distribution and exemplar-based hypotheses it is assumed that listeners use all the available distributional information. Three experiments were run, one varying only formant frequency between A and B, one varying only duration, and one varying both. Subjects were trained to classify stimuli drawn from the pdf's in the four conditions, and were tested on a fixed stimulus continuum. In all three experiments the slopes of the categorization curves measured in the test phase were not different for the four conditions, which supports the hypothesis that listeners used a boundary-based categorization strategy.

3 SIMPLE UTTERANCE GENERATION

As reported before (Annual Report 1998), the Simple Utterance Project has replaced the former Lexical Access Project, reflecting a shift of interest of the group members from the production of simple words to the generation of slightly longer utterances. Research on the production of multi-word utterances received a major impetus from the appointment of Kempen (U. Leiden) as a research associate, the sabbatical visit of K. Kuiper (U. Canterbury) and the visit of Vigliocco (U. Wisconsin) as well as the appointment of Sprenger as a Ph.D. student. Still, theoretical and experimental work on single word access continues to provide a basis for these new developments.

3.1 Single word generation

Even single word access is access in context. In a typical word production experiment, most trials are preceded by other trials and they create a setting for the subject which may affect performance on the current trial, due to priming or attentional control. We report on a number of experiments where such effects are systematically explored. In particular, we are responding to a critical study by Bachoud-Levi et al. concerning the (absent?) word length effect.

3.1.1 Semantic aspects of lemma selection

Picture-word interference has emerged as one of the predominant Chronometrie tools in investigating the production of single spoken words. The semantic interference effect obtained with this procedure is generally assumed to indicate a conflict in the retrieval of the appropriate *lexical-semantic* codes. In the WEAVER model this is formalized as lemma-level competition. Although previous studies have shown that semantic

interference disappears in memory tasks (where the picture is not named, but categorized as "old" or "new"), the reverse has not been tested: Will semantic interference disappear in a picture naming task where the distractor is non-lexical? In other words, will the mere concurrent activation of two closely related *conceptual* representations slow down naming latencies?

In pursuit of this issue, Damian, Bowers (U. Bristol) and Katz (Rice U.) compared the effect of word vs. picture distractors in a picture naming task. While distractor words yielded the expected semantic effect, distractor pictures presented within the outlines of the target pictures had no effect on naming latencies. Under the assumption that the distractor pictures were semantically processed, but not lexically encoded (they were not part of the response set), this finding supports the claim that lexical involvement is crucial for semantic interference to arise. However, in this experiment visual similarity between related pictures was not controlled for, and structural priming between related targets and distractors may have obliterated a potential semantic interference effect. Damian replicated the null finding with picture distractors in a new experiment employing SOAs ranging from - 200 msec to +100 msec, in which related and unrelated pictures were matched in terms of their visual overlap. At an SOA of 0 msec, related distractor *words* yielded the expected semantic interference effect. However, related distractor *pictures* still failed to affect naming latencies at any of the employed SOAs. In combination, these findings strongly support the assumption that semantic interference arises at the stage of lexical-semantic retrieval in speech production.

The semantic interference effect is, at present, the major Chronometrie evidence for the existence of semantic competition in word production. In the WEAVER model, competition among lemmas of the same semantic class is stronger than among lemmas of different semantic classes due to activation spreading among lexical concepts of the same class. Damian, Meyer and Levelt obtained another type of Chronometrie evidence for class-specific semantic competition in picture naming experiments where the same pictures were named in either same-class blocks (e.g., only tools, only vegetables, etc.) or mixed-class blocks (containing tools, vegetables, etc.). As predicted, pictures were named significantly faster when appearing in different-class blocks than in same-class blocks. One problem with this paradigm is that one has to control for within-block visual similarities;

another is that for many semantic categories it is hard or impossible to create pictorial materials. In order to avoid these problems, Vigliocco, Damian and Levelt transformed the task into a translation task (from English to Dutch, the subjects' native language). Thus, the subjects saw the English (non-cognate) translation of the target word on the screen and produced the Dutch equivalent. In all other respects, the experiment was identical to the original picture naming experiment, and the results were also similar. Subjects were significantly faster in mixed-class blocks than in same-class blocks. This, then, opens the possibility to test the "closeness" of semantic categories. Neuropsychological evidence suggests that related categories, such as vegetables and fruits, have a higher probability of becoming jointly damaged than distant categories, such as vegetables and clothing. Two follow-up experiments involved just two categories: close categories (vegetables and fruits) versus distant categories (vegetables and clothing). Both experiments reproduced the class effect, but it was substantially stronger when the categories were distant than when they were close.

3.1.2   Negative priming in multiple picture naming

The experiments in the preceding section show that successive trials in a picture naming task are not really independent events. Even single word access is affected by previous trials. Related research on attention - also often employing picture naming as the task - supports a similar conclusion: A subject's ignoring a particular distractor picture on one trial can hamper the subsequent processing of the same stimulus as a target, a phenomenon known as "negative priming". Previous research on the locus of this effect has yielded partial support for the claim that it results from attentional inhibition of central semantic representations. This is suggested by the finding that the effect appears to extend to semantic associates of ignored stimuli. Damian challenged this assumption by conducting a picture naming experiment in which pictures were either categorized or named, and in which distractor pictures were superimposed on the targets. The effects of identical prime-probe picture pairs were compared to those of categorically related pairs. Visual similarity between ignored and attended-to object in the semantic condition was eliminated as a potential confound. The results indicated substantial negative priming in both naming and categorization when the ignored and the target picture were *identical;* when they were *categorically related* negative priming only occurred in the categorization task. The finding of semantic negative priming in

categorization is most probably an artifact resulting from the fact that on semantically related trial pairs, a to-be-ignored response to a stimulus is identical to the response which has to be executed on a following target trial ("response repetition"). In contrast, the null finding in the naming task appears to argue against a central, semantic origin of the negative priming effect.

3.1.3   Semantic and episodic memory in lexical retrieval

Previous studies by Badecker et al. (1995) and by Vigliocco et al. (1999) have established that anomic speakers experiencing semantic memory lexical retrieval problems can still report syntactic and phonological information about the words they cannot produce. Vigliocco, together with Zorzi (U. Padua) and Garrett (U. Arizona) assessed whether the type of partial lexical information that can be retrieved is task dependent. Two anomic Italian patients (and matched controls) participated in the study. One experiment accessed the partial information (syntactic and phono-logical) available in a semantic memory task (picture naming and naming on definition); a second experiment assessed the partial information available in an episodic memory task (word pair learning). A striking dissociation emerged: during the semantic task, both patients and controls reported information about syntax and phonology above chance. During the episodic memory task, however, while participants reported phonological information, syntax and meaning were reported at chance. This finding indicates that when an episodic record for a word is created this record only comprises form information, while syntactic information is not recruited, even in a language in which the mapping between gender and phonology is for the most part transparent. (This research was also supported by a NATO grant (CRG98002) to Vigliocco, Garrett, Tabossi and Hupet).

3.1.4   Length effects in word production

The model of word production proposed by Levelt, Roelofs, and Meyer (1999) holds that phonological encoding is a sequential process, running from the beginning to the end of phonological words, and that speakers rarely begin to speak before having generated at least one phonological word. This predicts that speech onset latencies should be longer for long than for short phonological words. This prediction was borne out in several older studies, but Bachoud-Levi et al. (1998) failed to obtain word length effects in a series of carefully conducted experiments using French and English speakers. They concluded that either word forms were not

generated sequentially or that speakers began to speak before completing the phonological form of the target words. Either conclusion would require changes to our model.

Meyer, Levelt, and Roelofs carried out similar experiments with Dutch speakers, who named objects with mono- and disyllabic names, which were matched for ease of object recognition. Word length effects were obtained for the speech onset latencies and the times spent looking at the objects, but only when the materials were blocked for the length of the object names. When objects with long and short names were mixed, as in the study by Bachoud-Levi et al., the mean naming latencies were the same. We assume (following Lupker et al., 1997) that naming latencies do not depend exclusively on the time necessary to derive the articulatory score, but also on a response deadline speakers set for themselves. The deadline by which a response must be made depends on the speaker's judgement of the difficulty of the items. When response words are blocked by length, optimal response criteria can be set for each word type, and length effects emerge. But when long and short responses are mixed, an average criterion is used, concealing differences in the maximal speed of generating the articulatory code. In line with this argument we found word length effects in mixed blocks when participants were strongly encouraged to respond as quickly as possible. In this situation they probably set a very early deadline, which they often failed to meet. The result was that the response was made "as soon as possible", which was earlier for short than for long words. Thus, we still believe that word forms are generated sequentially and that speakers must carry out more work for disyllabic than for monosyllabic words before they can begin to speak. The current results, together with findings from other studies, suggest that speakers have some flexibility in the moment at which they initiate articulation.

3.2 Generating multiple word phrases and sentences

3.2.1 Sequentiality in object naming

An important tool in the group's research on the generation of simple utterances is the registration of the eye movements speakers carry out while they are describing scenes and events (Annual Report 1997, 1998). Earlier research had shown that speakers naming two or more objects proceeded strictly sequentially: They fixated upon the object to be named first until the corresponding utterance had been fully planned and only then turned to the second object.

Among the reported evidence was van der Meulen's finding that subjects look longer at an object when it is referred to by means of a full noun than when it is referred to only by a pronoun (as in 'The ball/It is next to the table" or 'The man/He is throwing the ball). It is not trivial to prevent confounds in such an experiment. In these experiments, either the pronoun was always Dutch *hij* "he", or it could be selected based on conceptual gender (male or female agent). By contrast, the noun phrases were variable and lexical information had to be retrieved to generate them. In a new experiment carried out in German van der Meulen carefully controlled the number of pronouns and nouns the speakers selected from. Lexical information had to be retrieved for pronouns as well as for nouns since German personal pronouns are marked for grammatical gender. In spite of these changes, the main results of the earlier study were replicated: The objects were less likely to be looked at and were inspected for shorter periods when they were referred to by pronouns than by nouns. This supports the hypothesis that when speakers use a linguistically simpler or a more complex utterance to refer to an object, the viewing times change accordingly.

The sequentiality of focusing on different objects does not mean that objects in the visual periphery are not processed to some extent in parallel with fovea! objects. Meyer and Wissink (Annual Report 1997) found, for instance, that naming latencies were shorter for pairs of pictured objects with phonologically related names than for pairs with unrelated names, which suggests that the phonological encoding of the second object name overlapped in time with that of the first object name. However, Meyer, Belke (U. Bielefeld), and Hermens (U. Nijmegen) failed to obtain any evidence for crosstalk between the retrieval processes for object names co-occurring in an utterance. Instead the results of a long series of experiments strongly suggested that the planning of the first of two object names was unaffected by the properties of the second object name.

The independence of the planning processes, which we now assume to be the rule (at least for noun phrase coordinations), may either mean that objects are not processed at all before they become the focus of visual attention, or that they are processed, but that their processing does not affect that of focused objects. To discriminate between these possibilities Meyer and Irwin (U. Illinois) carried out eye tracking experiments in which peripheral objects sometimes changed contingently on the speaker's eye movements. Shortly after the speaker had initiated the eye movement

from the first to the second object to be named, that object could change from an interloper object to another member of the same semantic category (e.g., from a bush to a tree), to an object with a related name (e.g., from a bee to a tree), or to an unrelated object. In the control condition, the second target object was shown throughout the trial. Speakers were rarely aware of the display changes. The viewing times for unchanged targets were much shorter than those for the changing targets, which shows that the peripheral objects were processed in parallel with the focal ones. However, there were no specific effects of semantic or phonological relatedness between the interloper and the target object. This suggests that the processing of the peripheral objects was rather shallow, engaging conceptual, but not linguistic processes.

These findings contrast with those obtained by Meyer and Wissink for foveal picture presentation. Using a probe technique they showed that pictures that were presented in the fovea and were attended to rapidly activated their names. This was true even when the viewers had no intention to name the pictures but categorized them with respect to color or object category, and even when the exposition time was only 50 msec. When the pictures were presented for 17 msec and were pattern-masked, the results corresponded to those for pictures seen in the visual periphery: There was evidence for visual-conceptual processing of the pictures but not for access to their names. Thus, it appears that the speakers' linguistic processing is confined to objects they have at least briefly consciously attended to.

An interesting accidental finding was that after an object had briefly been the focus of attention, its further linguistic processing did not heavily rely on the pictorial input: Meyer and van Elswijk (U. Nijmegen) found that picture naming latencies and error rates were not affected when the targets were withdrawn after 100 msec and replaced by a pattern mask or a new picture. Thus, the long viewing times observed in multiple object naming may be more closely related to buffer limitations than to the processing of the visual input. Many researchers have wondered how speakers manage to retrieve information rapidly enough to generate fluent speech. This, however, may not be the speakers' principal problem. Perhaps the speed of speech planning processes has been underestimated, and speakers must hold back the conceptual and linguistic planning processes to keep them in phase with the sluggish articulatory processes.

A final issue addressed was "preview" of scenes. In all earlier experiments speakers used fixed utterance structures to describe quite simple, mostly two-object scenes. Not surprisingly, this corresponded to rather fixed, invariant visual scanning patterns. In particular, the scan path almost always corresponded to the (fixed) order of mention of the objects in the scene. But what will a subject do when a scene is more complex and utterance structure is less constrained? Preliminary evidence suggests that speakers "preview" the scene in order to decide on an appropriate syntactic rendering of the information. Van der Meulen investigated gaze patterns of speakers when the utterance structure was variable. The scenes to be described contained four objects, appearing in the corners of the screen. For instance, in one condition the top objects could be a belt and a fork and the bottom objects a couch and a nose. In another condition the two bottom objects were identical, such as two noses. Speakers had to decide whether to use a sentence coordination, for example *the belt is above a couch and the fork is above a nose* or a noun phrase coordination, for example *the belt and the fork are above a nose* on the basis of the number of *different* objects on the screen (four or three). In fixed blocks, the number of object types was the same in all trials, whereas in variable blocks scenes containing three and four object types were mixed . Thus, in the latter type of blocks, speakers had to inspect the objects first in order to choose the most appropriate utterance structure. In the fixed blocks, the speakers inspected the objects in the order of mention, as in the earlier studies. This "linguistic" scan path was also observed in the variable blocks, but it was preceded by a preview of the bottom objects. This preview reduced the viewing times for the objects during the linguistic scan path. Thus, information retrieved during the preview could be used during linguistic planning.

3.2.2   Producing fixed expressions

The lexicon is not just a repository of words. Native speakers of a language also know a great many phrases, probably more in number than they know words. The phrasal part of the mental lexicon is not much studied but there are significant areas of enquiry on which it impinges. In linguistics itself, one can ask whether human beings can store any phrase in their mental lexicon, or only phrases which are subject to some type of constraints. To attempt to answer such a broad question is it useful to have databases of phrasal lexical items which can be searched for potentially relevant properties. K. Kuiper and McCann (U. Canterbury)

have nearly completed a syntactically annotated database in PROLOG form of 14,000 English phrasal lexical items, using labeled bracket annotation. This will be useful for checking hypotheses about the syntactic configurations which are permissible as phrasal lexical items. Kuiper and Everaert (U. Utrecht) determined several quite simple constraints on the phrase structural configurations of phrasal lexical items. Such configurations always feature a simple lemma functioning as the head while the other lemmas depend on the head either directly or indirectly. This connectivity constraint rules out the existence of fixed expressions that include several disconnected head-plus-dependent substructures, or that have no head at all.

From a psycholinguistic perspective, a core issue is how the phrasal lexicon is accessed and utilized in the production of fluent speech. Our approach to this issue has been four-pronged. First, Levelt, Kempen, and Sprenger developed an extension of the WEAVER model to include an account of accessing idioms in speech production, the so-called "superlemma" theory. Second, Sprenger, Levelt and Kempen developed an experimental paradigm for testing critical predictions from the superlemma theory. Third, Kuiper, Vigliocco, Lauer (U. Wisconsin) and Kempen coded a database of spontaneous idiomatic speech errors in English (over 1500) and Dutch (over 100). Fourth, Vosse (U. Leiden), Kempen and Sprenger developed a computer program for counting the frequencies of collocations (including idioms) in large text databases. A collocation is defined here as the joint occurrence of two or more target words in the same sentence.

The superlemma theory extends the language production model as described in Levelt, Roelofs, and Meyer (1999) to include an account of the representation and accessing mechanism for idioms. The lemma level in the model is extended to include "superlemmas"; they represent the limited syntax of idiomatic expressions, just as simple lemmas represent the syntax of words. Like any other content lemma, a superlemma receives its activation from a lexical concept, which is specific to that idiom. Selecting a superlemma is not different from selecting any other lemma. It will be in competition with all other active lemmas (whether super or simple), and its selection latency is governed by Luce's rule. Competing (super-)lemmas will typically be semantically related ones, such as *tip the scales* and *turn the tides.* The superlemma is connected to all simple lemmas that figure in the idiom (such as *tip* and *scale),* imposing

restrictions on their syntactic potential. Upon selecting the superlemma, its activation is spread to the simple lemmas involved, which in turn will be selected at a pace determined by Luce's rule. From here on, grammatical and phonological encoding run their normal course: lemmas are combined into phrases, phonological codes are retrieved and combined, etc.

Sprenger tested two predictions from the superlemma theory. The first was that generating idioms should be slower than generating minimally different compositional phrases. The reason for this is the two-step nature of accessing the simple lemmas of an idiom, involving the extra procedure of selecting the idiom's superlemma. The second prediction was that priming a simple lemma should be more effective in idiom production than in the production of minimally different compositional phrases. The reason is that in the idiomatic case, the primed simple lemma spreads its activation to the superlemma, which, upon selection, transmits it to the other composing simple lemmas, speeding up their selection, given Luce's rule. No such circuit is available in the generation of compositional phrases.

Subjects learned by heart combinations of prompt words and phrases, such that they were able to produce the phrase quickly whenever they saw the prompt on the computer screen. (An example is *escalate - get out of hand.* In the Dutch equivalent, *uit de hand lopen,* the noun is not phrase-final.) An acoustic prime was presented simultaneously with the prompt. In the first experiment it was either identical to the noun of the phrase (e.g., *hand)* or semantically and phonologically unrelated. In the second experiment the prime was either phonologically related or unrelated. In both experiments, idioms were produced at longer latencies than the corresponding non-idiomatic expressions, as predicted. Moreover, identity primes were more efficient for idioms than for non-idiomatic phrases. This did not hold for phonological primes. The latter result rules out the possibility that the identity prime is effective by virtue of its phonological relatedness to the target. In a further experiment the effect of identity priming was tested for a subset of the idioms used in the first experiment, for which the word order could be changed, so that the primed target word (the noun) appeared in phrase-final position. The priming effects were similar to those obtained in the first experiment. This may be taken as evidence for restricted (or even absent) incrementality in accessing an idiom's simple lemmas. Taken together, the three experiments support the assumption of an integrating superlemma that allows for quick and parallel

access to the words that are part of an idiom, all triggered by a single active lexical concept.

In addition to the experimental part of the project, Kempen and Sprenger, in collaboration with Vosse (U. Leiden), started a corpus study of idiom use in Dutch. They applied their collocation search tool to a 52 million word Dutch text corpus made available by the Institute for Dutch Lexicography (INL, Leiden). Frequency data for the idiomatic expressions used in the above mentioned experiments have been collected. They range between 0 and 13 per million words. The items were chosen such that the words they are composed of are well known and not restricted to idiomatic use. Under these restrictions, one should expect the frequencies of the single words to be higher than the idioms' frequency. The size of this frequency difference is not the same for nouns and verbs. On the average, nouns are 35 times more frequent than the idioms in which they participate, but verbs are 150 to 1500 times more frequent. Still, although the idioms we used have relatively high frequency as idioms, they are in the low word frequency range, for both their head nouns and verbs.

Kuiper, Vigliocco, and Lauer designed a database for a set of 1,800 potential phrasal blend speech errors collected by Tuggy (Summer Institute of Linguistics), who kindly granted permission for it to be used to investigate access to phrasal lexical items in speech production. The coding of some 800 clear blend errors has been completed. Initial analyses demonstrate what the superlemma theory leads us to expect. Idioms quite dominantly blend with near-synonymous other idioms (e.g., *All seriousness aside,* blending *All joking aside* and *In all seriousness)* or with near-synonymous single word items (e.g., *coasted on your laurels,* blending *rested on your laurels* and *coasted),* indicating the simultaneous selection of semantically competing (super-)lemmas.

3.2.3 Gender agreement in sentence production

Do speakers use conceptual and morpho-phonological information in computing syntactic dependencies such as agreement? Exploiting the characteristics of the gender agreement systems of Romance languages, Vigliocco, together with Franck (U. Louvain) (see Vigliocco & Franck 1999 for the initial study) investigated whether the conceptual correlates of sex and the morpho-phonological transparency of gender are taken into account in establishing gender agreement in French and Italian sentence production. All the experiments used the frequency of agreement errors in a sentence completion task as the dependent variable. In a series of

studies, nouns such as *vittima* "victim-fern" were matched to discourse referents of either sex (therefore introducing congruity or incongruity between the gender of the noun and the sex of the referent). In both languages a strong effect of the sex of the referent was found, indicating that the conceptual/discourse information is available during grammatical encoding beyond selecting the lemma for the subject (agreement controller) and establishing the diacritic parameters for it. (This research was also supported by NSF grant SBR9729118 to Vigliocco).

In another series of studies, the degree of transparency between gender and its morpho-phonological realization was manipulated in Italian, French and Spanish. It was found that agreement errors were modulated by the degree of syntactic to morpho-phonological correspondence. This result indicates that morphological and phonological factors have an impact on a syntactic operation. Further studies will assess whether this effect may be accounted for in terms of the operations of a monitor (both external and internal monitoring, Levelt 1989), in which errors might be more easily overlooked when the subject noun lacks morpho-phonological marking; or whether, instead, errors might be accounted for in terms of feedback of information from phonological to grammatical encoding within the production system.

4 NEUROCOGNITION OF LANGUAGE PROCESSING

The past year was characterized by continuation and by change. Research on sentence processing has remained at the center of attention, with several projects reaching completion, focusing both on normal and on disordered subject groups. Increasing effort was directed towards spoken language understanding, with a number of new, ongoing projects in which we investigate the nature and time course of contextual effects during real-time comprehension. Work on the neural architecture of the language system has continued, including new work with event-related fMRI, and an experiment with coregistered PET and ERP data. In addition to research, several members of the group were involved in an initiative to found a national center for cognitive neuroimaging in the Netherlands. As part of this initiative, C. Brown and Hagoort, in collaboration with Levelt, submitted a proposal to the President of the Max Planck Society to obtain funding for a 3-Tesla fMRI scanner. The proposal was granted, thereby providing a good basis for collaboration between the *Neurocognition of language processing* project and the recently founded *F.C. Donders Centre for Cognitive Neuroimaging,* which will be located in Nijmegen, and is funded by a consortium of Dutch universities with participation of the MPI. The new centre brings with it one important change for the *Neurocognition of language processing* project: Hagoort has accepted the offer to be the scientific director of the centre. His appointment began on November 1 of this year. There will, however, be a continuing and intensive research collaboration.

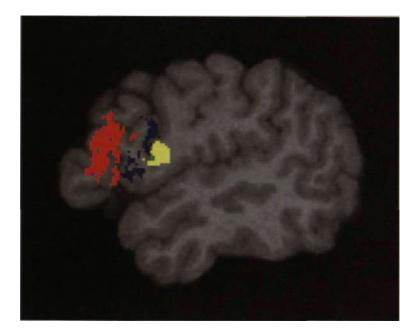## 4.1 The neural architecture of language processing

4.1.1 The localization of functional brain activation data

Indefrey and F. Hellwig, in collaboration with Amunts (C. und O. Vogt Institut für Himforschung, Heinrich-Heine U. Düsseldorf), developed a procedure to map functional brain activation data obtained with the SPM statistical package onto probability maps of Broca's area (see Annual Report 1998). Using this procedure, it is now possible to assess the probability that language-related activations of the posterior inferior frontal cortex are located in Brodmann areas 44 or 45, respectively (see Figure **1).**
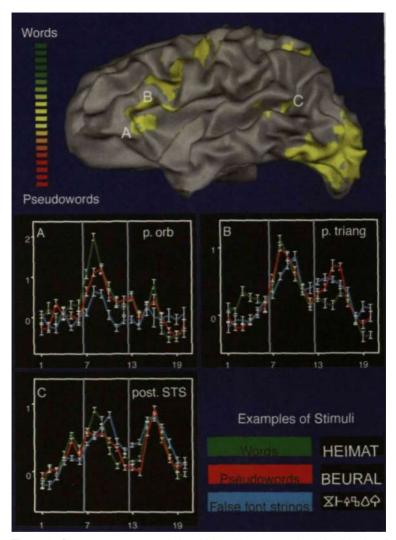
4.1.2 The separation of encoding-, delay-, and response-related brain activation in a verbal short-term memory task

Indefrey and F. Hellwig in collaboration with Goebel (MPI für Hirnforschung, Frankfurt) and Posse (Forschungszentrum Jülich) have conducted an event-related fMFtl experiment on verbal short-term memory in which subjects were asked to memorize two visually presented words, pseudowords, or nonverbal control stimuli (false font strings). After a delay period of 14 seconds, subjects indicated whether a visual probe was identical to one of the previous stimuli. During a control task, subjects memorized the random locations of the stimuli rather than their identities. In both tasks, there was bilateral activation of the visual cortex, the fusiform gyri, superior parietal areas, and the supplementary motor area during stimulus and probe presentation, as well as activation of ventrolateral prefrontal areas during the delay period.

Differences between verbal (word/pseudoword) and non-verbal (false font string) stimuli were observed in the identity task only. While all stimuli activated bilateral parietal areas and the frontal eye fields during encoding, only verbal stimuli activated Broca's area and the posterior superior middle temporal gyrus in this phase. Differences between words and pseudo-words were found for two areas (see Figure 2). During delay, bilateral parietal activation was maintained only for nonverbal stimuli. Activation of Broca's area and the left temporo-parietal junction was found for all stimuli during this phase. The results support the notion of a phonological loop (Paulesu et al. 1993) involving Broca's area and the temporo-parietal junction. The findings further suggest that activation of the posterior temporal lobe during the encoding of verbal stimuli should be added to this componentry.

Figure 1. Location of cortical activation due to sentence-level syntactic encoding (see Annual Report 1998: 31) with respect to Broca's area. Regions of significant functional activation as well as 50%-probability regions of Brodmann areas 44 and 45 were projected onto a reference brain. The largest part of the functional activation (yellow) is caudally adjacent to Brodmann areas 45 (red) and 44 (blue). The small number of activated voxels that overlap with Brodmann area 44 are shown in green.

Figure 2. Short-term memory task in which subjects memorized the identity of visually presented verbal and nonverbal stimuli for a delay period of 14 seconds. The map in the upper panel shows significant cortical activations due to the encoding of verbal stimuli in the presentation phase. Below, the time courses of signal change over the whole task period are given for the three regions marked A-C. Like most other areas, Broca's area (B) was not sensitive to the distinction between words and pseudowords during encoding. By contrast, the left pars orbitalis (A) and the left posterior superior temporal sulcus (C) were activated more strongly by words during the encoding phase, most probably reflecting some aspect of the lexical information that is retrieved for words. Note the delayed activation of areas B and C by nonverbal false font strings, possibly reflecting secondary verbal recoding of these stimuli, a strategy that was reported by most subjects.

4.1.3 The neural architecture of lexical access and lexical retrieval

Indefrey, C. Brown, Hagoort, F. Hellwig, and Kooijman, in collaboration with Herzog (Forschungszentrum Jülich), have completed data acquisition for a new experiment involving the combined registration of ERP and PET data. It is the aim of the experiment to identify graphemic and phonological access routes to the mental lexicon, and to distinguish between neuronal populations subserving the lexical semantic and the phonological aspects of words. The subjects silently read written verbal stimuli that were varied with respect to their lexical semantic content and the possibility of accessing the lexical semantic content via a visual pathway. Presence or absence of lexical-semantic processing was demonstrated by the elicitation of the N400 ERP-effect. The PET and ERP data are currently being analyzed.

4.2 Syntactic and semantic integration processes during comprehension

4.2.1 Establishing reference in language comprehension

Van Berkum initiated a new research project on referential aspects of spoken and written language comprehension, together with C. Brown, Hagoort, and Zwitseriood (U. Münster), and with the support of de Bruijn, van Dijk, and Kooijman. Prior ERP research with written and spoken discourse (Annual Report 1997: 101, 1998: 37) has revealed that a referentially ambiguous singular definite NP (e.g., "the boy" with two equally salient boys in the discourse) elicits a sustained frontal negative shift in the ERP waveform, at about 300 msec after onset of the head noun. By itself, the effect suggests that readers and listeners can determine very rapidly whether a singular definite noun has a single unique referent or not. However, the exact functional interpretation of this frontal negativity remained to be established. One possibility was that it reflects (anticipatory or other) processes associated with the option of a post-nominal restrictive relative clause, a structure that can resolve ambiguity in nominal reference. If so, then the effect should disappear with referentially ambiguous pronouns, since in colloquial Dutch the latter do not allow for such post-modification. Van Berkum and collaborators tested this by having subjects listen to naturally produced spoken sentences in which the number of candidate referents for the critical singular pronoun *hij* "he" was manipulated:

(1)a. David schoot op Linda terwijl hij over het muurtje dook. (1-referent)

"David shot at Linda while he dived over the wall."

(1)b. David schoot op John terwijl hij over het muurtje dook. (2-referent)

"David shot at John while he dived over the wall."

Relative to a referentially selective one-referent pronoun, a referentially ambiguous two-referent pronoun elicited a sustained frontal negative shift (see Figure 3). The effect emerged at about 600 msec after pronoun onset, and was significant at Fz only. Although referentially ambiguous pronouns thus also elicit a frontal negative shift, the pronominal effect emerges later and is much more focal than the nominal effect. The stability of this pronominal negativity is currently under further investigation.
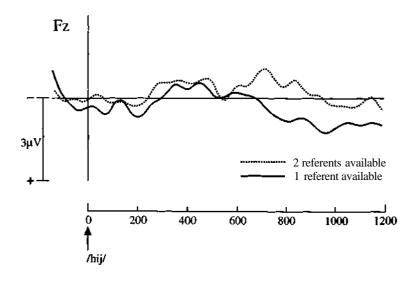

Figure 3. Sustained frontal negative shift elicited at Fz by a referentially ambiguous spoken pronoun (2-referent, dotted line), relative to a referentially selective pronoun (1-referent, solid line). Negative is plotted upwards, and acoustic onset of the pronoun is at 0 msec ".

To narrow down the functional interpretation of the observed frontal negativities, the pronoun study also included a zero-referent condition:

(2)   Jane schoot op Linda terwijl hij over het muurtje dook. (O-referent)

"Jane shot at Linda while he dived over the wall."

These zero-referent pronouns did not elicit any negativity at all, suggesting that the frontal negativity observed with two-referent pronouns is specifically tied to having *too many* referents, rather than to having any wrong number of referents. Interestingly, both the zero-referent and the two-referent pronouns elicited a P600/SPS-like parietal positivity, each emerging at about 450 msec after pronoun onset (see Figure 4). The onset of these two positivities reveals that pronoun-antecedent gender agreement is constraining referent identification very rapidly (since this is the only difference between these critical conditions and the one-referent basline condition). Also, to the extent that both effects are indeed P600/SPS effects, this suggests that their proximal cause is somehow related to a syntactic constraint.
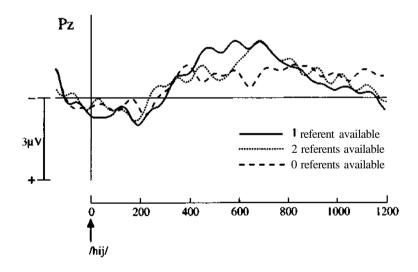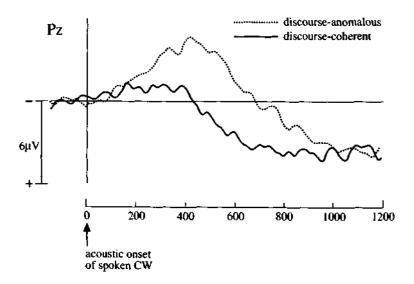

Figure 4. Two P600/SPS-like positivities elicited at Pz by referentially ambiguous (2-referent, dotted line) and referentially unsuccessful (0-referent, dashed line) spoken pronouns, both relative to a referentially selective pronoun (1-referent, solid line). Negative is plotted upwards, and acoustic onset of the pronoun is at 0 msec.

4.2.2   Parsing and interpretation in the processing of spoken discourse

Van Berkum also continued his ERP research on syntactic and semantic integration in discourse, together with Hagoort and C. Brown, and with the support of de Bruijn, van Dijk, and Kooijman. A replication study with fully connected natural speech input demonstrated that earlier findings on the interaction of discourse context and grammatical gender during parsing (Annual Report 1998: 36) were robust, and not due to the use of a slow serial visual presentation procedure.

Furthermore, van Berkum, C. Brown, de Bruijn, van Dijk, Hagoort, and Kooijman completed two ERP studies that investigated how and when listeners relate an unfolding spoken sentence to a semantic representation of the wider discourse. In the main experiment, subjects listened to spoken stories, some of which contained a critical word that, although coherent within its local carrier sentence, did not fit the wider discourse (e.g., "Jane told the brother that he was exceptionally *slow* today" in a discourse where he had in fact been very quick). Relative to a discourse-coherent control word (e.g., *quick),* these discourse-anomalous words elicited a standard N400 effect, emerging some 150-200 msec after acoustic word onset (see Figure 5).

Figure 5. N400 effect elicited at Pz by a discourse-anomalous spoken word (dotted line), relative to a discourse-coherent control word (solid line). Negative is plotted upwards, acoustic onset of the critical word is at 0 msec.

In an isolated sentence control experiment with the wider discourse removed, the earlier N400 effect disappeared completely, confirming that it indeed depended on the discourse. These spoken-language results are virtually identical to earlier ERP results obtained with written language (Annual Report 1997: 102), showing that listeners as well as readers match every incoming word against their model of the discourse very rapidly. Furthermore, because even a subset of spoken words that were at least 550 msec long elicited this discourse-dependent N400 effect at about 150-200 msec, the current findings reveal that acoustic signals that are still lexically incomplete are nevertheless immediately evaluated with respect to the global discourse.

4.2.3 The interaction of prosodic, semantic, and syntactic information during spoken sentence understanding

C. Brown and Hagoort, together with de Bruijn, van Dijk, and Kooijman, initiated research focusing on the activation and integration of prosodic, semantic, and syntactic information during the comprehension of spoken sentences. ERPs were recorded while subjects listened to sentences in Dutch that were temporarily syntactically ambiguous between two grammatical structures: (a) a conjoint NP, or (b) a sentence conjunction. These two structures are associated with distinct prosodic profiles in spoken Dutch. In the experiment, subjects listened to sentences with prosodic profiles that either matched or mismatched with a conjoint or conjunction analysis. In addition, the sentences were either semantically neutral with respect to the syntactic assignment (3), or contained a semantic bias toward the sentence conjunction reading (4).

(3) De toerist fotografeert de ober en de gids filmt de kerk.

  'The tourist photographs the waiter and the guide films the church."

(4) John schuurt de plank en de timmerman repareert de deur.

  "John sandpapers the plank and the carpenter fixes the door."

Before the second verb (i.e., *filmt* or repareert) has been heard, both sentences can, in terms of a purely syntactic analysis, receive either a conjoint NP or a sentence conjunction analysis (i.e., either *[the waiter and the guide]* are taken together in a conjoint NP, or *[the guide]* is the head of a new sentence). In the semantic bias condition, however, the selectional restrictions of the first verb (i.e., sandpapers) are not compatible with the (by default preferred) conjoint analysis. In the experimental design, the bias condition was crossed with the prosodic condition, thereby enabling

an assessment of the separate and possibly interactive effects of prosodic, semantic, and syntactic information on on-line spoken language comprehension.

The waveforms show that the prosodic manipulation has a clear and early impact on syntactic analysis. Sentences spoken with a prosodic contour that is compatible with a sentence conjunction analysis show a positive-polarity shift on the noun of the first NP (i.e., *waiter or planK).* This effect is not elicited when the same sentences are pronounced with a prosodic contour that is compatible with a conjoint NP. In addition, the results indicate that semantic information can have an early impact on syntactic processing. In the semantic bias condition, the ERPs reveal that listeners experience syntactic processing difficulty already at the second NP (i.e., *carpenter)* when listening to sentences with a conjoint NP prosodic contour. This effect is not present when the same sentences are spoken with a conjunction prosodic contour. Taken together, the results point toward an interactive effect of prosody and semantics on on-line syntactic analysis.

4.2.4   The topographic distribution of the P600/SPS

Hagoort, C. Brown, and Kooijman conducted an experiment to determine the topographic distribution of the P600/SPS under different syntactic and non-syntactic conditions. In the experiment, subjects read sentences while EEG was recorded from 64 electrodes. The aim of the experiment was to investigate whether the distribution of the P6007SPS was different from the distribution of the P300, and whether syntactic violation effects had a similar or different distribution from syntactic preference effects.

The materials for the experiment consisted of 90 triplets comprising a syntactically correct sentence, an agreement violation, and a syntactically correct sentence with an orthographic case violation. An example triplet is given in (5) (with the critical word underlined).

(5)a. Alleen de ervaren zwemmers duiken vanaf de hoge duikplank.

   "Only the experienced swimmers dive from the high diving board."

(5)b. * Alleen de ervaren zwemmers duikt vanaf de hoge duikplank.

   "Only the experienced swimmers dives from the high diving board."

(5)c. Alleen de ervaren zwemmers DUIKEN vanaf de hoge duikplank.

   "Only the experienced swimmers DIVE from the high diving board."

In addition to these triplets, the materials included another 120 triplets in which violations of syntactic preference and violations of syntactic structure were directly compared, as exemplified in (6).

(6)a. De man ziet de jongen en het meisje Staren naar de hemel.

'The man sees the boy and the girl staring at the sky."

(6)b. De man ziet de jongen en het meisje staart naar de hemel.

'The man sees the boy and the girl stares at the sky."

(6)c. * De man ziet de jongens en de meisjes staart naar de hemel.

'The man sees the boys and the girls stares at the sky."

Sentence (6b) is a violation of the preference to analyze such strings as conjoined noun phrases rather than sentence conjunctions (the preference for late closure). This preference biases towards an analysis of the conjoined-NP as part of a Comp-S construction, rather than an S-conjunction.

A preliminary analysis of the data indicates a different distribution of the P600/SPS for the straightforward syntactic violations in comparison with the violations of syntactic preference. This topographic difference, with a dense array of electrodes, further supports our earlier claim that the P600/SPS is not a unitary phenomenon, but consists of (partially) different neuronal generator contributions for different aspects of syntactic processing. A more detailed analysis of these data is ongoing.

4.2.5 Context effects during spoken-word recognition

Van den Brink's Ph.D. project, with involvement of C. Brown and Hagoort, investigates the moment at which contextual influences start to play a role in the on-line recognition of spoken words, using ERPs. An earlier study had revealed the possibility of an electrophysiological correlate of sentential context effects on spoken word recognition processes. An experiment was aimed at finding this separate ERP component. Subjects were presented with spoken Dutch sentences that ended with words that were either semantically congruent (7a), incongruent but with the initial phonemes identical to the congruent word (7b), or incongruent with initial phonemes that differed from the congruent completion (7c).

(7)a. De dierenverzorger gaf de aap een lekkere BANAAN.

'The zookeeper gave the monkey a tasty BANANA."

(7)b. De dierenverzorger gaf de aap een lekkere BARET.

'The zookeeper gave the monkey a tasty BERET."

(7)c. De dierenverzorger gaf de aap een lekkere TEMPEL.

   "The zookeeper gave the monkey a tasty TEMPLE."

In the two incongruent conditions there were large N400 components, reflecting difficulties in the lexical-semantic integration process. Moreover, there was also a negative component in all three conditions that preceded the N400 and had its peak at 200 msec (see Figure 6).
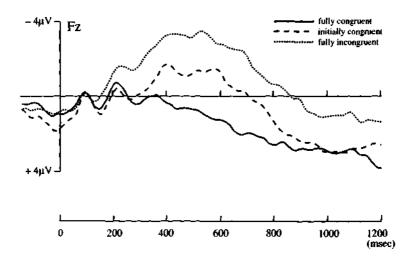

Figure 6. Connected speech stimulation. Grand average ERPs to sentence-final words that were congruent (solid line), semantically anomalous but shared initial phonemes with semantically congruent completions (alternating dash/dot line), and semantically anomalous and did not share initial phonemes with congruent completions (dotted line). The figure shows the N200 and the N400 for the frontal electrode site Fz. Time 0 is the onset of sentence-final words. Negativity is plotted upwards.

This component, the N200, was largest in amplitude for the incongruent words with initial phonemes that differed from the congruent completion. This N200 could be an indicator of a lexical selection process, where word-form information resulting from an initial phonological analysis and content information derived from the context interact.

4.3   Language disorders

4.3.1   ERP investigations of sentence processing by aphasic patients

During 1999 Wassenaar, Hagoort and C. Brown, with the support of Blaauw, designed and implemented an experiment on on-line sentence-level syntactic processing in aphasic patients. A previous study with young subjects (see Annual Report 1998: 41) revealed that word-category violations elicited two ERP effects: a Syntactic Anterior Negativity (SAN) (early latency window) and a P600/SPS effect (later latency window). Given these findings, Wassenaar and colleagues decided to carry out an experiment in which agrammatics and Wernicke's aphasics were confronted with word-category violations. The goal was to determine whether both groups of aphasic patients show the anterior negativity and P600/SPS effect, or whether they show a deviant pattern of results that might be informative with respect to their underlying processing impairment. The experiment consisted of reading sentences that were semantically partly anomalous, with in one version a clear word-category violation (8b), and in the other condition no syntactic violation (8a). An additional condition had a sentence-final semantic violation (8c).

(8)a. De houthakker ontweek de ijdele schroef op dinsdag.

'The lumberjack dodged the vain propeller on Tuesday."

(8)b. * De houthakker ontweek de ijdele schroeft op dinsdag.

'The lumberjack dodged the vain propelled on Tuesday."

(8)c. De priester zit de hele dag op de taart.

'The priest sits the whole day on the pie."

A relatively slow presentation rate was used (SOA=800 msec) and the EEG was recorded from 32 scalp electrodes. To date, 15 healthy elderly control subjects, 11 patients with Broca's aphasia, 3 patients with Wernicke's aphasia and 9 patients with a right hemisphere lesion (RH patients) have participated in the experiment. Preliminary statistical analyses of the results of the elderly control subjects showed a classical N400 effect followed by a late positive component for the semantic condition (8c). In comparison with the syntactically correct condition (8a), the word-category violation (8b) elicited no SAN effect in the elderly controls, only a P600/SPS effect. The Broca's aphasics and the RH patients also showed an N400 effect for the semantic condition (8c). The word-category violation (8b) did not elicit any effect in the Broca's aphasics. The absence of an effect in this condition indicates that the

processing of word-category information is rather problematic for the patients with Broca's aphasia. This is in line with earlier electrophysiological findings on the processing of word-category information in patients with Broca's aphasia (see Annual Report 1996, 1997). The data of the RH patients showed two effects for the word-category violations (8b): an equally distributed negative effect followed by a P600/SPS effect. The precise functional interpretation of this negative effect awaits further research. Testing of additional Wernicke patients and young control subjects is currently being carried out.

4.3.2   The processing of structural relations in language and music

Wassenaar, C. Brown, and Hagoort, in collaboration with Patel (Neurosciences Institute, San Diego) and with the support of Blaauw, designed an off-line judgement pilot-experiment to investigate whether the processing of structural relations in music has anything in common with the syntactic processing of language. If linguistic and musical syntactic processing both rely on a common set of neural resources for processes of structural integration, then one could predict that high and low comprehending agrammatic Broca's aphasics should differ in their musical syntactic processing abilities. In the off-line acceptability judgement experiment subjects listened to musical phrases with and without structural harmonic anomalies, to sentences with and without syntactic (subject-verb agreement) violations, and to sentences with and without semantic incongruencies. The subjects were asked to judge whether a musical phrase or sentence sounded "good" or "bad". To test for musical discrimination abilities the subjects were also required to classify a set of successive melodies as "same" or "different". Participants in this experiment were healthy elderly control subjects (N=14) and patients with Broca's aphasia (N=12). None of the subjects had had formal musical training. The main result of this pilot experiment was that the patients with Broca's aphasia were significantly worse at detecting subject-verb agreement violations than structural musical anomalies. Comparisons of high and low comprehending aphasics, as well as comparison of the aphasic to the control subjects, are in progress.

4.3.3   The left anterior-temporal cortex in language processing

Hagoort, in collaboration with Ramsey, Rutter and van Rijen (Utrecht U.), investigated the role of the left anterior temporal cortex in language processing. Recent brain-imaging studies suggest that this area might be implicated in syntactic processing. Five patients, whose left anterior

temporal lobe had been removed to treat intractable epilepsy, were tested on a battery of language tests, including sentence-level comprehension and, more specifically, syntactic comprehension.

Patients were tested 22 to 50 months after operation. The patients were administered the Dutch version of the Aachen Aphasia Test (AAT). In addition to the AAT, a specific test for syntactic comprehension (adapted for Dutch from German) was done (see Annual Report 1998). Three patients scored within the normal range on the comprehension test of the AAT, while two showed a minor language comprehension problem. These two patients were, however, not worse on sentence comprehension than on single-word comprehension. The syntactic offline test resulted for all five patients in scores that were within the normal range.

In conclusion, none of the patients showed any evidence for an impairment at the level of written and spoken sentence-level comprehension. These data, therefore, do not support earlier claims that the left anterior temporal cortex contributes to parsing or other sentence-level processes such as prosodic analysis. The only caveat is that one does not know for sure whether the brains of these patients are fully representative of the normal organization of language in the brain, as the resected temporal cortex partly consisted of epileptogenic tissue. Therefore, some reorganization might have taken place. Nevertheless, it is clear that more and stronger evidence is needed than has been presented so far in order to ascribe a role in language processing to the temporal pole and anterior portions of the superior temporal gyrus.

5 GESTURE

The Gesture Project had significant changes in personnel in 1999. De Ruiter left the Institute in May to take up a position at U. of Cologne. He has been at the center of the project since its inception in 1993. After finishing his Ph.D. in 1998, he continued in the project as a postdoc. Senghas, who was a scientific staflmember for one and a half years, left the Institute in August to start a position at Barnard College in New York. Özyürek, who has been a central figure in the project äs a postdoc for three years, also left at the end of the year to take up a position at Koc U. in Istanbul. The project welcomed a couple of new faces. A Ph.D. student, Seyfeddinipur, started her investigation on gesture and speech dysfluencies. Lausberg, who is also affiliated with the Free U. of Berlin, started a project on gestures by "split brain" patients in order to gain insight into the hemispheric specialization of different types of gestures. This project is funded by the "Deutsche Forschungsgemeinschaft" (DFG).

The Gesture Project continued to focus on crosscultural studies of gestures. In 1999, the project started to investigate how crosscultural variation emerges in the course of development.

We investigated the relationship between how speech syntactically packages Manner and Path components of motion events and how gesture expresses the same information. (See also Annual Report 1997, 1998). Özyürek explored this issue developmentally with Turkish speakers. We found parallel development of the verbal and gestural expressions of Manner and Path, which fits with the previous finding that the way Manner and Path are gesturally expressed by speakers of different languages parallels the way the languages lexically and syntactically package the same information.

Wilkins and de Ruiter investigated the cultural variation of hand choice in locally anchored spatial gestures, and how the variation emerges developmentally. It was found that the Arrernte adults have different hand choice than Euro-American adults. Furthermore, it was found that Arrernte children up to six years old exhibit the same pattern as Euro-American adults. This suggests that Arrernte children and Euro-American adults follow the universal tendency, and the Arrernte adult pattern has to be acquired later.

The Gesture Project continued on another line of investigation, which concerns the speaker-oriented function of gestures. In our previous studies (see Annual Report 1998), it was claimed that gestures are not merely externalization of mental representation, but that they play an active role in the conceptual planning for speaking. Alibali and Kita obtained further evidence for this position from the study of how gesture prohibition affects speaking.

5.1 Development of speech-gesture integration in Turkish children's motion event descriptions

Previous study by Kita and Özyürek showed that speakers' spontaneous iconic gestures are sensitive to the syntactic packaging of elements of motion events in different languages (Annual Report 1997). In the present study, Özyürek, in collaboration with Ozcaliskan (U. of California, Berkeley), investigated how the specific gestural encoding of motion events emerges in the course of linguistic development in Turkish children's descriptions.

In the previous study by Kita and Özyürek (Annual Report 1997), it was found that in descriptions of scenes where there is both manner and path, such as ROLL DOWN, Turkish and Japanese speakers produce (a) Manner-only gestures (e.g., hand rotating in the same location), and (b) Path-only gestures (e.g., hand moving across space without any rotation) in their descriptions more often than English speakers do. However, roughly an equal number of speakers in all three languages use Manner-Path Conflated gestures (e.g., the hand rotates as it moves across the gesture space). Turkish speakers' having the additional representational types (i.e., Manner-only gestures and Path-only gestures) parallels the fact that they use *two verbs,* one for manner and one for path (e.g., *yuvarlanarak iniyor* "descends rolling") to encode components of a

motion event. In contrast, English speakers use one manner verb with a satellite (e.g., *roll down).*

If adult speakers' iconic gestures are sensitive to the syntactic packaging of motion events, then how do these gestural differences arise developmentally? In order to answer this question Özyürek and Ozcaliskan examined the development of Turkish childrens' gestures used to describe the same motion event, ROLL DOWN, and compared the gestural patterns with those of Turkish adult speakers.

Seventeen adult, eleven 9 year-old, and eighteen 6 year-old Turkish speakers watched and narrated the animated cartoon "Canary Row". All the data was collected from monolingual speakers in Istanbul.

First, as in the previous study, we calculated the percentage of speakers in each age group who used manner verbs and path verbs to describe the scene in which Sylvester, the cat, rolls down a hill. Results showed that the percentage of speakers who used manner verbs increased from 6 to 9 years (61% to 90%) and this increase was less sharp for the use of path verbs (85% to100%). With adults, these percentages slightly decreased again to 76% for manner verbs and 80% for path verbs, indicating a reverse U-shape development for the verbal encoding of manner.

Next, we calculated the percentage of speakers who used any of the three types of gestures at least once in each age group: (1) Manner-only gestures, (2) Path-only gestures, and (3) Manner-Path Conflated gestures. The percentages of speakers who use the three types of gestures in the 6-year old group is found to be very similar to those of adult speakers who use these types of gestures. However, at the age of 9, there is a reorganization in the type of gestures used. At 9-years, the percentage of speakers who use Manner-only gestures increases (6-years: 55% to 9 years: 81%) and that of speakers who use Manner-Path Conflated gestures decreases (40% to 5%). On the other hand, the percentage of speakers who used Path-only gestures remained the same across the two child groups (6-years: 60%; 9-years: 65%). The trade-off between the overuse of Manner-only gestures and the decrease in Manner-Path Conflated gestures parallels the overuse of Manner verbs in 9-year olds' speech. Thus, gestural development shows increased sensitivity to development of linguistic encoding of Manner in Turkish 9-year olds' speech.

To summarize, this study shows that by the time Turkish children are 6 years old their gestural representations resemble the adult pattern, that is, the linguistic effect of gestures can be observed. Still, further development at 9 years suggests a reorganization of representations along with similar changes in speech.

5.2   The effect of gesture prohibition on the nature of explanation

Alibali and Kita investigated the effect of gesture prohibition on children's explanation of their own answer to a Piagetian conservation task. 36 kindergarten children were asked to make a quantity judgement in Piagetian conservation tasks, and then they were asked to explain the reason for their answer. For some tasks, children were prohibited from gesturing by having them put their hands in muffs that are sewn together. In the other tasks, they were allowed to gesture. The content and formulation of explanation were compared between the two conditions.

As for the content, it was found that gesturing causes children's explanations more bounded to the physical properties of the stimulus array in front of them. The children's explanations were divided into two types: 1) the ones that focus on the present state of the stimulus array (e.g., "Because this glass is taller."), and 2) the ones that focus on the prior state (e.g., "Because, before, those were out like the red ones."), or the transformation (e.g., "Because you just poured it into a cup."). The latter type of explanation was given more often in the gesture-prohibited condition than in gesture-allowed condition.

As for the formulation, it was found that gesturing makes children's description of size and shape to be a compact expression of the comparison between task objects. The size and shape of the task objects can be described by an uninflected adjective ("flat") or by an adjective in the comparative form ("flatter). The former type refers to a property of an object, and the latter type refers to the relation between two objects with respect to a property. The size and shape adjectives are more likely to be in the comparative form in the gesture-allowed condition than in the gesture-prohibited condition.

These two results indicate that gesturing leads children's thinking in a particular direction. First, gesturing makes the here and now (i.e., the task objects in front of them) more salient. Second, when the children refer to

the physical properties of the here and now, gesturing helps maintain the focus on a particular physical property and compare two task objects along this dimension. These results are significant in that they demonstrate that gestures are not mere externalizations of underlying mental representations. The act of gesturing influences what kind of mental representation is activated.

5.3   Hand preference for representational gestures: A comparison of Arrernte and Dutch speakers

Numerous observational studies by other researchers have revealed that co-speech unimanual gestures, especially "meaningful" gestures, tend to be performed almost exclusively by the right hand in right-handed speakers. The fact that the speech dominant hemisphere is typically the hemisphere that controls the stronger, preferred hand, and this hand is the one that is more active when making co-speech gestures has intrigued neuropsychologists, motor behavior researchers and gesture researchers alike. Wilkins and de Ruiter have explored what appears to be a very robust cultural deviation from these standard observations. As reported in the previous Annual Report (1998), they have been comparing the co-speech gestures of four right-handed Dutch speakers from the Netherlands and four right-handed Arrernte speakers from Central Australia. All speakers were interviewed within the area where they had lived most of their lives, and were videotaped conversing about the history and layout of that area. For the current comparison, Wilkins and de Ruiter have focused on co-speech "locally-anchored spatial gestures" which refer to locations, areas, directions or trajectories in the (nonvisually available) physical space that consultants are talking about.

The comparison involves 98 unimanual gestures from the Arrernte and 80 from the Dutch. The Dutch speakers behaved as previous studies had predicted: 81% of gestures were performed by the right hand, while only 19% were performed by the left hand. By contrast, the Arrernte speakers made only 58% of their gestures with the right hand, and 42% with their left. When one compares the Arrernte use of the hand with the actual locations of their (nonvisible) targets, one discovers a clear strategy: use the left hand for targets on the left-hand side, use the right hand for targets on the right-hand side. In other words, make ipsilateral gestures with respect to a spatial referent, not contralateral gestures. In fact, Arrernte speakers made no (0%) contralateral gestures. This suggests that if Dutch

speakers were talking about targets on the side opposite to their dominant gesture hand they would have made some contralaterally-oriented gestures. In fact, all Dutch speakers made some contralaterally-oriented gestures, giving a total of 13 (i.e., 16%).

How are we to explain this significant cultural difference between Arrernte and Dutch speakers, which appears to contradict the standard observation regarding hand preference and meaningful co-speech gesture? Work by Wilkins (1999, see also Annual Report 1995, 1996, 1998) has shown that Arrernte speakers are highly conscious of gesture, and have numerous conventions for gesturing, especially for producing and interpreting spatially-oriented gesture. Moreover, a separate developmental exami-nation shows that Arrernte children (aged 1;8 to 6;2) only make an average of 16% left-handed gestures, while adults observed under the same conditions make an average of 46% left-handed gestures. This suggests that Arrernte children start "right" and learn the convention to manipulate both hands for "orientational gesture". On the basis of these facts, Wilkins and de Ruiter hypothesize that, universally, there is a default alignment of control of speech, hand preference and meaningful co-speech gesture, but that this alignment may be over-ridden by cultural convention.

6 SPACE

The Space Project investigates the relation between language, culture and cognition through the crosslinguistic and crosscultural comparison of spatial systems as they are realized in linguistic expression and non-linguistic behavior. The primary research strategy has been to devise and implement elicitation tasks suitable for use under field conditions in a wide range of geographically and linguistically distinct communities. One of the main enterprises in 1999 was the creation of a new field manual and kit to coordinate our collaborative research activities. The 1999 field season yielded comparative data for more than 15 languages. Priority was given to the further exploration of two areas of research discussed in the 1998 Annual Report, namely Demonstratives and the verb component of Basic Locative Constructions. Research in the Space Project focuses not only on adult behavior, but also on children's acquisition of spatial systems and behaviors, and individual researchers also continued their work in this domain.

One of the main aims of the Space Project is to explore and test semantic typology in the spatial domain. A new feature of our joint work has been a more rigorous exploration of the role of pragmatics in the interpretation of spatial terms, and the relation of pragmatic interpretations to semantic typology. In particular, researchers in this project have pursued a form of Gricean analysis, as proposed by Levinson (1999, in press), in which three different conversational heuristics are used to explain default inferences which are frequently confused with the semantically encoded meanings of words and constructions. The heuristics which Levinson identifies, and which have been used to help distinguish between what is linguistically coded versus merely presumptively inferred, are as follows:

(a)   The Q[uantity]-heuristic: What is saliently not said is not the case;

(b)   The l[nformativeness]-heuristic: Unmarked, minimal expressions warrant maximal interpretations to stereotypical extensions;

(c)   The M[anner]-heuristic: Marked message indicates marked situation.

The Q-heuristic requires a metalinguistic notion of salient alternates, an attention to what else might have been said but wasn't. The l-heuristic licenses maximal interpretations to the stereotype on the basis of unmarked message type. The M-heuristic plays off the l-heuristic: whatever might have been implicated by a simple unmarked utterance is ruled out by the use of a marked message. The applications of these heuristics to the spatial domain, especially the Q- and l-heuristics, are illustrated below.

The 1999 results of the Space Project are summarized under three main sections: (1) demonstratives; (2) the verbal component of "Basic Locative Constructions"; and (3) the acquisition of spatial notions.

6.1   Demonstratives

In comparing demonstrative systems, we focused this year on deictic elements which appear within the NP and are used to establish reference to an entity that is present in the extralinguistic context (i.e., exophoric reference). Thus, we concentrated on terms like English "this" and "that", as used in sentences like "Could you pass me that book?" and 'This tooth is bothering me". Although pioneering research on demonstratives, like that by Fillmore (1972,1982), helped establish the basic parameters along which spatially deictic elements can vary, there has been remarkably little systematic exploration of the actual deployment of demonstrative terms for establishing exophoric reference. To help fill this gap, a couple of new tools were designed to facilitate the identification and comparison of the extensional range of use of the basic spatial demonstrative terms in a language. We will discuss results obtained from the application of an elicitation tool designed by Wilkins, namely, 'The 1999 Demonstrative Questionnaire: THIS and THAT in comparative perspective". This elicitation tool centers around a set of 25 diagrammed scenes in which a speaker is referring to a single object, noncontrastively, within the context depicted. These pictures are not stimuli to be shown to language consultants, but are used by a researcher to help reconstruct the relevant context in situ. This elicitation tool was designed to help differentiate and compare those parameters which most commonly appear to be encoded within demonstrative systems:

(1) speaker-anchored vs. addressee-anchored vs. speaker-and-addressee anchored vs. other-anchored;

(2) distance distinctions from deictic center [proximal, medial, distal, far distal];

(3) distinctions of visibility versus non-visibility.

The discussion of comparative research here first considers investigations of two-term systems, and then investigations of systems with more than two terms.

6.1.1 Two-term demonstrative systems

In typological discussions of demonstrative systems, it has been common to treat two-term systems as the most basic type of demonstrative system, and to identify only a single type of system, namely two speaker-anchored terms differentiated by distance, with a "proximal" term being marked in relation to an unmarked "distal" term (earlier work by Himmelmann and Diessel provides notable exceptions to this generalization). Using the elicitation tool designed by Wilkins, we were able to bring the two-term systems of 7 different languages into comparison: Ewe (Ameka and Essegbey); Italian (Wilkins); Yukatek (Bohnemeyer); English; Dutch (Wilkins and de Witte); Russian (Dunn); and Brazilian Portuguese (Meira and Guirardello). The terms from each of these languages, and how they apply to a representative range of 8 scenes (from the 25), are given in Table 1. The number of consultants for each language is also provided.

Recall that we are concentrating on the exophoric use of demonstratives to pick out a single unique referent, and avoiding contrastive reference at this point. The eight scenes from Table 1 may roughly be described as follows:

diagram 1,   the speaker is referring to one of his/her own front teeth (with pointing);

diagram 6,   the speaker is referring to an object to his/her right side, which is away from the direct view of the addressee;

diagram 19, the speaker is outside a room speaking through a window to an addressee within the room, and is referring to an object in the room which is physically closer to the speaker;

diagram 9,   the speaker is referring to an object which is directly in front of the addressee and out of immediate reach of the speaker;

diagram 12, the speaker is referring to an object that is equidistant from speaker and addressee and is only about five paces away;

	(1)	(6)	(19)	(9)	(12)	(13)	(16)	(24)
EWE [n=3]	ke	ke	ke = kemi	kemi (ke)	kemi	kemi	kemi	kemi
ITALIAN [n=6]	questo	questo (quello)	questo = quello	quello (questo?)	quello (questo?)	quello	quello	quello
YUKATEK [n=3]	-a'	-a' (-o')	-a' (= -o')	-o' (-a'?)	-o' (-a'??)	-o'	-o'	-o'
ENGLISH [n=6]	this (that)	this (that)	that (=this)	that (this)	that (this)	that	that	that
DUTCH [n=14]	deze/dit (die/dat)	deze/dit (&die/dat)	deze/dit = die/dat	die/dat	die/dat	die/dat	die/dat	die/dat
RUSSIAN [n=3]	ètot	ètot	ètot (tot)	ètot =tot	ètot =tot	ètot =tot	ètot =tot	tot (ètot)
BRASILIAN Portuguese [n=2]	esse	esse	esse	esse	aquele	aquele	esse	aquele

Table 1 : A comparison of 7 two-term demonstrative systems (non-contrastive, exophoric use)

diagram 13, the speaker is referring to an object that is equidistant from speaker and addressee and is about the length of a football pitch away;

diagram 16, the speaker is referring to an object that is at the place where the addressee is and is about the length of a football pitch away;

diagram 24, the speaker is referring to an object that is equidistant from speaker and addressee and is very far away, located high up in a range of hills.

Table 1 gives a sense of how each of the languages vary in the responses to this elicitation task. The full data clearly reveal at least four types of two-term system:

(a)   speaker-anchored proximal vs. speaker-anchored distal [Ewe, Italian, Yukatek]

(b)   speaker-anchored proximal vs. "neutral" [Dutch, English]

(c)   "neutral" vs. speaker-anchored distal [Russian]

(d)   speaker-and-addressee proximal vs. speaker-and-addressee distal [Brazilian Portuguese]

There are several noteworthy aspects of these results. First, we see a much richer typology of two-term systems emerging than had previously been imagined. Second, to our knowledge, a system of the Brazilian Portuguese type had not before been reported (i.e., two terms that are each anchored at the location of both the speaker and addressee). Third, in previous literature, the Yukatek system had been described as being "speaker-anchored" versus "addressee-anchored". Bohnemeyefs research shows that this analysis is wrong, at least for the community of speakers he works with: Both terms of the Yukatek system are anchored at the speaker, and manipulation of addressee position makes little difference. All languages which truly distinguish a speaker-anchored term from an addressee-anchored term, such as Japanese, will, for instance, apply different demonstrative terms to diagrams 13 and 16. Fourth, the existence of terms that are neutral with respect to a distance parameter (and hence may, under certain circumstances, be applied to all scenes) appear to be more common than had previously been thought. Finally, a system of the Russian type, where the marked form in the opposition is the distal and what was previously treated as the proximal turns out to be an unmarked neutral, has not before been described. A closer look at the Russian data will help us see the importance of keeping what is linguistically coded distinct from what is merely presumptively inferred.

The exophoric functions of the demonstratives in Russian were examined by Dunn. The two terms of the Russian system are *etot* ("this") and *tot* ("that"). These are traditionally treated as proximal and distal terms, both in grammatical description and in naive folk explanations. In tests using Wilkins' demonstrative questionnaire it emerged that whereas the "distal" term behaved as would be expected of a speaker-centered distal demonstrative, the "proximal" term could be used irrespective of actual distance from the speaker, and so might more properly be treated as a "neutral" term. Thus, when speaking of a place visible on the horizon it is possible to use either demonstrative: *V etom/tom gorode ja rodilas'* "In this/that city I was born", but speaking about one's own tooth (and avoiding contrastive usage) one can only say: *etot (*tot) zub bolit* 'This (*that) tooth hurts".

The pragmatics of this phenomenon can be dealt with along the lines proposed by Levinson using the Q-heuristic: What is saliently not said is not the case. For a set of alternates in the same semantic field which are logically compatible, use of the one implicates that another doesn't apply. More specifically, given a Horn-scale <S, W> where S is informationally stronger than W, using W implicates that the stronger S does not apply. Closed-class alternates, like demonstrative systems, frequently exhibit this kind of privative opposition. In the case of Russian, the distal term *tot* is the informationally strong term which entails *etot,* the weak term. In other words, if the Horn-scale for Russian demonstratives is «distal = S, neutral = W> then we expect an utterance asserting "neutral" to Q-implicate "not-distal", and so one presumptively infers a proximal interpretation. The same sort of analysis can be run for the other languages with a neutral term, English and Dutch, but in these cases the informationally strong term is the proximal, and the Q-implicature that follows from use of the neutral form is not-proximal (a presumptive inference of "distal"). It would appear that naive folk interpretations of the meanings of demonstratives are based on full interpretation in context, but these should not be confused with semantic content. Apart from showing that there is an over-simplification in the traditional description of Russian demonstratives, the results of this study also go against the typological tendency noted by Halliday (1985), that the distal form will be the unmarked member of a pair of demonstratives (as is the case in Dutch and English). Further, the value of a pragmatic analysis and its contribution to a clearer understanding of semantic typology should now be obvious.

6.1.2 Demonstrative systems with more than two terms

In the 1998 Annual Report, we reported on four multi-term demonstrative systems, Japanese (Kita), Kilivila (Senft), Turkish (Özyürek) and Yeli Dnye (Levinson). This year we were able to bring two more multi-term languages into the discussion, Tiriyö (Meira) and Warrwa (McGregor). As was the case for both Turkish and Japanese, a closer look at the actual exophoric spatial use of the demonstrative terms revealed that previous descriptions of the Tiriyö and Warrwa demonstrative systems needed to be corrected.

Through detailed field research, Meira arrived at a better understanding of the semantics that underlies the system of demonstratives in Tiriyö (Cariban, Amazonia). With the help of Wilkins' demonstrative questionnaire, the three main Tiriyö demonstratives were shown to form a three-level system based on distance (proximal, medial, distal), with the medial term showing a significant degree of overlap with the proximal and distal. Particularly in need of further research is the existence of two proximal terms, */sen/* and */serai,* whose semantic difference could not be resolved in terms of simple spatial deixis. Further discussion with other researchers led to a more accurate analysis of the entire system of demonstratives, including, in addition to the three spatial demonstratives, also the anaphoric and the "non-accessible-location" terms (previously analyzed as referring to "invisible" entities). A rough schema for the application of Tiriyö demonstrative terms may be sketched as follows.

(I) If the referent is in discourse or in shared knowledge, then use terms from the anaphoric set.

(II) If the referent is exophorically referred to in extralinguistic context then use a spatial form. To determine which spatial form to use, ask: Is the area where the referent is accessible to the speaker and/or addressee?

  (A) If yes, then ask

    (i) can the speaker "demonstrate" the location?

      (a) If yes, use the "accessible demonstrative pronouns", according to the relevant distance distinction (proximal, medial, distal);

      (b) If no, then do not use demonstrative terms, use locative prepositional phrases instead.

  (B) If no, (i.e., if it is in a "non-accessible" area) then use the "non-accessible demonstrative pronouns".

According to the analysis sketched in the schema above, anaphoric pronouns are used when the entities referred to are not in space, but in discourse (i.e., they were previously mentioned, or are assumed to be known to the hearer). If the referents are to be located in space, then one of the spatial forms is used. If the referents are in the "accessible area" (roughly, in an area easily definable with respect to the place where the speech act is taking place), then the speaker can use an "accessible" demonstrative (if the object is relatively easy to locate by demonstration), or a locative postpositional phrase (if the object is relatively difficult to locate). If the object is not in the "accessible area" (i.e., it is roughly "elsewhere") but somehow makes its presence known to the speaker or hearer (by making noise), it can be referred to with the "non-accessible" pronouns.

McGregor investigated the demonstrative system of Warrwa (non-Pama-Nyungan, Australia), a language with just two remaining speakers. Fieldwork revealed that his earlier analysis of this system (McGregor 1994: 17) was in need of revision. It is a three-term (not a two-term) system, distinguishing three degrees of relative distance: *nyinka* "proximal", *binka* "medial", and *kanka* "distal". All three terms can be used to refer to objects in table-top space (e.g., three items arranged in a line moving outwards from the speaker could be referred to as *nyinka, binka,* and *kanka* respectively); all can also be used in larger spatial contexts such as in reference to houses in town, or geographic features at varying distances from the speaker. They can also be used in reference to body parts - e.g., *kanka niyambala* "that foot" could refer to the foot on an extended leg, in contrast to one on a bent leg. There is no separate set of deictic adverbials; the appropriate local postposition is attached to the demonstrative stem, e.g., *nyinka-n* (this-LOC) "here", etc.

The medial *binka* is the most marked demonstrative. One speaker almost never uses it, though she accepts it and can interpret it when heard; the other speaker used it primarily in contrastive contexts involving entities at different distances. A set of items at the same distance from the speaker are normally referred to by the same demonstrative by this speaker, but by *nyinka* and *kanka* according to order of mention by the younger (possibly under English influence). Rather than there being a ternary opposition proximal vs. medial vs. distal, it may be better to analyze the system as proximal vs. distal [or non-proximal], and within the latter category, medial (marked) vs. non-medial (unmarked).

6.2 The verbal component in "Basic Locative Constructions"

This sub-project is concerned with topological spatial descriptions, that is spatial descriptions based on concepts of propinquity, coincidence, superposition and containment. As outlined in the 1998 Annual Report, the strategy has been to use picture-book stimuli to isolate the "Basic Locative Construction" (BLC) - the preferred unmarked form of answers to *where* questions - in specific languages, and then see what the properties of each BLC are, and what its range of use is. Extensive crosslinguistic comparison seemed to indicate that there is a general hierarchy of contexts over which the BLC may be employed:

Hierarchy of contexts for application of BLC (see Annual Report 1998: 58).

I. Figure is impaled by ground

II. Figure is stuck to ground

III. Figure is "damage" (e.g., hole or crack) in ground

IV. Figure is part of whole

V. Figure is adornment on body

VI. Figure is inanimate, moveable entity on/in ground

There is an implicational scale such that if the BLC in any language is used to describe a higher context in the hierarchy (e.g., II), then it will also be employed for all those below (e.g., III-VI). This has now been tested on further languages, requiring some modification, as illustrated below. But here we concentrate our report on a neglected aspect of topological description, namely the verb component of the construction. A working typology of locative predication has been developed as follows:

Typology of locative predication:

Type 0: No verb in basic locative construction: Turkish (one construction)

Type I: Single locative verb (or suppletion under grammatical conditioning)

> *Type la: Copula* (i.e., dummy verb used in many other constructions): English, German, Tamil

>> *Locative + Existentiah* Yukatek

> *Type lb: Locative verb:* Japanese, Chinese, Ewe

Type II: Large set of "dispositional" verbs: Likpe, Tzeltal, Zapotec

Type III: Small, contrastive set of posture or positional verbs. Arrernte, Guugu Yimithirr, YelT Dnye, Dutch, Goemai

Often, as in Type II and III systems, detailed information about the orientation and disposition of the located object is encoded in the verb. The typology carries with it a number of *working hypotheses* about syntactic, semantic and pragmatic distinctions between these kinds of systems, which have been developed and partially tested over the year. For example, Type II systems consist of a dozen or more competing predicates specifying the disposition of the subject, and often seem to occur with other kinds of classifier systems (indicating mass-like nominal semantics), or a lack of specific spatial adpositions. Type II systems also exhibit some interesting semantic contrasts with Type III systems. For example, assertions with one of the many verbs in a Type II system commit the speaker to the actual disposition of the subject, whereas in Type III systems assertions are more presuppositional about the actual orientation of the object located - thus, when you say in a Type II system "the bottle is standing on the table" you are committed to its upright stance, whereas in a Type III system you are merely committed to there being a bottle on the table, and you are presuming of bottles that they canonically stand. Many Type III systems (e.g., Guugu Yimithirr) allow the deletion of the positional verb just in case the located object and the location are in a stereotypical or normal relation, in accord with a pragmatic principle of minimization (research by Levinson). Many further detailed hypotheses of this kind have been developed and tested, using a special book, referred to here as the Positional Picture Book, designed by Ameka, de Witte (U. of Amsterdam) and Wilkins.

6.2.1   Type II systems

Sonnenschein investigated the use of dispositional verbs in Zoogocho Zapotec, an Otomanguean language spoken in the Mexican state of Oaxaca. He used both the Topological Relations Picture Book (a.k.a. the BowPed book) and the new Positional Picture Book in his investigation. Zoogocho Zapotec is a Type II or Multi-verb language, having more than 10 verbs occurring in the verb slot of the BLC. The BLC in Zoogocho Zapotec consists of a noun phrase indicating a figure, a ground, a positional verb, a relational noun, and an optional demonstrative as in the following example.

(1) (dem)   Positional Figure   Relational Noun Ground
    (na')   *dxi*   *beko'*   *lho*   *yixe'*
    (there)   sit   dog   intestine   weeds
    "A dog is in the weeds".

As a Type II language, the hypothesis is that the positional verb should describe actual disposition rather than sortal classification, and by and large this seems to be so. There are two ways to ask a where-question, one in which the disposition of the figure is presupposed and one where it is not:

(2) WHERE Positional Figure

   Gan   *dxi*   *beko'?*

   where   sit   dog

   'Where is the dog?"

The answer to this type of locative question generally does not include the positional verb and consists solely of the relational noun and the ground. An alternative form does not include the positional and is as follows:

(3) WHERE Figure

   Gan   *beko'*

   where dog

   "Where is the dog?"

The answer to this type of question is generally a fully formed BLC construction, as in (1).

Zoogocho Zapotec also raises a potential problem for the hierarchy of contexts for the application of a language's BLC as described in the 1998 Annual Report in that it does not use a BLC for the "damage as figure" scenes (context type III), but does use a BLC for the "stuck to" and 'lied/encircled" scenes (context type II), suggesting that more than one dimension is involved here.

6.2.2 Type Hi systems

In this section we discuss three languages which in their BLCs use locative predicates of Type III, i.e., a small set of contrastive postural verbs.

First, Goemai, a West Chadic language of Nigeria, is being investigated by B. Hellwig as part of her PhD research. The locative information is distributed across two elements: spatial nominate which encode information about the spatial relationship between Figure and Ground, and positional verbs which encode information about the Figure. Four positional verbs are used: *t'og* ("sit"), *tö* ("lie"), *dyem* ("stand") and *lag* ("hang"). A locative scene picturing a cup on a table is described as:

(4) *Cup*   *t'dg*   *kä*   *teäbür*

   cup   sit   HEAD table

   'The cup is on the table (lit. cup sits at the head of table)."

All four positionals belong to the set of most frequent, basic verbs in the language as shown by textual counts, and they appear in contexts outside the locative construction. In particular they appear within the noun phrase where they modify nouns (e.g., "this/my sitting house") and within progressive constructions where they specify an accompanying posture (e.g., "doing something while sitting"). Since these are the only verbs allowed in these positions, it can be argued that they form a minor form class.
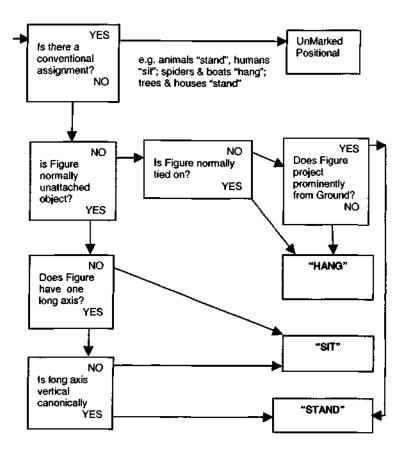
It is possible to use a general existential verb in the description of locative scenes, which however does not belong to the same formal set as the positionals. If the existential were to be analyzed as part of the "basic locative construction" this construction would be applicable in the description of all scene types in the BLC context hierarchy above. If it were not regarded as part of this construction, Goemai's "basic locative construction" would extend up to level IV (part-whole). It would again be used for level I (piercing), but not for the intermediate levels. This is not predicted by the typology, and is further evidence, along with Zapotec, that the hierarchy is in fact probably multi-dimensional.

Levinson did further research on the Yell Dnye positional verbs, as part of ongoing work on the language isolate of Rössel Island, Papua New Guinea. The outlines of the system were given in the Annual Report for 1997 (p. 71-72), but we are now able to put it into typological perspective. It has a small set of three verbs ("sit", "stand", "hang") covering most locative predications. What guides the choice of a specific verb in locative descriptions? Collocational constraints - that is conventional assignments - seem to drive many of the choices, for example with abstract nominals (see Table 2). But since novel objects are assigned the same verb by different speakers, there has to be an underlying rationale for the choice of a specific verb when describing the location of physical objects. Figure 1 is a sketch of a partial algorithm that does the necessary kind of assignment. But this is not the whole story: actual usage is rather flexible. Speakers can compute the expected positional. Switches to other than the expected positional will signify by a pragmatic marking rule (the M-Principle above), such things as actual (non-canonical) position, a precarious position, or the like. The types of switching rules are sketched in Figure 2.
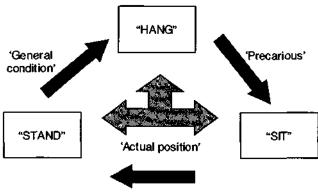
SIT	STAND	HANG
Shell money darkness, light tides rain, calm-weather, mist	trees, palms, houses, mountains, islands, (calm?)	canoes, boats, roads, clouds, currents, winds, rivers persistent rain
sun	stars	moon, red-sky (dawn)
people, friends, relatives, descendants, wife, etc. snakes	chickens, dogs, birds (in tree), pigs, fish, grubs (inside fruit) crocs (in river)	 crocs (on bank)
water juice	fire, steam	smoke
yams (in ground) fat	taro & tapioca (in ground)	
coconuts, betelnuts, fruits on ground	pineapples, fruits on trees	mangoes, nuts in trees
meetings, feasts	beginning of meeting, feast	
sleep story, news discipline, work happiness fornication debt, peace medicine, mortuary payment	 threat debt	taste, hunger, thirst signs, tracks flagrant fornication sorcery/power
clothes firewood	smells, light	smoke (also 'stand')
skin disease	cancer	disease/epidemic
books	cups, candles	holes (negative spaces)
	eyes, teeth, hair, qrey-hair	

Table 2

Collocation table: Some default assignments of different figures to positional predicates in Yélî Dnye

Figure 1: Partial algorithm for Positional Verb choice in YélT Dnye

	conventional assignment	shift to other positional	
yams	"sir	"hang"	implicates all the yams, yams in general, harvest
taro	"stand"	"hang"	as above, but for taro
humans	"sit"	"stand"	implicates actually standing
animals	"stand"	"sir	implicates lying down, sleeping
		"hang"	implicates perched, as of crocs on steep river bank

Figure 2: Pragmatic Marking Rules for Positional Verb usage in Yelî Dnye

Using the Positional Picture Book, we were able to test some more specific hypotheses about systems of this kind. First, these systems are classificatory, since they assign different subject nominals to different predicates under specific conditions - but what is actually classified, the referent, the noun or the nominal concept? The YeIT Dnye system makes it quite clear that it is the nominal concept that is classified (as we had supposed), because the positional chosen is changed if a classifier is used: thus one says for the same array of six balls on the ground "the balls are sitting on the ground", or alternatively "a small pile of balls is standing on the ground". Second, we had hypothesized that, in systems of this kind, when one says 'Ihe bottles are standing on the table" one is asserting location and presupposing the sortal category for bottles, namely that they have a canonical upright position. The Positional Picture Book puts this to the test: for example, a picture of seven bottles only three of which are upright can be happily described as 'Ihe bottles are standing on the table".

Finally, we had hypothesized that systems of this kind always have a residual category, and the YeIT Dnye facts seem to establish that, for this language at least (and perhaps the majority of these systems), this is "sit" - it is the residual category in the algorithm in Figure 1, and the commonest verb by far in the Positional Picture Book.

Ameka and Wilkins analyzed the Dutch data collected by Haak using the Positional Picture Book. Prior research revealed that, in terms of the typology of locative predication, Dutch is also a Type III language which employs a small set of posture verbs in localizing entities, the principal ones being *zitten* "sit", *staan* "stand" *hangen* "hang", and *liggen* "lie". The structure of the BLC is as follows:

(5) Figure   Positional verb   [preposition Ground]
    De fies   Staat   op   de tatet
    the bottle   stands   on   the table
    'The bottle is on the table".

The new data confirmed findings from earlier research in terms of the general patterns of use of the verbs. For instance, earlier research showed that the verb *staan* "stand" is used to localize objects that have bases. However, there are new findings as well. One new finding is that this holds true irrespective of canonical verticality of extended objects. Thus whether bottles are right side up or upside down on flat surfaces they are always localized with *staan.* We concentrate here on one set of pictures, with

bottles as the figure, to exemplify the new findings and illustrate regular patterns and pragmatic variations. As expected, the thirteen consultants used *staan* in response to the question *Waar is de ties?* "Where is the bottle?" in relation to a picture of a bottle standing upright on a flat rock surface (picture 10).

However, deviations from canonicality evoke the selection of alternate verbs based on pragmatic principles (the M-principle mentioned in the introduction to this chapter) taken together with what is being highlighted in the particular context. As is evident from Table 3 below, speakers begin to choose *zitten* "sit" once containment is a feature of the relation between the figure and the ground and is not dependent on canonicality. On the other hand, *liggen* "lie" seems to be used to signal that one should not presume canonicality. (Note: The responses reported in the tables include the first choices and alternate responses of the consultants, so sometimes the number is greater than 13.)

Picture No. & Description	zitten	staan	liggen
(10) bottle right side up on flat upper surface of rock		13	
(62) bottle right side up in basket	5	13	1
(67) bottle upside down in basket	9	6	5

Table 3: Single bottles as figure

Furthermore, pictures in which multiple bottles function as Figure show that different degrees of containment also affect the choice of verb; as shown in Table 4 (see below), when the bottles are fully contained (see figure 3).

11 respondents opted for *zitten,* while *staan* scores the lowest number of responses. When the bottles are partially contained there are only 5 responses for *zitten* (picture 28).

Significantly, the responses for picture 28 show that canonical vertically does not make a difference. *Liggen* was not offered as a response but the other verbs were. One conclusion to be drawn from the Dutch data is that *staan* is nearly always possible for the vertical orientation of a figure with a long axis like a bottle *(liggen* being the right description for horizontal orientation). However, when figures are in mixed positions or in enclosed spaces, alternative descriptions are sought, indicating by the M-principle a

marked extension: *zitten* appears to indicate enclosure while *liggen* implicates non-canonical position. For instance, when a plate has the right side up it is *staan* but when it is upside down the verb that is used is *liggen.*

When the bottles are in mixed positions, there is a difference between Dutch and YelT Dnye because in the latter the verb for "stand" is used in relation to 46, whereas half of the Dutch respondents felt obliged to go outside the posture verb system to the copula *zijn* "be" or the verb *zieh bevinden* "be located".

Picture No. & Description	zitten	staan	liggen	zijn	zieh bevinden
(60) 4 bottles upright 3 bottles upside down in basket	11	2	3	-	
(28) 1 bottle upright and two bottles upside down planted in the ground	5	12			
(46) 4 bottles lying and 3 bottles standing on upper surface of table		3	3	5	2
(52) 7 bottles lying on upper surface of table			13		

Table 4: Multiple bottles as figure

The difference between the Type III languages is indicative of other factors that have to be considered. Yell Dnye does not have any default copula to fall back on when there are mixed positions, whereas Dutch does. This is also reflected in the nature of the *where* question in both languages. In Yeli Dnye the preferred form of the question uses a zero copula. Thus the form of the question in relation to picture 46 is "bottles where?". The answer to such a question must always contain a positional verb. For Dutch the unmarked form of the *where* question uses the copula *zijn: Waar zijn de Hessen?* "Where are the bottles?". Presumably because of this, Dutch respondents feel able to switch out of the positional system altogether to indicate mixed canonical postures whereas YelT Dnye speakers simply use the classificatory "stand".

PICTURE 60

PICTURE 28

PICTURE 46

PICTURE 52

Figure 3: Pictures from Positional Picture Book (as discussed in table 4)

6.3   The acquisition of spatial systems

6.3.1   Positionals in adult and child Tzeltal narratives

In line with the work just reviewed, P. Brown also explored positional verb usage, but took a different tack. She pursued this research by looking at positionals in adult and child "Frog story" narratives in the Mayan language Tzeltal. In terms of the typology sketched earlier, Tzeltal is a Type II multi-verb language. Not only are positionals an important component of the Tzeltal static descriptions of location (Annual Report 1992:55), but they often combine with motion and/or path in one clause to indicate position-while-moving or position-as-a-result of movement. For example:

(6) motion verb + directional + positional:

   ch'ay koel jawal.

   "He [the boy] fell down face-up."

(7) positional + directional:

   ja' a snutz' te yajwale, te luchul bei.

   "He [the dog] chases his master, who is perched awaywards there
   [on the deer]."

P. Brown was particularly interested to see how these constructions with positionals might affect narrative style and how that style might be acquired by children. She examined these constructions in the Frog Story narratives of ten Tzeltal adults and nineteen children (grouped into ages 3-5, ages 6-7, and ages 8-13). She found that even among the 3-5 year olds, a relatively large proportion of clauses in Tzeltal Frog Story narratives specify the position of the Figure, but children of this age do not yet combine position and motion in one clause. In the 6-7 age group, rather than simply alternating scene-setting position-descriptions with descriptions of pure motion that move the story along through time, narrators begin to express position in the same clause as motion. Thus by age 6-7, children are able to produce a Tzeltal-type frog narration which integrates motion + path (expressed with motion verbs and directionals) and "manner"-like stasis (expressed with positionals), to provide vivid snapshots of events in the journey. This characteristic is compatible with the observation (Brown 1994) that, in Tzeltal, position is integral to descriptions of where things are and where they are going. This is a property of 'Ihinking for speaking" which Tzeltal children have to learn. Even 3-5 year-olds are attuned to this propensity, as seen in the roughly equal incorporation of position and motion in their stories, although

for the most part they lack the syntactic ability to combine both in one clause. Yet the fact that position is already heavily attended to even at this age (unlike what has been reported for other languages) reinforces the conclusion of the Berman and Slobin (1994) research that legalization patterns shape narrative style, via the shaping of attention produced by habitual language use.

The expression of position and motion/path in one clause means that both can be foregrounded. This usage increases with age for children. However, the adults actually produce less as a percentage of total clauses than do the 8-13 year olds, and in any case this is not a highly frequent linguistic strategy. This suggests that expressing position + motion/path in one clause is a *stylistic resource* that children even at age 3-5 are beginning to acquire; by the 8-13 age range they are outstripping adults, showing "over-sensitivity" to this feature of Tzeltal narrative style.

Though Tzeltal is a verb-framed language - since the preferred locus for PATH is in the verb or the adverbial directional - complex predicates play an important role in motion description and a significant portion of these (up to 7 percent in the Frog stories taken as a whole; up to 35 percent in the cliff scene) convey path and position in the clause.

The results of this exploratory study are broadly compatible with the Berman and Slobin findings: Children of 3-5 do seem to be already attuned to nonobligatory features of narrative style in their language, if these are accessible and easily expressed in the language.

6.3.2 The acquisition of the Marquesan landmark-based absolute system

Cablitz continued her dissertation project on the acquisition of spatial expressions in Marquesan (Austronesian, French Polynesia; see Annual Report 1998). The research in 1999 focused on whether the following three factors have an influence on children's acquisition of the Marquesan local landmark-based absolute system of SEAWARD, INLAND and ACROSS:

(a) perceptual clues in the environment (e.g., overall inclination of the volcanic island),

(b) familiarity of the surroundings (at home vs. an unknown place), and

(c) difficulty of localizing the child's own current position.

The results suggest that all three factors are closely interrelated. The less familiar children are with their surroundings, the more likely younger children are to get disoriented, because they cannot keep track of their own current position. To overcome disorientation they use perceptual clues from the environment to infer where the fixed local landmarks are. Adults and children alike need perceptual cues in order to use an absolute system. Disorientation also occurs in Marquesan adults, but their linguistic response to disorientation is more systematic than that of younger children (below age 7). When adults mistakenly refer to what in reality is the ACROSS direction with the SEAWARD locative, they also shift around the other absolute axes: If the SEAWARD locative refers to one pole of the true ACROSS direction, then the opposite pole is referred to with the INLAND locative. The true SEAWARD and INLAND directions are then referred to with the locative ACROSS. In other words, regardless of real world coordinates, the system is applied by adults as a full system of terms with specific relations to one another. It is not until age 8 that Marquesan children show this kind of systematic shifting around of absolute axes when they are disoriented. Thus the systematic oppositions of the adult system are acquired relatively late.

6.4   Concluding remark

This has, of course, been a highly selective presentation of the research results of the Space Project in 1999. We have chosen to highlight the collaborative research within the project, but individual researchers in the project have also continued to pursue important lines of research, not the least of which is the production of better descriptions of the grammatical systems dedicated to spatial description in particular languages. Moreover, we have not been able to adequately represent our important cross-project collaborations. In particular, the Space Project and the Gesture Project have worked together to gain a better understanding of the role of pointing gestures in demonstrative reference, and the Space Project and the Argument Structure Project continue to jointly pursue an interest in the description of motion scenes.

7 SCOPE

In the Scope Project we expect that learning more about how children interpret configurations containing scope elements may provide a clearer picture of scope phenomena in adult language and also a basis for new insights into theoretical matters related to scope phenomena in natural language. The phenomena we investigate are the scope behavior of focus particles, scope-related aspects in the interpretation of nominal expressions, and the scope properties of temporal adverbials and finiteness.

First, some of the core questions in the acquisition research on focus particles are the following. How do language learners find out which part of a sentence (the "domain of application") a focus particle actually applies to? How do they interpret focus particles in the input? How are linguistic means for scope marking (e.g., position, intonation) acquired?

Second, in our research on scope-related issues of nominal expressions we address the question of how children understand scope (non)-ambiguities triggered by nominal expressions. Moreover, we investigate whether children's interpretations are compatible with the ways in which existing theories explain scope properties of nominal expressions.

Third, studying the acquisition of temporal adverbials and their scope properties requires a wide understanding of the acquisition of aspect and tense, of the interaction of argument and event structure, and of the contribution focus makes to the interpretation of adverbials.

Finally, the project's view on finiteness in child language is based upon Klein's (1998) view that finite morphology is the linguistic realization of an abstract finiteness. This finiteness operator takes scope over the asserted part of a sentence. For each finite sentence, finiteness creates an

information-structural split into a presupposed and an asserted part. The acquisition of finiteness is thus expected to be closely related to the acquisition of how the information conveyed by an utterance is structured.

7.1   Focus particles

Bergsma continued her research on children's understanding of sentences with the focus particle *alleen* "only". In the 1998 Annual Report, Bergsma reported that children perform nearly as well as adults in interpreting sentences in which *alleen* precedes its domain of application marked by intonational prominence. In order to investigate whether children use the syntactic position of *alleen* or intonational prominence for the identification of the domain of application of *alleen,* another experiment was conducted. In this experiment, children's interpretation of sentences in which *alleen* follows its domain of application marked by intonational prominence was investigated. It was predicted that children would interpret those sentences in a less adult-like manner. Results of this experiment revealed that this prediction was borne out.

In addition, Bergsma investigated how children interpret sentences with the particle oo/f "also". In Dutch, either the domain of application of *ook* is marked by intonational prominence or the particle itself is stressed. Bergsma hypothesized that this stress behavior of *ook* might be responsible for children's confusion when interpreting sentences with *ook.* This hypothesis was confirmed by experimental data. When asked to select pictures corresponding to sentences like (1), (2), and (3), children are confused about which picture to choose, especially for sentences in which the particle itself is stressed.

(1)   Ook de JONGEN aait de hond.
        'The boy also pets the dog"
(2)   De jongen aait ook de HOND.
        'The boy also pets the dog"
(3)   De jongen aait OOK de hond.
        'The boy pets also the dog"

These findings may reflect problems in the interpretation of the stress on the particle. When the particle itself is stressed, children find it difficult to determine the domain of application of *ook.* This finding is consistent with the delay of children's prosodic understanding as reported in acquisition studies.

Heinzel continued her dissertation project on the acquisition of *auch* "also" and *noch* "another/still" in German. Although previous analyses (see Annual Report 1998: 77) have shown that children essentially use intonation in the same way adults do when marking the domain of application of these two particles, considerable differences between the two particles exist. Both particles are traditionally analyzed as additive particles with *auch* as the core representative (Jacobs 1983). However, the differences Heinzel found between the two particles are too atypical to analyze them in exactly the same way. Furthermore, children's usage of *auch* is also in contrast to what has been suggested in the literature: Children most frequently use accented *auch* that follows its domain of application, as in (4), but rarely use *auch* preceding its accented domain of application, as in (5):

(4) <u>rElefantl</u> AUCH ich beide in Bett leg.   (Caroline 2;06)
     elephant too I both of them in bed put

(5) dann darf man auch [BARFUB laufen] wenn
     man eingecremt is.   (Caroline 2;09)
     then can one also barefoot walk if one sun-creme has on

Since so far, linguistic arguments on the use of intonation in relation to the two particles have only been based upon theoretical consideration, a study of the adult use of *auch* and *noch* in spoken language was carried out. Therefore the adult utterances of the Caroline Corpus and utterances from the Verbmobil 2.1. Corpus (Bayerisches Archiv für Sprachsignale) were analyzed. Notwithstanding a number of differences between child and adult language, the adult data, too, showed that there are differences between *auch* and *noch* and that these differences are also reflected in the way intonation is used for the identification of the domain of application of the particles. The adult use of *auch* also shows parallels to child language in the sense that the accented *auch* following its domain of application is the pattern most frequently used.

7.2   The interpretation of nominals

Drozd and van der Lely (Birkbeck College, U. of London) continued their work on children's understanding of universal quantification. Drozd's experimental research (Annual Report 1997,1998) has suggested that 4-7 year-old Dutch children who make the Exhaustive Pairing error do not consistently analyze the universal quantifier *iedere* "every" correctly as a presuppositional quantifier, as expected. Drozd proposed that children
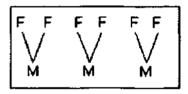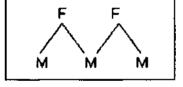
who make this error assign nonpresuppositional interpretations to universal quantifiers, interpretations which are normally associated with weak or cardinal quantifiers like *three* and *many.*
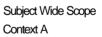
If this is correct, English-speaking children should analyze universal quantifiers as cardinal quantifiers similarly on tasks other than Drozd's original tasks. Universally quantified sentences like (6) differ from sentences with cardinal quantifiers like (7) in that they do not have cumulative interpretations.

(6)   Every monkey is holding two flags.

(7)   Three monkeys are holding two flags.

Universal quantifiers in subject determiner position, like *every* in (6), require that there be an instance of the predicate, e.g., a holding of two flags, for each of the members in the domain of the quantifier, as shown in Context A. Sentences with two cardinal NPs like (7) can be assigned either a scopal interpretation, and be matched with Context A, or a cumulative interpretation, and be matched with Context B.

Subject Wide Scope   Cumulative
Context A   Context B

Drozd and van der Lely hypothesized that if children analyzed *every* as a cardinal quantifier, they should respond similarly when asked to judge if (6) and (7) matched Contexts A and B. The results revealed that, like the adult controls, the children (age 4-7), correctly accepted (6) in Context A nearly 100% of the time. However, the children accepted both (6) (incorrectly) and (7) in Context B at roughly the same rate (55% and 65%, respectively). Moreover, the children's acceptance of both (6) and (7) in Context B decreased with age. This suggests that the children may have analyzed sentences with universal and cardinal quantifier subjects in a

similar manner, as expected under Drozd's Weak Quantification Hypothesis.

Van Geenhoven found evidence for the view that a Carlsonian kind-based approach to the inherent narrow scope of an English bare plural can never be naturally extended towards a uniform account of inherent narrow scope. This evidence is drawn from the fact that some inherent narrow expressions can never be said to denote a kind (e.g., Liu's class of nonspecific NPs in English, West Greenlandic incorporated nouns and their numeral modifiers). Neither can a kind-based approach deal with narrow scope as a uniform phenomenon. Moreover, if we look at Kramer's findings about children's interpretation of indefinites (see Annual Report 1998), it seems that children interpret indefinites as adult bare plurals, that is, with inherent narrow scope. Unlike adults, more than 80% of the children age 4;0-5;6 interpret (8) in a narrow way, i.e., as the non-adultlike "-i 3".

(8) De jongen heeft een vis niet gevangen.

   the boy has a fish not caught

   i. # 'The boy didn't catch any fish." # -i 3

   ii.There is a fish such that it is not the case that the boy caught it." 3 -.

In a Carlsonian approach, indefinites never denote kinds, and the question arises how such an approach would be able to treat children's indefinites and adult bare plurals as a natural class.

An alternative account for the inherent narrow scope of the English bare plural is the property-based account called semantic incorporation that was developed in Van Geenhoven (1998). This account is based upon the view that a bare plural's narrow scope results from the way in which a verb controls its (implicit) property-denoting arguments. A first advantage of a property-based approach is that we get one account for all inherently narrow scope nominals, which is simultaneously the account for the narrow scope of all nonquantificational nominals. Unlike a kind-based approach, a property-based approach allows for regarding children's indefinites and adult bare plurals as a natural class, that is, as property arguments. Second, (8) seems to indicate that semantic incorporation is the earlier acquired mechanism to combine verbs with their arguments. Further crosslinguistic evidence for this idea could be gained if the question of whether Greenlandic children interpret wide scope structures in a narrow way too, receives a positive answer.

In collaboration with L. McNally (U. Pompeu Fabra, Barcelona), Van Geenhoven investigated the semantics of verbs of absence (e.g., *to look for, to want)* and their arguments. Van Geenhoven and McNally offer additional crosslinguistic support in favor of a property analysis of opacity arising with verbs of absence by interpreting these verbs as relations towards properties, rather than towards intensional quantifiers. More interestingly, Van Geenhoven and McNally show that it is a natural consequence of what can be argued to be the independently identifiable semantic phenomenon that verbs can take property arguments (Van Geenhoven 1998). Moreover, they also regard the relations to properties that verbs of absence denote as lexicalized attitude verbs towards a proposition. By integrating a clausal/propositional analysis of verbs of absence into their lexical entailments, their property analysis gains room to solve apparent problems for nonclausal analyses. Their integrating property analysis improves upon previous property analyses because it draws a clear border between nonspecificity and opacity and, in addition, opens a way to formally differentiate between the opaque/transparent distinction, on the one hand, and between de dicto and de re interpretations, on the other. Finally, taking into account objections to a clausal analysis of opacity as well as criticisms of a property analysis, Van Geenhoven and McNally's proposal also improves upon previous approaches to opacity in correctly predicting that inherently property-denoting complements of verbs of absence have only opaque readings.

Krämer continued her dissertation research on children's interpretation of indefinite NPs. Her investigations are guided by the following hypothesis:

(9)   NON-INTEGRATION HYPOTHESIS

      Children acquire the predicative interpretation of indefinites early.
      The free variable interpretation is acquired later because it requires
      discourse integration.

Following Van Geenhoven, predicative indefinites have a nonspecific interpretation and take narrow scope, and free variable indefinites have a specific interpretation and can occupy different scope. The hypothesis in (9) predicts difficulties for the free variable interpretation for children between roughly 4 and 8 years of age. Kramer's results show that these difficulties lead to narrow scope interpretations of indefinite NPs that take obligatory wide scope for adults, and to the children failing to relate sentence initial indefinite subject NPs to elements previously mentioned in a story context.

7.3   Temporality

Swift continued her Ph.D. research into aspects of the development of temporal reference in Inuktitut and its relation to verb meaning. To learn the meaning of a verb a child is faced with a multi-faceted task which includes decoding event structure, temporal features, and perspective. This is a tall order in any language, and because different languages encode information in different ways, the decoding problem to be solved by the child varies crosslinguistically. Slobin (1985) has proposed Result (punctual, completive) and Process (nonpunctual, noncompletive, ongoing) as universal temporal perspectives which define a semantic contrast in the early acquisition of tense-aspect systems and predicts that children learning languages with salient past or perfect markers will first use them to refer to resultative situations. Evidence for this in English comes from the use of past marking (-ed or irregular forms) with accomplishment and achievement verbs, and progressive *-ing* with activity verbs as the earliest forms of temporal marking.

The temporal system of Inuktitut contrasts in interesting ways with the temporal system of a language such as English, so the development of temporal reference in Inuit children offers new perspectives on temporal acquisition theory. The contrast between process and result is manifested in early Inuit speech without overt morphology, but rather in different contexts of use for verbs with different lexical aspect, as licensed by the target language. When Inuit children begin to use overt temporal markers, they use markers with future time reference, so their first temporal marking does not appear to pattern with the Process/Result distinction. After marked future reference, the first overt past marking appears in Inuit child speech, and in contrast to findings for English-speaking children, it is not in resultative contexts.

Klein continued his work on the temporal structure of German (see Annual Report 1997). It is generally assumed that verbs have an argument structure, which imposes various constraints on the noun phrases that can or must go with the verb, and an event structure, which reflects the particular temporal characteristics of the event which the verb relates to: they may be states, processes, "events" in the narrower sense, etc. In a detailed analysis of German receptive constructions such as *ein Buch geschenkt bekommen* or *das Fenster geöffnet kriegen,* it was shown that a straightforward analysis is possible if argument structure and event structure are brought together. The lexical content of a verb assigns

descriptive properties to one or more arguments at one or more temporal intervals. Hence, verbs have an "Argument-Time-structure" (AT-structure). It is this structure which is primarily responsible for the grammatical encoding of arguments. Thus, arguments that are specified at two times - so-called change-of-state arguments - are normally expressed by an NP in the accusative, whereas arguments that are specified at one time normally require the dative. NPs in the nominative are ambiguous in this respect. The core of verb government in German can be described by the following default principles (DPs):

(10) DP A: One argument variable is filled by an NP_{nom}-

       DP B: Two-times argument variables are filled with NP_{acc}-

       DP C: One time-argument variables are filled with NP_{dat}-

       DP D: If V assigns the property "active" to an argument, then this
               argument is realized as NP_{nom}-

       DP E: If V is lexically empty, then the argument which expresses
               the descriptive property is realized as NP_{acc}.

       In cases of conflict, NP_{acc} is strongest.

There are few exceptions to these principles. They also naturally account for the ambiguity between "unergative" and "unaccusative" intransitive verbs: The argument of the former is specified at one temporal interval, the argument of the latter at two time intervals. Finally, it is also shown that numerous morphological and syntactical operations, such as participle formation or complex verb constructions, can best be described as modifications of AT-structure provided by the lexical content of the underlying verb stem.

Van Geenhoven elaborated a discourse semantic analysis of the interaction of quantificational adverbs with *when-, before-,* and after-clauses based upon Klein's theory of time in language (see Van Geenhoven 1999). In answering the question of how the restriction of a quantificational adverb is determined, her analysis takes into account the focus structure, the grammatical aspect of the matrix, and the syntactic distribution of the temporal adverbial clause. She argues that quantificational adverbs take topic times as their domain and that *when-, before-,* and after-clauses provide the restriction of these adverbs if they describe the matrix's topic time. If they describe the matrix's situation time, Van Geenhoven's account predicts that only those matrices with perfective

aspect can contribute a specification of their topic time and, hence, provide the restriction of a quantificational adverb. This correct prediction follows from the fact that only the semantics of perfective aspect does not give rise to a conflict with the semantics of the connective *when* since both perfective aspect and *when* denote inclusion between the topic time and the situation time. Finally, Van Geenhoven shows that drawing a distinction between restrictive and nonrestrictive wrien-clauses enables us to tell apart genuine quantificational adverbs (e.g., *always, often)* from indefinite temporal adverbs (e.g., *sometimes, once).* Moreover, adopting the restrictive vs. nonrestrictive distinction, which is commonly used in the class of nominal modifiers, widens our understanding of what the common characteristics of the verbal and the nominal domain are.

Recently, Matsuo joined the project. She intends to study the acquisition of embedded tense in sequence of tense (SOT) and non-SOT languages, as well as the acquisition of temporal adverbials.

7.4   Finiteness

Gretsch pursued her research on the abstract finiteness element and its scope marking properties in adult and child language. In collaboration with Dimroth (page 103), a unified theoretical framework for first and second language acquisition has been proposed which is based on Klein (1998). Within that framework, the notion "topic" comprises minimally "topic time" (i.e., the time for which an assertion holds) and "topic place" as coordinates for the interpretation of an utterance. 'Topic" is defined as a "time:space" tuple which gives a specified reference point for the anchoring of the information carried by the assertion. The reason for localizing topic time in the topic component and not in the finiteness position, as originally proposed by Klein, is based (i) on a generalized notion of topic as a prerequisite for sentence interpretation, and (ii) on the meaning potential of sentences with a focusing accent on the finite verb, since this excludes an interpretation highlighting the topic time. From an acquisition perspective, this framework allows for a simplified account of root infinitives in German child language, e.g., *meine Hände abtrocknen* "my hands dry-INF" while acting out the respective action or *ich der Frosch haben* "I the frog have-INP' when requesting something. Gretsch addresses the question of what it is that makes one grammatical form, root infinitives, particularly suitable for the expression of two incompatible functions, namely comments and requests.

In terms of Gretsch's and Dimroth's framework, the common denominator must be sought in the way topic time is fixed: If it is finiteness that allows for a specification of topic time by grammatical means via the interaction of tense and aspect information, root infinitives lack that feature. Consequently, the specification of topic time must be found in the nonlinguistic context. For comments on on-going actions, a specification of topic time is obsolete since by definition an action accompanies these utterances which themselves refer to that action. In that way the reference to the here-and-now is made explicit by the simultaneity of speech and action. For requests no such immediate cue exists. Here, the following roughly sketched semantic-pragmatic reasoning may account for the intended interpretation:

(i)   the actual nonlinguistic context does not allow for an interpretation as a comment on on-going action;

(ii)   no grammatical specification of the topic time has been achieved, thus excluding reference to the actual world (and to past worlds);

(iii) a topic in the sense of the above proposed [time:space] tuple is necessary for interpretation;

(iv)   the variables for topic time and topic place have to be associated with suitable substitutes which must consist of non-here-and-now interpretations, i.e., they point to other worlds (i.e., "wish worlds");

(v)   the description of a proposition tied to a future world is compatible with a wish or request interpretation.

Generalizing on the idea that different grammatical forms may invoke reference to actual or possible worlds, Bittner (Rutgers U.) points out that an interesting parallel between the nominal and the verbal domain seems to exist: In Polish, case marking can "distinguish between worlds" in much the same way as finite clauses and root infinitives in German. For example, uttering *woda!* "water-NOM", all by itself, is understood as a comment about the actual world, roughly equivalent to *This is water!* It is in contrast to the oblique *wody!* "water-GEN", which expresses a wish or request for water, as in *Give me water!* or / *need water!* The same pattern is found in Eskimo, too. In short, finite verb forms and nominative case forms - the unmarked forms - refer to the actual world, whereas nonfinite verbs and oblique cases - the marked forms - refer to alternative possibilities, e.g., wish worlds.

Returning to developmental issues, it is generally expected that children start with the unmarked forms to proceed to the marked ones. This is true

only for the nominal domain, whereas the verbal domain shows the opposite direction. How can this pattern of development be reconciled with the here-and-now centering of children's early utterances? On the one hand, children employ root infinitives as comments, on the other hand, children use precursor forms for implicit assertions. These substitutes are the focus particles *auch* "also" and *nicht* "not". This acquisitional pattern - first *auch* and *nicht* as precursors, and the emergence of finiteness at a later stage - is exactly mirrored in second language acquisition (See Dimroth's results (page 103-104).

8 ARGUMENT STRUCTURE

The Argument Structure Project explores the universal and language-specific aspects of argument structure and its acquisition through investigations of individual languages, crosslinguistic comparisons, and the analysis of acquisition data from unimpaired and specifically language impaired (SLI) children. The project has been in a transitional phase during 1999, with the loss of several core members (Allen, Bowden, Schultze-Berndt, Senghas, Wittek, Zavala) and the addition of several new ones (Dunn, Eisenbeiß, B. Hellwig, Lüpke, Narasimhan, Sonnenschein); some subprojects were finished and new ones were explored. The work of the group in 1999 addressed the following topics:

(i)   predicate semantics: The semantic structure of predicates viewed from a crosslinguistic perspective;

(ii) predicate classes: The semantic basis and morphosyntactic characteristics of verb classes in individual languages;

(iii) encoding of participants: The encoding of participants as arguments; expression or omission of arguments, and their morphosyntactic realization;

(iv) event representations: The linguistic encoding of basic and complex events.

The studies referred to in (i), (ii), and (iii) are extensions of earlier crosslinguistic and developmental research in the Argument Structure Project. These studies provide the background for a new subproject examining argument structure development in German, Hindi and Tamil. For this subproject, Eisenbeiß and Narasimhan are collecting extensive longitudinal corpora from three German children (Eisenbeiß), and from four Hindi and four Tamil children (Narasimhan).

(iv) represents another new direction of research within the project. This is part of a new subproject on event representation in language and cognition that has been set up in a collaboration between the Acquisition Group and the Language and Cognition Group. The domain of this subproject is the encoding of complex events in natural languages. It attempts to unite four lines of research:

(i)   descriptive research on the constraints individual languages impose on the coding of complex events;

(ii)   typological research on the relationship between the formal and semantic complexity of event expressions;

(iii) acquisition research on the development of universal and language-particular constraints on the coding of complex events in learners; and

(iv)   psychological research on the cognitive representation of events, and on the mutual impact of cognitive and linguistic event representations on each other.

To explore possible approaches and methodological issues, experts in the domain of the new subproject were brought together in a workshop on "Event Representation in Language and Cognition", held at the Institute in December (see chapter 11.7).

8.1   Predicate semantics

Ameka, Wilkins, and Essegbey investigated the semantic structure of individual predicates both crosslinguistically and within particular languages. Such investigations help determine the dividing line between what is universal and what is culture-specific in lexicalization patterns, and further clarify the relationship between predicate semantics and argument structure.

Building on Ameka's earlier investigation of the argument structure of elements that can be translated as "die" crosslinguistically (see Annual Report 1998), Ameka arid Wilkins explored the lexical semantics of the Ewe (Kwa, Niger-Congo) and Arrernte (Pama-Nyungan, Australian) equivalents of "die". This study was carried out against the backdrop of a proposal by Goddard and Wierzbicka (1998) that DIE is a universal semantic prime. DIE is paired with LIVE in their Natural Semantic Metalanguage (NSM) and is linked, not surprisingly, to the domain of "life and death". This represents a shift in position for Wierzbicka, who, in her

1996 book *Semantics: Primes and Universals* provided an explicit definition of the English verb *die* using the prime LIVE. The findings of Ameka and Wilkins question the universal semantic primitive status of DIE, even though dying is a universal experience. For DIE to qualify as a semantic prime we must answer the following three questions:

(i) is the experience lexicalized in all languages?

(ii) if it is lexicalized in all languages are the lexicalizations equivalent, i.e., semantically identical?

(iii) are the lexical items definable in simpler terms already available in the NSM lexicon of 60 items (within the language)?

The relevant Ewe and Arrernte lexical equivalents for DIE are *kü* and *ilweme,* respectively. Ameka and Wilkins show that DIE is subject to much cultural variation. Some of this variation cannot be easily dismissed as cases of "resonance". Indeed the dying of humans is one of the domains that is talked about universally in euphemisms. This has consequences for the semantics of the DIE verb: First, the euphemistic expressions and the "bald" expression may be in complementary distribution. Second, there are cultures in which the equivalent of DIE is generally tabooed for talking about humans dying. The Central Australian languages, one of which is Arrernte, are a case in point. The term all bilingual speakers identify as equivalent to DIE, and which is used, for instance, of animals dying, is more often used with respect to humans to mean "become unconscious, faint", and a euphemism tends to be used for humans dying. This suggests that a child would be more likely to learn, and experience the conditions, for *Uwe-* in the sense of "dying" with respect to non-humans, animals and plants first, and in the sense of "unconsciousness" with humans.

Even though the meanings of the Ewe and Arrernte verbs are similar in applying to animals, plants and humans, the two languages differ in the range of things that the verbs can be predicated of in a way that parallels what the correspondents of "alive" or "live" can be predicated of. For example, in Arrernte the verb *Uwe-* can be predicated of "fire" whereas this is not possible in Ewe. Even in cases where they can be predicated of equivalent referents such as river or water, the interpretations are different. In Arrernte, it means that the river or water has become poisonous or has dried up. In Ewe, on the other hand, it means that the river is no longer a river because it has lost a property that can be used to define a river, namely having water. This means that the Ewe and Arrernte

terms are not semantically equivalent, and the selection restrictions placed on their arguments are different.

With respect to the question of definability, it appears the Ewe and Arrernte equivalents of DIE are not to be defined via the prime LIVE, which itself may be subject to cultural and semantic variation but, instead, using primes from the domains of "time" and "existence and possession".

On the basis of these pieces of evidence, Ameka and Wilkins surmise that DIE is perhaps a concept which is "acquired" via "the cultural tool of language" (Wierzbicka 1996:19) rather than being one of the "fundamental innate elementary meanings" that "are the same" across all languages (Wierzbicka 1998:114). We should not assume that apparently universal experiences will be lexicalized in monomorphemic verb roots, and, even if they are, this does not guarantee uniform syntactic and semantic treatment.

Essegbey's (1999) dissertation on inherent complement verbs and argument structure in Ewe shows that semantically general verbs in Ewe pose a challenge to various semantic and syntactic theories. A theory that seeks to give a proper account for these verbs appears to require a pragmatic component. Since Role and Reference Grammar (RRG) is one theory that pays attention to pragmatics in its syntactic analysis, Ameka, Essegbey and Wilkins explored how one of the verbs with a general or underspecified meaning, *dze* "contact", is accounted for within the RRG framework, and they have suggested some fine-tuning that needs to be done to the RRG architecture to be able to handle such verbs. They investigated the interaction between verb semantics, construction semantics, the semantics of NPs which function as arguments of the verb, and pragmatic rules of interpretation to demonstrate what is required in order to treat the verb within the RRG framework.

The verb *dze* occurs in one-place, two-place, and three-place constructions in Ewe. It is an achievement verb in all occurrences and there is a clear semantic invariant across all uses. Ameka, Essegbey, and Wilkins treat the two-place construction as the default since it is the most frequently used pattern in texts and it is the one most readily elicited from speakers. When *dze* occurs in the two-place construction, it expresses "one entity coming in contact with another". It does not have a "be-located" element, even though in some uses the complement invites a "be-located" inference. However, such an inference can always be defeated. Moreover,

dze does not have a motion component. Thus, it does not allow for a simultaneous action to take place as it happens. As *dze* is an achievement verb, the lexical representation of this verb should have the structure "INGR predicate' (x,y)", where INGR stands for "ingressive". However, there is no predicate type in the current proposals in RRG to account for the semantics of *dze.* Therefore, Ameka, Essegbey, and Wilkins introduce the predicate "contacted' (x,y)" where the x argument is the contacter and the y argument is the contacted. In some of the uses of the verb, the contacter also represents an experiencer and attributant while the contacted represents a sensation and attribute. The semantic representation of *dze* is therefore "INGR contacted' (x,y)".

Ameka, Essegbey, and Wilkins show that inferences can be drawn based on the semantics of the verb and of the complement in context yielding various interpretations. Some inferences, for instance, are due to a contrast between a generic and a specific use of a complement, as the two sentences below illustrate:

(1) Kpe-ä   dze   dzo-a
    stone-DEF   V   fire-DEF
    The stone hit the fire".

(2) Kpe-ä   dze   dzo
    stone-DEF   V   fire
    'The stone became hot".

In (1) a definite complement *dzo-a* "the fire" is treated as a concrete location with which the stone makes contact. In (2) on the other hand, *dzo* is generic, and therefore, invites a property reading. The natural inference of what happens when something comes into contact with fire is that the thing becomes hot. Ameka et al. argue that this provides the bridging context for the interpretation of the verb in structures in which its complement denotes a property as predicating an attribute of the subject, as in (3).

(3) Ami   dze   tugbe
    ami   V   beauty
    "Ami is beautiful".

Furthermore, Ameka et al. account for the occurrence of the verb in the one-place constructions as an idiomaticization of interpretation in terms of frame semantics. The construction places an unusual restriction on the

single expressed NP, requiring that it possesses the following four properties: (i) it should be animate or a self-controlled entity; (ii) it must be intentionally moving; (iii) it must move in a way which is typical for the entity; (iv) it must make contact with a place which is its typical location.

This analysis has implications for RRG. First, it draws attention to the need for "contacted" as a predicate notion to be built into the lexical representation of achievement or INGR verbs. Second, it underscores the fact that verb semantic representation alone does not buy everything. The role of complement semantics and construction semantics needs to be explicitly recognized in RRG theory. Thirdly, the pragmatic component of the theory should be enriched by default interpretations and generalized conversational implicatures, as well as processes of grammaticalization (de-pragmaticization). As noted more specifically in chapter 6, to do semantic typology properly, one needs to distinguish between what is semantically encoded and what is presumptively inferred on the basis of pragmatic implicatures.

8.2   Predicate classes

A second line of research concerns the semantic basis and morphological characteristics of predicate classes in individual languages.

McGregor has almost completed a monograph *Verb classification in Australian languages.* A number of languages from the northern part of the continent show a compound verb construction (CVC) consisting of two verbal items belonging to distinct parts of speech: An uninflecting verb (UV) (variously referred to as a preverb, coverb, verbal particle, etc.) and an inflecting verb (IV). These are usually contiguous, and occur in the order UV-IV. An example is the Nyulnyul CVC *kurd i-n-d-in* "he/she hid" which involves the UV *kurd* "hide" and an inflected form of the IV *J* "say, do". One type of CVC is a verb classifying construction: IV roots indicate to which of a small number of categories the UVs they collocate with belong. The basis for the classification is semantic. Three parameters are relevant to most systems: valence, Aktionsart, and an abstract shape-configuration. In Nyulnyul, for instance, the IV *KAL* "wander" marks a category characterizable semantically in terms of the shape-configuration "undirected or uncontrolled action". The level at which the semantic features are relevant is not lexical; they are features of the referent event. By assigning a UV to different categories the speaker can designate conceptually different event types. The Nyulnyul UV *junk* "run" is normally

categorized by the IV *JID* "go", the meaning being "be running". By assigning it to the *-NY* "get" category, the meaning is instead "start running" (cf. English "get running"). In some languages (e.g., Gooniyandi, non-Pama-Nyungan, the central Kimberley) the system has grammaticalized to the point that the erstwhile IVs are no longer lexical verbs, and have become dedicated category markers. The process has gone even further in Pama-Nyungan languages, where, McGregor argues, these category markers have become conjugation markers. This analysis of the origin of Pama-Nyungan conjugation classes accounts for certain features of the systems that are inexplicable in the received scenario, which has the conjugation markers as the relics of root final consonants.

Dunn studied morphosyntactic phenomena related to verb classification in Chukchi, an indigenous language of the Arctic North East of the Russian Federation. Nouns in Chukchi are case-marked according to an ergative-absolutive system, and verbs have pronominal affixes which determine the arguments in core syntactic roles. Chukchi has noun incorporation of generic O-role (O = object) nouns, and there is also incorporation of other, non-syntactic arguments, intransitive verbs, and oblique modifiers. Transitive verbs in Chukchi enter into covert classes which determine their behaviour in particular morphosyntactic contexts. These classes can be termed "antipassivizing" and "applicativizing". With the antipassivizing class of transitive verbs, verbs with the *me-* prefix make an antipassive, i.e., they become intransitive, with the argument in S-role (S = intransitive subject) coreferent with the A-role (A = transitive subject) of the transitive verb. The O argument of the transitive verb cannot be expressed as a core argument of the antipassivized verb. When verbs of this class incorporate an O argument, they become intransitive. Verbs in the applicativizing class form an applicative with *ine-.* They remain transitive, but the O argument marks a referent from an oblique role (beneficiary or goal) of the nonapplicativized verb, and the O argument of the non-applicativized verb is not expressed (or, marginally, is expressed as an oblique noun). If the argument in the O-role of an applicativizing verb is incorporated, the verb likewise remains transitive, and there is a new O which marks the same beneficiary or goal argument that appears with the applicative. Semantic and functional motivations have been proposed to account for this classification. The key element is that verbs with a highly salient third participant such as verbs of transfer are more likely to enter the applicativizing class, and verbs without a highly salient third participant are more likely to be in the antipassivizing class. Another outcome of this

research is the observation that nonsyntactic incorporation of verb stems shows similarities to a classification system. Transitive, intransitive and labile motion verbs can incorporate intransitive verb stems which indicate manner or purpose of the motion.

Guirardello continued her research on Trumai, a genetically isolate language spoken in Brazil. One focus of her research was the verb classes and the auxiliaries found in this language. Verbs in Trumai can be subdivided into four classes: intransitive, extended intransitive, transitive, and extended transitive. This classification is based on morphosyntactic facts such as case marking on the arguments, person marking on the verb, basic word order, changes in order and occurrence of extra morphology after the verb, and the kind of particle required by the verb in the imperative construction. The class of extended intransitive verbs is of particular interest, because although the event they express involves two participants, these verbs are not coded as transitive (their formal characteristics are clearly different from transitive verbs). Their second argument is always marked as dative, and in the imperative construction these verbs require the same particle, *wana,* as that used for simple intransitive verbs. The semantic and pragmatic characteristics of the second participant are crucial to understanding the morphosyntax of extended intransitive verbs and why they differ from transitive verbs.

Margetts completed her Ph.D. research on Saliba, an Oceanic language spoken in Papua New Guinea (Margetts 1999). Her thesis is concerned with Saliba verbs and verbal clauses and the manifestations of valence and transitivity on different structural levels of the grammar. She defines these notions independently for three levels: the verb root, the inflected verb, and the clause (see Annual Report 1998). Based on the manifestations of valence and transitivity on these levels, Saliba has been classified as a preferred intransitive language. Parameters for such a classification are e.g., (i) on the root level: a preference for monovalent verb roots over bivalent ones; (ii) on the word level: predominantly valence-increasing derivational processes; (iii) on the clause level: sensitivity of transitivity marking to criteria such as object individuation or TAM distinctions. Margetts brought forward preliminary evidence suggesting that the feature of preferred intransitivity may also be reflected in the choices of event encoding a language makes. She discussed the Saliba tendency for encoding only certain event participants as arguments while others are pragmatically implied rather than syntactically encoded.

This can be observed in the tendency to make use of directional markers or possessive constructions rather than ditransitive clauses to express events with three participants.

8.3   Encoding of participants

A third direction of research deals with the question of what determines how arguments are overtly realized, what form they take, and how children learn the language-specific conditions for argument realization. P. Brown continued her work on children's argument realization in Tzeltal, examining the realization of O arguments as lexical, pronominal, or null in relation to the semantic specificity of the verb (see Annual Report 1998). Brown extended the analysis from the original three children to a fourth child, and found the hypothesis confirmed that Tzeltal children of age 3;6-3;9, like Tzeltal adults, realize the O argument lexically less often when the verb is semantically specific than when it is semantically general.

Slobin (UC Berkeley), Bowerman, and Behrens (MPI for Evolutionary Anthropology, Leipzig) began to explore differences in the ways that parents communicate about object placement to children in English, Dutch, and German. Slobin had noted that English-speaking parents make more frequent use of explicit nominals as locative goals (e.g., *put the ball in the box),* in comparison with parents speaking Dutch (e.g., *stop de bal daarin)* or German (e.g., *leg den Ball rein).* Although these three Germanic languages are typologically identical in terms of lexicalization patterns for motion events, they differ with regard to syntax. In English, verb particles and prepositions are often the same form, and the same word-order pattern can be used for prepositional phrases as goals *(put it in the box),* verb particles *(put it in),* and deictics *(put it (in) there).* It is possible that the English speaker does not have to commit to degree of specificity of goal encoding at the outset, since more specific information can be provided online, without rephrasing *(pur it in...the box).* In the other two languages, by contrast, the speaker must make an early commitment *(stop de bal erin/hierin/daarin* vs. *stop de bal in de doos).* A conceptual difference may also be at play. It is possible (following von Stutterheim and Carroll) that English conventionally treats sources and goals as THINGS, whereas Dutch and German treat them as (deictic) PLACES. Note that in Dutch and German there are no equivalents of English forms such as *in this/that/it,* rather, one must use deictic forms such as *hier/daar/er; hin/her/r-.* When Dutch and German speakers leave off the ground

nominal, they are presumably conceptualizing the ground as a PLACE, since they have to represent it with one of these deictic forms. Thus, going from *doe het erin* to *doe het in de doos* involves a shift of ontological category, from PLACE to THING. For English speakers, it is likely that the implicit ground in *put it in* is conceptualized as a THING; consequently, forms such as *put it in the box* would be frequent, even if there are no discourse pressures to focus on the goal. Slobin, Bowerman, and Behrens plan to examine early child language corpora in the three languages, looking for utterances expressing caused motion *{put, take,* etc.) in parent and child speech. If these suggestions are plausible, they should find a greater proportion of utterances with explicit mention of source/goal in English, and perhaps earlier use of nominal reference to sources and goals in children's speech in English.

Narasimhan, in collaboration with Budwig (Clark U., Worcester, MA) has examined the use of transitive and intransitive verbs in Hindi child and caregiver speech. The data come from videotaped interactions of 10 caregivers and their 3-4 year old children, collected for a larger longitudinal project on language socialization by Budwig and Chaudhary (U. Delhi). They looked at the distribution of transitive and intransitive verbs, argument realization, animacy of subjects, and relation to communicative purpose. Results so far suggest that children are more likely than their caregivers to use explicit realization of arguments with both transitives and intransitives. Although they found no animacy differences in caregivers and children's subjects in transitive constructions, in contrast there were significant animacy differences in the subjects of intransitives. Mothers were far more likely to have animate subjects in intransitives than their children (70% caregivers vs. 26% children). This suggests that the differences between caregivers and children have to do with the distinct communicative acts the speakers are engaged in. For instance, caregivers' intransitives link up with imperatives about how their children should act, while children rarely used imperatives to compel people to move in particular ways.

As part of his dissertation research, Sonnenschein investigated possession and argumenthood in Zoogocho Zapotec, an Otomanguean language spoken in the state of Oaxaca in Mexico. Zoogocho Zapotec has the phenomenon first described (by Croft 1985) as "indirect object lowering" in which an indirect object is (optionally) demoted to being the possessor of a direct object as in the following example.

(4) b-en=a'   to   libr   chi=o'
    COMP-give=1sg one   book   of=2sg
    "I gave you your book."

This differs semantically from the construction in (5), where the recipient is (obligatorily) marked on the verb, since in (4) the transfer is entailed, but in (5) transfer is defeasible.

(5) b-en=a=le   to   libr
    COMP-give=1sg=2sg one   book
    "I gave you a book."

There is also a similar construction, provisionally called "subject lowering", which Sonnenschein is currently investigating. In this construction, the subject of an agentive verb can be conflated with the possessor of a possessed object, if the two are coreferential. It seems to serve the role of disambiguating potentially ambiguous clauses. See the following two examples, where (6) is potentially ambiguous, whereas (7) is unambiguous.

(6) b-enh=e'   lizh=e'
    COMP-build-3sg(r) poss.house=3sg(r)
    "Hei built hisi/2 house."

(7) b-enh   lizh=e'
    COMP-build   poss.house=3sg(r)
    "He builti hisi house."

It is important to note that sentences normally must have a pronominal clitic or nominal NP directly following the verb in Zoogocho Zapotec. These indirect object and subject lowering constructions are just two means of realizing arguments in the language. Others - including focus constructions - are currently under study.

Eisenbeiß investigated the acquisition of the German case-marking system and its relation to argument structure in monolingual German SLI children and unimpaired monolingual German children. In a study of early noun phrase development, she showed that the unimpaired children do not exhibit any case distinctions in the early two-word stage. These children either omit the elements that exhibit case markers in the adult language {e.g., articles) or they produce phonologically reduced forms of articles and use case-marked forms inappropriately. In cooperation with Clahsen (U. Essex) and Bartke (U. Marburg), Eisenbeiß compared the

acquisition of case marking in unimpaired children with the development of case marking in SLI children. In this study, they analyzed the distribution of correct and incorrect case markings in later stages of development, when case-marked forms are used contrastively. The analysis showed that both groups of children correctly used nominative markers for subjects, dative markers for indirect objects, and accusative markers for direct objects and complements of prepositions which require an accusative marker. In contrast, children overgeneralized nominative or accusative forms to direct objects of verbs requiring dative case marking, and they overapplied accusative markers to complements of dative prepositions. These findings can be given a unified account based on the distinction between structural and lexical case: nominative subjects, dative-marked indirect objects, accusative-marked direct objects, and accusative-marked prepositional complements can be analyzed as instances of structural case. As structural case can be predicted from the structural position of the respective argument, one would expect that structural case markers are used in a target-like way once the appropriate case markers are available. Dative marking for direct objects and prepositional complements, however, can be attributed to lexeme-specific case requirements of certain verbs or prepositions. Thus, one would predict that children have to learn this lexeme-specific property for each individual dative-assigning preposition or transitive verb.

The analysis of the data from the SLI children also showed a dissociation between structural case marking and agreement. Whereas the SLI children did not seem to have any problems with respect to structural case marking, they exhibited a high rate of subject-verb agreement errors. This suggests that structural case and agreement are not two sides of the same coin as has been suggested by many generative linguists, e.g., by Chomsky (1995).

8.4 Event representations

To start off the new subproject called "Event Representation in Language and Cognition", Bohnemeyer compiled the Event Integration Questionnaire, which was included in the 1999 Field Research Manual of the Language and Cognition Group. This questionnaire comprises 56 scenarios that represent crosslinguistically recurrent cut-off points in the coding of complex events in the domains of motion, causality (i.e., caused state change or caused motion), and transfer (i.e., change of possession).

Responses to the questionnaire were provided by Ameka and Essegbey (Ewe), Bohnemeyer (Yukatek), P. Brown (Tzeltal), Guirardello (Trumai), Kita (Japanese), Levinson (Yélî Dnye), Meira (Tiriyö), Sonnenschein (Zoogocho Zapotec), and Wilkins (Arrernte).

A substantial amount of variation across these languages was found in the segmentation of scenarios into "macro-events". Thus, a translational motion event from a source to a goal *(She went from the tree to the rock)* can be packaged into single clauses in Arrernte, English, Japanese, Tiriyö, and Trumai, but has to be distributed across minimally two clauses in Yélî Dnye, Tzeltal, Yukatek, and Zapotec. This grammatical packaging restriction can be taken to be indicative of semantic event construal according to a set of semantic tests that show that the monoclausal representations indeed behave like simple event representations (e.g., they have a single accomplishment event structure, and positional time adverbials can only have scope over both consecutive location changes), whereas the multi-clausal representations do not. Some of the scenarios elicited constructions of an intermediary degree of complexity (serial verb constructions in Ewe, converb constructions in Japanese), and the languages in the sample differ as to where they show cut-off points between more simple and more complex forms of coding (e.g., English and Tiriyö also permit the accommodation of a ground passed by on the trajectory from source to goal in the monoclausal construction, whereas Trumai and Arrernte do not).

In a follow-up pilot study, Bohnemeyer created the ECOM clips (short for "Event COMplexity"). a set of 75 short video animations in which simple geometrical shapes (triangles, squares, etc.) are involved in motion events, caused state changes, and transfer scenarios. The complexity of these video clips was varied according to those parameters and cut-off points that the questionnaire returns had shown to be relevant, but additional types of complexity were built in as well. Data with this stimulus was collected from Japanese, Yélî Dnye, Tiriyö, Trumai, Yukatek, and Zapotec (by the researchers mentioned above), and in addition from Dutch (by Caelen), Sign Language of the Netherlands (Wilkins), Farsi (Seyfeddinipur), Marquesan (Cablitz), and Russian (Dunn). Wherever possible, both the range of applicable constructions and the consultants' preferred description was recorded for each of the clips with separate sets of consultants. The most important finding of this study is that languages differ in their preferred level of event segmentation, and that the preferred

level of event segmentation in a language cannot be predicted from the constraints on the information that can be maximally integrated in a macro-event representation in the language. Thus, whereas speakers of Japanese, Marquesan, and Tiriyö preferred to describe complex locomotion scenes at the tightest level of event integration which their languages offer (i.e., monoclausally in the case of Marquesan and Tiriyö), speakers of Dutch and Russian prefer to use descriptions that show language-particular patterns of event segmentation below the tightest degree of packaging possible in their languages. Moreover, the ECOM study provided new insights into the types of complexity that control the linguistic segmentation and integration of events: As soon as certain types of changes in the orientation of the motion vector (up, down, left, right, etc.) are added to the location changes in the motion scenarios, even in languages such as Dutch and Tiriyö which allow for the packaging of multiple location changes in single clauses, it is necessary to use multiclausal descriptions that represent the locomotion scenario as a sequence of macro-events. Hence, in these languages, changes of motion vectors provide for a kind of complexity different from mere location changes, whereas in languages such as Yelt Dnye and Yukatek, the two kinds of complexity are treated alike.

9 THE DYNAMICS OF LEARNER VARIETIES

The project described in this chapter differs from other Institute projects in that only a small fraction of the work is done at the Institute itself. Its role is rather to co-ordinate the joint research of a group of European research centers, in particular the universities of Aix-en-Provence, Amsterdam, Bergamo, Berlin (Freie U. and Humboldt U.), Cambridge, Heidelberg, Paris III, Paris VIII, Paris X, Pavia and Tilburg. Since its beginning the project has been concerned with the comparative analysis of untutored adult language acquisition from a crosslinguistic and longitudinal perspective. Its research is in many ways based on work done in the European Science Foundation's project "Second Language Acquisition by Adult Immigrants" (Perdue 1993) and some other contemporary projects with a closely related set-up.

The core idea of the project is not just to investigate the process of language acquisition, its course and the factors that often bring it to a premature end, but also to contribute to an understanding of the human language faculty itself. The project thereby takes an approach in which the process of second language acquisition is characterized in terms of the two-fold systematicity which it exhibits: the inherent systematicity of a learner variety at a given time, and the way in which such a learner variety evolves into another one. In 1999, the emphasis shifted more towards the second systematicity, the key question being "What pushes the learner to go beyond the so-called basic variety (Klein and Perdue 1997)?"

An underlying assumption of the project is that the dynamics of adult language acquisition are located at the interface of information structure and the linguistic means the learner brings along. This assumption

determines the choice of the main research topics that have been agreed upon as being the empirical domains which seem most sustainable for testing the causal factors mentioned. These are in particular:

(i)   various kinds of "optional elements" such as adverbials, particles and negation

(ii) finiteness;

(iii) complex structural devices (e.g., reference to space and time); and

(iv) discourse cohesion.

The optional elements mentioned in (i) exist in the basic variety, but the way in which they are integrated in the structure of utterance is much simpler than in source and target languages. Finiteness marking is strikingly absent from the basic variety and it will be interesting to see what its structural precursors are and how they evolve in later stages of acquisition, (iii) refers to the acquisition of more complex structures, in particular, to the acquisition of means of temporal expressions, of linguistic devices of combining clauses, and of items that violate certain basic-variety-level semantic constraints. A fourth issue addressed is how the development of further linguistic means at the three above mentioned focal points enhances discourse cohesion (anaphor, reconciling utterance-structure and the informational organization of text-types).

In the following report, we will give an example of the research done in these four sections. The work of Dimroth (section 9.2) and Starren (9.3) was done at the Institute itself. The work of Perdue et al. (9.1) and Carroll et al. (9.4) was carried out at other centers.

9.1   The acquisition of "optional elements"

Benazzo, Giuliano, Perdue and Watorek (U. Paris VIII) investigated the acquisition of scope elements in English, French and German, using the longitudinal data of five informants from the ESF data base. The scope items analyzed are negation, and additive, restrictive and temporal items. These scope items are acquired in a fixed order, with negation preceding additive and restrictive particles (e.g., *also, only* and their translation equivalents), which in turn precede the temporal items. For these latter, forms marking the iteration of an event (e.g., *again)* are used before temporal adverbs of contrast ("TACs": e.g., *already, still, no longer).*

It has been independently shown (Annual Reports 1992 and 1997) that the learners progress from a nominal utterance organization through an

organization based upon uninflected verbs (the "basic variety") on to utterances organized around a finite verb. The placement and scope properties of the items analyzed correspond closely to this development. Items occur first in nominal utterances adjacent to the constituent they affect, then immediately before or within the VP, then immediately behind the finite verb (see Benazzo and Giuliano 1998). It is not before this final stage that an item is both integrated within the utterance-structure while affecting a non-adjacent constituent. Furthermore, it is only at this stage that TACs, including temporal negation, occur in the same position.

The correspondence between the acquisition order of these items and the fact that the VP is acquired before verbal morphology is, is consistent with other results from the project (see Dimroth in 9.2, Starren in 9.3). It also throws light on a communicative limitation of the basic variety which may contribute to push learners beyond it, namely, the impossibility of contrasting or negating NP-referents or time-spans in the topic component of an utterance by means of additive or negative particles.

9.2 The acquisition of finiteness

Dimroth continued to investigate the acquisition of assertion marking in German as a second language in relation to the structural integration of optional scope bearing elements in utterances in a context. This work is based on the assumption that finiteness is the carrier of the assertive component in a declarative clause and that it has scope over the focused part of the underlying information structure (Klein 1998). Concerning the role of finiteness marking for the localization of the Topic Time (i.e., the time span for which a claim is made), some refinements of this framework were proposed by Gretsch and Dimroth (see chapter 7.4).

Such a concept of finiteness is a prerequisite for a distinction proposed in Dimroth (1998) for optional scope-bearing elements like additive scope particles or negation. In a post-finite position, these elements have scope over the focused part of the utterance and can thus specify the assertive meaning of finiteness by their meaning contribution (type 1) or they function themselves as the focus of an utterance. In the latter case, they bear contrastive stress (type 2). When they bear contrastive stress, the "normal" scope relation for assertion seems to be overruled by a superimposed information structure and the post-verbal particle applies to a distant contrastive topic constituent to the left.

Dimroth has shown that this distinction and its interpretation are supported by longitudinal data from the untutored acquisition of German as a second language by Polish, Turkish and Italian learners. With respect to the integration of finiteness marking and additive scope particles in the structure of the sentence, learners of German can be shown to pass through two main acquisitional stages before a target-like behavior is reached.

Additive particles are first attested at the so called basic variety stage (Klein and Perdue 1997) when utterance organization is essentially non-finite. In order to convey meaning, these nonfinite utterances have to rely heavily on a somehow "universal" display of topic-focus structure. Though it is not always easy to reconstruct what is actually meant to be asserted, additive particles at this stage seem to cover the scope of the mostly implicit assertion (type 1) while particles of type 2 are still absent.

(1) Extract from basic variety film retelling (Charlie Chaplin: "Modern Times") (L1 = Italian):

   und alles drei zusammen ine erde (...)

   and all three (=charlie chaplin, a policeman and a girl) together to earth

   alles in Ordnung charlote

   everything all right charlie

   unde polizei iste schlafe

   and policeman is sleep (= unconscious)

   (...)

   schla/ **auch** [die mädchen]

   sleep also the girl

The picture becomes more complex when, at a post-basic variety level, finite utterance organization comes into play. This developmental step has far-reaching structural consequences, one of them being the availability of a position for focused additive particles, adverbs or negation that have scope over (parts of) the distant contrastive topic component of the utterance (type 2). When learners start to use type 2 additive particles (while continuing to use type 1), they have to deal with nonconvergent scope properties of finiteness and focus particles. Many learners pass through an intermediate stage in which the omission of the finite part of verbs frequently occurs in utterances that contain type 2 additive particles:

(2) Retelling of the same scene at a post-basic variety stage (L1 Turkish)

die sindFiN runnergefallen von dem wagen

they (=a policeman and a girl) have fallen down from the car

und [der mannjcT 0FIN **auch** runtagefallen (...)

and the man (=Charlie chaplin) also fallen down

und die mädchen und der chaplin sindpiN aufgestanden

and the girl and chaplin have gotten up

und [die polizei]ct 0FIN **auch** aufgestanden

and the policeman also gotten up

dann die chaplin hatFiN ihn über den köpf geschlagen

then chaplin has hit him over his head

The learners' omission of an explicit assertion marker (which is ungrammatical in standard German) supports the idea that the set of alternatives induced by a focused additive particle contains only assertion and negation. In case of an assertion that is repeated with respect to a contrastive topic, focused *auch* highlights the positive choice. In post basic learner varieties, the particle is furthermore able to incorporate the overt expression of assertion that is rendered by finite verbs in other utterances.

9.3   The acquisition of temporality

Starren continued her analyses of temporal expressions in a longitudinal study of the untutored acquisition of Dutch by Turkish and Moroccan learners. She has found clear cases of double auxiliary marking with one indicating tense and the other aspect, as shown in (3):

(3) die meisje was nooit heeft verkering

that girl was never has a relationship

"That girl never had a relationship"

It is argued that this protoverbal morphosyntactic system of tense and aspect can be explained as the L2 learners' need to spell out the target system of tense and aspect marking through free morphemes. Starren found that the decisive factor in the emergence of (double) protoverbal auxiliary markings (Proto-Aux) is their embedding in the utterance structure. Since the structural embedding of these tense and aspect markings is the same as the structural embedding of temporal adverbials (TAdvs) in an earlier basic lexical stage of acquisition (the basic variety, Klein and Perdue 1997), the position of TAdvs in the utterance structure

functions as a default embedding which later on in the acquisition process triggers the positioning of free Proto-Aux expressing tense and aspect notions.

The grammaticalization process observed also shows that these protoverbal auxiliary markings were a precondition for acquiring the *relation* between the reference time and the event time (grammatical aspect), as there is no possibility of doing this in Dutch by means of TAdvs. In contrast, TAdvs like *gisteren* "yesterday" or *over twee dagen* "in two days" can specify the relation between the reference time and the time of utterance (tense). These facts lead to the conclusion that (grammatical) aspect is acquired before (grammatical) tense. Furthermore, the observation that in the basic lexical stage TAdvs cannot *relate* the event time to the reference time is a better explanation for grammaticalization than lexical-aspect-driven or foreground-background-driven explanations.

9.4   The acquisition of discourse cohesion

Carroll, Murcia-Serra, Bendiscioli (U. Heidelberg) and Watorek (U. Paris VIII) studied the relevance of principles of information organization at advanced stages of acquisition. The principles in question allow speakers to organize and shape the flow of information in context with respect to a communicative goal. In acquiring the lexico-grammatical means of a language and the rules which determine their combination, first language learners thereby discover the principles whereby representations of states of affairs are typically paired with the lexicogrammatical structures provided in the language in question. This involves the selection of viewpoints from which the material at issue will be presented for expression (specification of a spatio-temporal frame, topic focus assignments, selection of a linearization principle etc).

Crosslinguistic studies of English, German, and Romance languages (French, Italian, and Spanish) show that information organization follows distinct patterns which reflect unifying principles of a typological nature. The principles are perspective-driven and linked to patterns of grammaticalization. Languages thus have a preferred perspective in information organization which guides the selection of linguistic form. This was illustrated on the basis of the same task (description) for the linguistic means used in reference introduction (existentials vs. locationals), the morphosyntactic means used in reference maintenance (nominal vs. adverbial means), the spatial concepts used to structure space, and word

order. In English and Romance languages a high rate of existentials in reference introduction correlates with a high rate of nominals in reference maintenance, reflecting an object-based perspective on the information at issue. In German, on the other hand, speakers follow a spatial perspective with a high rate of locationals in reference introduction and a high rate of adverbial forms in reference maintenance. In order to discover the relevant perspective in information organization, language learners must thus recognize clusters of form-function relations which range over different domains. Analyses of descriptions of advanced second language learners of German (L1 = English; L1 = Spanish), though native-like in many respects, show that ultimate success in achieving native-like proficiency is constrained by principles of information organization in their learner varieties which are typical of their source language. With respect to the dynamics of learner languages, the results indicate that one of the core factors driving and constraining language acquisition is the tendency to establish consistency in the pairing of form function relations under a unifying perspective.

10 OTHER RESEARCH

10.1 Response congruity effects evoked by subliminally presented words

The extent to which information that is presented below a person's subjective awareness threshold is processed has received long-standing interest in cognitive research. Damian investigated this issue with a new "response priming" paradigm introduced by Dehaene et al. (1998). Subjects were presented with a subliminal prime (presented for 40 msec) and a target, both of which were orthographically presented words denoting concrete objects. Subjects were asked to make a size judgement about the object represented by the target word, and response times were influenced by whether the prime and target were congruent or incongruent as to size. This congruity effect appears to support Dehaene et al.'s claim that the primes are unconsciously categorized and processed to the response stage. However, Damian further found that the effect crucially depends on the prime words being in the response stimulus set (i.e., the prime words had to be targets on other trials). These findings suggest that the congruity effect might result from automatized stimulus-response mappings rather than from unconscious prime categorization. Consequently, claims regarding the extent of unconscious information processing that this paradigm reflects are questionable.

10.2 Hindi schwa-deletion and speech synthesis

Narasimhan, in collaboration with Sproat (AT&T Research) and Kiraz (Bell Labs) worked on describing how schwa-deletion in Hindi can be handled by a text-to-speech (TTS) synthesis system. The Hindi text-to-speech synthesis project at Bell Labs is part of a larger research effort which

focuses on building multilingual capabilities into multimedia communications. In order to convert text to speech, one must map the potentially ambiguous input orthographic string onto a disambiguated level of representation containing information about pronunciation, duration, intonation, etc. In Hindi, the phenomenon of schwa-deletion presents a challenge for a TTS system, since the orthographic "schwa" is deleted in some contexts in spoken language. Ohala (1983) proposed a phonological rule which predicts the contexts for schwa-deletion, but this rule presupposes knowledge of phonotactics and morphology which cannot be attributed to the computer. Narasimhan and collaborators showed that the phenomenon of schwa-deletion can be handled in a TTS system by augmenting Ohala's linguistic rule with additional lexica and filters. The system was implemented using finite-state technology (Sproat 1998).

10.3   Variable-free semantics

Böttner conducted research on variable free semantics, pursuing two approaches to the interpretation of relations, one static and one dynamic. Within the context of the static approach, a problem of anaphora interpretation was solved (Böttner 1999). The dynamic approach expanded on state transition semantics (STS). STS is characterized by denotations being transitions of states. As an extension of and improvement on previous work (see Annual Report 1992), states are no longer restricted to the internal states of the processor. This enhances the treatment of input and output in line with internal states.

10.4   Machine learning

Böttner, in collaboration with Suppes (Stanford U.), conducted research on machine learning of natural language, focussing on physics word problems as a learning context. The specific area of investigation was uniform motion, involving notions of distance, duration, speed, velocity, and acceleration. The use of methods from Lexical-Functional Grammar allowed the elimination of intermediate levels of representation, thus making possible a direct mapping of natural language to the language of physics equations.

10.5 Comprehension in discourse

10.5.1 Semantic/pragmatic and syntactic integration processes

Experiments in English, German, and Dutch have consistently shown that object relative (OR) clauses are more difficult to process than subject relative (SR) clauses. Previous work using both self-paced reading and eye tracking has found no difference in reading times between Dutch locally ambiguous SR and OR relative clauses (1-2), however, when the subject is animate and the object inanimate (see Annual Report 1998: 105). (In such clauses, the auxiliary disambiguates the sentence. English translations are given here with Dutch word order in order to make the position of the disambiguating auxiliary clear.)

(1) ... de wandelaars, die de rots weggerold hebben,...   [SR]

   "the hikers, that the rock rolled away have..."

(2) ...de rots, die de wandelaars weggerold hebben,...   [OR]

   "the rock, that the hikers rolled away have..."

This finding supported the idea that in parsing sentences with multiple possible parses, readers rely initially not only on structural preferences (e.g., the Active Filler Strategy, Frazier 1987), but also on semantic/ pragmatic information: the animate NP is the likely subject.

Vonk, in collaboration with Mak and Schriefers (U. Nijmegen), extended the research on the factor animacy by investigating whether readers rely exclusively on the animacy of the two NP's to interpret the sentence. If so, readers would always analyze a relative clause with an inanimate subject and animate object (3-4) incorrectly at first, regardless of whether the relative clause has SR or OR structure. This would result in equally long reading times for SR and OR clauses.

(3) ... de rots, die de wandelaars verpletterd heeft,... [SR]

   "the rock, that the hikers crushed have..."

(4) ... de wandelaars, die de rots verpletterd heeft,... [OR]

   "the hikers, that the rock crushed have..."

If, on the other hand, the antecedent of the relative clause is seen as the topic of the relative clause, then both NPs would be likely subjects of an SR clause such as (3). In OR clauses such as (4), though, animacy of the NPs as well as topichood of the antecedent would make reanalysis necessary. In a self-paced moving-window experiment and an eye-tracking experiment, OR clauses with inanimate subjects and animate

objects had longer reading times at the auxiliary than such SR clauses. This gives further evidence for the interplay between semantic/pragmatic and structural factors.

In a further study of topichood in the reading of relative clauses, indexical pronouns were investigated. In general, the use of indexical pronouns is connected to topichood. This suggests that if an indexical pronoun such as *jullie* "you (pi.)" appears in the NP position within the relative clause, as in (5) and (6), it should initially be interpreted as the subject of the relative clause, leading to longer reading times at the auxiliary in (5) than in (6). This again would argue against a parse that is based initially on structural principles only.

(5) ... de man, die jullie gezien heeft...   [SR]

   "the man, that you (pi) seen has..."

(6) ... de man, die jullie gezien hebben ...   [OR]

   "the man, that you (pi) seen have..."

In both a self-paced reading experiment and an eye-tracking experiment, reading times at the disambiguating auxiliary were indeed longer in an SR relative clause (5) than in an OR clause (6). It might be that readers initially parse the relative clause as an SR clause and reanalyze it as an OR clause when they encounter the pronoun in the relative clause. However, this reanalysis might not take place if the pronoun were marked as an object, as in (7). This would imply that only a relative clause pronoun marked as a subject (8) forces a reanalysis. In this case, (8) would require longer processing time than (7).

(7) ... de man, die ons gezien heeft...   [SR]

   "the man, that us seen has..."

(8) ... de man, die wij gezien hebben ...   [OR]

   "the man, that we seen have..."

However, the opposite was found: in both self-paced reading and eye-tracking, the reading time at the pronoun was shorter in (8) than in (7) . This again gives evidence for the interplay between pragmatic information and structural factors. This line of experimentation is currently being extended to third person pronouns in context.

10.5.2 Inference processes

Vonk and Noordman (U. Tilburg) continued work on inferences (see Annual Report 1997: 87), together with Koppen (NICI, U. Nijmegen) and Frank (NWO, U. Tilburg and U. Nijmegen). The aim of the project is to develop a model for text comprehension that is also able to account for knowledge-based inferences. The model should simulate the experimental data Vonk and Noordman obtained in earlier projects on inference processes during reading of economic texts by experts and non-experts. In the model, both the text and the reader's knowledge will be represented as input-propositions. These propositions spread activations to each other. This first phase of the work concentrated on the basic mathematical properties of the model.

Some of the requirements this project investigated are that the activations in the processing of one input (a sentence) should converge to a stabilized set of values; that the final activations should be of the same size as the initial activation; that after processing a sentence, there should be a clear difference between activations of the input-propositions; that after processing a sentence the total activation should be of similar size to the activation after a previous sentence; that the activations of previous inputs should decay, but that the current input should be able to reactivate previous inputs if there is a relationship between current and previous inputs. Simulations were carried out with a few existing models (Kintsch's Construction-Integration model and various versions of Myers & O 'Brien's Resonance model) to test these requirements. Current models are less able to account for these requirements, in particular for the stabilization and reactivation, than one might expect on the basis of the literature.

11 OTHER ACTIVITIES

11.1 Activities of the Technical Group

11.1.1 Overview

Modern computer technology is a very dynamic area, and research at the Institute must keep up with changes in technology. Modern technology facilitates research in a number of areas in the Institute, for example through miniaturization of field equipment, access to digitized media via networks, and efficient execution and analysis of experiments. The Institute has seen another year of great changes in the computer infrastructure and considerable improvements in software developed to meet these needs. The restructuring of the server infrastructure for both UNIX and NT to apply new and more powerful technology was finished. The TG successfully carried out these changes without disrupting scientific research, creating a stable infrastructure for the next few years.

With respect to tool concepts and software development, especially in the area of linguistic applications, the Technical Group now has a leading position. The acceptance of a large proposal for the 5th Framework program of the EC, with the goal of further developing our basic technology, demonstrates this. The TG was also a leading participant in a joint US/EC initiative to reach standards for multimedia language resources. We were also, as in past years, asked to give advice and provide our software to many external collaborators.

11.1.2 Computer systems and networks

In 1999, we completed the restructuring and renewal of the server infrastructure, which began in 1998 and had the goal of introducing new technology and more redundancy. All Novell services were successfully

ported to Windows NT servers, and an NT domain concept was established to integrate all Windows-based systems. The Windows terminal concept allows us to serve the many guests without excessive management overhead, and to re-use older PCs. SMP servers from SUN are now used to house databases, multimedia corpora, neuroimaging data, and other large sets of files. SUN machines, as well as some HP and NT servers, share the load of file serving. We will continue the policy of using primarily NT servers as print and file servers for the PC and Macintosh world. Much disk space was added as cache space for the hierarchical storage management system, which also includes a 3 TB tape library for handling larger data sets. The backup system was changed to operate on the tape library, and to include all NT machines as well. To meet new scientific documentation requirements (long term documentation of scientific results), a Java applet was built which allows the user to gather files to create an archive set, describe the set and the files, and send it to the archive to be stored for many years. The script and the archiving mechanism will be put into operation in 2000. It is the TG's responsibility to maintain this document archive for the long term. The tape library is also an important component of this archiving system. The archiving applet can be used from NT as well as UNIX computers, but cannot yet be used with Macintoshes because there is no up-to-date version of Java for Macintosh.

A major task for the TG was the introduction of the NAT protocol, which separates the internal from the external IP address domains. A new DNS structure was set up and tested, with consequences for secondary name servers outside the Institute. A new isolated mail host was installed to increase robustness, and the sendmail configuration was changed to prevent others from misusing our facilities as a mail relay. A package filter was also established on the router to increase the level of security and better control internet traffic. Currently, the Institute transfers about 35 GB per month, and this is expected to increase due to multi-media streams.

Windows applications can now be executed on UNIX machines using Citrix Metaframe as the front-end software. This has been a great improvement, as it allows users of UNIX machines to use all the office products of a Windows machine as well. Since Macintoshes are the current basis for multimedia annotation, it was important to improve Macintosh networking performance. With a new SMB client for the Macintoshes, reasonable speeds (about 4,5 MB/s) were achieved, allowing

direct media streaming from UNIX-based media servers. Another major task was defining and building a general image for NT, and doing the cloning necessary to install the large number of NT systems needed.

Thanks to the excellent multimedia annotation tools, a large quantity of digitized video and speech material is on the computers (currently more than 400 GB). Because of these large quantities, we needed to improve the logistics for dealing with such data, and needed to train users so that they would have a better understanding of data flow and of what they are expected to do. A test with a remote and stand-alone Macintosh-based multimedia setup including digitization and back-up facilities was stopped because we found it to be too complex and unstable. Digitization and data maintenance is now carried out at the Institute.

11.1.3 Information systems

The database for managing the journal *Linguistics* was upgraded, and a database to store information on subjects for the new baby lab was created. Part of the ESF Second Language Learner Corpus was made available directly through the internet to reduce the support effort. The design of the Institute web page was made more consistent, although we have not yet been able to dedicate the human resources necessary to create a web site which would be attractive for young people and professionals such as journalists, while also being informative about research at the Institute.

It is becoming more and more problematic for individual users at the Institute to cope with the quantity of information generated during research. Sources such as email, document exchange and creation, experimental results, stimulus material, corpus annotations, etc., make it increasingly difficult to organize information and files. We held a workshop about document management in science to address this problem. Through this workshop, we reached the conclusion that it is worthwhile to put effort into centrally managing documents of scientific relevance (papers, dissertations, experimental results, corpora, etc.), but that it is not worthwhile to impose the use of a "GroupWare tool" on users. Such a tool has limitations as well as drawbacks in training and overhead, with relatively little benefit.

11.1.4 Linguistic applications

In this area, the TG had another very successful year. In addition to minor but useful projects such as continuing the linking of the ESF corpus data to sound information, creation of a database and script to operate on fixed

expressions, and improvements to the TED field annotation tool, we also carried out some larger projects.

The TG designed and built a user interface for a large German lexicon project. This involved building a lexicographer station which allows the user to query a large SGML-structured corpus (10**10 words), and which presents the results in a very short time. For this purpose, two indices (header and body information) were generated, which return sentences as hits. The user can specify typical header information such as author and year, and look for orthographic, lemma, syntactic, and semantic patterns. For the last three, extensive help is given through linking an existing lexicon and a semantic tree. The user interface was realized in Visual C++, and has simple, advanced, and professional modes.

The traditional multi-media programs were updated and improved, for example through a major revision for MediaTagger. MediaTagger was extended to support MPEG1 movies. We chose MPEG1 because Cinepak does not provide sufficient quality, Quicktime now supports MPEG1, and the new CPUs can decode MPEG1 streams on the fly, so that no special hardware is needed.

The EUDICO technology was extended so that a full player version can now operate via either inter- or intranet. EUDICO was also extended to handle Tipster-based annotations - a format well known in language technology. The viewer concept was optimized, and viewers such as a partitur viewer have been completed. EUDICO now needs only type definition and coding input modules to make it a full multi-media corpus annotation tool, and these additions will be accomplished in 2000. Further RMI-based streaming technology and support for multi-user access to corpora was added to EUDICO as well, and we expect that in 2000 it will be a tool ready for use by linguists. For more information on its features and functionality, see the Institute's web site, where there is a completely revised section about EUDICO with a demo of the player version.

Using meta-descriptions, the Institute made further efforts to organize its many corpora. Meta-descriptions make it possible to create a separate browse and search universe to help the user easily find and access specific corpora. Further, an improved editor, which can input existing meta-descriptions and work with the DTD, is in progress. Flexibility is necessary because of the inherent flexibility of meta-descriptions

themselves. This tool will be available early in 2000 and will speed up the creation of meta-descriptions.

The TG participated in writing proposals for the 5th Framework R&D program of the EC. The Institute will play a major role in two projects funded by the EC in 2000. One project concerns "MultiMedia Indexing and Searching (MUMIS)", which is of great interest for research on endangered languages. This project will involve improvements to EUDICO. The other project is on "International Standards for Language Engineering (ISLE)". Together with experts from the EC and the US, the TG will define guidelines for annotating multi-media corpora. Another part of the ISLE project will involve the TG developing a standard for meta-descriptions of language resources in cooperation with other international experts. This project includes the ambitious goal of designing a framework for meta-descriptions which will be accepted worldwide.

The TG also provided much help and advice to external institutions with respect to these linguistic technologies.

11.1.5 Experimental facilities

In 1999, as in past years, several new labs were set up and a number of features were added to existing setups. In the ERP labs it is now possible to add up to 256 different codes to the data stream to code various types of events. A new group experiment setup was implemented, with much more stable interaction and state-of-the-art input devices. The speech perception experimental setup and analysis software were re-programmed and ported to a new up-to-date platform. The MIX program used for randomization was ported to JAVA in order to continue its usefulness, since the ICON software it was written in is not supported anymore.

Much effort was devoted to supporting eye tracking experiments. One eye tracker setup with a head-mounted camera was put into operation, allowing experiments and observations with subjects acting under realistic conditions. We enhanced the existing eye tracker setup for computer-based stimuli in several ways. It now allows experiments where subjects can click and move objects by mouse interaction. A feedback feature was also added which indicates in real-time whether the subjects are looking at the target object. The analysis program was modified to support these changes, and finally, a new master-PC was integrated to control the experiments. This setup was so successful and will be used by so many researchers in the future that another eye tracker of this type was bought.

The NESU software (Nijmegen Experiment SetUp, the Institute's general experiment presentation software) was enhanced in several ways. Particularly important additions were the support of multiple VGA monitors and of the ESS sound system of certain notebook computers. Since the Windows sound system (WSS) is becoming the standard, the software will be adapted to that in 2000. It is also possible now to install NESU on Windows 95 systems, using a dual boot mode procedure. Because so many new experimental setups were developed, there was not enough time to develop the new NESU II version. The real-time capability of NT was further studied in prototypical experimental setups. We determined that the system timer can be used with 1 msec ticks and that its jitter is quite small. For visual and acoustic stimulus presentation it is important to understand how to program with the Direct X tools and to study their real-time behavior. We determined that programming with Direct X is not straightforward, for example with regard to the vertical retrace signal, which is of great importance in experiments with visual stimulus presentation. The normal flip instruction of Direct X is not sufficient for our purposes. In 2000, more time will be spent on the new NT-based version of NESU.

We also provided considerable help to external laboratories in this area. In Jülich the NESU software was connected to the brain imaging equipment.

11.1.6 Electronics and audio/video facilities

Several new electronic boxes were designed and built for use in experiments controlled by NESU, including special push button boxes for ERP experiments, several PC boxes, and a completely revised version of the NESU box. An external company took over production of the NESU box, but it was difficult to transfer knowledge of design details, which has evolved over years of experience, to the external company. Outsourcing is necessary, though, because many other institutions are interested in buying NESU boxes for their experimental needs.

To improve recording quality for experiments with speech stimuli, a double-walled sound proof cabin was installed in a quiet environment. Full use of the features of the gesture lab began. Four synchronized cameras were used for a sign language study, resulting in an enormous amount of video material. The TED software will be used for pre-analysis of this data, followed by analysis with the multimedia software. In order to do this, the EUDICO software will have to be extended to include several video tracks. A new baby lab, which has a large monitor (50") and also uses video recordings as the basis of the analysis, is in the process of being built.

We investigated the possibilities of digital video and added new equipment. We decided to carry out compression and reduction to MPEG1 to handle the amount of video in the on-line archive. The original DV or MJPEG streams will be stored on DLT and used as backups. We also discussed whether we should use boards which generate MPEG2 or MPEG1 streams directly. A final decision will depend on what video editing system is bought in 2000. A professional DVCam recorder was also acquired to make it possible to handle time codes.

22 field trips were prepared and the returning equipment was checked and repaired. A new type of solar panels was found to function well under difficult circumstances. New super-light notebooks and digital cameras were also tested in the field.

11.1.7 Other activities of the Technical Group

The TG was asked to help with creating professional animations. The TG and interested researchers evaluated the current status and future needs for animation. The need for animated stimuli will probably increase in the future. We determined that researchers' needs vary widely, from simple 2D animations to complex 3D ones with moving human-like creatures. The TG will set up appropriate systems and carry out tests regarding creating and playing animations either on notebooks or on video players. We began evaluation of software in order to approach the problem efficiently in 2000, and in the future, the TG will help in creating animation.

The TG designed the data management infrastructure (computers and network) and gave advice for the F.C. Donders Centre for Cognitive Neuroimaging (see Chapter 4, this Annual Report). The TG also supported the Dutch initiative to unify access to typology databases. Principles similar to those of EUDICO were chosen. The project has good chances to be funded, and the TG will continue to support that project.

Wittenburg continued to be a member of the Central Computer Committee of the Max-Planck-Gesellschaft. This involved supporting several activities which are important for the larger society, and advice was given to a number of other institutes.

11.2 Nijmegen Lectures

This year's Nijmegen Lectures, entitled "Language and the brain: Mechanisms of developmental change" were presented by Patricia Kuhl (U. Washington). In the mornings three lectures were presented,

"Language, mind and brain: Linguistic experience alters perception", "Multimodal speech: Perception-production links", and "Reinterpreting 'critical periods': Biological clocks and developmental change". In the afternoons three seminars were given, with discussants, "NLM theory: Perceptual maps for speech" (discussant: F. Koopmans-Van Beinum, U. v. Amsterdam), "The nature of speech representations", (discussant: G. Butterworth, U. Sussex at Brighton) and "Mechanisms of developmental change" (discussant: W. Wickler, Max-Planck-Institut für Verhaltensphysiologie, Seewiesen). The lectures were organized in cooperation with the Interfaculty Research Unit for Language and Speech (IWTS) of the U. of Nijmegen. The series was organized by Smits, Swingley, and Hartsuiker (U. Nijmegen) with assistance from Jonas.

11.3   Honors/Awards

Cutler received the 1999 NWO/Spinoza Prize. This is the highest scientific prize that exists in the Netherlands, and carries a research fund of 3 million guilders. Cutler was also appointed member of the Academia Europea.

Bohnemeyer received the AVT/Anela prize, which is annually awarded by an independent jury on behalf of the Dutch Linguistics Associations (AVT), the Dutch Association of Applied Linguistics (Anela) and the National Dutch Graduate School of Linguistics (LOT) to the best doctoral dissertation in linguistics defended at a Dutch university during the previous year. He also received a dissertation award from the Praemium Erasmianum Foundation. This prize is annually awarded to maximally five outstanding dissertations in humanities. He also received the dissertation prize of the SNS Bank Tilburg which is annually awarded to the best dissertation defended at Tilburg University during the previous year.

Bowerman was named honorary professor in the Faculty of Letters of the Free University of Amsterdam.

McGregor was appointed fellow of the Australian Academy of Sciences.

Levelt was appointed member of the Royal Flemish Academy of Belgium for Sciences and Arts.

11.4   Internal lectures and colloquia

During 1999, nine speakers gave lectures in the Institute's Formal Colloquium series. The speakers were J. Pustejovsky (Brandeis U.), B. Heine (U. Köln), J. Hege (U. Alabama), S. Baum (McGill U.), M. Garrett (U. Arizona), K. Bock (U. Illinois, Urbana-Champaign), J. Pater (U. Alberta and U. Massachusetts, Amherst), J. Kroll (Pennsylvania State U.) and M. Bittner (Rutgers State U., New Jersey). These lectures were organized by Bowerman, Warner, and P. Brown, the Institute's colloquium committee. Many informal lectures were also given by long-term and occasional visitors to the Institute.

11.5   Teaching

Members of the Institute taught at the following institutions:

   Cutler (Royal Institute of Technology (KTH), Stockholm)

   Eisenbeiß (U. Düsseldorf)

   Indefrey (U. Düsseldorf)

   Kita (U. Aarhus; Kyoto U.; LSA Linguistics Institute,

   Urbana-Champaign)

-   Klein (U. Heidelberg)

   McGregor (U. Stockholm)

   McQueen (U. Libre de Bruxelles)

-   Roelofs (U. Exeter)

-   Senft (U. Köln; U. Bielefeld)

   Vonk (U. Nijmegen)

11.6   Colloquia presented

The following members of the Institute presented colloquia at various institutions.

   Brown, C. (Georgetown U., U. Groningen)

   Brown, P. (Max-Planck-Institut für evolutionäre Anthropologie, Leipzig; Universidad Nacional Autönoma de Mexico)

-   Cablitz (U. Auckland)

   Cutler (City U. of New York, Graduate Center; U. Pennsylvania)

   Gretsch (U. Nijmegen)

Hagoort (Max-Planck-Institut für neuropsychologische Forschung, Leipzig; U. Magdeburg; U. Nijmegen; Wetenschapsdag, U. Nijmegen,)

Heinzel (Max-Planck-Institut für evolutionäre Anthropologie, Leipzig)

Hellwig, F. (U. Nijmegen)

Indefrey (U. Maastricht)

Kita (Keio U.; Keio U. at Shonan-Fujisawa Campus; U. Essen)

Klein (Koreanische Gesellschaft für Germanistik, Seoul)

McGregor (U. Groningen; U. Melbourne)

McQueen (MRC Cognition and Brain Sciences Unit; U. Libre de Bruxelles; Ohio State U.)

Meyer (Philipps-U. Marburg, U. Osnabrück)

- Özyürek (U. Utrecht)

- Roelofs (U. of Cardiff; U. of Kent at Canterbury; U. Edinburgh; MRC Cognition and Brain Sciences Unit, Cambridge UK)

Senft (U. Bielefeld; Sommerakademie, U. Bielefeld)

- Sinha (U. v. Amsterdam; SUNY Buffalo; U. Chicago)

- Slobin (CNRS; U. du Lyon)

Sonnenschein (U. of California at Los Angeles)

Vigliocco (U. Louvain)

Vonk (VIOT (Vereniging Interuniversitair Overleg Taalbeheersing), U. v. Amsterdam).

- Wilkins (SUNY Buffalo; Max-Planck-Institut für Wissenschafts-geschichte, Berlin)

- Wittenburg (U. München, U. Stuttgart)

11.7 Workshops organized

Bohnemeyer organized a workshop, entitled "Event representation in language and cognition", held at the Institute on 17-19 December. Presentations were delivered by Institute members, and by the following invited participants: B. Bickel (U. California, Berkeley), J.A. Lucy (U. Chicago), E. Pederson (U. Oregon), D.I. Slobin (U. California, Berkeley), R.S. Tomlin (U. Oregon), B. Tversky (Stanford U.) and R.D. van Valin (SUNY Buffalo).

P. Brown organized a workshop on Mayan acquisition, July 20-21, as there are now four scholars working on early language acquisition in four different Mayan languages spoken in southern Mexico and Guatemala. The aim was to share early acquisition data and findings for these four languages, and to plan future collaborative research. The workshop participants included these four - P. Brown (Tzeltal); L. de Leon of CIESAS-Sur, San Cristobal de las Casas, Chiapas (Tzotzil); B. Pfeiler of UADY, Merida (Yukatek); and C. Pye, U. of Kansas (K'iche'), as well as J. Haviland of Reed College, Portland, Oregon and several researchers of the MPI.

Levinson and P. Jaisson (LEEH, Paris) organized the International Fyssen Colloquium on "Evolution and Culture" in Paris, November 12-15. Participants were: R. Aunger (U. of Cambridge), C. Boehm (U. of New Mexico), R. Boyd (UCLA), J.-P. Changeux (Institut Pasteur), C. Combes (U. de Perpignan), B. Conein (U. Ch. de Gaulle), T. Deacon (Boston U.), D. Dennett (Tufts U.) R. Dunbar (U. of Liverpool), B. Durham (Stanford U.), R. Foley (U. of Cambridge), R. Gallistel (UCLA), P.-H. Gouyon (U. Paris-Sud), M. Häuser (Harvard U.), M. Kreutzer (U. Paris-X), K. Laland (U. of Cambridge), J. Lucy (U. of Chicago), B. McGrew (Miami U.), D. Premack (CNRS), T. Shallice (U. College London), W. Singer (MPI Frankfurt), D. Sperber (CREA, Paris), M. Tomasello (MPI Leipzig), and Wilkins (MPI Nijmegen).

McGregor organized a workshop on "Verb classification" ALT III (3rd Biennial Conference of the Association for Linguistic Typology), held at the U. of Amsterdam, August 25-28. Papers were presented by McGregor (MPI), Guirardello (MPI), Dunn (MPI), H. van der Voort (U. v. Amsterdam), S. Matthews & Yip (U. of Hong Kong & Chinese U. of Hong Kong), X. Zhou & McGregor (La Trobe U. & MPI), I. Green (U. Tasmania), E. Knight (U. of New England) and N. Reid (U. of New England).

In collaboration with van der Sandt (U. Nijmegen), Van Geenhoven was the organizer of a monthly semantics colloquium which took place at the philosophy department of the U. of Nijmegen.

Wittenburg organized a workshop on "Access to distributed linguistic databases", held in Nijmegen, 5-6 February, with about 19 participants. Wittenburg also organized a workshop on "Document management in scientific institutes", held in Nijmegen, 25-26 October, with about 45 participants.

11.8 Presentations at conferences, congresses, and workshops

Ameka, F. K. "Ideophones and the nature of the adjective class in Ewe". International Symposium on Ideophones. St. Augustin, Germany, January.

Ameka, F. K. 'The syntactic scripting of body parts for emotions: On the syntax and semantics of expressions for 'jealousy' in Ewe". Workshop on Typology of Ghanaian Languages. Accra, Ghana, March.

Ameka, F. K. and Wilkins, D. P. "Is 'DIE' a semantic prime? Evidence from Ewe and Arrernte". 4th Rasmus Rask Colloquium on Language and Communication (The Anna Wierzbicka Festival). Odense, March.

Ameka, F. K. "Verbs in locative constructions in two Kwa languages: Ewe and Likpe". 30th Annual Conference on African Linguistics. Urbana-Champaign, IL, July.

Ameka, F. K., Essegbey, J. K. and Wilkins, D. P. "Semantically under-specified verbs in Ewe: An analysis of the verb DZE in role and reference grammar". Role and Reference Grammar Conference. Urbana-Champaign, IL, July.

Ameka, F. K. 'The verbal component in locative descriptions in Ewe and Likpe: A comparison". 1999 Annual Conference of the Australian Linguistics Society. Perth, September.

Ameka, F. K. and Essegbey, J. K. "Reciprocal, reflexive and logophoric expressions in Ewe". Workshop on Typological Perspectives on Anaphora. Utrecht, October.

Arai, T. and Warner, N.L. "Word level timing in spontaneous Japanese speech". 14th International Congress of Phonetic Sciences. San Francisco, August.

Böttner, M. "Peirce Grammar". 3rd International Workshop on Computational Semantics (IWCS-3). Tilburg, January.

Bergsma, W. "Children's interpretation of Dutch sentences with the focus particle alleen (only)". Child Language Seminar. London, September.

Bergsma, W. "Children's interpretation of Dutch sentences with the focus particle alleen (only)". Generative Approaches to Language Acquisition. Potsdam, September.

Berkum, J.J.A. van, Hagoort, P. and Brown, CM. "Semantic integration in single sentences and stories: Evidence from the N400". 6th Annual Meeting of the Cognitive Neuroscience Society. Washington DC, April.

Berkum, J.J.A. van, Hagoort, P. and Brown, CM. "Semantic integration in single sentences and stories: Evidence from the N400". 7th International Conference on Cognitive Neuroscience (ICON-7). Budapest, June.

Berkum, J.J.A. van, Brown, CM. and Hagoort, P. 'Tracking referential processes with event-related brain potentials". 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Berkum, J.J.A. van, Hagoort, P., Brown, CM. and Zwitserlood, P. "Relating spoken sentences to prior discourse: Evidence from the N400". 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Berkum, J.J.A. van, Hagoort, P., Brown, CM. and Zwitserlood, P. "Een goed verstaander heeft aan een half woord genoeg: Een N400 Studie". 7e Wintercongres van de Nederlandse Vereniging voor Psychonomie. Egmond aan Zee, December.

Blom, C and Vonk, W. "Hoge of läge aanhechting bij complexe NPs". 22e Minisymposium Lezen. Nijmegen, April.

Bock, J.K., Humphreys, K.R., Butterfield, S. and Cutler, A. "Collective agreement in British and American English". 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Bohnemeyer, J. 'The primitives of time". 4th Rasmus Rask Colloquium on Language and Communication (The Anna Wierzbicka Festival). Odense, March.

Bohnemeyer, J. "Argumentmarkierungsmuster in der Maya-Sprachfamilie". Workshop on Neuere Perspektiven zum Yucateco. 2. Meso-amerikanistisches Symposium. Bremen, April.

Bohnemeyer, J. "Invisible time lines in the fabric of events: Temporal coherence in Yukatek discourse". Presidential Symposium on Telling time: Temporal coherence in narrative. The 98th Annual Meeting of American Anthropological Association. Chicago, November.

Bohnemeyer, J. "Event complexity across languages". Workshop on Event Representation in Language and Cognition, Nijmegen, December.

Bosch, L.F. ten and Smits, R. "On error criteria in human classification modeling". 14th International Congress of Phonetic Sciences. San Francisco, August.

Brown, C M. "Effects of grammatical gender on sentence processing: Electrophysiological evidence". 12th Annual CUNY Sentence Processing Conference. New York, March.

Brown, C M. "From sound to meaning: A functional account of the electrophysiology of spoken language understanding". 39th Annual Meeting of the Society for Psychophysiological Research. Granada, October.

Brown, P. "Descended legs upwards: Position and motion in Tzeltal frog stories". Stanford Child Language Research Forum. Stanford, April.

Brown, P. "Learning about deception in Tzeltal Mayan: Towards the acquisition of pragmatics". VIIIth International Congress of IASCL (International Association for the Study of Child Language). San Sebastian, Spain, July.

Brown, P. "Verb semantics and argument realization in Tzeltal". VIIIth International Congress of IASCL (International Association for the Study of Child Language). San Sebastian, Spain, July.

Brown, P. "Positionals in two Mayan languages (and Dutch): Implications for acquisition". Ill Encuentro de adquisiciön de lenguaje en Mexico. Queretaro, November.

Brugman, H.G. and Rüssel, A. "RMI in verteilten Multimedia Anwendungen", Datenverarbeitungstreffen der Max-Planck-Gesellschaft 1999, Göttingen, November.

Cablitz, G.H. "Learning to talk about SPACE in Marquesan (Austronesian, French Polynesia)". TIN (Taalkunde in Nederland)-dag '99. Utrecht, February.

Clahsen, H., Bartke, S. and Eisenbeiß, S. "Case marking and agreement in German-speaking SLI children: Evidence for a selective linguistic impairment". 24th Annual Boston University Conference on Language Development. Boston, MA, November.

Cooper, N, Cutler, A. and Wales, R. "Can non-native processing outstrip native processing?" 12th Australian Language and Speech Conference. Bundoora, Melbourne, November.

Cutler, A. "Phonemic repertoire effects in lexical activation". 137th Meeting of the Acoustical Society of America. 2nd European Acoustics Association (EAA) Convention. Berlin, March.

Cutler, A. "Possible and impossible words, universally and language-specifically". Workshop on Crosslinguistic Speech Perception. Aarhus, March.

Cutler, A. "De ontdekking van woorden in gesproken taal". Nederlandse vereniging voor Stem- Spraak- en Taalpathologie. Amsterdam, October.

Cutler, A. and Otake, T. "Phonemic effects in spoken-word recognition in Japanese". 138th Meeting of the Acoustical Society of America. Columbus, November.

Dahan, D., Tanenhaus, M. K. and Chambers, C. G. "Use of accent during reference resolution in spoken-language comprehension". 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Dahan, D., Swingley, D., Tanenhaus, M. K. and Magnuson, J. S. "Linguistic gender and spoken-word recognition in French". 40th Annual Meeting of the Psychonomics Society. Los Angeles, November.

Damian, M. F. "Response congruity effects evoked by subliminally presented primes". 40th Annual Meeting of the Psychonomic Society. Los Angeles, November.

Dickey, M.W. 'The representation of temporal anaphora: Evidence from on-line processing". Annual Meeting of the Linguistic Society of America. Los Angeles, January.

Dickey, M.W. 'The processing of temporal anaphora". 12th Annual CUNY Sentence Processing Conference. New York, March.

Dimroth, C. "Facteurs informationnels 'moteur' et facteurs structurels 'faconnants': Quelle est leur influence sur l'acquisition de la grammaire de la portee en allemand L2"? Workshop on Acquisition de langues (CNRS). Berder, France, March.

Dimroth, C. and Watorek, M. 'The scope of additive particles in basic learner languages". 9th Eurosla Conference. Lund, Sweden, June.

Franck, J., Vigliocco, G. and Collina, S. "When morpho-phonology hits syntax". 11th Conference of the European Society for Cognitive Psychology (ESCoP). Gent, September.

Gijn, I. van, Kita, S. and Hulst, H. van der "How phonetic is the symmetry condition in sign language?" Holland Institute of General Linguistics Phonology Conference 4. Leiden, January.

Gnanadesikan, A. and Walsh Dickey, L. 'The one/many distinction in phonology". Annual Meeting of the Linguistic Society of America. Los Angeles, January.

Gretsch, P. "Are wh-elements really optional in early question acquisition? The case of wh-drop against focal ellipsis". Generative Approaches to Language Acquisition. Potsdam, September.

Guirardello, R. "Verb classes and spatial-orientation auxiliaries in Trumai". 3rd Biennial Conference of the Association for Linguistic Typology (ALT). Amsterdam, August.

Hagoort, P. "Neuropsychological approaches of language disorders". International Workshop on the Classification of Language Disorders. Nijmegen, January.

Hagoort, P. "Beyond Biology Lecture". Amsterdam, February.

Hagoort, P. "ERP's in language disorder evaluation". Symposium Neuro-imaging. Groningen, February.

Hagoort, P. "Onderzoek naar hersenen en cognitie". Psychologie & Toekomstperspectief. Leiden, April.

Hagoort, P. 'The cognitive architecture of parsing: Evidence from event related brain potentials". 6th Annual Meeting of the Cognitive Neuroscience Society. Washington, DC, April.

Hagoort, P. 'Taal en hersenen". Symposium Taal- en Totaalontwikkeling, Werkverband Amsterdamse PsycholinguTsten (WAP) Amsterdam, May.

Hagoort, P. "Gagarin in de neurale kosmos; taal, brein en bewustzijn". OKW-Wetenschapslezingen in Paradiso; Hersenen en Bewustzijn. Amsterdam, May.

Hagoort, P. "Neurocognition of syntax: The issues". 7th International Conference on Cognitive Neuroscience (ICON-7). Budapest, June.

Hagoort, P. and Brown, CM. 'The consequences of the temporal interaction between syntactic and semantic processes for haemodynamic studies of language". 5th International Conference on Functional Mapping of the Human Brain. Düsseldorf, June.

Hagoort, P., Brown, CM. and Wassenaar, M. "Nature and nurture of agrammatic comprehension". International Conference on Basic Mechanisms of Language and Language Disorders. Leipzig, September.

Hagoort, P. "De toekomstige eeuw zonder psychologie". Symposium. De volgende eeuw van de psychologie. Amsterdam, September.

Hagoort, P. "Het samenlevingscontract tussen lichaam en geest". Multifacultair seminar. U. Nijmegen. Nijmegen, September.

Hagoort, P., Ramsey, N., Rutten, G.-J. and Rijen, P. van 'The role of the left anterior temporal cortex in language processing". Academy of Aphasia, 1999. Venice, October.

Hagoort, P. "De verbeelding aan de macht: Hoe de menselijke geest zichtbaar wordt in de beeldanalyse van hersenactiviteit". Symposium Royal Dutch Academy of Sciences (KNAW). Biologie en psychologie: naar vruchtbare kruisbestuivingen. Amsterdam, November.

Heinzel, U. "Intonation - A clue to identify the domain of application of focus particles?" Child Language Seminar. London, September.

Heinzel, U. "Prosody: A clue for the interpretation of focus particles". Center for Language Studies (CLS) Opening of the Academic Year 1999/2000. Nijmegen, October.

Higginbotham, D.J., Wilkins, D.P., Lesher, G.W. and Moulton, B.J. "Frametalker: A communication frame and utterance-based augmentative communication device". Rehabilitation Engineering Society of North America Annual Conference. Long Beach, CA, June.

Hoeks, J.C.J, and Vonk, W. "Processing coordinated structures in context", [poster]. 12th Annual CUNY Sentence Processing Conference. New York, March.

Hoeks, J.C.J., Vonk, W. and Mak, P. "A method artefact in self-paced reading experiments" [poster]. 11th Conference of the European Society for Cognitive Psychology (ESCoP). Gent, September.

Indefrey, P. "PET studies on language production". Neuroimaging Symposium. Groningen, February.

Indefrey, P., Brown, CM., Hagoort, P., Hellwig, F., Herzog, H. and Seitz R.J. 'The left frontal operculum is sensitive to local and sentence-level syntactic encoding: A 0^{16}-butanol PET study". 12th Annual CUNY Sentence Processing Conference. New York, March.

Indefrey, P. "PET evidence on the neural architecture of syntax". 7th International Conference on Cognitive Neuroscience (ICON-7). Budapest, June.

Indefrey, P. and Levelt, W.J.M. "A Meta-analysis of neuroimaging experiments on word production". 5th International Conference on Functional Mapping of the Human Brain. Düsseldorf, June.

Indefrey, P., Brown, CM., Hagoort, P., Amunts, K., Hellwig, F., Herzog, H. and Seitz, R.J. "Noun phrase and sentence level syntactic encoding during language production activate the left frontal operculum - A PET study". 5th International Conference on Functional Mapping of the Human Brain. Düsseldorf, June.

Indefrey, P., Hellwig, F., Posse, S., Linden, D. and Goebel, R. 'Task- and stimulus-dependent differential activation during verbal and visuo-spatial short-term memory". 29th Annual Meeting of the Society for Neuroscience. Miami Beach, October.

Janssen, D.I. "Production of verbal inflections". 41. Tagung experimentell arbeitender Psychologen (TeaP '99). Leipzig, March.

Janssen, DJ. "Producing past and plural inflections". Workshop on Language Production. Max Planck Institute for Psycholinguistics. Nijmegen, May.

Janssen, D.I. "Production of inflectional morphology". 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Jensen de Lopez, K. and Sinha, CG. "Culture and cognition in language and cognitive development". International Research Workshop Ecology of Language Acquisition. Amsterdam, January.

Jensen de Lopez, K. and Sinha, CG. "Cultural practices, canonical rules and language acquisition in Danish and Zapotec cultures". 7th International Congress of the International Association for Semiotic Studies. Dresden, November.

Kempen, G. "Models of language processing: Implications for disorders". Workshop on Classification of Language Disorders. U. Nijmegen. Nijmegen, January.

Kempen, G. "Cognitive constrains on syntax: A computational model of syntactic processing in human sentence comprehension and production". Department of Linguistics, U. Bergen, Bergen, Norway. March.

Kempen, G. "Cognitive constraints on grammar: A performance model". U. Wisconsin. Madison, March.

Kempen, G. and Vosse, T. "Syntactic structure assembly in human parsing: A computational model based on competitive inhibition and lexical grammar", [poster]. 12th Annual CUNY Sentence Processing Conference. New York, March.

Kempen, G. "Grammatical coding of conceptual messages: Structural and dynamic aspects". Workshop on Language Production. Max Planck Institute for Psycholinguistics. Nijmegen, May.

Kempen, G. and Vosse, T. "Computer demonstration of the Unification Space Model of grammatical decoding". Workshop on Language Production. Max Planck Institute for Psycholinguistics. Nijmegen, May.

Kempen, G. "Cognitive constraints on syntax: A computational model of syntactic processing in human sentence comprehension and

production". Department of Linguistics, U. of Amsterdam. Amsterdam, June.

Kempen, G. and Olsthoorn, N. "Interactive multimedia for grammar and writing instruction". Biennial Conference on Computer-assisted Language Learning. Exeter, September.

Kita, S. 'Two dimensional semantic analysis of Japanese ideophones". Ideophone Symposium. Bonn, January.

Klein, W. "Könnten natürliche Sprachen nicht sehr viel einfacher sein?" Düsseldorf, January-

Klein, W. "Wieder - une particule de portee?" Workshop on Acquisition de langues (CNRS). Berder, France, March.

Klein, W. "Der Mythos vom Sprachverfall". Festvortrag Jahreshauptver-sammlung Berlin-Brandenburgische Akademie der Wissenschaften. Berlin, June.

Klein, W. "Elementary forms of linguistic organization". Origins of Language. Berlin-Brandenburgische Akademie der Wissenschaften. Berlin, December.

Krämer, I. "What are you talking about? Children's interpretation of sentence initial indefinite subjects in sentences containing negations". TIN (Taalkunde in Nederland)-dag '99. Utrecht, February.

Krämer, I. "An interface approach to comprehension of specific indefinites". GALA conference, Generative Approaches to Language Acquisition. Potsdam, September.

Krämer, I. "Scrambling and Scope of VP-operators: Late acquisition". GALA conference, Generative Approaches to Language Acquisition. Potsdam, September.

Levelt, W.J.M. "Where do spoken words come from? A meta-analysis." [keynote lecture] Opening Lurija Institut. U. Konstanz. Konstanz, January.

Levelt, W.J.M. "65 en andere getallen". Symposium ter gelegenheid van het afscheid van mevrouw Truus van der Lern als directeur van de Nederlandse Stichting voor het Dove en Slechthorende Kind. Amsterdam, January.

Levelt, W.J.M. "Classification of language disorders" [introduction]. International Workshop on Classification of Language Disorders. Nijmegen, January.

Levelt, W.J.M. "Sentences in the brain: Further research perspectives". 6th Annual Meeting of the Cognitive Neuroscience Society. Washington, DC, April.

Levelt, W.J.M. "Where do spoken words come from? A meta-analysis". Colloquium NIH, Bethesda, Laboratory of Brain and Cognition. Bethesda, April.

Levelt, W.J.M. "How the brain produces words: A meta-analysis". Workshop on Language Production, Max Planck Institute for Psycholinguistics. Nijmegen, May.

Levelt, W.J.M. 'The brain's production of words: A meta-analysis". International Neuropsychological Symposium. Arcachon, June.

Levelt, W.J.M. "Word for word: Multiple lexical access in speech production" [Broadbent lecture]. 11th Conference of the European Society for Cognitive Psychology (ESCoP). Gent, September.

Levelt, W.J.M. "Word for word: Multiple lexical access in speech production". 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Levelt, W.J.M. "Word for word: Multiple lexical access in speech production". Institute for Research in Cognitive Science (IRCS) Advisory Board Meeting. Philadelphia, November.

Levinson, S.C. "H.P. Grice on location on Rössel Island" [plenary lecture] 25th Annual Meeting of the Berkeley Linguistics Society (BLS). Berkeley, CA, February.

Levinson, S.C. "Central issues in the coevolution of language and culture". Fyssen Colloquium on Evolution and Culture. Paris, November.

Lüpke, F. "Nouns, verbs, nouny verbs? On noun-verb-distinction in Bambara (Mande)". Colloquium on African Languages and Linguistics. Leiden, August.

Magnuson, J. S., Tanenhaus, M. K., Aslin, R. N. and Dahan, D. 'The time-course of spoken word recognition: Measurements and models".

5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Mak, P., Vonk, W. and Schriefers, H. 'The influence of animacy on the initial parse of Dutch relative clauses" [poster]. 12th Annual CUNY Sentence Processing Conference. New York, March.

Mak, P., & Vonk, W. "Informatiestructuur en het verwerken van relatieve bijzinnen". 22e Minisymposium Lezen. Nijmegen, April.

Mak, P., Vonk, W. and Schriefers, H. "Information structure and relative clause processing" [poster]. 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Martin, R., Vigliocco, G. and Garrett, M. "Access to count/mass information without access to phonology in an anomic patient". Academy of Aphasia. Venice, October.

Mauth, K. "Morphologie und ihre Rolle bei der Segmentierung gesprochener Sprache". 41. Tagung experimentell arbeitender Psychologen (TeaP '99). Leipzig, March.

McGregor, W.B. "Ideophones as the source of verbs in Northern Australian languages". International Symposium on Ideophones. St. Augustin, Germany, January.

McGregor, W.B. "Introduction". Symposium on Verb classification" ALT III (3rd Biennial Conference of the Association for Linguistic Typology). Amsterdam, August.

McQueen, J.M., Norris, D. and Cutler, A. 'The time course of lexical involvement in phonetic categorization". 137th Meeting of the Acoustical Society of America. 2nd European Acoustics Association (EAA) Convention. Berlin, March.

McQueen, J.M. and Connine, CM. "Spoken word recognition: Are vocalic and metrical mismatches tolerated?" 40th Annual Meeting of the Psychonomic Society. Los Angeles, November.

McQueen, J.M., Cutler, A. and Norris, D. "Lexical activation produces impotent phonemic percepts". 138th Meeting of the Acoustical Society of America. Columbus, OH, November.

Meulen, F.F. van der and Meyer, A.S. "Augenbewegungen bei der Benennung von Pronomen vs. Nominalphrasen". 41. Tagung experimentell arbeitender Psychologen (TeaP "99). Leipzig, March.

Meyer, A.S., Wissink, M. and Schmitt, B. "Sesam öffne Dich! Wann öffnet sich das mentale Lexikon? 41. Tagung experimentell arbeitender Psychologen (TeaP '99). Leipzig, March.

Narasimhan, B. "Encoding complex events: Linking in Hindi and English". Texas Linguistics Society Conference: Perspectives on Argument Structure. Austin, TX, March.

Narasimhan, B., Budwig, N. and Chaudhary, N. "Imperative constructions in Hindi caregiver-child interactions". South Asian Language Analysis Roundtable. Urbana-Champaign, IL, July.

Olsthoorn, N. and Kempen, G. "Can we grammatically encode and decode simultaneously? Exploring the picture-sentence interference task", [poster] 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Olsthoorn, N. and Kempen, G. 'The cognitive architecture of grammatical encoding and decoding: Evaluating the single-processor hypothesis using a picture-sentence interference test". 11th Conference of the European Society for Cognitive Psychology (ESCoP). Gent, September.

Olsthoorn, N. and Kempen, G. "Het tijdsverloop van syntactic priming in taalproductie". 7e Wintercongres van de Nederlandse Vereniging voor Psychonomie. Egmond aan Zee, December.

Özyürek, A. and Ozcaliskan, S. 'Typological differences and the development of representations in speech and gesture: A comparison of Turkish and English". 13th Annual Stanford Child Language Research Forum. Stanford, April.

Özyürek, A. and Kita, S. "Expressing manner and path in English and Turkish: Differences in speech, gesture, and conceptualization". 21st Annual Meeting of the Cognitive Science Society. Vancouver, August.

Özyürek, A. and Kita, S. "What gestures can tell us about language-specific conceptualization of motion event". Event-X Workshop. Nijmegen, December.

Riley, K.C. and Cablitz, G.H. "Children in conflict: Linguistic change and miscommunication in the Marquesas". Pragma99. Tel Aviv, June.

Roelofs, A. "Perceptual cohorts and the time course of lexical access in picture naming". Experimental Psychology Society (EPS) Meeting. Oxford, March.

Roelofs, A. "Shared phonological processes and representations in bilingual speakers: WEAVER with two languages". Second International Symposium on Bilingualism. Newcastle upon Tyne, April.

Roelofs, A. "Speaking while hearing or seeing words". Workshop on Language Production. Max Planck Institute for Psycholinguistics. Nijmegen, May.

Roelofs, A. 'Timing of phonological encoding". Workshop on Phonological Encoding and Monitoring. Nijmegen, June.

Roelofs, A. "Interaction between word production and perception". 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Roelofs, A. "Shared phonological processes and representations in bilingual speakers". 11th Conference of the European Society for Cognitive Psychology (ESCoP). Gent, September.

Schriefers, H. and Meyer, A.S. "Interindividuelle Unterschiede in der Satzplanung". DFG-Symposium on Time and Timing in Language Production". Osnabrück, July.

Senft, G. Participation in the Expert Panel on the Documentation of Endangered Languages at the Zentrum für interdisziplinäre Forschung (ZiF) der Universität Bielefeld, at invitation of the Volkswagen-Stiftung. Bielefeld, January.

Senft, G. "Datenerhebungsmethoden zum Thema Sprache, Kognition und Konzepte des Raumes". Internationales Wissenschaftsforum der Universität Heidelberg. Heidelberg, January.

Senft, G. "Sprache, Kognition, und Konzepte des Raumes in verschiedenen Kulturen - affiziert sprachliche Relativität die Philosophie?". 43. Jahrestagung des Instituts der Görres-Gesellschaft für Interdisziplinäre Forschung. Feldafing, Germany, September.

Senft, G. "Sprache, Kognition und Konzepte des Raumes in verschiedenen Kulturen". Eintauchen in die Wissenschaften - eine Sommerakademie der Universität Bielefeld für Schülerinnen der Jahrgangsstufe 13, Zentrum für interdisziplinäre Forschung, Bielefeld. Bielefeld, September.

Senft, G. "Linguistik und Völkerkunde - ein Plädoyer für interdisziplinäre Zusammenarbeit". Jahrestagung der Gesellschaft für Völkerkunde. Heidelberg, October.

Senft, G. "Sprache, Kognition und Konzepte des Raumes in verschiedenen Kulturen". 1st International Symposium on Die Adresse des Mediums, Kulturwissenschaftliches Forschungskolleg. Medien und kulturelle Kommunikation. Köln, December.

Sereno, J., Jongman, A. and Wang, Y. "Native and non-native perception of tune". International Symposium on Future directions in Cross-language and Second Language Speech Perception Research. Sandbjerg, Denmark, March.

Sinha, C. G. "Reference, intersubjectivity and discursive grounding". 6th International Cognitive Linguistics Conference. Stockholm, July.

Sinha, CG. "Language, culture and the embodiment of spatial cognition" [plenary lecture]. International Cognitive Linguistics Conference. Stockholm, July.

Sinha, CG., Moebius, B. and Narasimhan, B. "Contextual effects on consonant voicing profiles: A cross-linguistic study". International Conference of Phonetic Sciences. Berkeley, CA, August.

Sinha, CG. "Intersubjectivity and the emergence of symbolization". International Seminar on Theories of Signification. New Delhi, November.

Smits, R. "On the link between acoustic cue distributions and categorization dependencies". 137th Meeting of the Acoustical Society of America. 2nd European Acoustics Association (EAA) Convention. Berlin, March.

Smits, R. "Predicting dependencies in phonetic categorization from distributions of acoustical cues in natural utterances". 14th

International Congress of Phonetic Sciences. San Francisco, August.

Sprenger, S., Levelt, W.J.M. and Kempen, G. "Producing idiomatic expressions: Idiom representation and access" [poster]. 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Sprenger, S., Levelt, W.J.M. and Kempen, G. "Producing idiomatic expressions: Idiom representation and access" [poster]. 7e Wintercongres van de Nederlandse Vereniging voor Psychonomie. Egmond aan Zee, December.

Swift, M. D. "Lexical aspect and temporal reference in Inuktitut child language". VIIIth International Congress of IASCL (International Association for the Study of Child Language). San Sebastian, Spain, July.

Swingley, D.C. and Fernald, A. "Rapid activation in the 24-month-old's lexicon". 24th Annual Boston University Conference on Language Development. Boston, MA, November.

Swingley, D.C. "Reference and linguistic forms in one-year-olds". Ist Bisontine Conference for Conceptual and Linguistic Development in the Child Aged 1 to 6 Years. Besancon, France, December.

Van Geenhoven, V. "A before-&-after picture of when-, before-, and after-clauses". Semantics and Linguistic Theory IX. Santa Cruz, CA, February.

Van Geenhoven, V. "On the English bare plural and other bare nominals". Workshop on Weird Quantification. Utrecht, June.

Vigliocco, G., Anton-Mendes, I., Franck, J. and Collina, S. "Sound and syntax in sentence production: The effect of phonological predictability on syntactic encoding". 5th Conference on Architectures and Mechanisms of Language Processing (AMLaP-99). Edinburgh, September.

Vigliocco, G., Franck, J. and Collina, S. "When sex hits syntax". 11th Conference of the European Society for Cognitive Psychology (ESCoP). Gent, September.

Vigliocco, G., Zorzi, M., Caielli, F. and Garrett, M. "Meaning, sound and syntax in lexical retrieval from semantic and episodic memory".

40th Meeting of the Psychonomic Society. Los Angeles, November.

Vinson, D., Vigliocco, G. and Collina, S. "Meaning and syntax in the mental lexicon". 11th Conference of the European Society for Cognitive Psychology (ESCoP). Gent, September.

Vonk, W. and Bestgen, Y. "Preposed adverbial phrases in processing episode-discontinuous sentences". 11th Conference of the European Society for Cognitive Psychology (ESCoP). Gent, September.

Vonk, W. "De lezende lezer". 3e Nijmeegse Letterencongres. Nijmegen, April.

Warner, N.L. "Syllable structure and speech perception are inter-related". Annual Meeting of the Linguistic Society of America. Los Angeles, January.

Warner, N.L. 'The relationship between syllable structure and speech perception". 4th Holland Institute of Linguistics Phonology Conference. Leiden, January.

Warner, N.L. 'Timing of perception of vocalic distinctive features: Implications for vowel system universals". 14th International Congress of Phonetic Sciences. San Francisco, August.

Warner, N.L. and Weber, A. "Perceptual consequences of unintended epenthetic stops". 137th Meeting of the Acoustical Society of America. 2nd European Acoustics Association (EAA) Convention. Berlin, March.

Wassenaar, M.E.D., Hagoort, P. and Brown, CM. "Functionele plasticiteit bij afasiepatienten met agrammatisch taalbegrip? Een ERP studie". 7e Wintercongres van de Nederlandse Vereniging voor Psychonomie. Egmond aan Zee, December.

Weber, A. "Help or hindrance: How violation of different assimilation rules affects spoken-language processing". 137th Meeting of the Acoustical Society of America. 2nd European Acoustics Association (EAA) Convention, Berlin, March.

Weijer, J.C. van de "Phonotactic cues to word boundaries in speech to a prelingual infant". The 6th International Cognitive Linguistics Conference (ICLC). Stockholm, July.

Wilkins, D.P. "Spatial deixis in Arrernte speech and gesture: On the analysis of a species of composite signal as used by a Central Australian Aboriginal group". Workshop on Deixis, Demonstration and Deictic Belief, ESSLLI XI. Utrecht, August.

Wilkins, D.P. 'The adaptive advantages of having more than one mode of communication: A case-study from Central Australia". Fyssen Colloquium on Evolution and Culture. Paris, November.

Wittenburg, P. "Multi-Media annotation". International Castle Meeting. Spa, September.

Wittenburg, P. "Document-Management in science - An Introduction". Document Management Workshop. Nijmegen, October.

Wittenburg, P. "Meta-Schemas in the World Wide Web". Document Management Workshop. Nijmegen, October.

Zhou, X.K. and McGregor, W.B. "Verb classification in Mandarin Chinese". Symposium on Verb Classification" ALT III 3rd Biennial Conference of the Association for Linguistic Typology. Amsterdam, August.

PUBLICATIONS

Ameka, F. K. (1999). Partir c'est mourir un peu: Universal and culture specific features of leave taking. *RASK International Journal of Language and Communication* [Special issue: E Pluribus Una - The one in the many. For Anna Wierzbicka], 9/10,257-283.

Ameka, F. K. (1999). Review of Korle meets the sea: A sociolinguistic history of Accra by M.E. Kropp Dakubu. *Bulletin of the School of Oriental and African Studies,* 62(1), 198-199.

Ameka, F. K. (1999). Spatial information packaging in Ewe and Likpe: A comparative perspective. *Frankfurter Afrikanistische Blätter* [Special issue: Comparing African Spaces], 11,7-34.

Ameka, F. K. (1999). The typology and semantics of complex nominal duplication in Ewe. *Anthropological Linguistics,* 41(1), 75-106.

Arai, T., & Warner, N.L. (1999). Word level timing in spontaneous Japanese speech. In J.J. Ohala, Y. Hasegawa, M. Ohala, D. Granville, & A.C. Bailey (Eds.), *Proceedings of the 14th International Congress of Phonetic Sciences:* Vol. 2 (pp. 1055 -1058). Berkeley: Department of Linguistics, UC Berkeley.

Berkum, J.J.A. van, Brown, CM., & Hagoort, P. (1999). Early referential context effects in sentence processing: Evidence from event-related brain potentials. *Journal of Memory and Language,* 41, 147-182.

Berkum, J.J.A. van, Hagoort, P., & Brown, CM. (1999). Semantic integration in sentences and discourse: Evidence from the N400. *Journal of Cognitive Neuroscience,* 11 (6), 657-671.

Berkum, J.J.A. van, Brown, CM., & Hagoort, P. (1999). When does gender constrain parsing? Evidence from ERPs. *Journal of Psycholinguists Research,* 28(5), 555-571.

Böttner, M. (1999). Peirce Grammar. In H.C Bunt & E.G.C. Thijsse (Eds.), *Proceedings of the 3rd International Workshop on Computational Semantics (IWCS-3)* (pp. 21-34). Tilburg: Computational Linguistics, Tilburg University.

Böttner, M. (1999). *Relationale Grammatik.* Tübingen: *Niemeyer.*

Bosch, LF. ten & Smits, R. (1999). On error criteria in human Classification modeling. In J.J. Ohala, Y. Hasegawa, M. Ohala, D. Granville, & A.C. Bailey (Eds.), *Proceedings of the 14th International Congress of Phonetic Sciences:* Vol.3 (pp. 1949-1952). Berkeley: Department of Linguistics, UC Berkeley.

Bowers, J., Vigliocco, G., Stadthagen-Gonzales, H., & Vinson, D. (1999). Distinguishing language from thought: Experimental evidence that syntax is lexically rather than conceptually represented. *Psychological Science,* 10, 310-315.

Brown, CM. (1999). Hersenpraat: Neuronale activiteit en taal. *Natuur & Techniek,* 67(10), 29-35.

Brown, CM., & Hagoort, P. (1999). The cognitive neuroscience of language: Challenges and future directions. In CM. Brown & P. Hagoort (Eds.) *The neurocognition of language* (pp. 3-14). Oxford: Oxford University Press.

Brown, CM., Hagoort, P., & Keurs, M. ter (1999). Electrophysiological signatures of visual lexical processing: Open- and closed-class words. *Journal of Cognitive Neuroscience,* 11 (3), 261-281.

Brown, CM., & Hagoort, P. (Eds.). (1999). *The neurocognition of language.* Oxford: Oxford University Press.

Brown, P. (1999). Anthropologie cognitive. In C. Lefebvre & C. Jourdan (Eds.), Etat des lieux en ethnolinguistique [Special edition] *Anthropologie et Societäs,* 23(3), 91-119.

Brown, P. (1998). Conversational structure and language acquisition: The role of repetition in Tzeltal adult and child speech. [Special edition] *Journal of Linguistic Anthropology,* 8(2), 1-25.

Brown, P. (1999). Repetition [Special issue]. *Journal of Linguistic Anthropology,* 9(2), 219-222.

Brown, P., & Levinson, S.C. (1999). Politeness: Some universals in language usage. In A. Jaworski & N. Coupland (Eds.), *The Discourse Reader* (pp. 321-335). London: Routledge.

Clifton, C.E. Jr., Cutler, A., McQueen, Ü.M., & Ooijen, B. van (1999). The processing of inflected forms. (Commentary on H. Clahsen: Lexical entries and rules of language: A multidisciplinary study of German inflection). *Behavioral and Brain Sciences,* 22, 1018-1019.

Cutler, A. (1999). Foreword. In Z.S. Bond (Ed.), *Slips of the ear: Errors in the perception of casual conversation* (pp. xiii-xv). New York: Academic Press.

Cutler, A. (1999). Prosodische Struktur und Worterkennung bei gesprochener Sprache. In A. Friederici (Ed.), *Enzyklopädie der Psychologie: Sprachrezeption* (pp. 49-83). Göttingen: Hogrefe.

Cutler, A. (1999). Prosody and intonation, processing issues. In R.A. Wilson & F.C. Keil (Eds.), *MIT Encyclopedia of the Cognitive Sciences* (pp. 677-679). Cambridge, MA: MIT Press.

Cutler, A. (1999). Spoken-word recognition. In R.A. Wilson & F.C. Keil (Eds.), *MIT Encyclopedia of the Cognitive Sciences* (pp. 791-793). Cambridge, MA: MIT Press.

Cutler, A., & Clifton, C.E. (1999). Comprehending spoken language: A blueprint of the listener. In P. Hagoort & CM. Brown (Eds.), *The neurocognition of language* (pp. 123-166). Oxford: Oxford University Press.

Cutler, A., & Norris, D.G. (1999). Sharpening Ockham's razor. (Commentary on W.J.M. Levelt, A. Roelofs, & A.S. Meyer: A theory of lexical access in speech production). *Behavioral and Brain Sciences,* 22, 40-41.

Cutler, A., Ooijen, B. van, & Norris, D.G. (1999). Vowels, consonants, and lexical activation. In J.J. Ohala, Y. Hasegawa, M. Ohala, D. Granville, & A.C. Bailey (Eds.), *Proceedings of the 14th International Congress of Phonetic Sciences:* Vol. 3 (pp. 2053-2056). Berkeley: Department of Linguistics, UC Berkeley.

Cutler, A., & Otake, T. (1999). Pitch accent in spoken-word recognition in Japanese. *Journal of the Acoustical Society of America,* 105, 1877-1888.

Donselaar, W. van, Kuijpers, C.T.L., & Cutler, A. (1999). Facilitatory effects of vowel epenthesis on word processing in Dutch. *Journal of Memory and Language,* 41, 59-77.

Eisenbeiß, S. (1999). The acquisition of the determiner phrase in German child language. In M.A. Friedemann & L Rizzi (Eds.), *The acquisition of syntax: Studies in comparative developmental linguistics* (pp. 26-62). London: Longman.

Hagoort, P. (1999). De toekomstige eeuw zonder psychologie. *Psychologie Magazine,* 18(10), 35-36.

Hagoort, P. (1999). Trompetten als gordijnen. *Punt.komma,* 1, 3-5.

Hagoort, P., & Brown, CM. (1999). The consequences of the temporal interaction between syntactic and semantic processes for haemodynamic studies of language. *NeuroImage,* 9(6), S1024.

Hagoort, P., & Brown, CM. (1999). Gender electrified: ERP evidence on the syntactic nature of gender processing. *Journal of Psycho-linguistic Research,* 28(6), 715-728.

Hagoort, P., Brown, CM., & Osterhout, L. (1999). The neurocognition of syntactic processing. In CM. Brown & P. Hagoort (Eds.), *The neurocognition of language* (pp. 273-316). Oxford: Oxford University Press.

Hagoort, P., Indefrey, P., Brown, CM., Herzog, H., & Steinmetz, H. (1999). The neural circuitry involved in the reading of German words and pseudowords: A PET study. *Journal of Cognitive Neuroscience,* 11(4), 383-398.

Hagoort, P., Ramsey, N., Rutten, G-J., & Rijen, P. van (1999). The role of the left anterior temporal cortex in language processing. *Brain and Language,* 69(3), 322-325.

Higginbotham, D.J., & Wilkins, D.P. (1999). Slipping through the timestream: Social issues of time and timing in augmented interactions. In D. Kovarsky, J.F. Duchan, & M. Maxwell (Eds.), *Constructing (In)Competence: Disabling evaluations in clinical*

and social interaction (pp. 49-62). Mahwah NJ: Lawrence Erlbaum Associates.

Hiraga, M., Sinha, CG., & Wilcox, S. (Eds.) (1999). *Cultural, psychological and typological issues in cognitive linguistics.* Amsterdam/ Philadelphia: John Benjamins.

Indefrey, P. (1998). De neurale architectuur van taal: Welke hersen-gebieden zijn betrokken bij het spreken van woorden? *NeuroPraxis,* 2(6), 230-237.

Indefrey, P. (1999). Some problems with the lexical status of non-default inflection (Commentary on H. Clahsen: Lexical entries and rules of language: A multidisciplinary study of German inflection). *Behavioral and Brain Sciences,* 22,1025.

Indefrey, P., & Levelt, W.J.M. (1999). A meta-analysis of neuroimaging experiments on word production [abstract]. *NeuroImage, 7,* S1028.

Indefrey, P., & Levelt, W.J.M. (1999/2000). The neural correlates of language production. In M. Gazzaniga (Ed.), *The New Cognitive Neurosciences -* 2nd Edition (pp. 845-865). Cambridge, MA: MIT Press.

Indefrey, P., Brown, CM., Hagoort, P., Amunts, K., Hellwig, F., Herzog, H., & Seitz, R.J. (1999). Noun phrase and sentence level syntactic encoding during language production activate the left frontal operculum - A PET Study [abstract]. *NeuroImage,* 9, S1027.

Kempen, G. (1999). Fiets en (centri)fuge. *Onze Taal,* 68,88.

Kempen, G. (1999). Visual grammar: Multimedia for grammar and spelling instruction in primary education. In K.C. Cameron (Ed.), *CALL: Media, design, and applications* (pp. 223-238). Lisse: Swets & Zeitlinger.

Keurs, M. ter, Brown, CM., Hagoort, P., & Stegeman, D.F. (1999). Electrophysiological manifestations of open- and closed-class words in patients with Broca's aphasia with agrammatic comprehension. An event-related brain-potential study. *Brain,* 122(5), 839-854.

Kita, S. (1999). Japanese Enter/Exit verbs without motion semantics. *Studies in Language,* 23,317-340.

Kita, S. (1999). Japanese ideology of conversation and its structural manifestations: A study of aiduchi and head nods. In J. Verschueren (Ed.), Language and Ideology: *Selected papers from the 6th International Pragmatics Conference* (pp. 262-269). Anterwerp: International Pragmatics Association.

Klein, W. (1998). Ein Blick zurück auf die Varietätengrammatik. In U. Ammon, K. Mattheier, & P. Neide (Eds.), *Sociolinguistica. Internationales Jahrbuch für Europäische Soziolinguistik,* 12, Variationslinguistik (pp. 22-38). Tübingen: Niemeyer.

Klein, W. (1999). Die Lehren des Zweitspracherwerbs. In N. Dittmar, & A. Giacalone Ramat (Eds.), *Grammatik und Diskurs/Grammatica e discorso. Studi sull acquisizione dell italiano e del tedesco. Studien zum Erwerb des Deutschen und des Italienischen* (pp. 279-290). Tübingen: Stauffenberg.

Klein, W. (1999). Wie sich das deutsche Perfekt zusammensetzt. *LiLi, Zeitschrift für Literaturwissenschaft und Linguistik,* 29(113), 52-85.

Klein, W., & Musan, R. (Eds.) (1999). *Das deutsche Perfekt.* Stuttgart: Metzler.

Krämer, I. (1999). What are you talking about? Children's interpretation of sentence initial indefinite subjects in sentences containing negation. In R. van Bezooijen & R. Kager (Eds.), *Linguistics in the Netherlands* (pp. 121-134). Amsterdam: John Benjamins.

Kuijk, D. van, Wittenburg, P., & Dijkstra, T. (1999). A connectionist model for the simulation of human spoken word recognition. In B.P.L.M. den Brinker, P.J. Beek, F.J. Maarse, & L.J.M. Mulder (Eds.), *Cognitive ergonomics, clinical assessment and computer-assisted learning* (pp. 76-90). Lisse: Swets & Zeitlinger.

Levelt, C.C, Schiller, N.O., & Levelt, W.J.M. (1999). A developmental grammar for syllable structure in the production of child language. *Brain and Language,* 68, 291-299.

Levelt, W.J.M. (Section Ed). (1999/2000). Introduction Section VI Language. In M. Gazzaniga (Ed.), *The new cognitive neurosciences* - 2nd Edition (pp.843-844). Cambridge, MA: MIT Press.

Levelt,.W.J.M Language Production: A blueprint of the speaker. In P. Hagoort & C M. Brown (Eds.), *The neurocognition of language* (pp. 94-122). Oxford: Oxford University Press.

Levelt, W.J.M. (1999). Language. In G. Adelman & B.H. Smith (Eds.), *Elsevier's Encyclopedia of Neuroscience,* 2nd enlarged and revised edition (pp. 1005-1008). Amsterdam: Elsevier Science.

Levelt, W.J.M. (1999). Models of word production. *Trends in Cognitive Sciences,* 3(6), 223-232.

Levelt, W.J.M., Roelofs, A., & Meyer, A.S. (1999). A theory of lexical access in speech production. Target paper for *Behavioral and Brain Sciences,* 22(1), 1-38.

Levelt, W.J.M., Roelofs, A., & Meyer, A.S. (1999). Multiple perspectives on lexical access. Reply to commentaries. *Behavioral and Brain Sciences,* 22(1), 61-72.

Levinson, S. C. (1999). Language and culture. In R. Wilson & F. Keil (Eds.), *MIT Encyclopedia of the Cognitive Sciences* (pp. 438-440). Cambridge MA: MIT Press.

Levinson, S.C.(1999). Maxim. *Journal of Linguistic Anthropology* 9 (1),140-43.

Magnuson, J. S., Tanenhaus, M. K., Aslin, R. N., & Dahan, D. (1999). Spoken word recognition in the visual world paradigm reflects the structure of the entire lexicon. In M. Hahn & S. Stoness (Eds.), *Proceedings of the 21st Annual Conference of the Cognitive Science Society* (pp. 331-336). Mahwah NJ: Lawrence Erlbaum Associates.

McGregor, W.B. (1999). External possession constructions in Nyulnyulan languages. In D. Payne & I. Barshi (Eds.), *External possession* (pp. 429-448). Amsterdam: John Benjamins.

McGregor, W.B. (1999). How many types of internal conjunction. *Functions of Language,* 6(1), 139-151.

McGregor, W.B. (1999). Humpty Dumpty didn't have such a great fall after all. *BELL: Belgian Essays on Language and Literature,* 1999,35-40.

McGregor, W.B. (1999). Kukatja ethno-physiology and medicine. *Anthropos,* 94, 224-228.

McQueen, J.M., Norris, D.G., & Cutler, A. (1999). Lexical influence in phonetic decision-making: Evidence from subcategorical mismatches. *Journal of Experimental Psychology: Human Perception and Performance,* 25, 1363-1389.

Meyer, A.S., & Bock, K. (1999). Representations and processes in the production of pronouns: Some perspectives from Dutch. *Journal of Memory and Language,* 41 (4), 281-301.

Nuyts, J. (1999). Intentionality. In J. Verschueren, J.-O. Östman, & J. Blommaert (Eds.), *Handbook of pragmatics: Quintessence.* Amsterdam: John Benjamins.

Nuyts, J. (1999). Processing epistemic modality: Some consequences for modeling language production. In R. Klabunde & C. von Stutterheim (Eds.), *Representations and processes in language production* (pp. 181-203). Wiesbaden: Deutscher Universitätsverlag.

Nuyts, J., & Vonk, W. (1999). Epistemic modality and focus in Dutch. *Linguistics,* 37, 699-737.

Otake, T., & Cutler, A. (1999). Perception of suprasegmental structure in a nonnative dialect. *Journal of Phonetics,* 27, 229-253.

Özyürek, A., & Kita, S. (1999). Expressing manner and path in English and Turkish: Differences in speech, gesture, and conceptualization. In M. Hahn & S. Stoness (Eds.), *Proceedings of the 21st Annual Conference of the Cognitive Science Society* (pp. 507-512). Mahwah, London: Lawrence Erlbaum Associates.

Praamstra, P., Plat, E., Meyer, A.S., & Horstink, M.W.I.M. (1999). Dissociation of electrocortical and peripheral measurements of response generation in Parkinson's disease. *Movement Disorders,* 14(3), 790-799.

Price, C, Indefrey, P., & Turennout, M. van (1999). The neural architecture underlying the processing of written and spoken word forms. In C M. Brown & P. Hagoort (Eds.), *The neuro-cognition of language* (pp. 211-240). Oxford: Oxford University Press.

Roelofs, A. (1999). Phonological segments and features as planning units in speech production. *Language and Cognitive Processes,* 14(2), 173-200.

Schmitt, B., Meyer, A.S., & Levelt, W.J.M. (1999). Lexical access in the production of pronouns. *Cognition,* 69,313-335.

Senft, G. (1999). Bronislaw Kaspar Malinowski. In J. Verschueren, J.-O. Östman, J. Blommaert, & C. Bulcaen (Eds.), *Handbook of Pragmatics* 1997 (pp. 1-20). Amsterdam: John Benjamins.

Senft, G. (1999). A case study from the Trobriand Islands: The presentation of Self in touristic encounters. *HAS Newsletter,* 19, 9.

Senft, G. (1999). ENTER and EXIT in Kilivila. *Studies in Language,* 23,1-23.

Senft, G. (1999). The presentation of Self in touristic encounters: A case study from the Trobriand Islands. *Anthropos,* 94, 21-33.

Senft, G. (1999). Weird Papalagi and a fake Samoan chief - A footnote to the Noble Savage Myth. *Rongorongo Studies - A forum for Polynesian Philology,* 9(1), 23-32.

Senft, G. (1999). Weird Papalagi and a fake Samoan chief - A footnote to the Noble Savage Myth. *Rongorongo Studies - A forum for Polynesian Philology,* 9(2), 62-75.

Shattuck-Hufnagel, S., & Cutler, A. (1999) The prosody of speech error corrections revisited. In J.J. Ohala, Y. Hasegawa, M. Ohala, D. Granville, & A.C. Bailey (Eds.), *Proceedings of the 14th International Congress of Phonetic Sciences.* Vol. 2. (pp.1483-1486). Berkeley: Department of Linguistics, UC Berkeley.

Sinha, C. G. (1999). Grounding, mapping and acts of meaning. In T. Janssen & G. Redeker (Eds.), *Cognitive linguistics: Foundations, scope and methodology* {pp. 223-255). Berlin: Mouton deGruyter.

Sinha, C. G. (1999). Review of Bernd Heine: Cognitive Foundations of Grammar. *Linguistics,* 37(3), 549-552.

Sinha, CG., Thorseng, L.A., Hayashi, M., & Plunkett, K. (1999). Spatial language acquisition in Danish, English and Japanese. In P. Broeder, & J. Murre (Eds.), *Language and thought in development* (pp. 95-125). Tübingen: Gunter Narr Verlag.

Smits, R. (1999). Predicting dependencies in phonetic categorization from distributions of acoustical cues in natural utterances. In J.J. Ohala, Y. Hasegawa, M. Ohala, D. Granville, & A.C. Bailey (Eds.), *Proceedings of the 14th international Congress of Phonetic*

Sciences: Vol. 1. (pp. 207-210). Berkeley: Department of Linguistics, UC Berkeley.

Sonnenstuhl, I., Eisenbeiß, S., & Clahsen, H. (1999). Morphological priming in the German mental lexicon. *Cognition,* 72,203-236.

Suppes, P., & Böttner, M. (1998). Robotic machine learning of anaphora. *Robotica,* 16,425^131.

Swingley, D.C. (1999). Conditional probability and word discovery: A corpus analysis of speech to infants. In M. Hahn & S.C. Stoness (Eds.), *Proceedings of the 21st Annual Conference of the Cognitive Science Society* (pp. 724-729/ Mahwah, London: Lawrence Erlbaum Associates.

Turennout, M. van, Hagoort, P., & Brown, CM. (1999). The time course of grammatical and phonological processing during speaking: Evidence from event-related brain potentials. *Journal of Psycholinguists Research,* 28(6), 649-676.

Van Geenhoven, V. (1999). A before-&-after picture of when-, before-, and after-clauses. In T. Matthews & D. Strolovitch (Eds.), *Proceedings of SALT IX* (pp. 298-315). Ithaca: CLC Publications.

Vigliocco, G., & ZiIIi, T. (1999). Syntactic accuracy in sentence production: Gender disagreement in Italian language impaired and unimpaired speakers. *Journal of Psycholinguistic Research,* 28, 623-648.

Vinson, D., & Vigliocco, G. (1999). Can independence be observed in a dependent system? *Brain and Language,* 68,118-126.

Vonk, W. (1999). De lezende lezer. In W. de Moor & B. Vanheste (Eds.), *De lezer in ogenschouw* (pp. 117-135). Den Haag: Biblion.

Warner, N.L. (1998). Integrating speech perception and formal phonology. In A.R. Doran, T. Majors, C.E. Mauk, & N. Merchant Goss (Eds.), *Texas Linguistic Forum 41: Exploring the boundaries between phonetics and phonology* (pp. 189-202). Austin: Department of Linguistics, University of Texas at Austin.

Warner, N.L. (1999). Timing of perception of vocalic distinctive features: Implications for vowel system universals. In J.J. Ohala, Y. Hasegawa, M. Ohala, D. Granville, & A.C. Bailey (Eds.), *Proceedings of the 14th International Congress of Phonetic*

Sciences: Vol. 3. (pp. 1961-1964). Berkeley: Department of Linguistics, UC Berkeley.

Watorek, M., & Perdue, C. (1999). Additive particles and focus: Observations from learner and native-speaker production. *Linguistics,* 37(2), 297-323.

Wilkins, D.P. (1999). Spatial deixis in Arrernte speech and gesture: On the analysis of a species of composite signal as used by a Central Australian Aboriginal group. In E. Andre, M. Poesio, & H. Rieser (Eds.), *Proceedings of the Workshop on Deixis, Demonstration and Deictic Belief* (pp. 30-42). Utrecht: ESSLLI XI.

Dissertations:

Essegbey, J.K. (1999) *Inherent complement verbs revisited: Towards an understanding of Argument Structure in Ewe.* Ph.D. Dissertation: MPI Series in Psycholinguistics, 10. University of Nijmegen.

Hoeks, J.C.J. (1999). *The processing of coordination: Semantic and pragmatic constraints on ambiguity resolution.* Ph.D. Dissertation. University of Nijmegen.

Janssen, D. P. (1999) *Producing past and plural inflections.* Ph.D. Dissertation: MPI Series in Psycholinguistics, 11. U. of Nijmegen.

Margetts, A. *Valence and transitivity in Saliba, an Oceanic language of Papua New Guinea.* Ph.D. Dissertation: MPI Series in Psycholinguistics, 12 University of Nijmegen.

Lugt, A.H. van der (1999). *From speech to words.* Ph.D. Dissertation: MPI Series in Psycholinguistics, 13. University of Nijmegen.

Niise, Ft. (1999). *General meanings for German 'an', 'auf, 'in', and 'unter': Towards a (neo)classical semantics of topological prepositions.* Ph.D. Dissertation. Berlin, Humboldt-UniversitÄt.

Weijer, J. C. van de (1999). *Language input for word discovery.* Ph.D. Dissertation: MPI Series in Psycholinguistics, 9. University of Nijmegen.

Wittek, A. (1999) "... *and the prince woke Sleeping Beauty again". Learning the meaning of change-cf-state verbs: a case study of German.* Ph.D. Dissertation, Universität Tübingen.

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