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WITH ASSISTANCE FROM SYLVIA AAL



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## PREFACE

In June 1976, the Senate of the Max-Planck-Society decided to set up a "project group" to do research in the field of psycholinguistics. This decision meant an engagement in a new field - new for the Max-Planck-Society, but also comparatively new as a scientific discipline. So, this venture was felt to be a risk and a challenge, and the initial limitation of the project group's life span to five years reflected this feeling. Last year, the project group, which became a permanent institute in 1980, has been able to celebrate the tenth anniversary of the Senate's decision. This, we think, is a relief to those who took the risk. It leaves the challenge.

The institute has now reached the shape which we hope it will essentially keep over the coming years. The end of its youth and the transition to a more sedate period was marked in April 1986 by the official opening of the new institute building, to which we had already moved by the end of the preceding year and in which, after the usual initial disturbance, everything and everybody is working again. It was opened by the president of the Max-Planck-Society, Heinz Staab. Addresses were also given by the German ambassador to the Netherlands, Otto von der Gablentz, by the Rector Magnificus of the University of Nijmegen, J.H.G.I. Giesbers, by the Lord Mayor of Nijmegen, F.J. Hermsen, by C.F.A. Knol from Kraaijvanger Architects, and by the managing director of the institute, Willem Levelt. Peter Seuren from the University of Nijmegen gave the inaugural lecture on "Formal Theory and the Ecology of Language". The official part of the day was followed by an "open house": researchers and technicians gave examples of their work and demonstrated some of the facilities.

This report, like its predecessors, gives a condensed picture of the on-going work in the institute's four major research domains. Two points deserve special mention: The aphasia project, sponsored by the Dutch ZWO, was extended for five more years (cf. chapter 4), and the speech lab,

mainly designed by the comprehension group and our technicians, but available to and used by everybody in the institute. was essentially completed.

At the end of 1986, the managing directorship was passed over to me. We all wish to thank Pim Levelt who held this position for one decade, who during this time accomplished the work of two decades and who now, at least for some years, has the right to sit on the cart rather than pulling it.

Wolfgang Klein

## ORGANIZATION OF THE INSTITUTE DURING 1986

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## RESEARCH IN PROGRESS



# 1. LANGUAGE PRODUCTION

A central component in a theory of the speaker concerns the processes of formulating, the grammatical and phonological encoding of the semantic information ("message") to be expressed. Within this component lexical access plays a crucial role. Grammatical encoding is lexically driven. The semantically appropriate lexical items that are retrieved, mutually impose their intrinsic morphological and syntactic restrictions. Grammatical encoding consists in solving this set of equations with a well-formed surface structure as outcome. This process is "incremental". Speakers plan their messages as they speak. They may still be accessing one lexical item while already articulating an earlier one within the same sentence or phrase. Earlier elements therefore have priority in imposing their restrictions on the surface structure under construction; there is little room for backtracking in fluent speech. Incremental production has been the subject of a new series of experiments, carried out in cooperation with the University of Saarbrücken.

Phonological encoding is also based on lexical information. An item retrieved will, at some moment, make its intrinsic phonological information available to the articulatory planning procedures. At what moment? Our recent experiments show that this is very early. As soon as there is semantic activation, we found, there is also measurable phonological activation. Further experiments investigated the "unfolding" of the articulatory program for a word. Results suggest that these programs become available in left-to-right fashion, and acknowledge the syllabic build-up of the word. However, not all phonological information is transported into the articulatory program. There is, for instance, full neutralization of underlying vowel length in the articulation of Dutch open syllables.

In their turn, these central lexically-driven formulating processes depend on meticulous preparation at the message level. Several of the production studies reported here were concerned with aspects of this

conceptual preparation. Research on spatial deixis in weightlessness, for instance, revealed the way in which speakers map an unusual perceptual state of affairs on relational concepts (such as ABOVE, or LEFT OF) to be formulated. A far more complicated case of message preparation concerns the expression of temporality. The interaction of the conceptual categories of durativity and resultativity is a major determinant at the message level for the retrieval of different categories of verb during the process of formulating. But in addition, there should be a specification of the temporal parameters which are relevant for tense, and which are morphologically, not lexically expressed in German. What makes a theory of formulating really complex is that these two kinds of temporal information are not independent: the interpretation of tense depends on the "Aktionsart" of the verb.

The choice of conceptual materials to be expressed in discourse, finally, depends on one's relation to the interlocutor. The style of reporting, we found, has a predictable relation to the personal ties between speakers and addressees.

## 1.1 Reference and Deixis

### 1.1.1 Tense and Temporality

Ehrich continued her work on temporality. In particular, she studied the interaction between tense and 'lexical' or 'inherent' aspect (Aktionsarten), as well as looking at problems of tense generation in language production.

In her work on temporal semantics, she classified inherent aspect in terms of two parameters: durativity and resultativity. This yielded four different subcategories: (i) durative resultative verbs, such as solve the problem or disappear, denoting actions and processes, (ii) durative non-resultative verbs such as push a cart or be sick, denoting activities

and states, (iii) non-durative resultative verbs, such as leave or find, denoting acts and events which are defined by the resultative states to which they lead and (iv) non-durative non-resultative verbs, such as ask or sneeze, denoting 'semelfactive' acts and events which do not lead to non-contingent results. In this classification, acts, actions, processes, and events are considered to be temporally closed or bound, while activities and processes are temporally open.

This four-way classification formed the basis for Ehrich's analysis of tense and aspect in German, where the temporal interpretation of the tenses varies depending on the inherent aspect of the verb. For example, the Present Tense of resultative verbs (1) can be used to refer to actions as processes either simultaneous with or posterior to the speaking event. The Present Tense of non-resultative verbs (2), in contrast, does not allow for a posterior interpretation (unless it is accompanied by an adverb with *future reference*).

- |     |   |                           |       |
|-----|---|---------------------------|-------|
| (1) | a | Der Torwart hält den Ball | SIM   |
|     | b | Manchester gewinnt        | POST  |
| (2) | a | Das Baby weint            | SIM   |
|     | b | Hans hustet               | *POST |

Ehrich accounts for this difference by a situation semantic analysis enriched by Reichenbachian notions. She assigns different discourse locations to different types of situations depending on the perspective (internal or external) from which a given situation is seen. A discourse location is a conceptual representation of the space/time region covered by a given event, and is not isomorphic with a 'real' location. For example, even though the performance of an illocutionary act is a protracted event in real time, one usually conceives of it as momentary or punctual. This is why a sentence like "For two seconds, John asked whether it was raining" has an iterative but no durative interpretation.

Within the class of discourse locations, Ehrich distinguishes (i) sequential vs. punctual and (ii) complete vs. partial locations. Different verb-inherent aspects encode different frozen perspectives and



are thus interpreted by different types of discourse locations. Non-resultative verbs induce the internal perspective and assign partial discourse locations to the situations denoted by them. Resultative verbs induce the external perspective and assign complete discourse locations. Durative verbs present situations as temporally protracted and lead to sequential locations. Non-durative verbs present situations as temporally condensed and assign punctual discourse locations. This then allows her to reanalyse Reichenbach's notions of Speaking Time (S), Event Time (E) and Reference Time (R) in terms of the discourse locations of the speaking event (s), the narrated event (e) and the reference point (r) respectively.

In a second project, looking at tense generation in language production, Ehrlich started out from observations about the interaction between tense, inherent aspect and temporal adverbs. She has investigated the constraints that these interactions impose on a language production system which works on well-defined levels of processing (conceptual, functional, positional) and which is characterized by specific processing characteristics such as modularity, incrementality and linearity. She argued that a system which generates tense information at the same processing level as the level at which it assigns lexical items to concepts can only maintain the desired processing properties if an X-bar syntax is presupposed. This would allow temporal information to be structured hierarchically, such that Tense is assigned to the highest verb projection  $V''$ , whereas temporal adverbs and inherent aspect are created on the lower projection  $V^{n-1}$  and  $V^{n-2}$  respectively. Her work here is still very much in progress. Its main concern is to study the interdependency between structures and processes in a limited domain.

### 1.1.2 Language and Space

Friederici and Levelt completed the analysis of their experiment investigating the use of deictic terms in weightlessness (see Annual Report 1985). The error analysis had shown that, in the presence of relevant

gravitational cues. these are used as primary reference and that adequate use of spatial terms was possible in the absence of gravity by choosing the retinal coordinate system as primary reference frame. Response latencies were prolonged during the first hours in weightlessness, but decreased after one day's exposure to micro-gravity.

The conclusions that can be drawn from the combined analysis are twofold. The finding that adequate spatial reference assignment is possible in the absence of gravity indicates that the mental representation of space must be abstract and rather independent of current perceptual input parameters. Immediate adaptation to the perceptually new situation reflects the possibility of directly mapping new perceptual information onto this abstract representation. Adaptation over time may best be characterized by a process due to which these mapping procedures become more automatic.

In a study which investigated further the use of spatial terms under varying perceptual conditions. Friederici tested subjects in supine/horizontal and supine/head-down position. The task and the materials in these experiments were identical with those in the weightlessness study (see Annual Report 1985). In a first experiment, fourteen subjects were asked to verbally describe visual arrays while lying flat on their backs (supine), with their heads straight or tilted (with respect to the body) to the left or right side. In this supine/horizontal position, where gravitational information cannot be used as a relevant referential cue, retinal cues are chosen as primary reference frame.

A second experiment tested the subjects' use of deictic terms when they were in a supine position with their heads down. In this position, where the whole body is tilted down by seven degrees, gravitational cues are present, but in a reversed direction. Five subjects were tested first in an upright position, second in the supine position after being in it for a full day, and third again in an upright position after having been in the supine/head-down position for four days. In the first and the last test session all subjects chose the gravitational vertical as primary reference, both when their heads were straight and when they were tilted to the left or the right. In the second session, after one day in supine position with

their heads down, the subjects varied in their choice of reference frames. Three subjects used the retinal coordinates as primary reference - like subjects in a supine/horizontal position. The other two used the body's vertical, which coincided with the available gravitational cues as primary reference frame.

These findings show that in different perceptual situations different types of sensory information are used as the primary reference controlling the use of deictic terms. Possible conflicts between different perceptual cues are solved by giving dominant weight to one of them. The observed individual differences suggest that these weighting procedures are under cognitive control.

### 1.1.3 Discourse Structuring

Redeker finished her dissertation on language use in informal narratives. She found a stable register difference between speakers who were describing a film to a friend and those whose listener was a stranger. The friends' narrative style can be described as more 'mimetic' or dramatizing as compared to the more interpretive style speakers used when talking to a stranger. Friends referred more often to the current situation and mostly used direct quotes to report speech events and illustrate characters' thoughts. Strangers, in contrast, often supported their statements with information about the source and reliability of their knowledge. They preferred indirect speech reports and were using direct quotation mainly in a 'documenting' function - for instance, in verbatim quotes of film captions.

This difference in narrative style complements Redeker's earlier finding that speakers who were talking to a friend indicated the structure of their discourse with pragmatic means, whereas strangers relied more on propositional structuring with subordination and connectives (see Annual Report 1985). Taken together, these results indicate that talk among friends tends to be more oriented toward the current discourse situation and the listener, whereas talk between strangers tends to be more content

oriented, even under otherwise identical interactional conditions.

## 1.2 Lexicalisation

Pechmann and Schriefers continued research (initiated by Pechmann, see Annual Report 1983) on "incremental strategies in language production". When a speaker applies an incremental strategy of language production, he will sometimes start the description of a given target object before he has fully determined which properties distinguish the target object from a set of simultaneously presented context objects. This can lead to overspecified and redundant object descriptions.

Predictions derived from this notion of incremental production were tested in two experiments in which subjects had to name specified target objects which differed from a set of context objects in object class and in color and/or size. The main difference between the experiments concerned the types of stimuli used. In Experiment I, 48 different everyday objects (such as a chair, a car, or a table) were used. In Experiment II only three geometric figures (triangles, circles, and squares) were used, and, in contrast to Experiment I, there were no trials in which class of the target object alone would distinguish the target object from the context objects.

The results of the two experiments showed clear differences. In the first experiment, for 52% of the trials in which color was not a distinguishing feature of the target object, the descriptions were overspecified with respect to color. In Experiment II this held for 92% of the corresponding cases. Given the differences in the stimuli used in these experiments it appears as if, in Experiment II, subjects conceive of color and object as one conceptual unit (and therefore almost always name color, even if it is not a distinguishing feature), but that subjects did not do so in Experiment I.

The strength of the tendency to form one conceptual unit consisting of color and object class as input to the formulation processes should also

influence the ordering of the size- and color-adjectives in descriptions with two adjectival modifiers. This prediction was confirmed: Whereas in Experiment II only 11% of the descriptions with two adjectival modifiers showed the (irregular) ordering "color-size", 35% showed this ordering in Experiment I. This ordering should be expected if subjects produce their descriptions according to an incremental strategy, since color is an absolute property of the target object which can be determined more easily than relative size. The results of the two experiments suggest that speakers do not follow an incremental strategy in cases where color and object class tend to form one conceptual unit. The results of these experiments, then, give some insight into conceptual conditions which make application of incremental production strategies more or less probable.

### 1.3 Lexical Access in Production

#### 1.3.1 The Time Course of Lexical Access

Levelt and Schriefers continued their investigation of the time course of lexical access in language production. The research addresses the question of whether lexical access consists of two successive phases. According to such a two stage theory, the access of semantically addressable items begins with a phase of building up semantic activation which eventually leads to the selection of one (correct, appropriate) item. During this phase there should be no measurable phonological activation. But as soon as the item is selected the phase of activation (or "unpacking") of its phonological form is entered. During this second phase there is no role for semantic processes: the only measurable activity should be phonological. The extreme alternative view, the one stage theory, says that there is no semantic activation without phonological activation. As soon as there is a preverbal concept to be expressed, all lexical items whose semantic conditions are partially fulfilled by the concept undergo activation and make their phonological properties available

immediately.

In the main experiments subjects had to name objects whose pictures were presented one by one. In addition, on the critical trials subjects were presented auditorily with a word or a non-word after presentation of the picture. The words presented for lexical decision could be semantically related to the name of the picture (e.g., picture: table, word: chair), phonologically related (e.g., picture: table, word: tailor), identical (picture: table, word: table), or unrelated (picture: table, word: dog). In three experiments, these critical words for lexical decision were presented at a moment early after picture onset (70 msec), at an intermediate moment (370 msec), and at a late moment (670 msec). It was expected that when the process of accessing the object's name is in a stage of semantic activation, this will affect the lexical decision latency for semantically related words (as compared to a baseline, namely lexical decision latencies to unrelated test words). Similarly, phonological activation would reveal itself in the lexical decision latency for the phonologically related auditory test word.

The results of these experiments are incompatible with either theory. As far as the two stage theory is concerned there are indeed the intermediate and late moments during lexical access where there is phonological but no semantic activation. However, there is no early moment where there is semantic activation without phonological activation. A strong version of the one stage theory is contradicted by the finding that there is phonological but no semantic activation at the medium and late moments. The results suggest a weaker version of the one stage theory, a version which states that semantic activation always involves phonological activation, but that, after the appropriate lexical item has been selected, phonological activation can persist without semantic support.

### 1.3.2 Sublexical Units

Meyer continued her project on the generation of the phonological representation in word production. The central question was which part of this representation needs to be activated before articulation of the word can begin. The following paradigm was used: The subjects first learned a set of prompt-response word pairs. In each trial of the following test block, one of the prompts (e.g. "sjeik") was displayed and the subject said aloud the appropriate response (e.g. "kalief") as quickly as possible. There were two types of prompt-response sets: In the homogeneous sets, the response words had in common the same sequence of segments - e.g., their initial syllable. In the control sets, items from different homogeneous sets were recombined so that the response words within a set were not phonologically related. These contrasts are illustrated below:

#### Homogeneous sets

1.	2.	3.
touw- <u>k</u> abel	straf- <u>b</u> oete	docent- <u>l</u> ezing
sjeik- <u>k</u> alief	roof- <u>b</u> oeven	pokken- <u>l</u> epra
rivier- <u>k</u> ade	reis- <u>b</u> oeking	soldaat- <u>l</u> eger

#### Heterogeneous sets

4.	5.	6.
touw-kabel	sjeik-kalief	rivier-kade
straf-boete	roof-boeven	reis-boeking
docent-lezing	pokken-lepra	soldaat-leger

In the homogeneous sets, the subjects had advance knowledge about certain phonological characteristics of the response words. This advance information should facilitate the reaction to the prompt, but only if the string in question is activated before articulation begins. In the first experiment, the response words in the homogeneous sets shared their initial syllables, while in the second experiment they shared their final syllables (as in "camera-foto, circus-salto, bedrag-conto"). Only information about

the initial syllable speeded response-time. This showed that the second syllable was not activated before articulation began.

The subsequent experiments tested which part of the phonological representation had to be minimally activated before the utterance onset. The structure of the response words was varied, so that in the homogeneous sets they shared either the initial consonant, the initial CV-group or the initial CVC-group. The results of these experiments show that it is the initial syllable (rather than the initial consonant or the initial CV-group) which has to be activated before articulation can begin.

This means that a word can begin to be uttered before the entire phonological representation has been retrieved. This is additional evidence for the claim that language is produced incrementally: Several hierarchical representations of an utterance are generated, but the lower-level processes need not await the completion of processes at higher-levels. Instead, as soon as a sufficient part of the higher level representation is available, this information is passed on to the next lower-level processor, which starts constructing the appropriate representation. The minimal output unit of the phonological level - the string which has to be minimally generated before lower-level processing can begin - is the initial syllable.

#### 1.4 Phonological Aspects of Speech Production

Recent research on word final devoicing in languages like Dutch has claimed that phonological neutralization is 'incomplete'. These studies (e.g., O'Dell & Port, 1983; Dinnsen & Charles-Luce, 1984) have found production differences between voiceless consonants which are derived by a word final devoicing rule and voiceless consonants not derived by such a rule (e.g., Rad vs. Rat). As a test of the general claim about 'incompleteness' of phonological neutralization, Lahiri, Schriefers, and Kuijpers studied a qualitatively different neutralization phenomenon, the neutralization of vowel length in open syllables in Dutch. The study



compared the length of Dutch long vowels which are derived by an open syllable lengthening rule with the length of vowels which are underlyingly long. The results show that there is no difference in length between these vowels and that, at least in this instance, contextual neutralization does lead to identical surface realization of distinct phonological segments.

In a second study, Lahiri and Hankamer (UCSC) investigated the timing of geminate consonants in different languages. Although there has been a considerable amount of work done on the phonological analyses of geminates, there has been very little published on the acoustic properties of these consonants. The research compared geminate and non-geminate consonants in Turkish and Bengali and took three separate measures - duration of closure, VOT and duration of the preceding vowel. The duration of closure and the VOT were found to be significantly different across speakers for geminates and non-geminates in both languages. Cross-splicing the VOT and the duration of closure showed that only in the latter case was there a change in the perception of the geminate - non-geminate contrast.

In addition to the acoustic properties of geminates in general, Lahiri and Hankamer also compared different types of geminate consonants. Phonological theory distinguishes between heteromorphemic geminates which are merely a concatenation of homorganic consonants and those that are derived by total assimilation.

C	+	C	C	+	C	-->	C	C
			}				\	/
x		x	z	x			x	

The former, for instance, can be split by epenthesis but that is not the case for assimilated consonants since they are linked. Since the geminates have the same representation on the timing tier, the acoustic correlates corresponding to both types should be the same. The data showed that there were no significant differences between these geminates - indeed they were identical to the tautomorphemic ones also.

## 1.5 Processing Load During Speech Production

The pupillometric technique that had been developed to track mental load during speech production was tested by Levelt, van Oeffelen, and Terken, using a reaction time task in which subjects had to respond as quickly as possible when they heard a particular tone. Pupillary responses for different stimulus and response conditions and for each subject had identical temporal properties. The pupil typically dilates after 350 msec, reaches a local maximum after 800 msec, then dilates towards a second maximum after 1300 msec. It then constricts to its normal value. The amount of dilation is subject-dependent and also reflects on stimulus and response conditions, as well as the base value of the pupil diameter. In general, pupil dilations are larger when the base value, defined as the size of the pupil diameter at the moment of stimulus presentation, is smaller. Inspection of the stimulus-locked pupillary responses measured for various stimulus (high tone, low tone) and response conditions (manual: left hand, right hand; oral: saying 'high' vs 'low'; no overt response: thinking 'high' vs 'low') led to the conclusion that the early peak (800 msec) in the pupillary response primarily reflects the processing of perceptual aspects of the stimulus whereas the second peak reflects the processing of cognitive aspects (decision making).

Since these experiments show that the dilation response is not just a reflection of overt articulatory activity, it can be used as a measure of processing load during fluent speech. The constant delay in peak dilations (relative to load onset) is currently being exploited in the analysis of pupillary responses recorded during 5 minute runs in which subjects speak freely about diverse topics while fixating a small spot. Results show that peak dilations in the pupillary response curve are related to several linguistic features of the speech output.

## 2. LANGUAGE COMPREHENSION

The research of the Language Comprehension Group centers around three main themes. The first, and currently most dominant of these, can be characterised as the study of lexical representations and processes. How is sensory information -- whether visual or auditory -- projected onto the representation of word-forms in the mental lexicon? What is the nature of the decision processes that operate on these inputs during the recognition process, and what are the phonological, morphological, and semantic properties of the lexical representations involved? How are the semantic and syntactic attributes associated with different word-forms deployed in the construction of higher-level representations, and what consequences does this have for the recognition process itself?

These research questions are reflected not only in the summaries that follow, but also in the Max-Planck Conference organised in 1986 by the Comprehension Group (in cooperation with IWTS), under the title "Lexical Representation and Process" (described in more detail under Other Activities), in the group's role in guiding the development of CELEX (see also under Other Activities), and in the development of a multi-user speech laboratory. Much of the group's lexically oriented research involves spoken language, and this necessitates the use of computer-based methods for speech editing, analysis, and manipulation. The facilities that have been developed in this domain in 1986 represent a quantum leap in the ease and efficiency with which these operations can be carried out within the institute.

The group also has a strong interest in the processes of psychological parsing, and the mapping of utterances onto discourse representations. The problem of parsing is being pursued from both a linguistic and psycholinguistic perspective, and with a special emphasis on cross-linguistic comparisons. For the third area, discourse processes, the

current emphasis is on differing cues to text structure, and in the use of different types of referential device.

## 2.1 Lexical Processing

### 2.1.1 Phonological and Phonetic Aspects

The research described in this section groups together a number of studies that are concerned with the properties of the acoustic-phonetic input to the lexical access process, and with the implications of the phonological system of the language for the ways this input is structured and interpreted, relative to the mental representations of lexical form.

In a general theoretical analysis of a phonologically driven approach to lexical processing, Frauenfelder and Lahiri have begun exploring the ways in which a listener's phonological knowledge might play a role in lexical access. In doing this, they have appealed to recent developments in non-linear phonology in which rules and representations have a hierarchical structure. Using this framework they have analyzed several different types of post-lexical phonological processes (allophonic, neutralizing and deleting) with the objective of identifying properties of these rules with processing implications. Following on from this, they have examined several alternative processing accounts of how listeners deal with the variability in the phonetic shapes of words due to the operation of these phonological processes. Each processing account incorporates phonological knowledge, but in a different way: pre-compiled into the lexicon, coded in the form of a grammar which phonologically structures the input, or represented in the form of patterns of activation in the connectionist framework.

The role of phonological categories in defining the properties of lexical form representations was investigated in a series of studies by Marslen-Wilson, Lahiri, Zwitserlood (IWTS), and van Halen. These studies exploited the results of an earlier experiment (see Annual Report 1985) which investigated the effects of overlapping activation patterns in lexical access. The results of this experiment suggested that under certain conditions "rhyme primes" (such as the sequence jattle) could activate the lexical representations corresponding to the words with which they rhymed (such as battle). This was reflected in the cross-modal facilitation of lexical decisions to a visual probe (such as WAR) following presentation of rhyme primes like jattle, where WAR is semantically related to the rhyming word battle. This rhyme priming was only detectable, however, under conditions which suggested that the similarity of the initial segment of the rhyme to the initial segment of the original word was an important variable in determining the amount of activation.

The subsequent research has varied the phonological distance of the initial segments of non-word rhyme primes from their original words, and measured the resulting activation effects in an auditory-auditory priming task. To the extent that a rhyme prime is close to its original, then the more strongly it should activate the lexical representations associated with this original. To the extent that phonological categories correctly describe the relevant similarity space, then non-word rhyme primes should be more or less effective as a function of their phonological distance. The results of a first experiment show that different degrees of activation are indeed obtained by non-word primes deviating from their original words in terms of different phonological features. In particular, place differences are found to be highly distinctive - i.e. producing little facilitation - as are voice, sonorance, and nasality among the manner features looked at. Fricative/stop and fricative/glide contrast, however, seem much less distinctive.

In a second study, Lahiri and Marslen-Wilson used cross-linguistic differences in nasalisation to examine the role of phonological structure in speech processing. Nasalisation is a well documented phonological process which can have a different status in different languages. It can

be allophonic where the distribution of nasal/non-nasal vowels is predictable. It can also be neutralising if the vowel feature is distinctive in the language. The co-articulation effect -- that is, the purely phonetic effect of nasal spreading onto a preceding segment -- is similar in the two cases. Phoneticians and psychologists have argued that the nasalisation in the vowel can help listeners identify the upcoming consonant. Lahiri and Marslen-Wilson were interested in the question of whether human listeners interpret the acoustic property of nasalisation differently depending on the linguistic status of nasality in their language.

In English, nasal is non-distinctive for vowels. Here the phonological process of nasalisation is an allophonic process, so that the nasalisation is completely predictable. Nasal vowels in English do not occur in oral contexts. In Bengali, however, nasal is distinctive, and nasal and oral vowels contrast in the context of oral consonants. In addition, there is a neutralising rule of assimilation which nasalises vowels when followed by a nasal.

It seems obvious that subjects can anticipate the nasal consonant when they hear a nasalised vowel in English. It is much less clear, however, how the presence of nasalisation will be interpreted in Bengali. But if listeners use phonological information to interpret the signal, the nasality of vowels will be taken to be the underlying marked value. This means, in effect, that Bengali listeners will interpret nasalisation to signal the presence of a nasal vowel followed by an oral consonant -- the exact opposite of the interpretation of the same acoustic feature in a language like English. The lack of nasality, on the other hand, which is unmarked in both languages, will be interpreted in both languages in the same way. That is, listeners will be free to produce both nasal and oral vowels as responses.

Two gating studies have been carried out, in Calcutta and in Cambridge, to determine how listeners interpret the presence or absence of vowel nasalisation in, respectively, Bengali and English. Preliminary results suggest that the differing linguistic status of nasality does have consequences for how listeners in the two languages interpret nasalisation. In particular, the Bengali listeners show a very strong preference to

interpret nasality as signalling the underlying value. A nasalised vowel will be interpreted as a nasal vowel followed by an oral consonant, and not as an oral consonant followed by a nasal vowel.

In addition to these experimental studies, subjecting phonological concepts to the indignities of psycholinguistic interpretation, a number of collaborative projects have taken up issues within phonological theory itself.

The work of Lahiri and Dresher (Toronto) addresses a current controversy over the role of metrical structure in the phonology of a language. Instead of treating metrical trees as mere 'counting devices', for particular rules, they argue that grammars have coherent metrical structures to which a variety of phonological processes are sensitive. A recent analysis of Old English by Keyser and O'Neill proposes two kinds of metrical structures - one to provide a context for deleting high vowels and a completely different one for assigning stress. Lahiri and Dresher propose that Old English - and indeed all the older Germanic languages like Gothic, Old High German, and Old Dutch - had a quantity sensitive foot structure which incorporated the principle of metrical equivalence between one heavy syllable and two light syllables. Their analysis shows that this foot structure can capture in a unified manner various phonological phenomena without recourse to special structures for independent rules.

Lahiri and Hayes (UCLA) began an investigation of the intonational system of Bengali, and in particular of the phonological rules which temporally align intonational contours with texts. Their work has uncovered a number of ways in which Bengali differs from more familiar intonational systems. In particular, stresses in Bengali do not form invariant "anchors" for intonational patterns as in English; rather, each intonational pattern can induce a particular stress contour on the words that support it. Bengali also has phrase-internal "boundary tones", which appear at the right edge of focused constituents. Lahiri and Hayes also found evidence for "semi-ictic" tones in Bengali: these must associate close to, though not necessarily on, a stressed syllable.

During his visit, Hayes also continued development of a general theory of phonological stress assignment rules, based on the metrical theory of stress. His theory attempts to characterize the possible cross-linguistic variation in stress rules by encoding each rule as the setting of a limited, universally-determined inventory of parameters. The structures posited in the theory reflect a general principle developed in the psychological literature; namely, that rhythmic groupings based on duration tend to be iambic, whereas rhythmic groupings based on intensity tend to be trochaic.

Turning to the more phonetically oriented research, two further collaborative projects have investigated the phonetic correlates of syllable structure. Frauenfelder and Rietveld (Nijmegen) conducted a production study examining the relationship between measured vowel duration and two other factors: syllabic structure (open versus closed syllables) and strength of coarticulation (between the vowel and the following consonant). Syllable structure had a strong effect upon vowel duration, with shorter vowel durations in closed syllables than in open syllables. However, the size of the difference in vowel duration between the two syllable types varied as a function of the amount of coarticulation between the consonant and the vowel: The more coarticulation between these two segments, the greater the shortening effect in the closed syllable condition.

A second study aims to isolate phonetic cues to syllable perception in French. Earlier research has shown that French subjects base their syllable detection responses upon the syllable structure of the input. The present monitoring study was designed to determine the types of acoustic cues that subjects use to recover the syllable structure. In addition, since all the past studies showing syllable structure effects have been restricted to stimuli using liquids as the pivotal consonant (e.g. palace versus pal.mier), the study also investigated whether this syllable effect generalizes to other types of syllables or whether it depends specifically upon the strong allophonic character of the liquids used.



During a three-month visit to the institute, Sendlmeier worked on a model for the phonetic mental representation of words. Seven psychological models of word recognition were analysed in terms of their explicit and implicit assumptions about the phonetic representation of words, and then considered in the light of various experimental results. On the basis of these considerations he proposed a model for word representation which assumes the simultaneous representation of differently sized units in the form of prototypes. The size of the unit chosen for a given perceptual task is determined by the type of task, the context of perception, and the properties of the incoming stimuli.

Sendlmeier also continued his work with Goldbeck (Gießen) on the analysis of intonation contours, looking at the parameters which indicate word accent in sentence final position in questions. Acoustic measurements as well as a perception experiment showed that the most important cues are the position of the F0-rise within the sentence-final syllable and the duration of the stressed syllable.

More recently, Sendlmeier has returned to the institute to initiate a DFG-funded project to develop an auditory training programme for hearing-impaired listeners. The starting-point for this project is the fact that natural speech remains understandable even when seriously degraded, and that, for most phonological oppositions, there is more than one property that serves to distinguish between sounds. Sendlmeier hypothesizes that the inability to recognize one set of properties may, therefore, be compensated by other features also contained in the signal. To test this hypothesis, certain parameters in the time and frequency domain were varied systematically and independently from each other by digital computer programs. These modified speech signals will be used in a series of perception experiments and training procedures.

### 2.1.2 The Structure of Lexical Access

Frauenfelder continued his investigation into the informational relationship between lexical and sublexical processing, asking how and when top-down lexical information influences bottom-up processing, as reflected by the phoneme detection response. In previously reported experiments, lexical facilitation of phoneme detection times was only detectable when the target was located after the uniqueness point of the word. Three further experiments were conducted with Segui (Paris) to determine whether these lexical effects were not only facilitatory but also inhibitory, as some interactive activation models predict. In these experiments, the information from the lexicon was made incompatible with that of the bottom-up analysis by placing phoneme targets in words where they did not belong (for example, a /p/ target substituted for /l/ in the word "stimuli", producing "stimupi"). The phonological distance between the original and the substituted target phoneme was varied to test the hypothesis of increased inhibitory effects with decreased phonological distance. No inhibitory effect due to the lexical level was obtained even in cases where the target and substituted phonemes differed by only one distinctive feature. These results indicate that the lexicon only exerts a facilitatory influence upon bottom-up processing and that it does so only after word recognition.

In research with Souverijn, Frauenfelder investigated some consequences of the view that acoustic-phonetic analysis and lexical access are immediate and sequential processes. This implies that the analysis of the sensory input is constrained temporally, so that later arriving acoustic information does not affect decisions about earlier stretches of speech. Inversely, acoustic information that arrives early is assumed not to have an impact upon decisions about information arriving later. This argument against the existence of left and right context effects in speech perception was investigated in a series of phoneme monitoring experiments.

The existence of right context effects was evaluated by varying the degree of phonological similarity between the target phoneme (C1) and a subsequent critical phoneme (C2) constituting the right context. Targets

were placed at the beginning of monosyllabic words and nonwords with a C1VC2 structure. The critical phoneme was either identical (pap), dissimilar (pal), or similar (pak) to the target phoneme (/p/). The results showed increasing RTs for these three conditions with fastest RTs for the reduplicated target (as in pap), indicating that the response to the target phoneme is affected by its right context. Left context effects were studied in an analogous fashion by varying the amount of phonological similarity between the target phoneme (e.g. /p/) and a preceding critical phoneme in nonwords. The critical phoneme could be either dissimilar (/l/ in leipu) or similar (/t/ in teipu) to the target phoneme. The results showed slower RTs for the similar critical phonemes than for the dissimilar ones.

In another set of experiments Frauenfelder and Segui investigated associative context effects in lexical access to spoken words. In a first experiment faster phoneme detection times to both word-initial and word-medial targets were obtained when the target-bearing words were preceded by an associatively related word than by an unrelated one. These associative context effects suggest that subjects relied upon the lexical code in making their response. In a second experiment using word-initial targets only, no such facilitatory effect of lexical context was obtained with the same materials. The differential effect of context in the two versions of the phoneme monitoring task was interpreted with reference to task demands and their role in directing selective attention.

Marslen-Wilson and Brown continued their studies, based in Cambridge, of the relationship between word frequency and competitors in the early stages of the lexical access and selection process. If the frequency effect in spoken word recognition effect is either entirely or partially a competitor effect, then differences between High and Low Frequency items should either disappear or at least diminish when their competitor environments are controlled for - where competition is defined in terms of cohort membership. A stimulus set was therefore constructed which factorially contrasted the variables of frequency and competition. Four types of item were chosen: High Frequency items with only Low Frequency

competitors, High Frequency items with High (or higher) Frequency competitors, Low Frequency items with High Frequency competitors, and Low Frequency items with only Low (or lower) Frequency competitors. These stimuli, matched across conditions for recognition point and for measurement point, were tested in three experimental paradigms (gating, auditory lexical decision, auditory naming). With the possible exception of the isolation point measure in gating, no effect at all was found of competitor environment. High Frequency words are responded to faster than Low Frequency words, and there is no interaction with competitors.

This result suggests either that the frequency effect is late and post-perceptual, or that the competitors do not affect performance, or that the tasks used were not sensitive to the transient effects evidently involved. Current research is investigating the third of these options.

Brown returned to the Institute in April to start his dissertation research. This will focus on spoken language understanding, with an emphasis on word recognition, asking which sources of information can affect the recognition process and at what moments in time. A number of reaction-time experiments are planned on words in isolation and in context, as well as on fragments of words. An extensive search of a 72,000 entry phonetically transcribed lexical database has been completed, and a large scale gating experiment is now underway.

### 2.1.3 The Time-Course of Lexical Processing

As a listener hears more of a given word, he acquires not only more acoustic information, but also more time to process the acoustic information from earlier parts of the spoken word. Research by Zwitserlood and Schriefers aims to partial out the relative contributions of time and signal in spoken word processing, using a crossmodal priming task. Subjects heard fragments of words embedded in neutral carrier sentences (e.g., The next word is capt). In the "short" fragment condition, subjects

heard very short fragments -- usually the first two phonemes of a word (e.g., "ca", from the word captain). At the offset of this fragment a visual test word related to was flashed on a screen in front of the subjects. This test word was semantically related to the word for which the fragment was drawn (e.g. the probe SHIP after "ca"). In the "long" condition subjects heard a longer fragment (e.g.. capt), in combination with the same visual test probe (e.g.. SHIP). In the third condition, "short fragment plus silence", subjects again heard the short fragment. But this time the visual test word was seen after a time delay. The length of this delay corresponded to the difference in real time between the long and the short fragment. The subjects' task throughout was to make a lexical decision response to the visual probe.

A preliminary analysis of this experiment shows no facilitation of lexical decision in the "short" condition, but a significant facilitation in the "long" condition. In standard crossmodal priming experiments, this is interpreted as evidence that the long fragment selectively activates the word that is being heard but that the short fragment is not sufficient to do so. But there is also a significant facilitation, as large as in the "long" condition, for the "short plus silence" condition. This suggests that it is not the greater amount of acoustic information which leads to the facilitation effect, but rather the greater amount of time available to process the early part of the word.

In collaboration with Schreuder (IWTS), Dijkstra and Frauenfelder continued their research into the stage(s) of processing at which auditory and visual recognition processes first make contact. A series of experiments tried to distinguish inter-modal effects at representational and decisional levels. In a go/no-go task, subjects reacted to visual, auditory, or bimodal stimuli. The auditory target stimulus was always the sound "a:"; the visual stimulus was varied over three blocks, and was either "A" (name identity with auditory stimulus), "U" (different letter) or "\*" (symbol). The temporal relationship between visual and auditory stimuli was varied for the bimodal trials.

For each of the two SOAs and the three blocks. RT-differences between two-channel and single-channel targets were computed. Large redundant

signal effects were obtained in all three blocks when the visual and auditory stimulus were presented at the same moment in time, but when the visual stimulus preceded the auditory stimulus by 100 ms, a redundant signal effect was only found if both stimuli had the same name ("A"). This pattern of results suggests that the visual and auditory processing systems rapidly contact each other at a representational level. It may be possible to experimentally distinguish inter-modal effects taking place at representational and at decisional stages.

#### 2.1.4 Accessing Semantic and Conceptual Representations

Flores d'Arcais, together with Schreuder (IWTS) and De Vries and Glazenberg (Leiden), continued his investigation of semantic activation during word recognition and object naming. Several experiments examined the different semantic components which become available when a word or an object is recognized. D'Arcais and his collaborators were able to isolate the contribution of two different components in the process underlying object naming: a component of perceptually-based semantic information, and a more abstract, functional one. The results of the experiments on the naming of objects have provided an alternative explanation for some of the classic effects in object and word categorization studies, such as the difference in the ease of categorization of words and of objects.

In another series of experiments on context effects in word recognition (with Schreuder and de Vries), d'Arcais investigated the hypothesis that the same word has a differential activation pattern in different contexts. The targets of the experiments of this study were preceded by two primes, the first of which had the function of selecting a given semantic domain for the second prime. Consider, for example, the two following triplets (prime-prime-target) 1) cotton-wool-sheep; and 2) lamb-wool-sheep. Wool is obviously related to sheep, but in 1) the semantic domain which is likely to be activated is the domain of "materials", and in 2) the domain of "shepherd related animals". According

to a straight spread of activation type of theory, the priming effect of wool on sheep should be the same in 1) and in 2). On the other hand, if selective activation of a given semantic domain takes place, then a different priming effect of wool on sheep should take place with triplets such as 1) and 2). The experiments have shown that this second hypothesis is correct.

In a third project, d'Arcais studied the lexical access of idiomatic expressions in Italian, contrasting the access of literal versus figurative meaning. His approach to this problem starts with an analysis of the form of the semantic relation between the two meanings, in order to test the hypothesis that the ease of access of the two meanings is a function of the degree and the type of semantic similarity of the two "readings" of the idiomatic expression. The results so far support this hypothesis.

#### 2.1.5 Morphological Aspects

Friederici, Graetz, and Schriefers continued their research on the role of inflectional and derivational morphology in visual word recognition. The experiments used a lexical decision task with a repetition priming technique. In a first experiment, German adjectives and closed class items in their stem forms and in three inflected forms (e.g. gut, gut-e, gut-em, gut-es) could serve either as primes or as targets. The pattern of priming effects in this 'complete' design, where all possible combinations of a stem and its inflected forms can occur as prime-target combinations, clearly differ from the pattern of priming effects usually obtained with 'incomplete' designs where only stems function as targets, but both stems and inflected forms function as primes. In particular, a given inflected form appears to be primed less by its corresponding stem form or by a different inflected form than by identical repetition.

Supported by a grant from the DFG, Günther started a research project on the representation and processing of morphologically complex words. The first experiments, using a visual lexical decision task, concentrated upon inflectional morphology. Günther found that the large inflectional effects observable in visual lexical decision for single words are due to their occurrence in isolation: In such situations, subjects process base forms rather than inflected forms. A subsequent experiment compared homonyms where one reading is an inflected form of very high frequency, whereas the other is the base form of an infrequent different word. The results show that RT matches better to the infrequent base form controls rather than to the frequent inflected controls. This effect, however, vanishes completely if a pronominal syntactic prime is provided before the decision is made. Present research centers upon the nature of syntactic priming in visual lexical decision using different prime-target-SOA's, and the development of a 'word-and-paradigm' model for the processing of inflected word forms.

## 2.2 Syntax and Parsing

In collaboration with Marslen-Wilson and van Halen, Bayer has been investigating the (non-)configurational status of German. This can be tested by asking whether the constituent order OSV (Object, Subject, Verb) is as accessible to the processor as the SOV-order, given that the preceding discourse allows an OSV-order. The experiment had two conditions under which the accessibility of constituent order was investigated: One in which S and O are morphologically distinguishable (e.g. der Mann versus den Mann) and one in which they are not (e.g. die Frau versus die Frau). The focus of interest is in the condition in which the NPs are morphologically indistinguishable. Each item appears in four different subconditions, which allows one to factor out the influence of the preceding discourse and of its interaction with the two different constituent orders. An off-line investigation showed that when morphological clues are absent subjects strongly tend to apply an



SOV-order. Surprisingly they do so even when the preceding discourse is most naturally consistent with an OSV-reading. This suggests that German imposes a VP-node on the input stream and that this VP has to be undone in one way or the other in order to arrive at the topicalized construction.

In joint research with Torris (Paris/Cologne) Bayer has also studied the syntax and parsability of German WH-constructions involving unbounded dependencies. German is special in this respect because it offers four different ways of expressing the unbounded relation between the WH-item and the related gap. For example:

- (1) Wen glaubst Du, hat Hans gemeint, hat Maria gesehen
- (2) Wen glaubst Du, daß Hans gemeint hat, daß Maria gesehen hat
- (3) Was glaubst Du, was Hans gemeint hat, wen Maria gesehen hat
- (4) Wen glaubst Du, wen Hans gemeint hat, wen Maria gesehen hat

Was in (3) and the first two instances of wen in (4) must be analyzed as markers of question scope. Note that meinen does not subcategorize for a WH-complement. Thus, (3) and (4) are locally ill-formed, but in the larger context of the Q-scope marker they are well-formed. The psycholinguistic question is how the parser relates the WH-item to the gap. Cases like (2)-(4) - although considered marked or even dialectal - may be easier to parse than (1), because each cycle (for a potential gap location) is introduced by a special closed class element and thus explicitly marks the "edge" of the search domain.

D'Arcais and Frazier (Amherst) have been working on the comprehension of Dutch sentences, contrasting in the grammatical function of the first vs. the second NP and by the presence or absence of auxiliaries. The material used can be exemplified by the following set of sentences:

- (1) Welke bokser verslaat de kampioenen?
- (2) Welke bokser heeft de kampioenen verslagen?
- (3) Welke bokser verslaan de kampioenen?
- (4) Welke bokser hebben de kampioenen verslagen?

The test material included both grammatical sentences like these, and a set of ungrammatical sentences. These included sentences which started out similar in structure to the experimental ones, but then became ungrammatical at a given point. For example,

(5) Welche fietser namen het bospad?

The subjects' task was to make speeded ungrammaticality judgements during a rapid word-by-word presentation of the sentences.

Moving more into the domain of formal syntax, Bayer continued his work on the syntax of quantificational particles and distant quantifiers. He argues that the impossibility of having a particle inside a PP like \*mit nur dem Arzt (versus nur mit dem Arzt) cannot be related to the Case system. In negative and quantificational contexts the island effect disappears:

(1) \*weil Helene mit nur dem Arzt sprechen würde

(2) weil Helene mit nur dem Arzt nie sprechen würde

This suggests that the PP is an island for Quantifier-raising in the Logical Form component unless there is another quantifier (or some other LF-relevant element) which crosses the PP while undergoing Q-raising itself.

It also emerged from this research that the position of words like (adjoined) nur must conform to the canonical government direction of a language, given the existence of contrasts like:

(3) Nur daß Hans rauchte, hat Helene gestört

(4) \*Helene hat gestört, nur daß Hans rauchte

Assuming that German is "left governing", the contrast follows immediately from Kayne's Connectedness Theory: Since the embedded clause is an argument of the verb, nur must be able to raise to take scope over the

verb. This is only possible, however, when it is adjoined to an argument that sits on a left branch, which rules out the extraposed version in (4). From this it follows that the topicalized clause in (3) must be relocated in LF to the position at the left of the verb gestört, and that the extraposed position is a derived position. The ungrammaticality of (4) then suggests that relocation of extraposed material is not possible. The asymmetry between the two peripheral positions in (3) and (4) leads to an array of new questions, some of which may call for a parsing account.

During her visit Frazier also explored the classes needed to state generalizations about language processing and their relation to the natural classes of various grammatical frameworks. Specifically, she argued for the need to distinguish (i) constituent structure decisions from other grammatical decisions, and (ii) major syntactic category decisions from both constituent structure decisions and decisions about strict subcategorization. These processing classes, she argued, do not correspond to the natural classes of a categorial grammar. In particular, categorial grammars make no distinction between major syntactic category and subcategory (e.g. transitive verb vs. intransitive verb). Further, only a subset of constituent structure decisions are distinguished from decisions about the category of input items.

### 2.2.1 Other Research

During his three month stay at the institute, Tanenhaus (Rochester) completed an overview of psycholinguistics in which he traced the important influences in language comprehension, production, and acquisition during the last thirty years. He also completed research with Carlson (Iowa) on the comprehension of "deep" and "surface" verb-phrase anaphors. Their experiments examined the comprehension of deep and surface anaphors in cases where the antecedent either did or did not share the same syntactic form as the anaphor. This variable had different effects on the comprehension of deep and surface anaphors, suggesting that surface but not

deep anaphors access the linguistic representation of their antecedents.

### 2.3 Text and Discourse

In research on the expression and function of contrast relations (in collaboration with Spooren (Nijmegen), and Noordman and Jaspers (Brabant)) Vonk found that the expression of a contrast by means of the conjunction but had very weak effects in written discourse. Furthermore, the contrast relation expressed by but appears to be asymmetric: The sentence "The suitcase is big, but light" can easily be continued by "so it's easy to lift" and not by "so it holds a lot".

The analysis of a corpus of newspaper texts containing textual contrasts showed that the conjuncts differ not only in factors like sentence length, but also in the transition from an external point of view (first conjunct) to the writer's perspective (in the second conjunct). To investigate the effects of perspective marking, an experiment was conducted on contrast relations in sentences. The contrasting conjuncts were presented from two different external perspectives (e.g., According to A, according to B) or without any explicit marking of the perspective, and were connected either by but or by and. When and was the connective, there was no effect of the order of the conjuncts. The expression of the contrast by but appeared to be asymmetric, although this was less so if the conjuncts were expressed from different perspectives. The results suggest that marking of perspective is an important factor for the interpretation of the contrast relation even at the sentence level. At the text level the marking of the perspectives is a more important factor for the interpretation of the contrast than the marking by the contrastive conjunction but.

Garnham and Oakhill (Sussex) worked with Vonk on the interpretation of pronouns, in particular the effects of gender cue and verb bias. Earlier research by Garnham and Oakhill had produced different results from those

obtained in similar studies by Vonk. A number of differences between the studies were identified, relating primarily to the number and difficulty of the filler items and the subjects' task. A general framework was proposed within which the differences could be interpreted. In particular two aspects of pronoun interpretation were distinguished. (1) linking a pronoun to a name or some other previous description in a text. (2) linking the "thematic role" played by the referent of a pronoun to a previously introduced role. For example in:

Max confessed to Bill because he wanted a reduced sentence.

Linking he to Max can be distinguished from identifying the person who wanted a reduced sentence to the person who confessed. In many cases subjects' perception of their experimental task may lead them to be satisfied with only a "partial" interpretation of a pronoun.

Garnham (prompted by the earlier work of Levelt) investigated the use of spatial relational terms to the right of, to the left of, above, below, in front of and behind. He proposed a general framework within which the deictic and intrinsic uses of these terms could be described in the simplest possible terms. Within this framework all uses of spatial relational terms are subject to a single constraint: the framework vertical constraint, which forbids uses of those terms that are incompatible with the uses of above and below defined by the framework within which the related objects are located.

### 3. LANGUAGE ACQUISITION

The acquisition group's work focused on two domains: The ways in which the learner (child or adult) expresses certain concepts, such as time, space, or possession (3.1) and selected aspects of utterance structure, especially in interaction with discourse structure (3.2). Most of the work on second language acquisition was done within the scope of the ESF project, and section 3.3 gives a brief survey of the state of the project as a whole. After long preparation, we also started a new project on the acquisition of a creole language; first results are reported in 3.4. Finally, there were a number of smaller studies, which are briefly described in 3.5.

#### 3.1 The Expression of Possession, Time and Space

##### 3.1.1 Possession

Deutsch continued his project on "Possession in Child Language", based on the longitudinal data collected by Roger Brown and his co-workers in the United States and on the longitudinal data from the old German diaries of Clara and William Stern. The central result of a previous analysis was that the American and German children under investigation appeared to construct a form-function relationship, which did not exist in the target languages they were acquiring. They continued to use their own construction for a fairly long time in a systematic and predictable way. During the earlier phases of acquisition the children used pronominal forms like 'My', 'Mine', 'Mine's', when they wanted to claim or maintain possession of an object. In contrast, they used nominal forms (inflected or uninflected forms of their own proper names), if the function of the

utterance was to indicate that the possession is a sort of attribute of the object referred to (what Karmiloff-Smith refers to as the descriptor function). Does this form-function correspondence apply only to "self as possessor" or is it also valid for the expression of "other as possessor"?

The new results show that the children hardly ever use pronominal forms for reference to "other as possessor", so long as they were still following the form-function correspondence described above for "self as possessor". Once they had given up this self-constructed rule, they started using pronominal forms for "other as possessor". At the same time children began to use more frequently predicative constructions involving verbs of possession, while in earlier phases virtually all possessive constructions consisted of attributive phrases.

These results shed light on the question of which factors give rise to children's final approximation to the target language, as far as the acquisition of possessive constructions is concerned. First, since the disappearance of the form-function correspondence coincides with a general increase in pronominal forms for "self" and "other" as possessor, this suggests that the children are gaining insight into the deictic character of the possessive pronoun system. This insight becomes possible once children have given up their self-constructed form-function correspondence. Second, as long as children rely on attributive constructions for possession, they can make only very rough distinctions between types of possessive relations: that is, between static and dynamic relations. The acquisition of predicative constructions allows for the expression of more subtle distinctions among possessive relations. The self-constructed form-function correspondence becomes obsolete as predicative constructions enter children's language of possession.

### 3.1.2 Time

Within the broader scope of the ESF project and in cooperation with members of the various teams, Klein developed a unified framework for the analysis of spatial and temporal reference. It differs in the following

four respects from previous work on temporality and spatial relations in language acquisition:

- i. Instead of following the order in which certain morphemes crop up in the learner's language, the investigation explores how a learner (with a limited repertoire) proceeds in expressing certain temporal or spatial concepts.
- ii. Special attention is paid to how linguistic information and contextual information interact in conveying the intended meaning.
- iii. Principles of discourse organization are seen as an integral part of the expression of temporal and spatial concepts.
- iv. Essentially the same categories are used to describe both spatial and temporal reference.

The basic idea is this: There is a theme (time of some action, state, etc.. or place of some object), which has to be related with respect to some other time or place, the relatum. The relatum may be given in different ways, and the relation between theme and relatum may be different, depending on the structure of the underlying referential domain (temporal or spatial). We may plot this in a table:



	temporal reference	spatial reference
Theme (=what has to be situated)	time span occupied by some action, event, state, etc.	place occupied by some object (or more abstract entity)
Relatum (=entity, relative to which theme is situated)	other time span, e.g., time of preceding event, etc.	other place, e.g. position of speaker or other object
Relations (based on structure of referential domains)	topological (IN, PARTLY IN, IN REGION OF, (etc.); (BEFORE, AFTER) and combinations	topological (OUT, IN REGION OF, DISTANT etc.); order (ABOVE, BEHIND, etc.), and combinations

In both cases, the relatum may be given deictically or anaphorically, or else can be fully specified by a lexical noun phrase. Languages differ in the way the various components (themes, relata and relations holding between them) are encoded and, more specifically, clustered in a given word. Differences of this kind appear to be a major causal factor in the process of second language acquisition.

Hickmann and Weissenborn continued their cross-linguistic project which compares children's uses of referring expressions and of temporal/aspectual devices between the ages of four and ten years in four language groups: English, French, German, and Chinese (see previous Annual Reports). Preliminary analyses of some of the English, French, and German narratives suggest that, notwithstanding significant individual and age differences, the French- and German-speaking children seem to use fewer past verbal inflections in their narratives than the English-speaking children. This may be because the French and German systems of verbal inflection encourage children to use the nonpast -- where aspect is

unmarked -- in contrast to the English system where aspectual distinctions are formally marked both in the past and nonpast. Case-studies of the narratives in Chinese (where there is no verbal morphology) show a reliance on several means for temporal/aspectual marking, including some uses of connectives, adverbials, particles, and the frequent uses of "resultative" constructions already at 4-5 years (e.g., feil-qi2-lai2 'fly-rise-come' or pa2-dao4 'climb-reach').

### 3.1.3 Space

Bowerman, together with Gentner (Illinois), continued work on a cross-linguistic project begun in 1985 on the relationship between conceptual and semantic development in first language acquisition (see 1985 Annual Report for general description). The overall goals of this project are (1) to learn more about the origins of the early concepts children associate with relational words (specifically, to determine the relative contribution to early concept formation of nonlinguistic cognitive development vs. exposure to the distribution of linguistic forms in adult speech), and (2) to determine how children's early relational concepts, however they arise, are gradually transformed through (further) linguistic experience into the language-specific set of meanings associated with the morphemes in a given semantic domain.

Research in 1986 concentrated on the acquisition of the concepts required for certain spatial prepositions in Dutch and English--languages which, although closely related, show some striking differences in the way spatial configurations are categorized for purposes of selecting the conventionally appropriate preposition. Sixty Dutch children between 2 and 6 years old were interviewed in a naturalistic play situation involving a dollhouse and other toys. Objects were shown in spatial configurations that adult Dutch speakers would describe with either op "on", aan "on", om "on, around", or in "in". The children were encouraged to talk about where target objects in these configurations were located (e.g., "Where's the mirror?" "aan the wall"). Responses were elicited for eight exemplars of

each spatial relation. The exemplars were varied to allow examination of the roles of both representativeness and familiarity in the process of acquiring spatial terms. For each preposition, two exemplars were considered prototypical (from the adult point of view) of the spatial relation encoded by the preposition: (e.g., for OP: objects on a horizontal supporting surface; for AAN: objects hanging from something) and the rest were less representative (e.g., a bandaid OP a doll's leg; a handle AAN a pan). Of the prototypical exemplars for a category, one involved objects frequently encountered in the configuration shown, and presumably talked about by adults to children (e.g., cookie OP a plate), and the other involved objects rarely encountered in the configuration (e.g., (toy) dog OP a book).

A full analysis, that permits the questions posed above to be tackled, awaits data from 60 English-speaking children now being tested with the same materials. Analysis of the Dutch data alone suggests certain preliminary conclusions. "In" relationships were considerably easier than the other spatial relationships. They were dealt with relatively successfully by even the youngest children, and even the most difficult exemplars (e.g., an apple IN a (2-dimensional) ring) were described with the appropriate preposition more frequently than were the easiest OM and AAN exemplars; OP exemplars were intermediate in difficulty. This suggests that children may achieve a relatively abstract notion of "containment" early, without special help from linguistic input, whereas constructing the other categories, especially AAN (roughly, hanging or other attachment to a fixed point), is an extended process that is probably more dependent on language. In general, children's knowledge of the correct preposition was not related to the familiarity of the examples, which suggests that children generalize from the start, rather than learning prepositions first in highly context-bound situations. The effect of prototypicality was complex, but, in general, more pronounced for the older than the younger children, which indicates that in this semantic domain a sense of prototypicality may be the outcome of an extended learning process rather than a nonlinguistic "given" which guides semantic development from the beginning.

To properly understand the task of the child acquiring the categories

associated with the spatial terms of any given language, it is necessary to know the extent and nature of cross-linguistic variation in the partitioning of this semantic domain. To supplement the little information that is available, Bowerman has, in addition to the experimental work described above, conducted in-depth interviews with adult speakers of German, Dutch, Spanish, Polish, Hebrew, French, Chinese, Japanese, and Hungarian in order to determine how these languages classify spatial configurations in the rich subdomain of "containment", "contact" and "support" (covered by English "in" and especially "on"). In this work, she consulted extensively with Talmy who brought to his stay at the institute his expertise on linguistic analysis of spatial expressions.

Weeks continued work on her University of Kansas dissertation, which is a cross-linguistic comparison of Dutch, English, and Spanish children's early expression of motion and location. The theoretical question is whether current claims about a universal semantic basis for the acquisition of grammar (e.g., by Slobin) can be supported. Longitudinal data spanning more than two years were collected on two Dutch children's language development. During 1986, the transcription of these data was completed. The English and Spanish data have already been collected and are available at the institute and from Universidad Autonoma de Madrid respectively. Development of software for analyses of naturalistic language data was also begun.

### 3.2 Utterance Structure and Discourse Structure

Klein and v. Stutterheim have worked on properties of discourse structure and referential movement. In a coherent text, the information to be expressed is distributed over a series of utterances, rather than being projected into one utterance. This is not done at random; it is a consequence of the fact that the text is intended to answer an - implicit or explicit - question, the quaestio of the text, such as "What happened to

you yesterday?", "How do I get from here to the Ebertplatz?" or "Why should I get married?". The quaestio divides all utterances of the text into those which belong to its foreground or main structure (i.e. those which are consistent with (partial) answers to the quaestio) and those which constitute its background or side structures (all others). It determines, at least in part, the topic-focus structure of foreground utterances, and it constrains the way in which the information proceeds from one utterance to the next -- i.e. the given-new structure of successive utterances.

This "referential movement" concerns various domains of reference, such as persons involved, time and space. It has been mainly studied for person reference, under labels such as "introduction and maintenance of reference", "topic continuity" etc. But it also holds for temporal reference. In a narrative, for example, the main structure is the temporally ordered plot line. More precisely, the main structure of a narrative may be characterized by two conditions which constrain the referential movement, especially with respect to temporal features, and which define, for each of the subsequent utterances, what is topic information, and what is focus information. These conditions can be stated as follows:

Focus condition: Each utterance specifies a singular event  
falls in a time span  $t_1$  on the real time  
axis, its topic time.

Topic condition: The topic time of the first utterance is explicitly introduced (unless contextually given); all subsequent ones follow chronologically

Both conditions may be violated. This leads to side structures of various types, depending on the kind of violation. For example, an utterance may serve to specify a time interval in explicit terms, rather than have it given by the topic conditions. Typical examples are "background clauses" such as "We are quietly sitting in the garden". Very often, subordinate temporal clauses serve exactly this function, and this is why they belong to the background.

Other utterances do not violate the topic condition, but they do not specify an event, as required by the focus condition: typical examples are comments, evaluations or state descriptions.

Within the ESF project, Perdue (with Deulofeu, Provence) continued work, now from a longitudinal perspective, on the characterization of the linguistic repertoire of adult acquirers, and how their repertoire is used in solving complex verbal tasks.

Data from a film re-telling task conducted three times, at approximately ten month intervals, with 2 Moroccan and 2 Latin American learners, were analysed using the framework developed in Klein and Perdue, 1985 (see 1985 Annual Report). Two possible factors determining the development of the learners' repertoire were examined: the communicative requirements of the task itself and source language influence.

In an earlier study, Klein and Perdue (1985) had observed a strong tendency for learners to place in pre-verbal position the NP whose referent "controls", or intends to control, the action or process described in foregrounded utterances. This tendency was prevalent throughout in the production of all the learners in this new study, yielding the same basic pattern as before for the major constituents of such utterances, namely:

$$NP_1 \quad V \quad ((\text{Prep}) \quad NP_2)$$

where  $NP_1$  is the "controller". Some exceptions to this pattern will be described below.

A major communicative requirement for the learners in this retelling task was to maintain reference to one or the other of two main characters, who are typically chosen to be "controllers" of the actions they are involved in. Pronominalization phenomena across utterances seem first to occur in answer to this requirement, and are therefore initially restricted to human referents in  $NP_1$  position. Pronominalization for  $NP_2$  occurs later, for Latin American learners only, and again involves maintaining reference to humans before inanimates. As a result, forms approximating to the L2 clitic dative lui appear earlier than accusative le/la for "dative" verbs such as préparer, demander. The broader development of pronoun use

by Latin American learners, and the restricted development (in one case, the non-development) of anaphoric pronoun use by Moroccan learners, may be due to the greater or lesser facilitation of the corresponding Spanish and Moroccan systems respectively.

When the retelling requires the specification of one of a number of characters who could potentially form (given previous discourse) part of the topic of an utterance, some informants had recourse to an "antitopic" structure - V NP NP - as a disambiguation device, which constitutes one class of exceptions to the basic utterance pattern: e.g. volé le pain la FILLE ("stole the bread the GIRL" = the GIRL stole the bread). This structure was "grammaticalized" later on by Latin American informants - elle a volé le pain la fille - whereas it remained unchanged in the production of Moroccan informants.

The other main class of exceptions to the basic utterance pattern includes some uses of the "presentationals" - (Adv) V NP - observed by Klein & Perdue: arrive charlot ("arrives Charlie"); à côté est un garçon (nearby is a boy), and of verbs of locomotion. The exceptional pattern seems to function to mark an "unexpected event" - a rupture in the expected flow of events - and conforms to a tendency all learners have to develop means to mark explicitly a rupture in the referential domains (Klein and v. Stutterheim) of time, space, protagonist and action. Further research is needed to determine the precise distribution of such markings.

During his stay at the Institute, Jordens investigated the acquisition of verb categories and word order in Dutch and German both as first and second languages. In L1 Dutch and German there is an initial stage in which the finite verb in second position and the non-finite verb in final position constitute two different verb classes. The acquisition of finiteness as a morphological feature is a crucial development in the acquisition of word order rules. It enables learners to acquire the relation between verbal forms in second and final position and it is also a prerequisite for the acquisition of the modal verb category.

For adults, L2 acquisition depends on the perceived distance between L1 and L2, with either the L1 structure or the canonical sentence form forming the starting point for the acquisition process. For L2 learners of

German, with L1 Spanish, Italian and Portuguese, restructuring from SVO to SOV is an essential developmental process. In the L2 German of native speakers of English the canonical sentence structure is used in embedded clauses, as is the case in L1 English. Evidence for this are errors such as weil er ist falsch gefahren, 'because he is the wrong way driven'. Another L1-based problem for English learners of German is the acquisition of inversion.

Differences between L1 and L2 acquisition are mainly due to the fact that children have to acquire linguistic concepts such as 'finite verb' and 'embedded clause', whereas adults do not. On the other hand, although adults already have these notions, they are inclined to use them as they would in their L1. However, they will only do so if L1 and L2 are seen as typologically related.

### 3.3 The ESF Project

The ESF study of language acquisition is now in its final year (a full description of the project is given in the 1981 Annual Report). It has generated large sets of highly comparable, cross-linguistic data: the main data base consists of transcriptions of recorded encounters with forty guest workers, each of whom was interviewed about twenty times over a two and a half year period. These data, together with data from smaller cross-sectional studies, are to form a "European Second Language Data Base" under the joint auspices of MPI and the ESF, which, it is hoped, will serve as a resource for new co-ordinated European research.

At the 1986 meeting of the project's Steering Committee, general agreement was reached on the planning and structure of the final reports to the ESF, to be submitted in the summer of 1987. These are: "Processes of Understanding", "Feedback", "Aspects of the Developing Lexicon", "Temporal Reference", "Spatial Reference" and "Arranging Words in Utterances", together with the 'Control Group' study, designed to measure the effects that systematic observation may have had on the language acquisition of the



longitudinal informants (see 1985 Annual Report).

Members of the Institute co-operated in the research effort for temporal and spatial reference (Klein, see 3.1.2), utterance structure (Perdue, see 3.2) and in the control group study, where Edwards and Levelt took up the issue of the "observer effect". Guest workers are normally socially isolated from native speakers of the language they are acquiring in the host country. The native speakers interact with them mostly for official reasons, minimizing contact and sometimes using highly simplified, non-standard syntax (Foreigner Talk). In contrast, the guest workers who served as "longitudinal informants" in the ESF project were visited every month for over two years by project researchers, who expressed interest in their opinions, helped them with problems they were facing with authorities, etc., and spoke with them normally and at length in the language to be acquired. To ensure the generalizability (or determine the limitations) of the ESF results to the guest worker population as a whole, Edwards and Levelt are comparing the longitudinal data with data from "control informants". These are guest workers who were interviewed in similar ways to the longitudinals, but much less frequently (only 3 times during the entire ESF project instead of every month). Preliminary findings suggest a difference in strategy adopted in approaching the tasks they were given, which might reflect differences in degree of practice with the task or ego-involvement with the task. But there is no evidence to suggest significant differences between control and longitudinal informants in terms of their lexical or syntactic repertoire.

### 3.4 Creolization

The first phase of the project "A sociolinguistic study of child language acquisition, creolization and language change in Tok Pisin (New Guinea Pidgin)" was completed. Romaine and Wright did fieldwork in rural and urban areas of Morobe Papua New Guinea in February-May. The purpose of the project is to examine children's acquisition of Tok Pisin, an

English-based pidgin spoken in Papua New Guinea, which is currently undergoing nativization.

At the moment there is a multiplicity of situations in which children are exposed to Tok Pisin. In urban centres such as Lae, it may be the first learned and nearly sole language of the child in early years. In other areas, it may be first learned along with another local language or learned later in adolescence in addition to a local village language. A major aim of the research is to look at the comparative effects of the processes of rural and urban creolization on children's language development.

The Papua New Guinea University of Technology provided a base and facilities for the first stage of the research in and around Lae. A total of 74 children were interviewed at Taraka Community School, which has over 800 pupils and is the largest school in Papua New Guinea. Work was also done in Lae with a group of 12 children from the school whose parents lived on the university campus. Three brief additional field trips were made outside Lae, one of which was to Indage, a village in the Kabwum District of Morobe Province. A total of 35 children (mostly second language speakers) were interviewed at Indagen Community School and stories collected from an additional 12. A second field trip was made to Bulolo, a smaller town in Morobe province. 18 children were interviewed in Hompiri Community School and a further visit was arranged for 1987. A visit was also made to Aseki, a village at the southwestern end of Morobe Province.

Analysis at the moment is concentrating on the preparation of a concordance for all the texts collected. Among the features to be examined are tense, mood and aspect markers such as bai, save, pinis, bin. There are also plans to look at a number of narrative devices, e.g. the frames used to introduce reported speech, the discourse markers tasol and orait.

Among the theoretical questions to be addressed is how significant a process creolization is in terms of the evolution of human language. Preliminary analysis of the results for the future marker bai for two areas has revealed findings contrary to predictions made by a number of creolists. The phonologically reduced form of the clause initial adverbial baimbai. bai has not shifted to preverbal position in urban areas e.g. bai mi go/mi bai go. The shift is well advanced only in rural areas, where the

Tok Pisin is used as a second language. Thus, there is no evidence to indicate that creolization and/or urbanization is associated with the incorporation of tense markers into the verb phrase in preverbal position. We have also done a preliminary analysis of morphological condensation among urban children's speech, which gives rise to such allegro forms as disla [<dispela-'this/that'] and lap [<long hap-'over there']. These forms result from the greater speed and fluency with which urban children use the language.

### 3.5 Other Projects

3.5.1 Weissenborn started six longitudinal studies in first language acquisition with two French speaking, two German speaking, and two German-French bilingual children beginning at about age 1;7. All children are recorded by their parents. Five are videotaped, one is audiotaped. The aim of these studies is twofold: The first goal is to provide the study of first language acquisition in German and French with a much needed larger data base. The second is to use these data as input for comprehensive cross-linguistic studies of the development of early syntax.

3.5.2 Hickmann extended her research on reported speech in children's narratives (see previous Annual Reports). A first study -- in collaboration with Bassano and Champaud (Paris) -- examines French children's uses of verbs of saying and of propositional attitude verbs (particularly croire 'to think/believe' and savoir 'to know') when reporting dialogues. Video films were prepared in which the speaker referred to an action with targets of three types: (1) simple assertion: e.g., "C'est le chat qui a renversé la tasse" ('it's the cat who spilled the cup'); (2) "attitude context": e.g., "Je crois que c'est le chat qui a renversé la tasse" ('I think it's the cat who spilled the cup'); (3)

"perhaps-type modality": e.g., "C'est peut-être le chat qui a renversé la tasse" ('It's perhaps the cat who spilled the cup'). After viewing each film, children between four and eight years were asked to narrate the story to a "naive" listener (not present during film presentation) and to answer some systematic questions concerning the appropriateness of the target sentences in relation to the background knowledge of the interlocutors in the stories. The transcription of the data is in progress.

3.5.3 Sinha collected data for a pilot comparative study of narrative discourse production in children with developmental language disorders and delays and linguistically normally developing children. This is a joint project with Paprotté, Münster (see 1985 Annual Report). Data collection was completed for a comparative naturalistic observational study of communicative development in deaf and hearing pre-school children.

3.5.4 Xu has begun analysis of data about the acquisition of personal pronouns by Chinese children (from 2 to 4 years old) in comparison with some features of English speaking children. Part of the English data was collected by Marilyn Shatz (Michigan), with whom Xu had cooperated on a cross-linguistic pronoun study in the US. Some correlations were found between morphological complexity and the relative ease of pronoun acquisition.

3.5.5 Roche completed his dissertation on German speakers' linguistic adaptations towards foreign guest workers in naturalistic settings. The native speakers' special language for talking to foreigners ('xenolect') can be characterized by four different levels of grammatical changes in utterances (see 1985 Annual Report). The realization of a given utterance type is mainly dependent on its pragmatic function in a text. Thus the

main scaffolding of the message usually shows the strongest compression with the strongest structural changes in utterances. Other utterances that are attached to the main scaffolding are generally realized in less compressed forms. This is true for evaluations, comments, metacommunicative insertions, reflective speech and asides. These findings are in accordance with a minimal effort principle for the xenolect speaker. Switching into the xenolect can be seen as an anticipation of the needs of the addressee, not as a means to stigmatize the foreigner.

3.5.6 During her five month visit, Silva-Corvalan worked on two projects, one dealing with the expression of modality in the speech of monolingual and bilingual Spanish speakers, and the other with the question of the attrition of Spanish as a language secondary to English in a situation of societal bilingualism.

In regards to modality, Silva-Corvalan showed that an approach which goes beyond a level of underlying meaning (e.g. by interaction of pragmatics with verb morphology), adequately captures the relationship between underlying and contextual meanings of modals. Examination of bilingual speech showed that any simplification of verb morphology which was not compensated for by lexical means had the effect of reducing bilinguals' stylistic choices in the encoding of discourse about hypothetical situations.

The analysis of speech samples from fourteen Spanish-English bilinguals with different levels of Spanish proficiency evidenced stages of simplification of the 'tense-mood-aspect' system of this language. Across three generations of speakers, this system changes in a remarkably regular manner, conforming at all stages to the predictable development of what could be considered a least grammaticalized system within the constraints posed by universal grammar.

## 4. LANGUAGE DISORDERS

### 4.1 The New Aphasia Project

In early 1986, the Aphasia Working Group delivered a proposal to ZWO applying for a continuation of financial support for the next 5 years. This proposal has now been funded. In the proposal, the group developed at some length the research framework shared by the individual members as well as the divergencies within the group. In the following paragraphs a brief outline of the guiding ideas will be given. As in the first phase of the project, the research will be focused on grammatical disturbances. The specific hypotheses and questions are centered around two points:

- (a) The relation between the underlying deficit and the observed behaviour of the aphasic patients
- (b) The nature of the underlying deficit.

With respect to point (a), there is a general agreement that the relationship between the deficit and its observable manifestation is non-transparent, due to the intervention of compensatory/adaptive strategies. It remains to be shown how far-reaching this non-transparency is.

Two hypotheses should be mentioned. According to the first and weaker hypothesis, the language-module feeds its output into the general cognitive system where it is integrated and aligned with the general knowledge. If the language-module is disturbed and provides the general cognitive system only with deficient and distorted sentence representations, the general cognitive system must activate compensatory strategies in order to restore the output of the language-module or to make the best of this insufficient output. Most notably, it seems to make use of metalinguistic

generalizations such as "The first NP denotes the agent", as demonstrated for Broca-patients by Heeschen, Hagoort and Blomert (see previous Annual Reports).

According to this view, the aphasic patient has no choice with respect to the compensatory-adaptive strategies. Which one is applied is an inevitable function of the specific deficiencies of the output of the language module - an assumption which coincides with the assumption that the different types of aphasics - most notably, agrammatics versus paragrammatics - use different adaptive strategies. (This hypothesis is primarily defended by Friederici.)

A second and more radical hypothesis assumes that adaptation takes place within the language processing system (see Annual Report 1985). It consists of recruiting a special subsystem which - by hypothesis - is preserved in most agrammatic patients. This special subsystem is the formulation apparatus for elliptic speech which is frequently used by normals, too, in special pragmatic conditions. Whether or not to use this substituting system is optional to the patient. He can consciously decide if and when he uses it. (This hypothesis is primarily defended by Kolk and Heeschen.) There are several possibilities with respect to the origin of elliptic speech. According to one view, the message is made elliptic before it is sent to the formulation system. According to another one, the message is fully specified, but is then sent to either the major formulation system or to the special elliptic-speech-formulator.

The question remains why some patients adapt and others do not. In particular, why are some patients (the majority of agrammatics) so concerned about their deficiencies that they escape from trouble by resorting to elliptic speech, and why are other patients (the majority of paragrammatics) apparently unconcerned by their grammatical deficiencies and simply go on using the major formulation system irrespective of the errors they make. This raises questions about emotional attitudes and postmorbidity personality traits, which will be a major target of research over the next five years.

With respect to point (b). the underlying deficit must be characterized in terms of parameters which allow for degrees of severity of impairment. As a result of previous research. three options concerning the nature of the underlying deficit should be considered.

Instead of a loss of the automatic fast special access route to the syntactic information of closed class elements. the deficit may simply be a function of decreased speed. Furthermore. the fast access route may not only be affected for the retrieval of syntactic information from closed class items. but for syntactic information in general. According to this view. which is proposed by Friederici. the difference between agrammatic Broca's aphasics and paragrammatic Wernicke's aphasics derives from very different underlying deficits.

According to the two other options. agrammatics and paragrammatics have the same underlying deficit which manifests itself in a different way due to different modes of adaptation. Heeschen hypothesizes that in aphasia the neuronal systems controlling language processing become unreliable to a critical extent. such that the overt behaviour of the patient tends to become random. depending on the amount of "noise" in the system. It is predicted that intra-individual fluctuation will increase as a function of the overall severity of the disturbance. Kolk. on the other hand. characterizes the underlying deficit as a form of temporal disintegration. i.e. a narrowing down of the window available for computational simultaneity in sentence processing. This may be due to premature decay of activated elements which still have to be used in processing steps later on. It may also be due to a delayed activation of elements. The consequence in either case is that some elements will not be available precisely at the time when they are needed (see 4.3.5 below).



## 4.2 Clinical Application

It is appropriate to mention here the future prospects for the Everyday Language Test. Blomert, Koster, v. Mier and Kean completed the "Alledaagse Taalvaardigheidstest" (ATT) in 1986 (see previous Annual Reports). Several clinics have now expressed interest in using the ATT as part of their therapy program. To do this, a standardization procedure must first be carried out to obtain norms for aphasics which would make the ATT a reliable tool for clinical use. Starting in 1987, a project sponsored by the Preventie Fonds will standardize the ATT on a large population of aphasic patients and prepare the test for use by clinics in the future.

## 4.3 Ongoing Research

### 4.3.1 The Ellipsis Hypothesis

Kolk and Heeschen hypothesize that the telegraphic speech of agrammatics is identical to normal elliptic speech and that it is, in this respect, correct. To evaluate this hypothesis, Heeschen analysed a large corpus of the spontaneous speech of agrammatic and paragrammatic patients. The corpus consisted of very informal and relaxed conversations with the patients, some of which lasted for an hour or more. This mass of data allowed a statistically sound evaluation of individual patients and not just comparison of groups. Three major points emerged from this study:

- (a) The adaptation process was previously described as the omission of troublesome elements and a subsequent reorganization of the utterance. This view required the apparently problematic assumption that the formulation system can "intelligently look forwards", that is: it knows beforehand where problems may arise. New support for this

assumption comes from the current study: three German telegraphic speakers omitted prepositions in an "intelligent" way. Prepositions were omitted if they required overt case marking on the following element. e.g. "in der Schweiz" (in the Switzerland) becomes "Schweiz", while "in Österreich" (in Austria) remained as it is. These tendencies could be demonstrated as significant in three patients; no other patient out of a total of 15 telegraphic speakers yielded counterevidence: they either omitted all prepositions or used them always (and always correctly). These findings suggest the possibility of control loops within the formulation system, although this has until now been modelled predominantly as a completely unidirectional system.

- (b) The avoidance of verb inflection is a leading symptom of telegraphic speech; it leads to the construction Subj. + Inf. Such a construction, however, is ungrammatical in German, especially when the subject is a thematic ich. In fact, the telegraphic speakers in the current study almost never used this construction. One typical telegraphic speaker, for example, omitted the "ich" 18 times and used it only 4 times - and two of these latter uses were not totally illegal.
- (c) The hypothesis that telegraphic speech is correct speech may be trivialized by the fact that omitted parts of speech cannot be incorrect. It might also be argued that if there is a special elliptic formulation route, then this route could in principle also be disrupted by brain damage. Thus, for methodological justification, it was vital to find at least a few patients who made a substantial number of omissions without arriving at correct elliptic speech. Heeschen found two paragrammatic Wernicke-patients who exhibited a high portion of omissions, in addition to their paragrammatic substitutions. However, almost all of these omissions made the utterance ungrammatical, even as an elliptic utterance. For example:

"ich weiß immer, was Wetter ist"

I know always what weather is

Here a "für" (for) between "was" and "Wetter" is lacking.

Furthermore, these two patients did not obey the "final position" rule for uninflected verbs, producing, for example:

"ich sprechen das alles"

I speak(inf) that all

The following comparison is quite suggestive: A typical telegraphic speaker showed 17 occurrences of the infinitive in (correct) final position and only 3 in (wrong) non-final position, while one of the two paragrammatics showed a ratio 9/11. It is also significant that the two paragrammatic omitters felt vexed and tortured by their errors and were very concerned about their language problems. This is not typical for Wernicke-patients (see above). By omission, they obviously try to facilitate the utterance production, which however, does not lead to elliptic speech. It could be argued that in these cases both the normal and the elliptic formulation systems are disrupted.

#### 4.3.2 Open versus Closed Class Again

Graetz, Friederici and Schriefers pursued the issue of syndrome specific deficits in aphasia. A priming technique was used to investigate the aphasics' ability to access inflected open class words, in this case adjectives and inflected closed class words (demonstratives, possessives and quantifiers). The experiment included three different priming conditions: the prime was (1) the word stem, (2) word stem plus inflection -g, or (3) word stem plus inflection -g-. In all three conditions the target was the word stem. Reaction time data and error data from eight German-speaking agrammatic patients, seven paragrammatic patients and nine

normal controls were analyzed. Reaction-time data indicated a larger priming effect for adjectives than for function words in normal and paragrammatic subjects, but not in agrammatics. For this group the facilitation effect was equally strong for both word classes, suggesting that these patients treat the two word types similarly during lexical access. The error analysis supports what the reaction-time data had already shown, namely that normals and paragrammatics process morphologically complex words less easily when the inflectional suffix is infrequent. Error analysis shows that this effect is much more marked when the infrequent inflection is part of an open class word than when it is part of a closed class word, leading to the assumption that normal and paragrammatic subjects decompose inflected open class words, but not inflected function words. Agrammatics, in contrast, showed equally high error rates for inflected words of either class. They seem to have lost the fast holistic access route to the elements of the closed class. This fast access route is assumed to be a necessary condition for adequate syntactic parsing.

#### 4.3.3 Prosodic Investigations

Research on fundamental frequency and psychological stress in agrammatic patients by Heeschen, Ryalls and Hagoort was continued (see previous Annual Reports). In earlier research they showed that the speech of Broca patients can show a higher fundamental frequency (F0) than the speech of Wernicke patients. This higher F0 was interpreted as an indicator of the higher amount of psychological stress which Broca patients experience in the experimental situation, where they have to give up their telegraphic speech and use closed-class elements in complete sentences. In a follow-up study, Ryalls and Hagoort measured the F0 of the 'trouble spots' in the elicited speech of agrammatic patients. Trouble spots are those parts of the utterance where the patient clearly shows his inability to form a complete grammatical utterance, e.g. by restarting, repetition of the same element, breaking off. Preliminary analysis suggests that

these trouble spots do not show a higher fundamental frequency than the overall F0 of the utterance. If level of stress is reflected in an increase of the fundamental frequency, then this only shows up in global measurements.

Hagoort and Ryalls also conducted an experiment in which agrammatic patients and normal control subjects had to read newspaper-headlines. These headlines were either complete sentences, correct elliptical expressions or incorrect elliptical expressions. A preliminary analysis of the speech tokens of the agrammatic patients showed a significant increase in the normally low amplitude of closed class elements. Agrammatic patients seem to highlight the closed class elements that they use by increasing their amplitude.

#### 4.3.4 Adaptation and the Production/Comprehension Issue

Friederici based her ideas about adaptation mainly on comprehension data, while Kolk and Heeschen used primarily production data. Adaptation is a "shift of behavioral control" in Kolk's and Heeschen's view; an equivalent for adaptation in comprehension must be something like "shift of focus of attention". Grötzbach in connection with his PhD-project continued his research on agrammatic aphasics' language comprehension abilities and conducted a sentence-picture matching experiment to determine what syntactic information is used by German agrammatics in sentence comprehension. Reversible active and passive sentences were cut into three fragments of increasing size: in active sentences the first fragment consisted of the first (definite) NP of a sentence (e.g. "der Mann"), the second fragment comprised the first NP plus the verb (e.g. "der Mann weckt"), and the third fragment consisted of the whole sentence (e.g. "der Mann weckt den Jungen"). The fragmentation of passive sentences was analogous, with the exception of the second fragment which consisted of the first NP plus the auxiliary (e.g. "der Junge/wird/von dem Mann geweckt": slashes indicate fragment boundaries). The patients' task was to choose between two pictures with respect to segment 1, then to segments 1+2

and then to segments 1+2+3. In each case, the "ambiguity" disappears with the presentation of segment 2.

The results for active sentences showed that agrammatic aphasics' performance significantly improved as soon as the second fragment (i.e. the verb) was presented. The additional information carried by the third fragment only slightly improved sentence comprehension. A similar pattern of results was obtained for paragrammatic aphasics. Agrammatics' performance on passive sentences was relatively poor when the first and second fragment was presented. However, their performance significantly increased with the presentation of the third fragment. In contrast, paragrammatic aphasics' sentence comprehension was already above chance level with the presentation of the second fragment.

The results indicate that paragrammatic aphasics' performance is relatively good as soon as syntactic information is available which unambiguously determines sentence meaning. The same interpretation applies to agrammatic aphasics' performance on active sentences. In passive sentences, however, agrammatic aphasics are unable to utilize the information provided by the auxiliary, and they need the additional (redundant) information of the third fragment for sentence comprehension. Whether they are unable to use the information contained by the auxiliary or whether they simply neglect it (shift of focus of attention) is to be clarified by further investigations.

#### 4.3.5 Temporal Disintegration in Aphasia

Hagoort started his dissertation research which focuses on the temporal aspects of language processing in aphasic patients. This research tests the hypothesis that the aphasic language system suffers from either slowed activation or faster decay of certain types of information which are necessary to map the speech signal onto higher levels of representation. For this mapping to be successful, some temporal simultaneity of the information units in computational space is needed. Reduction of the 'temporal window' will lead to disintegration of the sentence

representation when constructions exceed the window. Both slower activation and faster decay rates of informative units will have the effect of reducing the 'temporal window'.

A series of experiments is planned in which patients will hear sentences in which the time-distance between elements that have to be structurally related (e.g. subject and verb) is varied. Before (in case of slowed activation) or after (in case of faster decay) a certain time-distance, the effect of violations of these structural relations (e.g. violation of subject-verb agreement) seen in on-line measures (e.g. monitoring latencies) will disappear, with different patterns of results for Broca's and Wernicke's aphasics, and for normal controls.

#### 4.3.6 Aphasic Disorders and Linguistic Theory

Bayer continued joint work with de Bleser (Aachen) on syntax and morphology in agrammatism and transcortical aphasia and on lexical structures in a case of deep dyslexia.

There is converging evidence now that agrammatics are able to construct local syntactic representations, e.g. by means of projecting rich lexical information about case, thematic structure, strict subcategorization etc. into X'-structures. It seems to be a function of the severity of the disturbance how expanded the X'-structures can be. They can reach from zero (i.e. one word agrammatism) to binary branching expressions like (den) Kuchen essen to full-fledged simple transitive sentences involving finite verb morphology. The interesting question, however, is at which point the agrammatic processor collapses. The abundant use of coordinative constructions suggests that linguistic structure is crucially involved. What was found is that the agrammatic patients under investigation have difficulties both in processing expanded phrase structures and in processing "derived" structures like topicalized sentences, marked (transformed?) constituent orders etc. A suggestive example is that ditransitive sentences like

(1) Der Vater gibt d(en) Schlüssel d(em) Sohn  
The father gives the key (to)the son

(where the patient had to supply the inflected article) were made into

(2) Der Vater gibt den Schlüssel des Sohnes  
The father gives the key (of)the son

i.e. the outer object is converted into a part of the inner object. It is clear that in (2) the dependency between the verb and the Dative-NP is avoided and that the purely local dependency between the two NPs is chosen, each subpart of the construction forming a legal syntagm.

In collaboration with de Bleser, Bayer has further investigated a case of deep dyslexia (see 1985 Annual Report). There is evidence now that the patient under investigation shows a sharp discrepancy between her abilities to interpret written common nouns (with semantic paralexias) and her inability to read proper names. What seems to count is that the word in question has an intension, i.e. semantic (associative) content. Proper names obviously do not have intensions. They refer directly, not via intensions. The results converge with the Kripkean theory according to which proper names are "rigid designators". The little content which surnames have is properly identified by the patient, namely whether the name refers to a male or to a female.



## OTHER ACTIVITIES 1986

### 1. Activities of the Technical Group

The primary activity of the TG in 1986 was to re-install in the new building all the existing experimental setups. This included the eye movement lab, the gesture lab, the speech lab, the group experiment room, various other experimental setups, and the video studio. In parallel to this, some new developments were also initiated.

The eye movement lab is now controlled by a dedicated PDP11/73: it uses a new vector oriented graphic processor to generate the stimuli, and the entire mechanical setup has been redesigned. Analysis of data can now be done on both the PDP and the VAX, since the PDP is connected via DECNET/Ethernet which allows fast data transfers. First steps have been made in the development of DBMS-tools to facilitate the analysis of large data sets.

The speech lab has been redesigned and reconstructed from scratch. Taking as a starting-point the LVS-software from IPO and the Brown University BLISS package, a user-friendly, multi-user speech editing, analysing, manipulating, and resynthesizing system has been implemented on a VAX computer. An advanced mouse-driven user interface for all waveform editing purposes has been installed. Electronic modules have been built which allow speech signals to be transmitted to up to five remote terminals for editing and analysis.

For the group experiment room a set of small handheld micros have been connected as slave systems to the controlling PDP. This makes possible the direct input of subjects' responses in a gating experiment. A DBMS application is under development to provide automatic analysis of the resulting data. This will be finished in early 1987.

Another MicroMax has been added to the set of experimental systems used for out-of-house experiments under computer control. The MPI now has a completely new video studio with several remote controllable video

cameras so that complex interactions can be recorded. The number of portable videosets has been increased to provide better support for the different projects working in the field. The ORACLE DBMS has been acquired and a dedicated MicroVAX has been installed for institute data-base activities. Some applications have already been implemented with problem oriented interfaces. Especially heavy use has been made of a first prototype of the lexical DB. The TG organized several SQL-training seminars, on the assumption that scientists collecting complexly structured data will have to learn to use this kind of algebraic, non-procedural query language.

The MPI now has a local area network based on DECNET/Ethernet with 5 VAX-computers (2 MicroVAXes are from the CELEX project), 4 PDP's, and 12 Terminal servers. Nearly all employees now have either a PC or a terminal on their desk, connected via the terminal servers with the computers in a very flexible way. Printers are also hooked up via terminal servers so that they can be accessed from all VAXes. Via a glass-fiber cable link the MPI is now also connected to the University LAN, and the Dutch research network. In addition the MPI users can now be addressed directly via EARN (@HNYMPI51).

## 2. Annual Conference

A conference on "Lexical Representation and Process", organised by Marslen-Wilson, Frauenfelder, and Schreuder (IWTS), was held in Nijmegen from June 30th - July 3rd. This was organised as a series of lectures, open to the general academic public, in order to mark the move of the Institute to its new building.

The goal of the conference was to develop a multi-disciplinary perspective on lexical representations (phonological, syntactic, and semantic) and the on-line process of language comprehension. The first day of the conference focused on the basic mechanisms of lexical access and selection, discussed from the standpoints of spoken and written language comprehension, and of language production. The speakers here included Marslen-Wilson, Cutler, Seidenberg, Günther, Rumelhart, Norris.

Butterworth, and Dell. The second day of the meeting considered the nature of the bottom-up input to the mental lexicon, as viewed from the perspective of research in acoustic-phonetics, phonology, automatic speech recognition, and visual information processing. The speakers here were Thompson, Vaissiere, Klatt, Elman, Kiparsky, Frauenfelder, Lahiri, Rayner, and Besner.

The second half of the conference turned its attention to the structural and semantic properties of lexical representations, and their integration with higher levels of language comprehension. The third day, where there was only a morning session, focused on problems in morphology and in lexical semantics, with presentations by Bierwisch, Hankamer, Henderson, Flores d'Arcais and Schreuder. The theme of the final day's sessions was the role of lexical representations in higher level processes, including a discussion of suprasegmental aspects, of the lexicon in syntactic information processing, and of the general structure of the language processing system. The main speakers here were Prince, Wiese, Steedman, Frazier, Forster, and Tyler. These presentations were followed by a general discussion, chaired by Garrett.

### 3. The CELEX Project

As we reported in 1985, the Dutch government has funded the development of a Centre for Lexical Information (CELEX). The aim of this project is to offer computerized, multilingual, lexical databases to interested institutions and companies via modern electronic access methods. The lexical databases being developed by CELEX include information on orthography, phonology, morphology, syntax and word-frequency, both for Dutch and English.

The Max-Planck Institute is cooperating in the CELEX project together with the IWTS in Nijmegen and several other Dutch institutions.

The project started in January 1986, and is located in the Max-Planck building, in the quarters occupied by the IWTS. During the first, developmental phase (up to December 31, 1988) a team consisting of five linguists, two computer-scientists, and one assistant is involved full-time

in the project. In 1987 two more computer-linguists will be appointed.

Since June 1986 the project has had its own hardware and software facilities, i.e. three MicroVAX-II configurations running ORACLE-RDBMS as a database management system, and an IBM-PC (AT). Before that CELEX used the computer facilities that were available within the Max-Planck Institute. At the moment CELEX is connected to the EARN network, and in 1987 it will join SURFNET. Thanks to DEC sponsorship, linkage to the national network is already in progress.

In May 1986 the first preliminary version of the Dutch CELEX lexical database was completed. This lexical database was based on the 'Woordenlijst van de Nederlandse Taal' and on Appendix B-1 from 'Woordfrequenties' by P.C. Uit den Boogaard. The original computerized dictionary which was used as a starting point, has been debugged, extended and reorganized into a lexical database. The main extension involved a complete phonematization and syllabification of the 70.141 headwords which were contained in the database. Since August 1986 researchers from the Max-Planck Institute and the IWTS have been able to access this database with SQL, the query language provided by ORACLE.

From June 1986 up to January 1987 the second version of the Dutch CELEX lexical database has been developed. It includes all words (i.e. headwords and inflectional forms) which are either in version 1, or in the van Dale 'Groot Woordenboek Hedendaags Nederlands'. This database now contains lexical information for 110.000 headwords. The main extension, performed during the second half of 1986, involved a complete morphological analyses of all headwords, based on the output of KASIMIR, a Categorical Parser written in LISP (developed in Leiden), followed by hand checking and augmentation.

#### 4. Teaching

The institute's staff taught courses of varying duration at the following universities:

International Society for the study of Behavioral Development Prague

(Deutsch). Inter-University Centre Dubrovnik (Bowerman), University of Berlin (Schriefers), University of Bonn (Sendlmeier), University of California Los Angeles (Klein), University of Cambridge (Brown), University of Hawaii at Manoa (Romaine), University of Koblenz (Sendlmeier), University of Köln (Günther), University of Leiden (Flores d'Arcais, Hagoort), University of München (Günther), University of Nijmegen (Dijkstra, Hagoort, Vonk, Zwitserlood), University of Oxford (Romaine).

## 5. Internal Lectures and Colloquia

A number of colloquia were organized by the institute's Colloquium Committee (Brown, Ehrich and Weeks (until March)):

D. Bassano, C. Champaud, M. Coltheart, M. Dascal, S. Dehaene, E. Dresher, J.E. Emonds, G. Fanselow, M. Fayol, R. Furrer, A. Garnham, J.A. Hawkins, P. Jordens, J.F. Juola, E. Lang, D.G. MacKay, J. Macnamara, G. Miceli, H. Mittelstaedt, J. Oakhill, K. O'Regan, Z. Réger, S. Romaine, L. Talmy, M. Tanenhaus, A. Vinter, F. Wright.

Two series of the Nijmegen Lectures were organized in 1986. From June 16-20 Jerry A. Fodor (Massachusetts Institute of Technology) gave a series of lectures covering various topics on philosophical and psycholinguistic issues concerning the architecture of the mind, including:

- Modularity: The Theoretical Background
- How do Thoughts Have Content?
- Remarks on recent proposals by Barwise and Perry.

Fodor also led seminars on related issues and had several discussions with members of the institute. These Lectures were organized in cooperation with the Interfaculty Unit for Language and Speech of the Catholic University Nijmegen by Dijkstra and Zwitserlood.

From 8-12 December Janet D. Fodor (City University of New York) and Gerald Gazdar (University of Sussex) lectured on Generalized Phrase Structure Grammar (GPSG), parsing and related issues. While Gerald Gazdar gave a comprehensive overview of GPSG, Janet Fodor showed how the GPSG

framework can be used in psycholinguistic theories of syntactic parsing and language acquisition. These Lectures were organized in cooperation with the Interfaculty Unit for Language and Speech of the Catholic University Nijmegen by Bayer, Schriefers, Stassen, and Weissenborn.

## 6. Colloquia Presented

Members of the institute presented colloquia at the following institutions in 1986:

Abteilung Neurologie der RWTW Aachen (Koster), Academisch Ziekenhuis Maastricht (Koster), MRC Applied Psychology Unit (Marslen-Wilson), Papua New Guinea University of Technology (Romaine, Wright), Salk Institute (Levelt), University of Amsterdam (Bowerman), University of Antwerp (Wenk), University of Bochum (Friederici, Schriefers), University of California at Los Angeles (Bowerman, Klein), University of Düsseldorf (Bayer, Günther), University of Gießen (Friederici), University of Gothenburg (Flores d'Arcais), University of Groningen (Bowerman), University of Hawaii at Manoa (Romaine), University of Kansas (Bowerman), University of Köln (Günther, Marslen-Wilson), University of Mainz (Deutsch), University of Nagoya (Flores d'Arcais), University of Nijmegen (Brown, Dijkstra, Levelt), University of Pennsylvania, Philadelphia (Levelt, Schriefers), University Rene Descartes Paris (Dijkstra), University of Southern California (Klein), University of Tokyo (Flores d'Arcais), University of Umea (Flores d'Arcais), University of Utrecht (Levelt).

## 7. Conference and Workshop Papers Presented

- J. Bayer, R. de Bleser and C. Dronsek. "Case marking and local syntax in agrammatism". poster at the Academy of Aphasia, Nashville/Tennessee, October.
- R. de Bleser and J. Bayer. "Inflectional morphology and aphasia". Milwaukee Morphology Meeting, Milwaukee, April.

- M. Bowerman, "What guides children's semantic development? Universal and language-specific in the growth of meaning", Barbara Gordon Memorial Lecture in Linguistics, Florida International University, Miami, March.
- "Learning a semantic system: What role do cognitive predispositions play?", Conference on 'Teachability of Language'. Kansas City, October.
  - "What guides semantic development? Universal and language-specific in the growth of meaning", Belgian Circle of Linguistics Theme Day on Child Language. Brussels, December.
- L. Colombo and G.B. Flores d'Arcais, "The access of idiomatic expressions". First joint Congress of the British Experimental Psychology Society and of the Experimental Psychology Division of the Italian Psychological Association, Padova, April.
- W. Deutsch, "Besitz im Spiegel des Spracherwerbs", 8. Jahrestagung der Deutschen Gesellschaft für Sprachwissenschaft, Arbeitsgruppe "Universalien der Kindersprache", Heidelberg, February.
- "A processing perspective for the development of referential communication", Symposium on Referential Communication in School-Age Children, Second European Conference on Developmental Psychology, Rome, September.
  - "Discussant paper", Symposium on Method and Theory in Language Research, Second European Conference on Developmental Psychology, Rome, September.
  - "Die Tagebücher von Clara und William Stern". 35. Kongreß der Deutschen Gesellschaft für Psychologie, Heidelberg. September.
  - "Possession in child language", Colloquium on Child Language of the Linguistic Society of Belgium, Brussels, December.
- A. Dijkstra. "Het samenspel van herhaling, associatie en frequentie in "geprimede" lexicale decisie", Negende Minisymposium over Lezen, K.U. Nijmegen, April.
- "Sublexical contacts of visual and auditory recognition processes". 28. Tagung experimentell arbeitender Psychologen. Saarbrücken, March.
- E. Dresher and J. Kaye, "On the theoretical implications of constructing learning systems", Workshop on Computer Simulation of Language Acquisition Models, Tilburg University, May.
- E. Dresher and A. Lahiri, "On the metrical equivalence of H and L L in Germanic", 61st Annual Meeting of the Linguistic Society of America.

December.

V. Ehrlich, "The generation of tense". Third International Workshop on Natural Language Generation. Nijmegen. August.

G.B. Flores d'Arcais. "Syntactic control on reading mechanisms". Attention and Performance XII - The Psychology of Reading. London. July.

- "Perceptual factors and word order in event description". Third International Workshop on Natural Language Generation. Nijmegen, August.

- "Conscious and unconscious processes in language comprehension", Introduction and Coordination of a Symposium on "Language Comprehension", 5th Congress of the Experimental Psychology Division of the Italian Psychological Association. San Pellegrino. October.

G.B. Flores d'Arcais and R. Schreuder. "Psycholinguistic issues in the lexical representation of meaning". Conference on Lexical Representation and Process. MPI, Nijmegen. July.

U.H. Frauenfelder "On lexical context effects in lexical access" 28. Tagung experimentell arbeitender Psychologen. Saarbrücken. March.

- "On the rise-time of the phonological code in spoken word recognition", Experimental Psychology Society. Padova. April.

- "Computer applications in psycholinguistics", Bilateral DFG-JPSS Symposium on Intelligent Language Processing. Bochum, May.

U.H. Frauenfelder and A. Lahiri. "Understanding words and word recognition: Can phonology help?" Conference on Lexical Representation and Process. MPI. Nijmegen. July.

- "The role of phonological structure in lexical access". ZIF Workshop on Speech Parsing, Universität Bielefeld. October.

L. Frazier, "Natural classes in language processing: Comments on Steedman", Conference on Lexical Representation and Process. MPI. Nijmegen. July.

- "Sentence processing: A tutorial review". Conference on Attention and Performance. Great Windsor Park. England. July.

A.D. Friederici. "Sensory input and cognitive representation". Journée d'Etude sur Perception et Motricité en Microgravité. CNRS. Laboratoire de Physiologie Neurosensorielle. Paris. April.

- "Sensorischer Input und mentale Repräsentation: Zur kognitiven Verarbeitung perzeptueller Informationen". Symposium Weltraumforschung



- und Sportwissenschaft: Der Mensch unter extremen Bedingungen. Köln. June.
- A.D. Friederici and Levelt, W.J.M.. "Sensory interactions in spatial assignment: Resolving the conflict cognitively". Eighth International Symposium on Posturography. Disorders of Posture and Gait, Amsterdam. May.
- "Spatial description in weightlessness: Aspects of cognitive adaptation", D1-Symposium, Norderney, FRG, August.
  - "'Oben" und "unten" im schwerelosen Raum: Wahrnehmung und Repräsentation". 35. Kongreß der Deutschen Gesellschaft für Psychologie, Heidelberg, September.
- P.A.M. Graetz, A.D. Friederici and H. Schriefers. "Aphasische Symptome und psycholinguistische Modelle: Worterkennung im normalen und aphasischen Sprachverhalten", 13. Jahrestagung der Arbeitsgemeinschaft für Aphasieforschung und Therapie, Freiburg, November.
- H. Günther, "Phonology by reading", Conference on Lexical Representation and Process, Max-Planck Institute, Nijmegen. June.
- "Sprache und Schrift - Eine falsche Dichotomie", Roundtable "Sprache und Schrift", RWTH Aachen, July.
- J. Hankamer and A. Lahiri, "The timing of underlying and derived geminates". Linguistic Society of America, December.
- B. Hayes, "A revised parametric metrical theory", Netherlands Phonology Workshop, Max-Planck Institute, Nijmegen. September.
- M. Hickmann and J. Weissenborn, "Temporal/aspectual markings in children's narratives: a cross-linguistic analysis". Second Conference of the International Society for the Study of Behavioral Development, Rome, September.
- W. Klein. "Quaestio and referential movement in narratives", Language Processing in Social Context. Universität Heidelberg, September.
- J. Koster and Ch. Koster. "The acquisition of bound and free anaphora". Eleventh Annual Boston University Conference on Language Development, Boston. October.
- A. Lahiri. "Markedness, underspecification and asymmetric assimilation rules". Workshop on Phonological Theory. Netherlands Institute of Advanced Studies. Wassenaar, May.

- A. Lahiri and J. Hankamer, "Acoustical properties of geminate consonants", 112th Meeting of the Acoustical Society of America, December.
- W.J.M. Levelt, "Speaking: processes underlying word access". Heidelberg Science Forum, Heidelberg, September.
- "Second language acquisition by adult immigrants". General Assembly of the European Science Foundation. Strasbourg. November.
- W.J.M. Levelt and H. Schriefers, "Stages of lexical access", Third International Workshop on Language Generation, Nijmegen University, August.
- W.D. Marslen-Wilson, "Projecting sound onto meaning: Access, selection, and integration", Conference on Lexical Representation and Process, Max-Planck Institute, Nijmegen, July.
- W.D. Marslen-Wilson and P. Zwitserlood. "Directionality and stimulus overlap in spoken word recognition". Joint Conference of the Experimental Psychology Society (UK) and the Societa Italiana di Psicologia, Padova, April.
- L.G.M. Noordman and W. Vonk, "Flexibility in inference making during text processing", Table ronde Les texts et leur traitement. Poitiers. September.
- Th. Pechman, "Adjektivfolge und Sprachproduktionsstrategien". 28. Tagung experimentell arbeitender Psychologen. Universität des Saarlandes, Saarbrücken, March.
- Th. Pechmann and H. Schriefers, "Inkrementelle Sprachproduktion und pränominale Adjektivfolge". 35. Kongreß der Deutschen Gesellschaft für Psychologie, Heidelberg, September.
- C. Perdue, "Real beginners, real questions". VIe Colloque International: "Acquisition d'une Langue Etrangère", Aix-en-Provence. June.
- G. Redeker, "Sprachproduktion in unterschiedlichen sozialen Kontexten". 35. Kongreß der Deutschen Gesellschaft für Psychologie. Heidelberg, September.
- H. Reetz and P. Wittenburg, "Technisch-wissenschaftliche Arbeitsplatzrechner - ein Vergleich auf der Basis gegenwärtiger Technologie". 3. DV-Benutzertreffen in der MPG, Frankfurt. November.
- J. Roche. "Der Ausdruck der Temporalität in Kenolekten des Deutschen". Tagung der Deutschen Gesellschaft für Sprachwissenschaft. Heidelberg,

February.

- J. Roche. "Möglichkeiten und Grenzen der Entwicklung von Testverfahren im Rahmen des Proficiency-System". Annual Meeting of the American Association of Teachers of German. Berlin, August.
- S. Romaine, "Language mixing and purism" Ferdinand Saussure Lecture, Polytechnic of Central London. May.
- S. Romaine and M. Long, Workshop on Explanation and theories in second language acquisition. TESOL Summer Institute. University of Hawaii at Manoa. Honolulu, Hawaii, August.
- H. Schriefers. "Semantische Markiertheit dimensionaler Adjektive und Kongruenzeffekte beim Benennen von Relationen", 28. Tagung experimentell arbeitender Psychologen, Saarbrücken. March.
- "Het tijdsverloop van lexicale toegang tijdens het spreekproces", Colloquium 'Onderzoeksinstituut Taal & Spraak'. University of Utrecht, October.
  - "Semantic markedness and congruity effects in the naming of relations", 27th Annual Meeting of the Psychonomic Society, New Orleans, November.
- W. Sendlmeier, "'F2-Transition' und 'Silent Interval' als 'Cues' für die Plosivwahrnehmung bei pathologischem Gehör". 17. Jahrestagung der Gesellschaft für Angewandte Linguistik. Hamburg, October.
- W. Sendlmeier and T. Goldbeck, "Perzeptive Untersuchungen zur Wechselbeziehung zwischen Satzmodalität und Akzentuierung durch suprasegmentelle Parameter", 17. Jahrestagung der Gesellschaft für Angewandte Linguistik, Hamburg, October.
- C. Silva-Corvalan, "On the semantics of poder and deber", 1986 Annual Meeting of the Association of Hispanists of Great Britain and Ireland, Edinburgh University, March.
- W.H.G. Simons and W. Vonk, "Tekstcoherentie en het gebruik van anaforische vormen", Negende Minisymposium over Lezen. K.U. Nijmegen. April.
- C. Sinha. "Adaptation and representation: the role of ontogenesis in human evolution and development", International Working Colloquium "Behaviour as one of the Main Factors of Evolution". Liblice, Czechoslovakia, December.
- C. Sinha. M. Moore and L. Pound. "The development of communication strategies by deaf pre-school children in an integrated setting",

- Language Development and Sign Language Workshop. Bristol. November.
- W. Vonk, "Contrast relations and the argumentative force of irrelevant information", 28. Tagung experimentell arbeitender Psychologen. Saarbrücken, March.
- W. Vonk and L.G.M. Noordman. "Readers' perspective and selective processing", Table ronde Les texts et leur traitement, Poitiers. September.
- P. Wittenburg, "Local Area Networks - experiences and future trends". 2nd KIP Computer Workshop, KU. Nijmegen. May.
- P. Wittenburg, C. v.d. Veer and H. Kerkman. "Lexical DB and selection of an appropriate DBMS", DECUS Europe Conference. Hamburg, September.
- F. Wright, "A sociolinguistic study of child language acquisition, creolization and language change in Tok Pisin in Papua New Guinea". Human Ethology Conference, Tutzing, July.
- P. Zwitserlood and W.D. Marslen-Wilson. "Overlapping activation in lexical access", 28. Tagung experimentell arbeitender Psychologen. Saarbrücken, March.

## PUBLICATIONS

- Bach, E., C.M. Brown and W.D. Marslen-Wilson: Crossed and nested dependencies in German and Dutch: A psycholinguistic study. Language and Cognitive Processes 1, 249-262 (1986).
- Bayer, J.: The role of event expression in grammar. Studies in Language 10, 1-52 (1986).
- Bayer, J.: Review article: Syntactic chains by Kenneth J. Safir. Studies in Language 10, 167-185 (1986).
- Bayer, J.: Book review: Neuropsychologie der Sprache by Angela D. Friederici. Studium Linguistik 19, 79-83 (1986).
- Bayer, J.: Report: Bericht über das GLOW-Kolloquium 1986. Linguistische Berichte 105, 435-437 (1986).
- Blomert, L., Ch. Koster, H. van Mier and M.-L. Kean: Verbaal communicatieve vaardigheden van afasie patienten: De Alledaagse Taalvaardigheids Test. Toegepaste Taalwetenschap in Artikelen 24, 16-23 (1986).
- Bowerman, M.: First steps in acquiring conditionals. In: On Conditionals, Eds. E.C. Traugott, A. ter Meulen, J.S. Reilly, C.A. Ferguson. Cambridge University Press, Cambridge 1986, 285-307.
- Clark, E.V. and M. Bowerman: On the acquisition of final voiced stops. In: Festschrift for Charles A. Ferguson, Ed. J.A. Fishman. Mouton, Amsterdam/Berlin 1986, 51-68.
- Deutsch, W.: Sprechen und Verstehen: Zwei Seiten einer Medaille. In: Perspektiven auf Sprache. Interdisziplinäre Beiträge zum Gedenken an Hans Hörmann, Ed. H.-G. Bosshardt. De Gruyter, Berlin 1986, 232-263.
- Deutsch, W.: Die Tagebücher von Clara und William Stern. In: Bericht über den 35. Kongreß der Deutschen Gesellschaft für Psychologie in Heidelberg 1986. Vol.1, Ed. M. Amelang. Hogrefe. Göttingen 1986, 363.
- Deutsch, W., Ch. Koster and J. Koster: What can we learn from children's

- errors in understanding anaphora? Linguistics 24, 203-225 (1986).
- Dijkstra, A.: Book review: Psycholinguistics by A. Garnham. Nederlands Tijdschrift voor de Psychologie en haar Randgebieden 41, 374-375 (1986).
- Flores d'Arcais, G.B.: Individual differences in the processes of comprehension and production of language. Ricerche di Psicologia 4, 10-48 (1986).
- Flores d'Arcais, G.B.: Konzeptuelle Strukturen und das mentale Lexikon. In: Perspektiven auf Sprache. Interdisziplinäre Beiträge zum Gedenken an Hans Hörmann, Ed. H.-G. Bosshardt. De Gruyter, Berlin 1986, 130-148.
- Friederici, A.D.: Kognitive Strukturen des Sprachverstehens: Prozesse und Strategien. Universität Gießen (Habilitationsschrift).
- Friederici, A.D. and W.J.M. Levelt: Cognitive processes in spatial coordinate assignment: On weighting perceptual cues. Naturwissenschaften 73, 455-458 (1986).
- Günther, H.: Was the alphabet discovered or invented? On the alleged common processes in speech and writing. In: New Trends in Graphemics and Orthography, Ed. G. Augst. De Gruyter, Berlin 1986, 248-261.
- Günther, H.: Zur Repräsentation morphologisch komplexer Wörter im mentalen Lexikon. In: Neuere Forschungen zur Wortbildung und Historiographie der Sprachwissenschaft - Festgabe für H.E. Brekle zum 50. Geburtstag, Eds. B. Asbach-Schnitker, J. Roggenholz. Narr, Tübingen 1986, 190-210.
- Günther, H.: Phonological recoding in the reading process. In: Phonology and Orthography, Ed. P.A. Luelsdorff. Benjamins, Amsterdam 1986, 151-169.
- Hagoort, P. and R. Maessen (Eds.): Geest, Computer, Kunst. Grafiet, Utrecht 1986.
- Hickmann, M.: Psychosocial aspects of language acquisition. In: Language Acquisition: Studies in First Language Acquisition, second edition, Eds. P. Fletcher, M. Garman. Cambridge University Press, Cambridge 1986, 9-29.
- Kean, M.-L.: Linguistic biases. Toegepaste Taalwetenschap in Artikelen 24, 7-15 (1986).

- Klein, W.: Über Ansehen und Wirkung der deutschen Sprachwissenschaft heute. Linguistische Berichte 100, 511-520 (1986).
- Klein, W.: Intonation und Satzmodalität in einfachen Fällen. In: Miteinander Sprechen und Handeln. Ed. E. Slembek. Athenäum, Königstein Ts. 1986, 161-177.
- Klein, W. (Ed.): Sprachverfall. Vandenhoeck, Göttingen 1986.
- Klein, W.: Der Wahn vom Sprachverfall und andere Mythen. In: Sprachverfall, Ed. W. Klein. Vandenhoeck, Göttingen 1986, 11-28.
- Klein, W. and R. Dietrich: Simple Language. Interdisciplinary Science Review 11(2): 600 years University of Heidelberg, 110-117 (1986).
- Klein, W. and C. Perdue: Comment résoudre une tâche verbale complexe avec peu de moyens linguistiques? In: Acquisition d'une Langue Etrangère (Tome I). Eds. A. Giacomi, D. Véronique. Presses de l'Université de Provence, Aix-en-Provence 1986, 306-330.
- Levelt, W.J.M.: Zur sprachlichen Abbildung des Raumes: Deiktische und intrinsische Perspektive. In: Perspektiven auf Sprache. Interdisziplinäre Beiträge zum Gedenken an Hans Hörmann. Ed. H.-G. Bosshardt. De Gruyter, Berlin 1986, 187-211.
- Levelt, W.J.M.: Herdenking van J.M.F. Jaspars. Jaarboek 1986 Koninklijke Nederlandse Akademie van Wetenschappen. North-Holland, Amsterdam 1986, 187-189.
- Noordman, L.G.M. and W. Vonk: Het leesproces vanuit psycholinguïstisch perspectief. In: Speerpunt Lezen. Eds. P. Mooren, H. Verdaasdonk. Zwijsen, Tilburg 1986, 31-43.
- Perdue, C. (Ed.): L'Acquisition du Français par des Adultes Immigrés: Aspects Psycholinguïstiques. Langages 84, 1986.
- Perdue, C. and J. Deulofeu: La structuration de l'énoncé: étude longitudinale. Langages 84, 43-64 (1986).
- Redeker, G.: Sprachproduktion in unterschiedlichen sozialen Kontexten. In: Bericht über den 25. Kongreß der Deutschen Gesellschaft für Psychologie in Heidelberg 1986. Vol. 1. Ed. M. Amelang. Hogrefe, Göttingen 1986, 358.
- Redeker, G.: Language use in informal narratives: Effects of social distance and listener involvement. University of California, Berkeley 1986 (doctoral dissertation).

- Rietveld, A.C.M. and U. Frauenfelder: Vowel duration, coarticulation and syllable boundaries. Proceedings Instituut voor Fonetiek 10. K.U. Nijmegen, 60-65 (1986).
- Roche, J.: Deutsche Xenolekte. Struktur und Variation der Äußerungen deutscher Muttersprachler in der Kommunikation mit Ausländern. Johann-Wolfgang-Goethe Universität, Frankfurt am Main 1986 (doctoral dissertation).
- Romaine, S.: The effects of language standardization on deletion rules: Some comparative Germanic evidence from t/d deletion. In: Linguistics Across Historical and Geographical Boundaries. Eds. D. Kastovsky, A. Szwedek. Mouton - de Gruyter, Berlin 1986, 605-620.
- Romaine, S.: Sprachmischung und Purismus: Sprich mir nicht von Mischmasch. Lili: Sprachverfall? 62. 92-107 (1986).
- Romaine, S.: The syntax and semantics of the code-mixed compound verb in Punjabi/English bilingual discourse. In: Languages and Linguistics: The Interdependence of Theory, Data, and Application, Eds. D. Tannen, J.E. Alatis. Georgetown University Press, Washington D.C. 1986. 35-50.
- Segui, J. and U. Frauenfelder: The effect of lexical constraints upon speech perception. In: Human Memory and Cognitive Capabilities: Mechanisms and Performances. Eds. F. Klix, H. Hagendorf. North Holland, Amsterdam 1986, 795-808.
- Sendlmeier, W.F. and H. von Wedel: Ein Verfahren zur Messung von Fehlleistungen beim Sprachverstehen - Überlegungen und erste Ergebnisse. Sprache - Stimme - Gehör 10. 164-169 (1986).
- Sinha, C.: Psychology, Education and the Ghost of Kaspar Hauser. Disability, Handicap and Society 1. 245-259 (1986).
- Tillmann, H.G. and H. Günther: Zum Zusammenhang von natur- und geisteswissenschaftlicher Sprachforschung - Phonetik und Phonologie. Zeitschrift für Sprachwissenschaft 5(2). 187-208 (1986).
- Tyler, L.K. and W.D. Marsler-Wilson: The effects of context on the recognition of polymorphemic words. Journal of Memory and Language 25. 741-752 (1986).
- Wedel, H. von and W.F. Sendlmeier: Diskriminationstests zur Feinstrukturanalyse von Sprachsignalen bei normalem und pathologischem



- Gehör. NTG-Fachberichte 94. 138-143 (1986).
- Weissenborn, J.: Learning how to become an interlocutor. The verbal negotiation of common frames of reference and actions in dyads of 7 - 14 year old children. In: Children's World and Children's Language, Eds. J. Streeck, W. Corsaro, J. Cook-Gumperz. Mouton - De Gruyter, Berlin 1986.
- Weissenborn, J. and J.M. Meisel (Eds.): Studies on Morphological and Syntactic Development. Special issue of Linguistics 24(1), 1986.
- Wenk, B.: Crosslinguistic influence in second language phonology: Speech rhythms. In: Crosslinguistic Influence in Second Language Acquisition, Eds. E. Kellerman, M. Sharwood Smith. Pergamon Press, Oxford 1986. 120-133.
- Wenk, B. and F. Wioland: Phonetic training for migrant worker pupils. ITL, Review of Applied Linguistics 73. 27-50 (1986).