MAX-PLANCK-INSTITUT FÜR PSYCHOLINGUISTIK

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Preface

In the course of 1988, the Institute's work underwent a gradual reorganization which, when completed, will lead to a concentration of its many research activities. When the Institute was set up in 1980, research activities were meant to be organized in two ways. In the words of the original "Institute Proposal":

"The institute will have both a fixed, and a flexible structure. The fixed structure is defined by a set of permanent research domains, with their own interdisciplinary composed research staff and internal coordination. The flexible structure is defined by sets of research themes which may involve more than one research domain and their respective scientists. Themes may be added or deleted as research progresses.
The permanent structure guarantees enduring research effort within recognized major areas of psycholinguistics. The flexible structure, on the other hand, makes it possible to adapt to matters as they stand in the literature, in own research, and in research contacts with other institutes. It also allows for studying themes where the permanent research domains touch or overlap."

The permanent research domains (Arbeitsbereiche) were language acquisition, language production, and language comprehension. Each of them was to be mainly coordinated by one director, although final responsibility is with the directorate as a whole. This joint responsibility also included a fourth long-term research area beyond the groups: aphasia. Over the years, this "fixed" structure proved to be an increasingly strong element in the organization of the Institute's work, tending to overshadow to some extent the other, more "flexible" structure of research

themes. This does not mean that research themes did not change over the years, or that there was no research across groups – quite the opposite. But when in May 1987, the staff met at Schloß Ringberg to discuss the past, present and future of the Institute, there was a general feeling that the balance between fixed and flexible structure was not ideal, and more weight should be given to the latter. This was to be done by concentrating the main research activities of the Institute in the form of a limited number of "institute projects" (IP) which would have a limited life-span and normally, though not necessarily, go across groups. As a result of the many discussions both at Schloß Ringberg and later, the following list of IPs was worked out.

IP A Interfaces between grammatical components in natural language comprehension
IP B Computational models of lexical processing and representation
IP C Lexicall access in language production
IP D Aphasia in adults
IP E Reference to time and space
IP F The role of input in second language acquisition
IP G Utterance structure in language acquisition
IP H The acquisition of phonology

In addition, there may be a ninth project devoted to the psychophysiology of language processing. These projects will constitute the focus of the Institute's work over the next few years. This does not mean that there will be no other research activities. Smaller projects ("personal projects") involving one or two researchers, are expected to start as well; otherwise, the Institute would lose a great deal of its present flexibility. These smaller projects may also eventually lead to new IPs at some point. They will therefore be supported to the extent possible. But priority in terms of research facilities, technical help, research assistants

and invitations for guest researchers will be with the IPs.

The "project structure" is not meant to replace the three existing groups acquisition, production and comprehension; it complements them, in accordance with the original proposal. Responsibility for all IPs is with the directorate as a whole, although in practice, one or at most two will be "mainly" responsible. In addition, each project has an internal coordinator.

Some traces of this re-organization are clearly to be seen in the present Annual Report, and they will become more distinct in the following ones.

Wolfgang Klein

Organization of the Institute in 1988

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J. Mehler
L.G M. Noordman
D. Ploog
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W.J.M. Levelt

External Scientific Member:

M. Bierwisch

Scientific Research Staff:

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R. Berman	U. Tel Aviv
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B. Comrie	U. Southern California, Los Angeles
P. Dasgupta	Deccan College, Pune
G.S. Dell	U. Rochester
A. Eschbach	U. Essen
M. Fayol	U. Dijon
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S.M. Garnsey	U. Rochester
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B. Hayes	U. California, Los Angeles
M. Kail	U. Paris V and CNRS
P. Keating	U. California, Los Angeles
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P. Graetz (NWO)	G.M. Schermer
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Research in Progress

1. Language Production

In the Institute's new project organization, language production research is largely concentrated in three projects. Firstly, the project on lexical access in production is involved with questions of how lexical items are selected from the lexicon, how their phonological forms are retrieved, and how the process of phonological encoding is organized. Secondly, the project on reference (see also section 3.2) includes the production work on the expression of temporal and spatial concepts. And thirdly, there is the aphasia project, which includes work on spontaneous production in agrammatism and paragrammatism. In the present section the first two types of production research are summarized. The aphasia work will appear in section 4. Apart from these three projects, the Institute has a small but highly valued involvement in Dutch sign language research; it is also mentioned in the present section.

1.1 Lexical Access in Language Production

This project studies the process by which (given the speaker's communicative intention) appropriate lexical items are retrieved from the mental lexicon and given phonological shape. The main topics are semantically driven access (how does a speaker, given a conceptual input, select appropriate lemmas?), phonological encoding (what are the mechanisms generating the phonological shape of a lemma?), and the time course of semantically driven access and phonological encoding. The subproject 'Semantically driven access' is also part of the project 'Computational models of lexical processing and representation' (section 2.2).

1.1.1 Semantically driven access

In September a joint project was started between the Nijmegen Institute of Cognition Research and Information Technology (A. Roelofs, G.A.M. Kempen) and the Max-Planck-Institut (W.J.M. Levelt, M. Bierwisch) with the aim of developing a computational model of lexical selection in production. The starting point was the analysis of the "hypernym problem" in Levelt's new book *Speaking: from intention to articulation* (MIT Press, 1989). No existing account of meaning-driven lexical selection prevents the selection of a target word's hypernyms if the semantic conditions of the target word are met. So, for instance, *animal* will (also) be selected when *dog* is the target. In the model to be developed, there is a built-in 'principle of specificity' which, together with some subsidiary principles, guards against this overgeneration. The model is implemented in a logical network which allows for parallel semantic processing.

1.1.2 *Incremental speech production in referential communication*

Th. Pechmann (U. Saarbrücken), in collaboration with H. Schriefers, studied whether referential noun phrases are produced incrementally. It is assumed that speakers start to encode parts of a referring phrase phonologically, before they have conceptualized or grammatically encoded the whole phrase. Speakers often quickly start to name a feature of the target which is easily determined, but which need not be distinguishing. This may account for the fact that speakers often overspecify their utterances, supplying the hearer with more information than he needs to identify the referent unequivocally.

It was first established that colour is particularly easy to access. Subjects were presented with items that consisted of a set

of objects. One of the objects was marked as the target object which the subjects had to describe unambiguously. For half of the items, the distinguishing features for the target object were object class and size. For the other half of the items, the distinguishing features were object class, size and colour. The subjects were asked to name only the colour, or only the size, or only the object class of the target. Colour had the shortest mean naming latency, followed by object class, followed by size.

If referential overspecification of colour is due to its fast access and subsequent incremental processing, the number of overspecified utterances should decrease when colour is less easily accessible. This hypothesis was tested in two experiments. Subjects saw sets of familiar objects. One object of each set was marked as the target. Subjects were asked to refer to this object unambiguously. Distinguishing features were colour, object class, size, height, roundness, and width. In the first experiment four colours (red, yellow, green, and blue) were used. In the second experiment, in which seven colours (red, yellow, green, blue, brown, orange, and purple) were used, colour was made a relative feature by varying its brightness. The colour of the target object was always of a medium brightness. Depending on the brightness of relevant context objects it had to be prefixed by *light* or *dark*. Thus, subjects always had to pay attention to relevant context objects before they could decide to describe a blue object, for example, as dark-blue or light-blue.

The results show a clear effect of the availability of colour on subjects' amount of overspecification. Colour is significantly less often mentioned as an overspecified feature in the second experiment.

1.1.3 Retrieving the phonological form from the lexicon

A project exploring the processes by which the phonological

form, the lexeme, of a word is adressed or recovered from the lexicon has been started by A.S. Meyer, K. Bock (U. Michigan, East Lansing), and M. Winkel (U. Leiden). Two different and perhaps complementary mechanisms have been implicated in this process. In the first, an increase in activation of the lexeme is accompanied by a spread of activation to lexemes with similar phonological constituents, increasing their accessibility to the retrieval process, and thereby the likelihood of their involvement in errors, among other things. In the second, lexemes with similar phonological constituents are inhibited, thereby 'sharpening' the representation of the word to be retrieved and increasing its distinctiveness to the retrieval process. There is evidence in the literature that is consistent with both of these accounts.

The goal of the project is to determine how a balance between facilitation and inhibition might be achieved in lexical retrieval. Meyer, Bock, and Winkel have conducted a preliminary experiment to establish the reliability of one set of inhibition-exhibiting phenomena. This experiment revealed that subjects who named two objects from pictures tended to place a phonologically primed name later than an unprimed one. Analyses of the utterance latencies, durations, pauses and disfluencies are under way.

A related project was started by Meyer, and J. Jescheniak and G. Bosshardt (Ruhr U., Bochum). Meyer had demonstrated in her dissertation research that a given word was produced faster if it was uttered in the context of phonologically similar words than if it was preceded by phonologically dissimilar words. Meyer, Jescheniak, and Bosshardt investigated if comparable results could be obtained using a different paradigm, namely the response priming paradigm introduced by D.E. Meyer and Gordon. The subjects saw pairs of words or non-words that were either phonologically similar or dissimilar. Each stimulus pair was followed by one of two response signals, indicating whether the first or the second member of the pair should be uttered. In most trials, the correct

response was the first word (primary response). As subjects were requested to prepare highly for this type of reaction, they had to replan their utterance in the remaining trials where they had to produce the second word of a pair (secondary response). While the mean speech onset latency for the primary response was unaffected by the phonological relatedness of the paired words, the mean latency for the secondary response appeared to be reduced for similar rather than dissimilar pairs.

This finding contrasts with the results obtained by D.E. Meyer and Gordon, who found **longer** latencies for the secondary responses in phonologically similar pairs. This difference can perhaps be accounted for by the types of phonological similarity in the studies, namely in terms of a single shared phonetic feature in D.E. Meyer's and Gordon's study, and as overlap in several phonological segments in the research reported here. Future experiments using the same paradigm will systematically investigate the effects of different types of phonological similarity between primary and secondary responses.

1.1.4 Phonological encoding

Most theories concerning the processes of phonological encoding in language production assume that during the phonological encoding of a word, the units of different representational tiers are retrieved independently and are subsequently mapped onto each other. In her dissertation research Meyer (cf. Annual Report, 1987) investigated the time course of phonological encoding and found it to be a sequential process, proceeding in a number of processing steps from the beginning of the word to its end. With each step, one phonological segment or cluster, corresponding to a syllable onset, nucleus, or coda, is associated to one or more positions of the skeletal tier.

Under the assumption that the syllabic structure of a word is created independently of its string of phonological segments,

one might expect speakers to be able to prepare themselves efficiently for the utterance of a given word, if they know in advance how many and which types of syllables it includes. Meyer tested this prediction in two experiments, using a priming paradigm. The results of these experiments were entirely negative. It should be noted that in earlier experiments using the same priming paradigm the predicted effects had been obtained (cf. Annual Reports 1986 and 1987). A possible interpretation of the new findings is that although the various tiers of a phonological representation might be conceptually independent, they are not independent with respect to the time course of their generation: It does not seem possible first to create the syllabic structure of a word and then to retrieve its phonological segments and associate them to the terminal positions of syllable structure. Rather, the two tiers must be constructed in parallel.

If phonological encoding is viewed as a mapping process between the terminal positions of the syllabic structure and phonological segments, one may ask how the correct associations between these units are established. A frequent assumption is that the phonological segments are explicitly marked with respect to the positions that they can take. By reference to the tags attached to the segments the so-called positional constraint on sound errors can readily be explained: Misplaced segments cannot appear in arbitrary new locations in the utterance, but usually migrate from their target positions to corresponding positions in new syllables.

An alternative assumption is that syllable positions are specified with respect to the classes of segments that can be associated to them. Syllables can be viewed as templates encoding the phonotactic constraints of the language. The nucleus, for instance, must always be realized by a vowel, while the positions of the onset and the coda may only be filled by consonants.

This assumption leads to the prediction that in speech errors misplaced vowels should be confined to nucleus positions, whereas

consonants should be free to slip into both onset and coda positions as long as the phonotactic constraints of the language are not violated. The prediction was tested and confirmed in two tongue-twister experiments in Dutch by G.S. Dell (U. Rochester) and Meyer. The stimuli of the first experiment were CVC-syllables including only consonants that could function both as syllable onsets and as codas. Consonants meant to appear as onsets were as likely to slip into new onset positions as into new coda positions, and the same held for consonants stemming from coda positions. The second experiment included syllables whose onset segment (/h/) could not appear as coda of a syllable, and syllables whose coda segment (/ŋ/) could not appear as syllable onset without violating the phonotactic constraints of Dutch. These segments were found to be confined to their respective types of positions, whereas other consonants that could appear both as syllable onset and coda again migrated equally often to both types of positions.

1.1.5 The time course of lexical access

Lexical access in language production is often seen as involving two serially ordered stages. In the first stage, a lexical item is selected which is specified with respect to its semantic and syntactic properties. Only in a second stage is the corresponding phonological form generated. The results of earlier experiments by Levelt, Schriefers, and Meyer (see Annual Report, 1987) provided evidence for a late stage of pure phonological activation. However, there was no evidence for a preceding stage of pure semantic activation.

In a new series of experiments, Schriefers, Meyer, and Levelt applied a different experimental paradigm, the picture-word interference paradigm, to study the time course of semantic and phonological activation in language production. In these experiments subjects were presented with line drawings of common

objects which they had to name. At different moments prior to or after the onset of the picture they heard a word stimulus which was either semantically or phonologically related to the picture name. With early presentation of these distractor stimuli there was an effect of the semantically related distractors on naming latency (relative to a baseline with unrelated words as distractors), but no effect of phonologically related distractors. With later presentation of the acoustic distractor, in contrast, there was an influence of the phonologically related distractors on the naming latencies, but no influence for the semantically related distractors. This pattern is in clear agreement with a two-stage theory of lexical access.

Pechmann and Schriefers started a related series of experiments also using the picture-word interference paradigm. These experiments aim at studying whether colour is quasi automatically activated when speakers name objects which differ with respect to colour in varying degrees, and more generally whether an interference effect can only be observed if the interfering stimulus is closely related to some part of the information the speaker actually selects for language production.

1.2 The Expression of Space and Time

1.2.1 Reference to space

Spatial cohesion in discourse

V. Ehrich started a new project investigating the interaction between temporal and spatial information in discourse.

In Indo-European languages, tense and sometimes aspect markers are obligatory verbal categories. Hence, any given utterance is grammatically bound to provide a minimum of temporal

information. Spatial markers such as adverbs and prepositional phrases, on the other hand, are optional modifiers, so from a **grammatical** point of view, spatial information is mostly optional. In some cases, spatial information can be inferred from temporal information: if two events involving the same participants are *overlapping in time they must be overlapping in space as well* (by virtue of the fact that nobody can be in different places at the same time). As a consequence, temporal markers like tense and aspect indicating temporal precedence or overlap can also indicate spatial discreteness or overlap. In the following pairs of sentences:

(1) John entered the office. He was talking to a secretary.
(2) *John entered the office. He talked to a secretary.*

the progressive aspect in the first pair marks the events as overlapping in time, and the simple past in the second pair marks them as successive in time. By virtue of this temporal interpretation, we understand the event of John's talking as being located at different places in the two sentences: in the entrance of the office in (1), inside the office in (2). Accordingly, the secretary will be located differently, too: *outside but on her way into the* office in (1), inside the office in (2).

In the project, Ehrich will investigate the temporal determination of spatial information. She will consider the effects of tense, aspect, deictic and anaphoric adverbs on the spatial interpretation of utterances in discourse.

Cross-linguistic studies of spatial relations

U. Bartels and A. Becker started their dissertation research.

Bartels' research is a crosslinguistic study of topological prepositions in German, English and Dutch. The main emphasis is to consider the relationship between meaning and conceptual representation. The aim is not only to describe both topological and functional conditions for the use of particular prepositions (and

verbs) but also the interaction of these conditions.

Becker's research compares reference to spatial relations in basic acts of localization in which the position of one object (**theme**) is described with respect to another or others (**relatum/relata**). Reference to spatial relations is understood as reference to projected-world entities and is thus to be described at a conceptual level. The intention is to compare how theme-relatum constellations are conceptualised and structured in English, French, German and Turkish.

The concepts considered are of a topological and geometric (Cartesian and Euclidian) nature, and relate to knowledge of physical laws and specific types of factual everyday experience. Although it can be supposed that the languages studied draw on a similar set of concepts, they differ: with respect to a) the role the concepts play in the language-specific structuring of space and b) the way they are mapped into lexical items. The objective then is to describe both crosslinguistic constants and crosslinguistic variation in the conceptual representation of theme-relatum constellations and language-specific processes of lexicalising spatio-conceptual information.

Analyses will be based on two types of production task: a living room description, and a comparison of two pictures from a picture sequence. These are being carried out with four native speakers of each of the above languages, and the data are being transcribed.

1.2.2 Past time reference in German

Ehrich continued her project on temporal deixis (see Annual Report, 1987). She completed a study of past time reference in German analyzing the present perfect as deictic, the simple past as anaphoric tense. A given event e_t referred to by the present perfect is temporally bound by the speaking event e_o, whereas the simple past binds e_t to an antecedent event e_{t-n} mentioned

in preceding discourse. Put in Reichenbachian terms, e_o provides the reference time (R) for the present perfect, the antecedent event e_{i-n} provides the reference time for the simple past. In the following pair:

(1) Mit einem Kleinbus bereisten wir zwei Wochen lang die "Ressorts" – Gemeindeverbände des Distrikts Silindung (e_1). Dabei kamen wir bis in entlegene Dörfer (e_2), ***in denen kaum je ein Europäer aufgetaucht ist*** (e_3).

(1') ..... (e_1)
..... (e_2)
in denen kaum je ein Europäer auftauchte (e_3).

(1) binds e_3 deictically to the event of speaking e_0, the rare showing up of Europeans is asserted for a period ranging from an indefinite past to the speaker's present. (1') binds e_3 anaphorically to e_2 (reaching remote villages) and e_1 (the bus journey through the Silindung district). The rare showing up of Europeans is asserted for the period of the writer's travelling through Silindung.

As a consequence of the deictic/anaphoric distinction, temporal overlap with an antecedent event is preferably expressed by use of the anaphoric simple past, whereas temporal succession may – as long as the principle of natural order is obeyed – be expressed by either the past tense or the present perfect.

The proposed analysis also accounts for the interaction between tense and temporal adverbials of different semantic types: anaphoric vs. deictic; frame vs. orienting. For example, one consequence of the meaning distinction between past tense and present perfect is that the former can be used to express 'present in the past' in cases where there is a shift from the narrator's to the protagonist's perspective, marked in the following pairs by *heute* ('*today*'):

(2) Hans stand früh auf. **Heute** fühlte er sich müde und lustlos.
(2') Hans stand früh auf. **Heute** hat er sich müde und lustlos gefühlt.

The deictic perfect points to the 'today' of the narrator, the anaphoric past to the 'today' of Hans.

1.3 Sign Language

G.M. Schermer continued her research within the dictionary of signs project that is carried out at the Nederlandse Stichting voor het Dove en Slechthorende Kind (Foundation for deaf and hard of hearing children) in Amsterdam. One of the most important goals of this project (KOMVA) is to complete a dictionary of signs of the sign language of the Netherlands. One part of the dictionary – a basic sign dictionary for parents and teachers of young deaf children – was produced in the first half of 1988. The second half of 1988 was spend on the production of a basic sign dictionary for adults. This dictionary is part of a communication course book that has also been produced by the KOMVA project team. Apart from the production of the dictionaries mentioned above, new material was collected for the dictionary of signs of emotions and feelings.

In addition Schermer carried out a study on some means for the expression of time and aspect in the sign language in the Netherlands (SLN).

2. Language Comprehension

As in previous years, the research activity of the Language Comprehension Group has been directed towards the investigation of various aspects and levels of natural language. Compared to the past, however, the work within the Group has become more strongly organized around specific, large-scale projects. During the year, one of the central projects of the Language Comprehension Group has been the "Interface Project" (described in 2.1), which has already produced a number of interesting results. New areas of investigation have also developed during 1988, one of which is lexical statistics (2.2), a project relating computerized lexical databases, computational modelling and psycholinguistic experimentation. Another developing area of interest has been the research involving the recording of event related potentials (ERP) (see 2.6) which investigates semantic processing during spoken language comprehension.

One of the dominant research themes continues to be the study of lexical representations and processes. This research focusses on a number of issues such as the acoustic-phonetic input to the lexicon, the structural constraints that the phonological system imposes on the input, and the kinds of syntactic and semantic properties used during lexical processing. The group has a continuing interest in syntax, which is explored from both a linguistic and psycholinguistic perspective, with an emphasis on crosslinguistic studies. Work has also continued on the process of mapping utterances onto discourse representations.

2.1 Interfaces in Language Comprehension

The Institute Project "Interfaces in Language Comprehension" was introduced in the Annual Report of 1987. It involves J. Bayer, M. Bierwisch, G.B. Flores d'Arcais, U.H. Frauenfelder, A. Jongman, A. Lahiri, and J.A. Sereno. The project is motivated by the observation that the various levels on which linguistic expressions are organized exhibit a great many structural incongruities which are nevertheless bridged in a rather efficient way during the process of language comprehension. The most striking case of such incongruity is provided by so-called clitic elements, which on the phonological level are integrated into the word phonology of the hosting element, whereas on the syntactic and semantic level they function as independent constituents, sometimes subject even to binding and scope phenomena. There is thus an obvious discrepancy in the organization of the levels involved which must be resolved in the comprehension process. Idioms also show such incongruity, this time between the semantic and syntactic level (see 2.3.4): While they are compositionally structured with respect to their syntactic form, they constitute an integrated unit on the semantic level, which must, moreover, be stored in the lexicon because of its non-compositional nature. A less obvious, but equally important, discrepancy concerns the structure of the phonetic input, compared to segmental and suprasegmental structure determined on the phonological level by the lexical representation. In all these cases, one level of representation can be construed as an interface between two (and sometimes more) structural conditions, which must be reconciled by the processing mechanisms.

Starting from these observations, the Interface Project integrates linguistic and psycholinguistic approaches in order to clarify the structural properties of the phenomena in question and their effect in language comprehension processes. It constitutes a hitherto unexplored way to develop a natural perspective on the

intricate, and highly efficient mechanisms of comprehension.

2.1.1 Acoustic/phonetic – lexical interface

As a first approximation, it is possible to distinguish between two different types of units in the description of language: grammatical units (such as morphemes, words and phrases) and phonological units (such as distinctive features, phonemes and syllables). If listeners extract phonological units from the signal to access the grammatical units stored in the lexicon, then this access process should be facilitated when there is a close match between the two types of units in question. It appears, however, that natural language does not set a premium on such a close correspondence since many languages require no systematic relationship between these two types of units. For example, in French and English there is no constant relationship between the syllabic and morphemic level (e.g. *vi.vo.ti.ons* versus *viv+ot+i+ons* or *far.mer* versus *farm+er*). Similar mismatches can be found between the syllable and the word level in cases where resyllabification leads to syllables straddling words.

U.H. Frauenfelder and J. Henstra investigated how the acoustic/phonetic-lexical interface deals with mismatches between syllabic and lexical representations in Dutch. They compared the amount of lexical activation (e.g., of the word *feit*) obtained when the syllable structure of the input matched (*feit.gir*) or mismatched (*fei.tir*) this lexical representation. They exploited a measure of lexical activation provided by the phoneme detection procedure in which subjects were asked to detect a previously specified phoneme target as quickly as possible. Since the phoneme detection process in words depends, at least in part, upon subjects having accessed lexical representations, detection latencies reflect lexical activation. Frauenfelder and Henstra derived a base-line measure of lexical activation by taking the difference in detection latencies to phoneme targets (e.g., /t/) in

matched words (*feit*) and nonwords (*seit*). A detection latency advantage for words over nonwords was assumed to reflect lexical activation since the contribution of the bottom-up analysis to the detection process for targets in words and nonwords must be comparable given that the targets and their local environment are identical. The base-line lexical activation obtained in this manner was contrasted with the activation differences found in the match (*feit.gir* versus *seit.gir*) and mismatch conditions (*fei.tir* versus *sei.tir*).

In addition to providing evidence for strong base-line lexical activation, the results revealed activation of the embedded word in both the syllable match and mismatch conditions. The presence of lexical activation in the mismatch condition suggests that lexical access cannot simply involve syllabic segmentation and mapping onto lexical representations. Rather, if syllable structure plays a role in the processing of Dutch, as the results described by Zwitserlood, Schriefers, Lahiri, and van Donselaar (Annual Report, 1987) suggest, then there was an intricate interface responsible for mediating between mismatching syllabic and lexical levels of representation. A cursory look at the Dutch lexicon reveals the need for a mechanism capable of reconciling the conflict between syllabic and morphological structure resulting from the pluralization of most nouns (singular: *hoek*, plural: *hoe.ken*). In order to investigate this interface further, Frauenfelder and Henstra conducted additional experiments following the same basic logic but manipulating the properties of the second syllable (i.e., the properties of the vowel; either reduced, short or long vowels) in the mismatch condition. These experiments consistently produced evidence for lexical activation that varied in strength as a function of the properties of the vowel. More specifically, strongest lexical activation was found when the second syllable contained a reduced vowel. This pattern suggests that the Dutch listener is sensitive to distributional regularities, such as the fact that syllabic sequences involving a consonant followed by a schwa most

often require morphological reanalysis.

Using a phonetic priming paradigm, A. Jongman and J.A. Sereno also investigated the interface between different levels of representation in language comprehension. They examined the nature of the acoustic-phonetic representation used by the listener to access lexical form, seeking to determine whether listeners can use phonemic as well as subphonemic allophonic information to facilitate lexical access. Speech segments (i.e., individual vowels or consonants) were used to prime target items containing those segments in an auditory lexical decision task.

In one experiment, the Dutch vowels [e, a, o] were used as primes for both word and nonword targets containing those particular vowels. Reaction times to word targets were significantly faster when preceded by the vowel contained in that word, as compared to response times when the word was preceded by a different vowel. The opposite effect held for nonwords: response latencies to nonwords were significantly slower when preceded by the matching vowel.

In the second experiment, individual fricatives [f, v, s, z] were used as primes for words and nonwords containing these fricatives in initial position. It was found that reaction times to word targets preceded by voiced primes were facilitated relative to items preceded by voiceless primes. Moreover, this priming was only evident when there was a matching place of articulation, with [v] priming target items whose initial consonants were [f] or [v], and [z] priming target items whose initial consonants were [s] or [z].

The preliminary results for the vowel and initial consonant priming suggest that listeners are sensitive to phonological information in a phonetic priming paradigm. The phonetic priming paradigm thus seems to be an appropriate tool to explore the nature of the input to the word recognition process.

2.1.2 Clitics as an interface phenomenon

The non-isomorphic relationship of the syntactic/semantic and phonological properties of clitic elements is continuously emphasized in research on natural language. This investigation explores the nature of clitic constructions in several languages as an interface between different components, from both linguistic and psycholinguistic perspectives.

Emphatic clitics in Bengali

In this research, J. Bayer and A. Lahiri investigated emphatic clitic constructions in Bengali with the hypothesis that no one level of analysis can account for the complex distributions of the clitic. The distribution of the clitic /o/ ('too') is as follows:

(a) /o/ attaches to a syntactic word
chele - o mar - be
The boy - too beat - fut, 3rd pers

(b) /o/ attaches after an inflected verb or noun
chele - ke - o
the boy - (obj) - also

mar - be - o
beat - (fut, 3rd pers) - also

(c) /o/ cannot come in between two affixes
mar - ch - i - l - am - o
beat-prog-link-past-1st pers - also

*mar - ch - i - o - l - am
*mar - ch - o - i - l - am

(d) /o/ cannot come between a noun stem and its affix
* chele - o - ke

(e) usually /o/ cannot be added between a verb stem and an affix

* mar - o - chilam

But sometimes the /o/ appears before an inflectional ending; specifically after the past participial ending. Compare the following:

(f) mer - e - ch - i - l - am - o
beat - [part] - [prog] - [link] - [past] - [1pers] - too

(g) mer-e-o-ch-i-l-am

In sum, the /o/ can only be infixed in the verbs (not nouns) and this happens only after the past participial /e/ and before the inflectional ending.

There is a straightforward lexical explanation of this asymmetric distribution if we examine the minimal phonological unit to which the /o/ can attach. /o/ can attach to *mere* and not to *mar*. Bayer and Lahiri argue that *mere* is a phonological word (W) while *mar* is a stem. Evidence in support of this can be found in a rule of degemination which deletes initial geminates when they cannot be resyllabified across a W. Compare the following:

(a) resyllabification of geminate affricate /cch/ after a vowel final stem; else, degemination applies
kha - cch - i > khac.chi
eat - prog - 1pers

mar - cch - i > mar.chi (consonant deleted)

(b) Resyllabification occurs also after the addition of another affix after the stem (/a/ is the causative affix)

mar - a - cch - i > ma.rac.chi

(c) But resyllabification does not occur after the past participle /e/; then degemination applies

mer - e - cch - i > *me.re.chi*
not * me.rec.chi

This, however, cannot account for all the facts. Recall that /o/ can attach to nouns like *chele* but the form *chele-o-ke is ill-formed; if /o/ can attach to a W, in principle one should allow the attachment of /o/ to *chele* before *-ke*. The explanation for this ungrammaticality does not come from morphophonology, but from the semantic interpretation of the clitic.

/o/ is similar to quantifiers like *only* and *even* in English. To be interpreted correctly, they have to be assigned scope over a particular syntactic domain.

To be able to assign scope over a clause, the quantifier in question must have access to a domain of quantification which can be S or at least predicate-level. Quantifiers, however, exhibit different island effects in different languages; it is not possible to raise a quantified element out of an NP. This accounts for the discrepancy between allowing /o/ inside inflected verbs, but not in inflected nouns.

With verbs the /o/ can percolate up to the S-node to obtain semantic scope, because the verb is the semantic head of the clause. However, if the /o/ had been infixed within the NP (*chele-o-ke), it could not be raised because NPs are islands for movement.

In sum, the complex distribution of the emphatic clitic in Bengali cannot be accounted for on one level of analysis: both a morphophonemic and a semantic explanation are necessary.

Dutch clitics and the lexicon

Lahiri, Jongman and Sereno began investigating the processing of certain pronominal clitics in Dutch. The underlying reduced

form of the pronouns *haar* or *er* is /dər/. When added to the 1st person, 3rd person singular, or imperative form of verbal stems, the following alternations are obtained:

(1) Underlying	/krab/	/knijp/	/leez/	/kus/
Lexical Level				
Final Devoicing	p	-	s	-
Postlexical Level				
Clitic attachment	$[krap]_w$ $[dər]_w$	$[knijp]_w$ $[dər]_w$	$[lees]_w$ $[dər]_w$	$[kus]_w$ [dər]
Voicing Assimilation	bd	bd	zd	zd
	$[krab]_w$ $[dər]_w$	$[knijb]_w$ $[dər]_w$	$[leez]_w$ $[dər]_w$	$[kuz]_w$ [dər]

Regressive voicing assimilation thus applies across two phonological words (Ws), producing voiced clusters, for example $[krab]_w$ $[dər]_w$. Clearly, on the question of whether the cliticized forms are in the lexicon or not, both from a syntactic as well as a phonological perspective, these forms should be dealt with on the level of syntax. This is, however, only one possibility.

It is also possible to get voiceless clusters for all the forms. This happens when a single phonological word is formed after the application of final devoicing. In Dutch, Ws only permit clusters with voiceless consonants. The derivation would then be as follows:

(2) Underlying	/krab/	/knijp/	/leez/	/kus/
Lexical Level				
Final Devoicing	p	-	s	-
Postlexical level				
Clitic attachment	$[krap]_w$ $[dər]_w$	$[knijp]_w$ $[dər]_w$	$[lees]_w$ $[dər]_w$	$[kus]_w$ $[dər]_w$
W-formation	$[kraptər]_w$	$[knijptər]_w$	$[leestər]_w$	$[kustər]_w$

The question is whether the lexical status of the cliticized forms with voiceless clusters is different from those with the voiced clusters. Does phonological-word formation automatically mean that these forms are lexicalized? Whatever view is accepted, there is no doubt that the two outputs in the cliticized forms have quite different phonological status; the output of the first derivation (1) involves two Ws and the output of (2) consists of a single W.

In this research a first attempt was made to investigate whether differences in the phonological status of Dutch clitics have any processing consequences. Are listeners faster in processing the cliticized forms with voiced clusters or voiceless clusters? This would suggest that a particular type of cliticization (regressive voicing assimilation or W-formation) is facilitated in processing. Or is it the correspondence of the cliticized forms with the underlying representation of the different stem classes that plays a role in processing? This would suggest that processing time is not affected by whether the surface form consists of one or two Ws, but rather by the relation of the surface form to the underlying representation of the verb.

In order to answer this question, they used an auditory lexical decision task. A cliticized form (either voiced or voiceless) was presented as the prime, followed by the imperative form of the same verb that occurred in the cliticized form. For example, subjects would make a lexical decision to the target [krap] that was preceded by either [ik kraptər] or [ik krabdər] as the prime. Similarly, subjects would hear either [ik knijptər] or [ik knijbdər] followed by [knijp]. Verbs with underlying stems ending in /-p, -b, -s, -z/ were used.

The results indicated that response latencies are faster when the cliticized form matched the underlying representation in terms of voicing. Thus, it was not the case that the voiceless cliticized forms (single Ws) were processed faster than the voiced cliticized forms (two Ws), or vice versa. The data provide some initial support for the claim that listeners, when hearing a surface cliticized form, interpret this form with respect to the underlying representation of the verb stem.

2.1.3 Affixation and the structure of the lexicon

The observation that complex lexical items frequently involve levels of structure exhibiting various sorts of incongruity entered

the Interface Project right from the beginning. Affixation – both inflectional and derivational – gives rise to a wide range of properties of the sort investigated in the project. M. Bierwisch set out to clarify the principles and possibilities involved in affixation in a systematic way that interrelates the phonological, syntactic, and semantic aspects of affixation. One of the results of the study is that crucial properties of affixation are related to principles of the overall organization of the lexical system as well.

Based on results and assumptions developed within the study of the structure of the lexical system, as described in 2.8.3, the core assumption of the theory of affixation developed here is that affixes are specific lexical entries whose combination with their base obeys general principles of syntactic and semantic compositionality and rules of lexical phonology.

The specific property of affixes was found in their characteristic argument structure, more specifically in the so-called 'key-θ-Role'. Like θ-Roles in general (see 2.8.3), the key-θ-Role of an affix is constituted by a lambda operator x, which binds a variable in the Semantic Form of the affix and determines its combination with the pertinent argument, which is, in the case of affixes, the stem to which the affix is attached. The distinctive property of the key-θ-Role is its lexical association with a syntactic category feature, rather than a Case feature (or some other grammatical feature). Due to this peculiarity, an affix can only combine with an element of the lexical level, rather than with a phrasal constituent. A direct consequence of this condition is that affixes combine with their argument, i.e., the stem they attach to, by way of functional composition, rather than functional application. From this, it follows in turn that the resulting complex element inherits (part of) the argument structure of the affixed stem. This analysis provides a natural account of the intricate and much discussed problem of inheritance of argument structure in inflection and derivation.

A detailed analysis of deverbal event nominals like *destruc-*

tion, (*the*) *fall*, (*the*) *gathering*, etc. revealed two further interesting consequences of the proposal. Affixes typically select the class of stems they can combine with in a sometimes highly idiosyncratic way. This property can naturally be accomodated by means of the assumption that the key-θ-Role of the affix is also associated with certain morphological features which identify the class of stems the affix can combine with. Each element of this class must then be provided with the same morphological features. In this sense, affix and stem fit together like key and key-role.

The second consequence concerns the content and the origin of the above morphological features which can be given a systematic interpretation on the basis of the following assumption. Affixes constitute a specific subsystem of lexical entries. This subsystem is organized in a highly structured way, providing a structurally determined place for each affix with a specific local system of affixes. Inflectional paradigms are but the most familiar type of these local systems. On this basis, each affix has a special place that can be identified by means of a structurally determined address. Morphological features are simply the encoding of this address in terms of binary features. It is now a natural assumption that the affix automatically associates the key-θ-Role with the features representing its address. An important and highly plausible consequence of this analysis is the fact that the actual idiosyncrasy involved in the stem-affix selection is a property of the stem, rather than the affix, although it is the affix that selects the stem.

As these observations show, the typical properties of affixation are both connected to the characteristic key-θ-Role of affixes, and depend on systematic organizational properties of the lexical system as a whole.

The variability and partial unpredictability of the semantic interpretation of affixes were also explored. Semantic idiosyncrasies and variations were found to be completely independent of morpho-syntactic conditions connected to the key-θ-Role. Rather,

they follow independently motivated principles and mechanisms of semantic organization, one of which is probably the so-called 'lexical templets'. Lexical templets are in a sense affixes without overt phonological and grammatical properties, they effect semantic shifts without introducing overt properties of any sort. They thus create a kind of semi-ambiguity, similar, for example, to the two readings of nouns like *book* (denoting an information structure of some sort, or a physical object). In fact, the polysemy of words like *book*, *school*, *parliament* etc. can be seen as an effect of templets in much the same way as the event- and the result-interpretation of a noun such as *destruction*. The existence of lexical templets must be highly restricted. Templets must in fact be supported by actual entries of the lexical system. This, then, is another respect that makes affixation dependent on overall properties of the lexical system.

The results gained in this study shed new light on certain aspects of the lexical system that are crucially involved in the organization and interaction of the different levels of structure which lexical items must be assumed to exhibit. Although these aspects are not to be construed as properties of the mental lexicon directly, but rather as principles of the lexical system, which specifies the computational structure of the mental lexicon, they nevertheless have important consequences for the organization of the mental lexicon.

2.2 Computational Models of Lexical Processing and Representation

This year saw the beginning of the project on computational models of lexical processing and representation, involving lexical statistics based upon computerized lexical databases, computational modelling, and psycholinguistic experiments.

2.2.1 Lexical statistics

Using the CELEX database for Dutch and English (see 5.2.1), U.H. Frauenfelder, W.D. Marslen-Wilson, G. Peeters and R. Schreuder have begun to extract statistical information about the distribution of orthographic and phonological representations of lexical forms, since recent research in lexical processing has shown that the identification of a given word depends not just upon the evidence for the word itself, but also upon the form relationship of that word to all the other words known to the listener.

A central objective has been to contrast different definitions of lexical space and neighbourhoods. The first definition (Coltheart N) attributed the status of neighbour in lexical space to those words that differed from a given target word by only a single segment (e.g., letter or phoneme) in any position; another definition (used by Nusbaum) generated neighbours not only by substituting, but also by adding or deleting a single segment. Finally, a third definition (Cohort model) assumed a sequential comparison and allowed words to remain neighbours until they diverged in their sequential segmental structure. In several analyses, the lexical neighbourhoods of words were examined as a function of word frequency and form class. The results of the comparison of the neighbourhoods of high and low frequency words constituted a Dutch replication of the original findings of Landauer and Streeter. When the first and second definition of lexical space was adopted for both phonological and orthographic representations, high frequency words had more neighbours than low frequency words, and the neighbours of the high frequency words were themselves higher in frequency than the neighbours of the low frequency words. A similar pattern emerged when the Cohort definition of lexical space was assumed. However, this definition introduced some intriguing complications into the analysis. For example, neighbourhoods or rather cohorts were dynamic and evolved in their membership over time, in contrast to the single

static neighbourhoods computed according to the other definitions. Furthermore, because words did not have to be similar in length to be in the same cohort, morphologically related words of differing length constituted a substantial proportion of the cohort members. This raises the central question of how the morphological relationship between words (i.e., related or unrelated) affects the definition of their respective lexical neighbourhoods.

Frauenfelder and Peeters have pursued the related problem of lexical embedding. They computed how often a word was embedded within a longer morphologically unrelated word using a Dutch database that excluded compounds. This lexicon was analyzed for lexical embedding in 3 different positions: beginning, internal, and end. The result of the analysis showed a remarkable amount of lexical embedding that did not vary across the three positions tested. For example, of the 954 words that were three phonemes in length, 61%, 64.3%, and 57.9% were found as a substring in a longer word for the three respective positions.

2.2.2 Computational modelling

Frauenfelder, Peeters and P. Wittenburg have developed and exploited computational models of lexical processing. The TRACE model of McClelland and Elman was taken as the point of departure for this subproject. A number of TRACE simulations were conducted to study the nature of information flow and the mechanisms of interactive activation in lexical segmentation.

The simulations on the nature of information flow within TRACE were compared directly with human performance data (see Annual Report, 1986). The simulation results closely matched the experimental data in that the amount of top-down lexical feedback – as measured by the difference between simulated recognition times to phoneme targets in words and nonwords – increased as the target appeared later in the items. There were, however, some noteworthy differences between the simulation and

experimental results. Although, as in the experiments, the simulated recognition times of phoneme targets located at the onsets of both words and nonwords were almost equal (suggesting no lexical effect), they were unusually fast. Indeed, they were considerably shorter than the simulated recognition times of targets located at later positions in their respective items. Further simulations revealed that these faster recognition times were attributable to strong and early top-down feedback for both word and nonword inputs: The recognition of the same phonemes with the top-down feedback turned off entirely (unfortunately, not possible in humans) produced much slower recognition times.

Frauenfelder and Peeters also studied the approach to the problem of lexical segmentation and recognition found in TRACE. The problem of segmenting a continuous and overlapping sensory input into discrete words is resolved in TRACE not at the level of a bottom-up analysis of phonetic or prosodic boundary cues, but rather at the lexical level. A multitude of different lexical hypotheses based on competing segmentation analyses are activated and the inappropriate hypotheses are eliminated via mutual inhibition. A series of TRACE simulations addressed the questions of which lexical hypotheses were activated during the processing of lexically ambiguous stretches of speech (e.g., *succeed* versus *suck* and *seed*) and how inappropriate ones, if activated, were dispensed with. These simulations showed that bottom-up excitation and lateral inhibition together led to specific preferences in segmentation. For example, TRACE recognized ambiguous stretches of speech as a single longer word rather than two shorter embedded words. In addition, these simulations shed some light upon two sets of related factors that determined excitation and inhibition: word length and word overlap, on the one hand, and alignment and match on the other.

2.2.3 Experiments

A primary objective of this subproject is to produce experimental data that relate to the simulation and the lexical database research. Several instances have been mentioned in 2.2.1 and 2.2.2. For example, the explicit hypotheses formulated in the computer simulations have been tested by experiments. Reciprocally, the experiments have provided additional constraints upon the computer models (like reducing the importance of inhibition). Experimental results have also informed the statistical lexical analysis which in turn generated stimuli and hypotheses for simulation and further experimental tests.

In the area of lexical segmentation, Frauenfelder and Henstra have conducted experiments which examined the activation and segmentation of words in nonword carrier sequences. Using the phoneme monitoring procedure, they compared the amount of lexical activation of words embedded at the beginnings and the ends of nonword sequences (e.g., the activation of '*cat*' in '*catpil*' versus that in '*pilcat*'). The results showed that the embedded word was equally activated in the two positions matching the outcome of comparable TRACE simulations. Current research in progress has shifted its focus to the activation of words embedded within words rather than within nonwords since at least for noninitially embedded sequences, TRACE predicts no lexical activation.

2.3 Other Issues in Lexical Representations and Processing

In this section research is summarized from four areas: Acoustic/phonetic analyses, morphophonological aspects in processing, syntactic and semantic effects in the lexical domain, and the rep-

resentation and processing of idiomatic expressions.

2.3.1 Acoustic/phonetic analyses

W.J. Barry (U. College, London) has prepared material for experiments differentiating basic psycho-acoustic and higher-level psychophonetic processes in the perception of pitch movement in speech. Other work on glide perception raised the assumption that the perception of frequency change as a glide is a function of the frequency difference edges and an auditory integration period. Pure tone and speech material were generated with falling and rising pitch contours and different steady state onsets or contrasting rising and falling glide onsets. One experiment already carried out showed that a temporal factor influences the subjective onset perception of glides. However, there is clearly not a simple integration constant.

P.A. Keating (U. California, Los Angeles) began to work with Lahiri on a cross-language comparison of the articulation and acoustics of certain consonant types. The question considered is whether one can distinguish true palatals (as in Hungarian or Czech) from velars which have been palatalized (cf. Russian) or contextually fronted (cf. English). Both lines of evidence indicate that they indeed can be. Therefore, existing proposals about the representation of these consonant types in terms of phonetic features which do not distinguish them must be revised.

2.3.2 Morphophonological aspects in processing

Structural lexicon properties in auditory word processing

J.A. Sereno and A. Jongman investigated how structural properties of the lexicon affect language processing. Recent re-

search in both the area of psycholinguistics and speech recognition has demonstrated the power of structural constraints on the sound patterns of a language. A lexical search of American English, using the Brown University Corpus, revealed that the syntactic classes of noun and verb have a different, frequency-dependent, distribution of the phonological classification of their vowels.
Among high frequency words, nouns are more likely to have back vowels (57%) than front vowels (43%) and verbs are more likely to have front vowels (62%) than back vowels (38%). This distribution, however, does not hold for low frequency nouns and verbs in English.

Noun and verb stimuli containing front and back vowels were examined in both an auditory noun/verb categorization task and an auditory lexical decision task. Results show that listeners are sensitive to the interaction between form class and vowel quality. In both tasks, nouns with back vowels (e.g., *month*) were processed faster than nouns with front vowels (e.g., *fact*), whereas verbs with front vowels (e.g., *reach*) were processed faster than verbs with back vowels (e.g., *move*). This effect was only obtained for high frequency stimuli, and thus mimicked the distribution of nouns and verbs containing front and back vowels in the language. The results suggest that lexical distributions may have a substantial influence on lexical processing.

The syllable and morpheme boundary in visual word processing

Some models of lexical access assume that the lexicon is organized around morphemes; some accounts of pre-lexical processing assume that words are parsed into syllables before the lexicon is accessed. If both these assumptions were true, then it should be more difficult to access words with a mismatch at the syllable-morpheme boundary, than words which match at this boundary. N. Sebastian (U. Barcelona) tested this hypoth-

esis in a lexical decision and a naming experiment. Two sets of Dutch words were used. In the first set, there was a match between syllable and morpheme boundary, e.g., *bom – bommen* ('*bombs*'): [bom.men] versus [bom+en]. The second set contained words with a mismatch between boundaries, e.g., *boom – bomen* ('*trees*'): [bo:.men] versus [bo:m+en]. No evidence was obtained that the syllable/morpheme mismatch does play any role in visual word processing, since in both tasks the latencies for words with a syllable/morpheme match were longer than for words with a syllable/morpheme mismatch.

Processing of prefixed words

H. Schriefers, P. Zwitserlood, and A. Roelofs (U. Nijmegen) completed a series of experiments on the processing of prefixed words (see Annual Report, 1987). Two competing approaches to spoken-word processing were tested: the decomposition model and the left-to-right processing approach (the Cohort model). The decomposition model claims that to gain lexical access, the speech input is decomposed into stems and affixes. On a left-to-right approach, no such decomposition takes place, and access to the lexicon is accomplished on the basis of a sequential analysis of the speech input. The data from a phoneme-monitoring experiment, using words with real prefixes (e.g., *verhandelen*) as well as 'pseudo-prefixed' words (e.g., *verdedigen*) provide clear evidence against the decomposition approach. Moreover, for words with real prefixes, there is no empirical support for the Cohort model's concept of the Uniqueness Point, that is, the point in the signal at which a word can be recognised on a left-to-right basis. As in earlier experiments using different materials and a different task (gating), there is an advantage for prefixed words (e.g., *uitknippen*) over their unprefixed counterparts (e.g., *knippen*), although these words have the same Uniqueness Point. Hence, the data do not support a pure left-to-right account for the processing of

morphologically complex words.

Processing of suffixed and infixed words

H. Günther pursued the research on oblique word forms and morphological complexity in German. Using the syntactic priming technique, he showed that at least three variables determine lexical decision times to inflected word forms: (1) appropriate syntactic context, (2) (ir)regularity of the inflected form, (3) paradigmatic organization. For example, past tense forms of German verbs are processed more slowly if presented in isolation than are present tense forms, and irregular forms are processed more slowly in context than regular ones.

2.3.3 Syntactic and semantic effects in the lexical domain

Sentential context effects on lexical activation

During the final year of his dissertation, C.M. Brown completed a series of reaction-time experiments on lexical activation and selection during spoken language comprehension. The main focus was on the effects on spoken word activation of constraining vs. non-constraining sentential-semantic contexts, and of local lexical-semantic information (operationalised by violating selectional restriction aspects of verb-argument structure). The experiments used a cross-modal repetition priming paradigm, in combination with a naming task. Different stimulus onset asynchronies (SOAs) were used to study the activation decay functions of lexical items in the various constraining contexts. Despite a number of attempts, not a single effect was obtained for the local constraints of the verb-argument structure variable. What did emerge from the data is that the global constraints present in sentential-semantic contexts can exert an early effect on the

activational status of lexical items.

Message content and semantic/syntactic disambiguation

In studying context effects in the processing of text, W. Vonk investigated whether the message content of one sentence immediately affects the parsing and interpretation of a word in a second sentence. The first word in the second sentence was syntactically ambiguous with a verb interpretation (nominalized verb) and a noun interpretation (plural noun). The interpretations were either unrelated, as in *schatten* (verb interpretation: '*estimating*'; noun interpretation: '*treasures*') or related, as in *schaatsen* ('*skating*' vs. '*skates*'). The ambiguous word was preceded by a context sentence, which syntactically or semantically makes only one of the interpretations of the ambiguous word appropriate. The ambiguous word was followed by a disambiguating finite verb *is* ('is') or *zijn* ('are').

Subjects had to name the visually presented target *is* or *zijn* in a cross-modal naming paradigm or in a one-modal naming task, in which all material was presented visually. These two tasks were used in order to compare processes in listening and in reading. The naming had to be performed under one of two conditions. In one condition subjects had to judge whether the disambiguating word *is* or *zijn* was appropriate in the context or not, in the other condition they had to process the sentences just for comprehension.

Facilitation in naming the appropriate target relative to the inappropriate one provides evidence that the context has already affected the interpretation/parsing of the ambiguous word as early as the disambiguating target word *is* or *zijn* is encountered. The results so far show that reading the context facilitates the naming of the appropriate finite verb only if the reader has to judge whether the target word is an appropriate continuation, and has no effect whatsoever in the case where the subject has to read

the two sentences for comprehension. Listening to the context, however, resulted in the appropriate-judgement task, as well as in the listening-for-comprehension task, in a facilitation for the naming of the appropriate finite verb relative to the inappropriate target. These results were obtained for both a syntactically and a semantically biasing context sentence, suggesting that message content, at least in listening, can affect parsing and interpretation of the lexical item very early.

2.3.4 The representation and processing of idiomatic expressions

Idiomatic expressions provide a means for studying how complex lexical entries are stored and accessed. A central question is how the idiomatic expression is represented in the lexicon and what the relation is between the meaning of the separate words and the meaning of the expression as a whole.

G.B. Flores d'Arcais, together with J. Henstra, continued research concerning the way the processor deals with the possible conflicts that arise between two alternative semantic interpretations based on the same semantic analysis, at the point at which a phrase becomes an idiom – where a 'literal interpretation' is no longer possible, or is inappropriate.

Flores d'Arcais further investigated the semantic interpretation of idioms. Idioms are often taken to be listed as complete entries in the mental lexicon. While a listener-reader would compute the appropriate interpretation of a metaphor, the meaning of an idiom would become available as result of accessing the **whole** idiomatic entry in the mental lexicon. Experimental work by Flores d'Arcais has given clear indications that, contrary to this position, the correct semantic interpretation can also be assigned to some completely unknown idiom. The results indicate that the

assignment of an interpretation to the idiomatic phrase seems to be based on a careful use of the semantic information available in the lexical elements present in the idiomatic phrase.

W. Vonk continued research on phrasal idioms whose meaning cannot be derived compositionally from the meanings of the individual words. She used a repetition priming paradigm, in which sentences with an idiomatic interpretation were compared with sentences that had no idiomatic interpretation. Sentences were used that contained three nouns, two of which were the nouns of an idiom. The construction of the material allowed for the manipulation of the number of idiom-related primes, keeping the number of primes constant. Subjects had to judge the acceptability of the sentences. As expected, when the number of idiom-related primes was increased from one to two, idiomatic sentences were facilitated, but the processing of non-idiomatic sentences was slowed down, indicating a difference in representation between idioms and non-idioms.

2.4 Syntactic Parsing

Syntactic dependencies in Dutch

L. Frazier (U. Massachusetts, Amherst) and G.B. Flores d'Arcais continued their research into the processing of moved constituents in Dutch. Since adjuncts may precede arguments in Dutch, it is possible to determine whether – without changing the argument structure(s) of the sentence – the mere presence of additional syntactic nodes on the path between a moved argument ("what") and its gap increases processing complexity. If it does, this would support syntactic theories casting filler-gap relations as the sequence of nodes connecting a filler to a gap (as proposed by Kayne, Pesetsky, and others). In two experiments, speeded gram-

maticality judgment times for visually presented sentences were collected, and are now being analyzed.

Syntactic processing during extremely fast reading

Flores d'Arcais has been investigating for some years whether, or under which conditions, readers can understand text without fully processing it syntactically. Does the human parser always carry out a full syntactic analysis of the input, even when it can make up the sense of the message in the text by using some heuristics based, for example, on the use of few content words, as in certain simulation programmes such as FRUMP? In an experiment a special type of rapid serial visual presentation technique was used, in which one, two or three words were presented simultaneously. The average length of each display was 9 characters, which corresponds to the length of the functionally useful 'window' of a fixation in reading. Even at a presentation rate corresponding to 800 or 1000 words per minute, the reader is capable of extracting the meaning of the text presented.

In the experiment, sentences with different syntactic structures were used, some of which contained a syntactic violation. Among the critical sentences, there were wh-relatives with the pronoun in subject or object function. The results indicate that at a very high presentation rate, syntactic information can no longer be fully exploited, and readers try to rely on simple principles such as the order of the main content words for constructing an interpretation of the sentence and for the appropriate assignment of thematic roles to the various elements in the sentence. Thus, although previous work had shown that syntactic analysis is always performed, even when readers can rely on other information for text understanding, the present data suggest that in extremely fast reading conditions the reader can still make sense out of the content of the text, but no longer does this on the basis of a full, explicit syntactic analysis.

2.5 Text Comprehension

Inferential processes in text comprehension

Previous research on inference processes in reading by W. Vonk suggested that the knowledge of the reader of the topic of the text might be an important factor in controlling on-line inferences (see Annual Report, 1987). To investigate this issue a project was set up with L.G.M. Noordman (U. Tilburg) and W. Simons (U. Nijmegen) on inference processes in reading texts in the domain of economics by experts and novices.

The first step was the investigation of the representation of economic knowledge by experts and novices. An elicitation experiment revealed that experts, not surprisingly, gave more associations to a concept than novices, but also produced a more homogeneous set of associations than novices. A further exploration indicated that experts specified more relations between concepts and were more consistent in specifying the relations than novices. The relations specified by experts were predominantly of a causal nature. The knowledge of the novices was not organized in terms of causal relations.

On the basis of these descriptions of knowledge structure, verification statements were constructed of the form "X leads to Z, and Z leads to Y", e.g., *The increase in wages (X) leads, because of the increase of production costs (Z), to an increase in inflation (Y).* The position of the intermediate Z clause was varied. The sentences were presented as three consecutive clauses. The subjects were required to read the first clause, and to verify the second and the third clauses. The overall verification times for the second and third clauses together were about equal for experts and novices, but the allocation of the time was different. The results suggest that the knowledge of the reader indeed increases the inferencing in this task, and that inferencing is a

time consuming process, but need not lead to an overall longer processing time.

2.6 Psychophysiology of Language Comprehension

C.M. Brown and P. Hagoort continued the event related potential (ERP) research which they began in 1987. A physiological psychologist – T. Swaab – was engaged for a period of eight months, thanks to a research grant from the Dutch Science Foundation (NWO) awarded to Brown, Hagoort, and R. Schreuder (U. Nijmegen). Further impetus was provided by S.M. Garnsey (U. Rochester) and M. Kutas (U. California, San Diego), who visited the Institute in 1988.

The research has focussed on semantic processing during spoken language comprehension, investigating both methodological and psycholinguistic aspects. A major methodological question with strong implications for ERP research in psycholinguistics is what – if any – the effects are of continuous temporal variation in the input signal on the human electro-encephalogram (EEG). The possible differential effects of temporal variation in the input signal on the P3 component in the EEG were investigated in a classical odd-ball paradigm. The subjects listened to three randomised sequences of 80 tones of 2 kHz and 20 tones of 1 kHz, and were instructed silently to count the number of low tones (the odd-balls) they heard. The first sequence contained tones of 40 msec duration, the second sequence contained tones varying between 300 and 800 msec duration, and the third sequence contained tones of 650 msec duration. The EEG was measured from three vertex locations, Fz, Cz, Pz, using a common reference derivation to the left mastoid. It was very clear from the data that the P3 is unaffected by temporal variation as operationalized in

these experiments: The amplitude and the latency range of the P3 component was the same across the three tone sequences. An interesting side-effect emerged in the EEG to the long constant tones (650 msec). Here, a N1P2 exogenous stimulus component is evident as a function of stimulus offset.

The next question studied was whether a linguistic analogue of the P3 tone odd-ball effect could be obtained in the auditory modality. To investigate this, 15 subjects listened to a randomised sequence of 80 bird names and 20 names of fruits, and were instructed silently to count the occurrences of names of fruits. The EEG was measured from the same three vertex locations as for the tone sequences. The standards (i.e., the bird names) produced a sustained negativity (averaging 5 mV) in the latency range between 280 and 600 msec following stimulus onset. The oddballs produced a clear and sustained positivity (averaging 3.5 mV) in the latency range between 500 and 850 msec, on Cz and Pz, but not on Fz. This is clearly the P3 component. This result shows that a robust and reliable semantic categorization effect can be produced and measured in the human EEG, on the basis of auditory input.

Two questions concerning N4 effects were investigated. The first question concerned whether a reliable N4 effect, by now demonstrated only with written language material, can also be obtained for spoken language. An auditory semantic priming ERP experiment was performed, using 40 related and 40 unrelated word-pairs. There was a strong N4 effect for the unrelated targets, relative to the related ones. This, then, establishes that despite the intrinsic variability of the spoken signal (both physically and in terms of linguistic information value), a reliable N4 effect can be measured as a function of the semantic relatedness between spoken words.

The second question focussed on the processing nature of the N4: Is the N4 component a reflection of automatic or of controlled processing? A visual masked priming experiment was performed.

First, a standard reaction-time visual lexical decision experiment was run, using both forward and backward masking on the prime. The reaction-time data showed a 17 msec significant priming effect for the related targets. Second, the EEG was recorded from a different group of subjects on the unmasked version of the reaction-time experiment. The EEG data effectively replicate the findings for the auditory N4 experiment: clear exogenous components, and a strong N4 effect for the unrelated targets. Finally, a different group of subjects was run on the masked priming version as used in the reaction-time experiment, but now measuring the EEG. The major finding is that there is no indication whatsoever of an N4 effect for the unrelated targets. The results of these experiments imply that the N4 component is best used as a dependent variable in research directed towards investigating higher order processes like semantic integration, and not in research on lexical access and selection. However, more research is needed before it can be unequivocally stated that the N4 effect is a post-perceptual effect. This research is in progress now.

2.7 Processing of Letters and Phonemes

2.7.1 Recognition processes of letters and phonemes

A. Dijkstra (U. Nijmegen), in collaboration with R. Schreuder (IWTS, U. Nijmegen) and U.H. Frauenfelder, continued research investigating the stage(s) of processing at which auditory and visual recognition processes make contact or converge. Earlier experiments demonstrated cross-modal contacts at a grapheme/phoneme level by means of a bimodal go/no-go task (see Annual Report, 1987). In a new experiment more information was obtained concerning the division of the subjects' responses over the visual and auditory modalities by means of a **modality decision** technique. Subjects reacted by pushing a button as quickly

as they could when they saw or heard the graphemes "A" or "U" or their corresponding phonemes. They had to push a button marked "SEEN", if the target stimulus was presented in the visual modality, and a button marked "HEARD" if the target stimulus was auditorily presented. Sometimes trials occurred in which both the visual and auditory stimuli were target stimuli. In that case subjects had to react as soon as they could to the first identified target. The results indicate that the subjects' responses were sensitive to the temporal relationship between the two target stimuli and to the grapheme/phoneme correspondence of the stimuli. Furthermore, the results indicated a predominance of reactions to the visual modality, a finding referred to in the literature as "visual dominance".

2.7.2 The recognition of Kanji characters

In a project on the recognition of complex Kanji characters in Chinese and Japanese, G.B. Flores d'Arcais tried to find out whether the components of a single complex character are activated when the character is recognized, even when the relation between the complex character and the component is completely opaque. For example, both in Chinese and in Japanese the simple character for MOUTH is a component of the complex character STONE, but '*stone*' is neither semantically nor associatively related to '*mouth*'. Will the meaning of MOUTH, or some meaning component of it, become available when the character STONE is recognized? This was the basic question.

So far, two main experiments have been carried out, both with Japanese and Chinese subjects, with appropriate material obtained independently for the two languages in preliminary studies. The first experiment required the naming of a target character preceded by a prime character, the second involved a speeded judgment of semantic relatedness between two words. In each experiment the critical pairs were made by a complex character A

(such as STONE), and a second character B related in meaning to the 'opaque' component of A (such as EYE, semantically related to MOUTH, which is an opaque component of the character STONE). In Japanese the character reading experiment offered no evidence in favour of the hypothesis investigated, but also failed to produce any priming effect. On the other hand, the experiment on speeded judgment of semantic relatedness, which presumably requires a substantial amount of semantic processing, has given some indications supporting the hypothesis. The experiments in Chinese have so far given indications consistent with the last results in Japanese. Altogether, the results seem to indicate that during the access of a complex character the meaning of the single component can in some conditions become available and affect the recognition of the character.

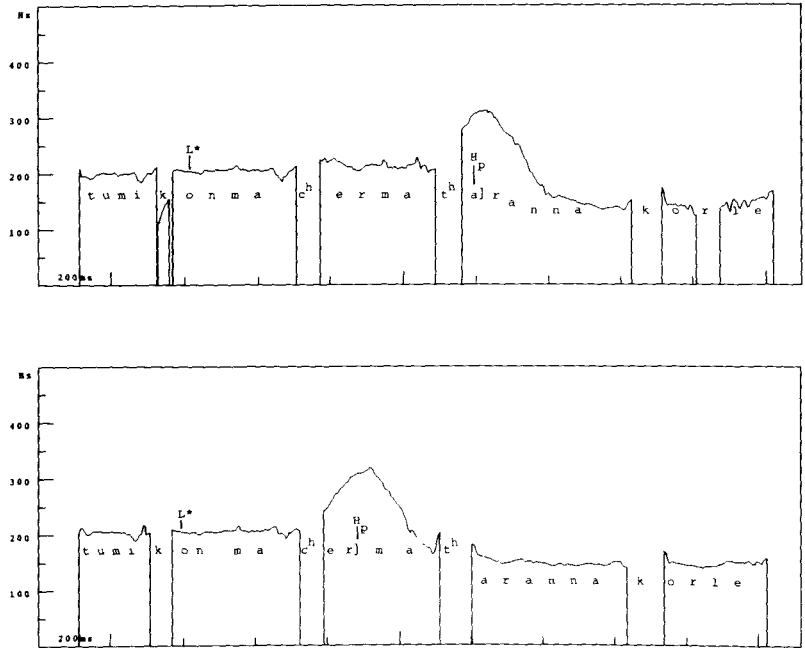
2.8 Issues in Theoretical Linguistics

2.8.1 Phonology of Bengali intonation

B. Hayes (U. California, Los Angeles) and A. Lahiri continued their research on the phonology of Bengali intonation. Adopting the typology of tones found in recent proposals, pitch accents (marked with an asterisk) are associated with stressed syllables, and phrase accents, analysed as boundary tones (marked with the appropriate boundary symbol), are aligned to the edge of the relevant phrasal boundary. In the analysis of the Bengali intonation system, three important theoretical conclusions were drawn. First, despite the rather weak nature of the stress in Bengali, it shows the same attraction of pitch accents to stressed syllables as in languages like English. Second, the boundary tone of the focus tune (observed to be L* H_P), clearly marks the edge of a focussed phonological phrase. The following minimal pair supports this analysis.

(a) tumi kon macher-matha ranna-korle?
you which fishhead cooked
'Which fishhead did you cook?'
[...[kon macher-matha]$_P$ [ranna-korle]$_P$]$_I$
L* H_P

(b) tumi kon macher matha ranna-korle?
you which fish's head cooked
'Which fish's head did you cook?'
[...[kon macher]$_P$ [matha]$_P$ [ranna-korle]$_P$]$_I$
L* H_P



The location of the pitch peak in utterances (a) and (b) (compare figures above) is predicted by the principle that H_P is a boundary tone of the focussed constituent.
The third conclusion is that the Bengali intonational inventory obeys the Obligatory Contour Principle (OCP), which prohibits consecutive identical phonological units. The OCP prevents sequences of identical tones and triggers repair rules to eliminate violations when such configurations occur. This is observed in focussed yes/no questions (where the yes/no tone is H_I L_I). The surface contour L* H_I L_I is derived from /L* H_P – H_I L_I/, where the H_P is deleted by a rule to preserve the OCP.

2.8.2 The syntax of Logical Form

J. Bayer, in collaboration with P. Dasgupta (Deccan College, Pune), has shown that 'directionality of government' is an important factor in the determination of interrogative scope in Bengali. Bengali is an interesting language in this respect, because it combines properties which are not found in the languages hitherto studied with this theoretical perspective. These properties are:
(A) Like Chinese, Japanese and many other languages, Bengali does not move its WH-words to a preverbal COMP-position, but rather keeps them "in situ" e.g.

(1) tumi kake dekhecho?
you who seen-have
Who have you seen?

(B) Although Bengali is a head-end language (a Greenbergian SOV-type) like Japanese, it can freely order clausal complements to the left and to the right of the matrix verb, e.g.

(2)a. ami [babul asbe] suni-ni
I Babul come-will heard-have-not
I haven't heard that Babul will come
b. ami suni-ni [babul asbe]

The ordering options (B) have an influence on the interpre-

tive range of a question word which is "in situ" (A) inside the bracketed clause. Consider the following pair of sentences:

(3)a. tumi [ke asbe] sunecho
you who come-will heard-have

b. tumi sunecho [ke asbe]

(3a) is ambiguous between a direct question reading and an indirect question reading, i e. "Who have you heard will come?" versus "You have heard who will come". This ambiguity is absent in (3b). (3b) can never be interpreted as a direct question. Building on earlier work by Bayer, this difference can be explained as follows: According to a standard assumption about LF, abstract movement raises the WH-element *ke* to an operator position. From there it can be raised further in the fashion of cyclic COMP-to-COMP movement This second movement is possible in (3a), because the matrix verb *sunecho* governs to the left, which is the canonical government direction in Bengali. Since the complement appears to the right in (3b) the second movement is blocked, and a wide scope reading cannot be derived.

Interestingly it is possible to assign wide scope interpretation to an interrogative subconstituent of a non-finite postverbal adjunct, like *ke* in

(4) tumi jege uthbe [ke caecale]?
you wake-up-will who shout-if
For which person x [you will wake up if x shouts]?

In the case of (4), the bracketed clause is not governed. This confirms the conclusion that it is the orientation of the matrix verb in (3) which causes the interpretive difference.

If the orientation of lexical governors can be shown to have the same effect both on scope assignment and on overt syntactic movement, LF as a syntactic level of representation is empirically supported.

2.8.3 The structure of the lexical system

Continuing research on the structure of lexical entries (see Annual Report, 1987), M. Bierwisch investigated the content of **intra-lexical principles**, which determine the structure of the system of actual and virtual lexical entries, and their relation to **extra-lexical principles** (like X-bar Syntax, Projection Principle, etc.), which apply to the output of the lexical system, in order to determine the structure of complex expressions.

These principles are not disjoint: the principles of X-Bar-Syntax for example operate both intra- and extra-lexically. In order to indicate some of the results, the general structure of lexical entries must be indicated. Lexical entries, whether basic or complex, actual or virtual, consist of the following four components:

(1) (PF, GF, θ-Grid, SF), where
   (a) the phonological form PF contains all and only the unpredictable phonological features of the entry;
   (b) GF is a (structured) set of grammatical features specifying the syntactic category and other grammatical properties of the entry such as Number, Case, Tense, etc.
   (c) the thematic grid (θ-Grid; see Annual Report, 1987, for background) is a sequence of θ-Roles specifying the argument structure of the entry.
   (d) the Semantic Form SF represents a propositional condition on the conceptual interpretation of the entry; it consists of constants and variables that are organized by principles of categorial grammar. θ-Roles (c) are constituted by Lambda operators, binding variables in SF.

Principles determining the structure of θ-Grids are the main interest of the present research and will be commented on directly.

(1) can be illustrated by the following entry for the German

preposition *bei* (near):

(2) /bay/, [–V, –N, –Dir], $\underset{[+\text{Obl}]}{\hat{x}}$ $\hat{y}$ [LOC y ⊂ PROX x]

PF GF θ-Grid SF

LOC and PROX represent functions that assign an object its location and its proximal environment, respectively, ⊂ is the containment relation. The variables y and x are bound by the θ-Roles $\hat{y}$ and $\hat{x}$, respectively, by means of which they can be specified by appropriate syntactic arguments according to general principles of θ-Role discharging. The grammatical feature [+Obl] associated with the θ-Role $\hat{x}$ indicates that the internal argument of *bei* must be an oblique NP, i.e. must be marked by the Case features of Dative. The GF-component of (2) specifies *bei* as a nondirectional [–Dir], i.e. locative, preposition [–V, –N].

Turning to the principles that determine the structure of θ-Grids, it is first to be noted that the lambda operators constituting the θ-Roles form a sequence of the general form

(3) $\hat{x}_n\ \hat{x}_{n-1}\ \ldots\ \hat{x}_1$

where $\hat{x}_i$ must be discharged before $\hat{x}_{i-1}$. This corresponds directly to the syntactic relatedness of a lexical head and the hierarchy of its complements. θ-Roles furthermore are to be distinguished according to the following criteria:

(4)(a) internal vs. external θ-Roles
(b) referential vs. non-referential θ-Roles
(c) obligatory vs. optional θ-Roles

Given these distinctions, θ-Grids are subject to the following conditions (among others):

(5)(a) Only nouns and verbs have a referential θ-Role. The referential θ-Role is always constituted by $\hat{x}_1$.

(b) For verbs, the external θ-Role is $\hat{x}_2$, otherwise it is $\hat{x}_1$.
(c) If $\hat{x}_i$ is an internal θ-Role, then i > j, where $\hat{x}_j$ is the external θ-Role of the entry.
(d) Only internal θ-Roles can be optional.
(e) For [+N] entries, i.e. nouns and adjectives, internal θ-Roles are always optional, for other entries, optionality must be lexically marked.

The conditions in (5) relate basic properties of θ-Grids to syntactic category features in the GF-component of lexical entries.

θ-Roles are furthermore associated with grammatical features. This association can either be idiosyncratic, i.e. lexically marked, or structural, i.e. determined by default rules. Feature assignment is subject to the following conditions:

(6)(a) $\hat{x}_1$ can never be associated with lexically determined features.
(b) Referential θ-Roles cannot be associated with structurally determined grammatical features either.

While the conditions in (5) relate the structure of θ-Grids to the theory of syntactic categories, those in (6) relate it to an extended version of Case Theory.

The conditions in (5) and (6) are strictly intra-lexical principles. They interact with other (intra- and extra-lexical) principles, thereby determining a wide range of consequences in the combinatorial behaviour of lexical entries.

On the basis of this (incomplete) exposition, a number of more general conclusions can be indicated.

1. The θ-Grid of a lexical entry is the interface between its semantic and grammatical properties in essential respects. This holds not only for the organization of lexical entries as such, but also for the behaviour of lexical items with respect to intra- and extra-lexical combinatorial processes.

2. The structure of the θ-Grid thus determines to a large extent the syntactic and semantic properties of its lexical entry. Interacting with extra-lexical principles of X-Bar Syntax, θ-Marking, and (extended) Case-Theory, the θ-Grid defines much of the syntactic structure a lexical item participates in. By means of compositional principles of categorial grammar and lambda conversion, it also determines the construction of the semantic form of complex expressions containing the lexical entry.

3. The lexical system (LS) must now be understood not as a module of the Grammar, but rather as a highly modular system in itself whose organizing principles interact in systematic ways both within LS and with extra-lexical principles.

3. Language Acquisition

The main research interests of the acquisition group remain the acquisition of syntactic structure, viewed from a sentential and discourse perspective, and the acquisition and expression of spatial and temporal concepts. Within these areas, the acquisition of many (first and second) languages are investigated in an attempt to distinguish phenomena specific to one target language from more generalizable phenomena in the acquisition process.

The group has divided its year between pursuing already-established research, and setting up new projects within the group, such as the "Input project" (see below 3.4), and cross-group projects on clause structure, and on the expression of space and time – called the "Reference project" (for ease of reference). These projects were not under way in 1988, and so the emphasis in this chapter will be more on individual work in progress. As a preliminary to the Reference project, a stimulating series of joint informal seminars was held on temporal reference throughout the year with members of the production group.

The year was also marked by the development of first and second language acquisition data bases (3.5).

3.1 Clause Structure

3.1.1 Cross-linguistic studies in developing word order

French, German, Hebrew comparisons

J. Weissenborn continued his studies on early syntactic development in French and German. This research is now being conducted in cooperation with R. Berman (U. Tel Aviv), and has been extended to Hebrew. It is supported by grants from the German-Israelian Science Foundation (GIF) and the Deutsche Forschungsgemeinschaft (DFG). Berman spent the month of August at the Institute, working closely with Weissenborn. Apart from the collection and transcription of longitudinal data in the languages under study and the development of experimental designs for the collection of additional data in different areas of syntactic development, work has focussed on three main areas:

(a) Development of a coding system.

A detailed system of coding for naturalistic language data was worked out, coordinated with the CHILDES system of transcription and data-analysis (see 3.5). This is an original system of coding by tiers (including syntax, lexicon, and morphology) which is applicable cross-linguistically, and which makes it possible to look into a range of problems connected with word order, as well as other problems of morpho-syntactic and lexical development. The system is now being refined for Hebrew, prior to specifying the final version of the Hebrew coding manual.

(b) Subject development in early French, German and Hebrew.

Continuing previous work (see Annual Report, 1987) the development of subjects in French, German and Hebrew was pursued

and the findings evaluated against so-called 'parameter setting' theories of language acquisition developed within the framework of Chomsky's 'Universal Grammar'. The theory assumes the child endowed with a set of general linguistic principles, which must be adjusted to sets of target-language-specific facts; in other words, the 'parameters' must be 'fixed' for the value of the input language. The null-subject, or 'Pro-drop', parameter, for example, is purported to distinguish languages like English from languages like Italian in that the latter, but not the former, has (with related grammatical properties) the possibility of omitting lexical subjects. None of the languages studied here is overall 'pro-drop' or 'non-pro-drop' but they have optional or obligatory thematic or expletive subjects in restricted environments. This results in contradictory input to the children as regards this parameter. Thus none of the features commonly associated with the null subject phenomenon constitute non-ambiguous evidence for the children to correct, if necessary, the initial +pro-drop setting of the parameter to –pro-drop. In fact, in French as well as in German, children continue to use subjectless sentences well after other features of the parameter (type of verbal inflection, tense, expletives, +/– clitic climbing) have been analysed. Whereas in German there are still 15% – 20% thematic null subjects produced by children of about 3,5 years old, the occurrence of null subjects in French eventually comes close to zero at about the same age.

These findings seem best to be explained if one assumes two possible lines of development:

– first, that development may consist not in the change of a parametric value but in the restriction of the scope of the initial value of a parameter. Thus the acquisition of verb second in German is assumed to constrain the possibilty of having thematic null subjects to the preverbal topic position;

– second, the resetting of one parameter may be dependent on the setting of another parameter. We assume that there is one context where the child does not get conflicting input with respect

to the occurrence of null subjects in French and presumably other languages: subordinate clauses. The prediction then is that null subjects should no longer occur when embedded clauses showing lexical complementizers develop. It is proposed that this development hinges on the setting of another parameter, namely whether there is overt WH-movement in the language or not. The disappearence of null subjects and the development of WH-movement (relative clauses) and of lexical complementizers around the same time (3;2-3;6) are evidence for these assumptions.

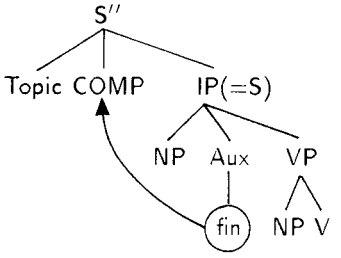
German, English comparisons

In a preliminary study, Weissenborn, in collaboration with T. Roeper (U. Massachusetts, Amherst) investigated how question formation in English and German acquisition differ. Short recordings were made of how a German speaking child of two years old dealt with complex questions such as *wie hat er gesagt wie das Auto fährt?* ('how did he say how the car drives?'). The results suggest that children as young as this already use a copying operation in questions. German speaking children do hear instances of the copying operation in the adult input (as in the example); it seems however that the same process is present in English-speaking children where there is no adult model. It is hoped to extend this line of research to include Dutch and French speaking children.

German, Dutch comparisons

P. Jordens (Free U., Amsterdam) continued his work on the acquisition of word order in L2 Dutch and German also within the framework of Universal Grammar. The central question concerns the acquisition of Verb-Second in L2 Dutch and German by native speakers of Romance languages such as Italian, Spanish and Portuguese and also by native speakers of English, Turkish

and Moroccan. The study compared and reanalysed data that are available from earlier studies carried out by several research groups. Romance and English speakers start out with a NP-V-NP constituent ordering, presumably as a function of initial hypotheses based on their native language. In order to learn Verb-Second in Dutch and German these learners have to find out that the finite verb (fin) occurs in COMP:



This development, schematized by the arrow in the tree diagram, is accompanied by a re-ordering of the VP from V–NP to NP–V, as also indicated. With the realization that Vfin is moveable, and that COMP must be filled – if not by Vfin, then by the complementizers *dat*, *daß* – these learners achieve correct word order both in main clauses with topicalized non-subject constituents, and in embedded clauses with Vfin moved rightwards because of the presence under COMP of *dat*, *daß*. In other words, they learn that the finite verb and the complementizers are in complementary distribution under COMP. Thus these learners are able to acquire Verb-Second after they have found out about the relevance of COMP for the positioning of the finite verb. For Turkish learners, however, there is no relation between the acquisition of embedded clauses and Verb-Second. The finite element is used external to IP as soon as the Aux-Subject-Object-Verb pattern is learned on the basis of their initial hypothesis, again due to their native language, that Dutch and German are S-O-V.

3.1.2 Word order development in Dutch

In his research on the acquisition of word order in L1 Dutch, Jordens investigated the acquisition of the positioning of finite and non-finite verb forms in simple clauses. From his data collection it appears that children first use two verb categories that are distributionally different. There is a small class of verbs with finite morphology, such as *slaapt* ('*sleeps*'), *komt* ('*comes*'), *valt* ('*falls*'), used in second position and a large class of verbs with non-finite morphology used in final position. The non-finite verbs are mainly transitive action verbs, the finite verbs do not take an argument as patient When in the course of development the **same** verbs (with different morphology) are used for the finite and the non-finite verb category, a relation between the two clause patterns is established. If there is a modal verb, the lexical (non-finite) verb occurs in final position. If there is no modal verb the lexical (finite) verb occurs in second position. Modal and finite verbs, however, continue to be different verb categories until agreement is acquired.

3.1.3 Clitic object pronouns and word order development in French

The main result of this study by Weissenborn, is that contrary to what has been assumed in much previous work, object clitics are quite early in development, showing up at the same time as the first finite verb forms at about 22 months. This finding is at variance with an account of clitic placement by movement that would predict clitic placement to be contemporaneous with other forms of movement like passive formation and WH-movement, which are relatively late developments. As an alternative it is proposed that the early use of object clitics is best accounted for if it is assumed that cliticization is a morphological process.

The analysis of the clitic as a spellout of the case features of the verb accounts for the absence of case errors in the use of clitics, whereas, as predicted, errors show up in such agreement processes that do **not** involve inherent features of the verb as agreement in person, number and gender between the clitic and a coindexed NP. As a consequence of the development of clitic object pronouns and the fact that they 'absorb' case in French, the complement NP positions of the verb become unavailable for lexical NPs in the presence of a coindexed clitic. This means that lexical NPs can only show up in adjoined positions to IP or VP. This accounts for (most of) the 'deviations' from 'basic' S-V-O order noted by earlier investigators. We assume that the early acquisition of word order in French in simple sentences is related to the fact that the underlying structure and the surface structure are almost identical and that elements like clitics and negation constitute reliable positional clues in French as to how the mapping between both levels of representation is done. Hence, crosslinguistic differences in the development of word order may be explained by how different levels of representation are related to each other. The reorganisational processes intervening in the development of German word order are thus attributed to the fact that different movement operations lead to the overt word order of German matrix clauses.

3.1.4 Verb-argument structure

Continuing her long-term investigations of children's acquisition of verb-argument structure, M. Bowerman examined the hypothesis that agents and patients play a special role in the development of sentence structure. This proposal has recently figured prominantly in approaches to language acquisition that are otherwise quite divergent. For example, within the framework of learnability theory, Pinker credits children with inborn knowledge of "linking rules", i.e., regular associations between the se-

mantic/thematic roles played by the arguments of verbs and the syntactic functions of subject, direct object, and oblique object. He hypothesizes that this knowledge is applied to the initial acquisition of phrase structure rules in a process termed "semantic bootstrapping": the child looks for noun phrases that play key semantic roles and infers that these phrases also perform the correlated syntactic function (thus, "if it is an agent, assume it is the sentence-subject"; "if it is a patient, assume it is the direct object"). From a more functional perspective, Slobin has argued that children first use the linguistic devices associated with transitivity in their language (e.g., case endings, appropriate word order) in connection with a conceptual gestalt he terms the "Prototypical Transitive Event" or "Manipulative Activity Scene", an event in which "an agent carries out a physical and perceptible change of state in a patient by means of direct body contact or with an instrument under the agent's control".

Bowerman analysed detailed longitudinal diary data from two English-speaking children for evidence that agents and patients – particularly clear-cut or prototypical instances of these – play a privileged role in the acquisition of basic word order for strings containing a subject, verb, and direct object. Word order was chosen for investigation because for children learning English, the identification and positioning of subject and object noun phrases relative to the verb is the first and most important grammatical correlate of transitive phrase structure to be learned.

Counter to the hypotheses under investigation, there was **no** selective advantage for sentences with agents and patients over S-V-O strings with other thematic roles, or for those with prototypical agents and patients over those with non-prototypical agents and patients. For one child, the emergence and appropriate ordering of S-V-O strings occurred simultaneously across a variety of verb/event types, e.g., both for utterances expressing prototypical agent-patient relations with verbs like *break* and *open* and for utterances expressing other thematic relations with verbs like

want, *see*, and *need*. For the other child, strings involving agents and patients were not only not selectively advantaged, but in fact even **disadvantaged**: the ordering of constituents in such strings was wildly unstable for a full month beyond the point at which stable and correct word order had been established for S-V-O strings of other kinds. The difficulty this latter child had in ordering agents and patients relative to the verb in three-constituent strings is congruent with an often-overlooked finding of Braine, that children at the **two**-word stage often have trouble ordering verb and object, and supports his tentative proposal that since prototypical patients undergo a change of state or location, they share certain properties such as movement with agents and other actors and may at times be confusable with these.

Earlier (see Annual Report, 1987) Bowerman had tested the linking rule hypothesis by comparing the relative time at which children acquire the syntactic frames of verbs with 'canonical' vs. 'non-canonical' mappings, and found no difference in favour of canonical mapping. She showed further that 'default' mapping errors (i.e., errors in which non-canonical verbs are mapped canonically) do not occur in the early stages of acquisition, as would be compatible with (although not required by) the "innate linking rules" hypothesis, but may occur as much as several years later. Late 'default' linking errors cannot be accounted for on the hypothesis that knowledge of linking rules is innate, but is explainable if we assume that children **learn** (and sometimes overgeneralize) the typical linking patterns of the language to which they are exposed. These earlier results, together with the current evidence concerning agents and patients, indicate that children learn both the syntactic frames of verbs and the basic phrase structure rules of their language without assistance from *a priori* expections about the mapping between thematic and syntactic roles.

J.H. Randall (North Eastern U., Boston, Mass.) investigated

the role of 'inheritance' in the grammar. Inheritance is the preservation of argument structure under lexical operations.

(1) a. She flies aircraft through windstorms.
b. the flying of aircraft through windstorms...
c. the flier of aircraft *through windstorms...

While certain English affixes, *-ing* for example, allow a verb's arguments to be fully inherited, others, like *-er*, *-able*, *-t*, do not. Inheritance also plays a role in deriving resultative verbs like those in (2),

(2) The baker pounded the dough smooth.
The joggers ran their shoes to tatters.

In a study in progress with J. Carrier-Duncan (U. Harvard), it is claimed that here the conceptual structure of one verb (*pound*, *run*) is inherited into a larger conceptual structure, to form a resultative verb. Inheritance is limited, however, by an independent syntactic constraint on the number of arguments a verb may take. Thus three-argument verbs cannot form resultatives:

(3) *The horses dragged the logs to the mill smooth.

These questions are now being studied from the perspective of acquisition. A striking result is that learners overgeneralize inheritance, accepting (1b) and (1c) equally. They only retreat from this overgeneral 'Inheritance Hypothesis' when they master an affix's categorial properties.

K. Kilborn continued his investigation of the comprehension of verb-argument relationships in a series of experimental studies. One of the main topics of interest is that of transfer. While much research has been directed at describing the conditions under which transfer occurs, and the forms such transfer takes, very little is known about how transfer affects – and is affected by – the constraints inherent in real-time processing in a second language. An on-line sentence comprehension paradigm was used to show how three cues to thematic role (word order, noun-verb agreement, animacy relations) interact during comprehension. In

the first set of experiments, native German speakers carried out both visual and auditory versions of the task in both their native language and in English. Monolingual English speakers served as controls. Results indicate that monolingual English speakers depend on word order, often making thematic role assignments immediately after the first noun is encountered, and generally do not attend to morphological information. In contrast, native German speakers depend on morphological cues in German, delaying responses until all potential cues are in. When the same subjects perform the task in their second language, a similar result is observed, indicating that German-based processing strategies are transferred to on-line processing in the second language. A group of native English speakers who speak German as a second language are now being tested in both languages, along with a control group of native German speakers.

3.2 The Expression of Space and Time

3.2.1 Space

Cross-linguistic studies of the acquisition of spatial categories

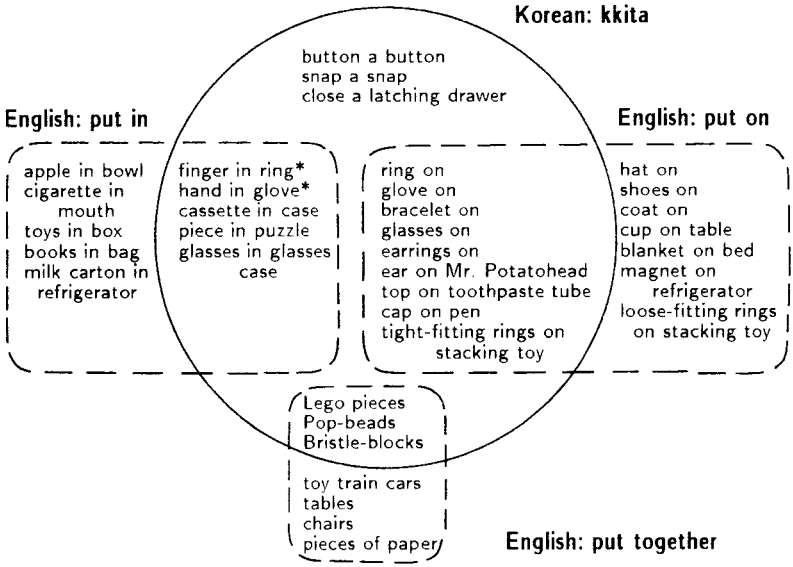
M. Bowerman has continued her cross-linguistic research on the acquisition of spatial categories in first language development. This research investigates the structure and origin of the categories children initially identify with the spatial morphemes of their language, exploring (1) the relative influence of non-linguistic cognitive development vs. experience with the categories of the input language, and (2) the process by which language-specific categorization principles are discovered.

In addition to continuing work on a study (together with D. Gentner, U. of Illinois) of Dutch vs. English-speaking children's acquisition of topological spatial prepositions for static support,

attachment, and containment relationships (see Annual Report, 1987), Bowerman extended her project in 1988 to include dynamic spatial actions. Working jointly with S. Choi (San Diego State U.), she analysed and compared how spatial manipulations of objects are classified in English vs. Korean, and investigated the initial implicit categorization of such actions by children learning these languages.

Spatial manipulations are highly salient for young children, and they typically begin to talk about them before two years of age, in English often with words like *in*, *out*, *on*, and *off* (= 'put *in*', 'take *out*', etc.). Similarities in the way English-speaking children initially use these and other relational words have led many investigators to hypothesize that the words map directly onto relational concepts that children form on the basis of sensorimotor development during the second year of life. This proposal both reflects and contributes to the broader prevalent assumption that children's initial semantic categories are moulded by universal constraints on human cognition and development rather than by attention to the way adults use language. Bowerman and Choi examined this hypothesis with data from Korean and English-speaking children.

According to Bowerman and Choi's analyses, spatial manipulations are categorized strikingly differently in the two languages. For example, the Korean category associated with the word *kkita* (which means, very roughly, 'bring into a relationship of tight fit or attachment') cross-cuts the territory of English *put in*, *put on*, and *put together* in such a way that it often collapses distinctions that English regards as basic, such as between 'containment' and 'surface contact', and, conversely, introduces distinctions among relationships that English treats as equivalent (e.g., between putting an object into a tight- vs. loose-fitting container, which are both routinely encoded with *put in* in English). (See the classifications of acts of 'joining' in the figure on the following page.)



* Canonically, rings are put on fingers and gloves on hands, but envision here a situation in which the ring or glove is held stable and the finger or hand moves toward it

These differences between English and Korean mean that children learning the two languages receive different linguistic guidelines about how to categorize spatial manipulations. Nevertheless, if it is sensorimotor concepts rather than experience with the categories of language that initially guides children's extensions of relational words to novel contexts, the situations in which children learning English say *in* (for example) should correspond closely to the situations in which Korean children say some Korean word; similarly for *out* and so on.

To test this hypothesis, Bowerman and Choi compared detailed longitudinal spontaneous speech data from two English-speaking children and four Korean children. Counter to the 'sensorimotor concepts' hypothesis, they found that by at least 20 months (the earliest age for which Korean data were available), the two sets of children extended words for spatial manipulations

on the basis of profoundly different underlying categories: they were clearly already sensitive to certain fundamental semantic cleavages of their language. The children did make errors in their use of spatial morphemes (which demonstrated that the forms were productive, not simply rote-learned in certain contexts), but the errors reflected difficulties in working out the details of language-specific classification principles rather than solely the effects of uniform (universal) spatial concepts to which the different words had been assimilated. However, although the input categorization schemes clearly influenced the structure of children's early semantic concepts, this influence was not absolute: some of the distinctions important in the input language were easier or more salient for the children than others, presumably for cognitive/perceptual reasons.

The static-dynamic distinction

In addition to her research with Bowerman, Choi looked at the relationship between the encoding of static versus dynamic spatial relationships in the verbal suffixes in Korean. The database was the spontaneous speech of three Korean children, sampled regularly between 20 months and 3 years of age.

In Korean, verbs denote both dynamic situations where an object is **moving** or is being moved from one place to another (see example (1)) and static situations where an object **is** at a particular location in relation to another. The latter is expressed by adding a past tense morpheme to the verb (example (2)). Korean also has locative nouns (similar to inside, outside, top, bottom in English) which can be used to describe static situations (Example (3)).

(1) talamcwi-ka namwu-ey ollaka-n-ta
squirrel-Subj. tree-to go up-Present-Assertive
"The squirrel is going up the tree."

(2) talamcwi-ka namwu-ey ollaka-ss-ta.
squirrel-Subj. tree-to go up-Past-Assertive
"The squirrel is up in the tree."

(3) talamcwi-ka namwu-WUI-ey iss-ta.
squirrel-Subj. tree-TOP-at be-Assertive
"The squirrel is up in the tree."

Choi examined the development of these spatial expressions. Her goal was to see whether children differentiate action and state by using verbs for action and nouns for state. Her analysis of the acquisition of spatial verbs and locative nouns in the spontaneous speech data showed that (1) the children produced spatial verbs much earlier than locative nouns: spatial verbs appeared between 1;8 and 2;0, while locative nouns did not appear before the end of the children's third year. Verbs were used for both dynamic and static situations (children may have started using the verbs for dynamic situations initially and extended them later to static situations, but data on earlier periods is needed to investigate this). The data suggest that children perceive dynamic actions and the states resulting from such actions as closely related concepts.

L.A. Weeks continued her dissertation work on the acquisition of verb-particle constructions in Dutch and English. The major question investigated is how children detect the language-specific rules of use and untangle the interaction of these rules with auxiliary selection, transitivity, and pronominalization. The age range studied is approximately one-and-a-half to three-and-a-half years. A corpus of weekly recordings from two Dutch children for the period in question is being analysed to characterize their use of verb-particle constructions (verbs with separable or non-separable prefixes), together with their choice of auxiliary (*zijn, hebben*), in expressing location and locomotion, in order to see whether their

awareness of this semantic (static/dynamic) distinction directs their early language use.

3.2.2 Temporal reference and verbal markings

M. Hickmann, in collaboration with M. Fayol, J.-E. Gombert, and I. Bonnotte (U. Dijon) completed data analyses concerning how French adults and 8 to 10 year-old children use verbal inflections. This study focusses on the relations between speakers' cognitive representation of different predicate types and their uses of past tense inflections in written French with sentences which were presented in isolation versus embedded at three points (beginning, middle, end) within short narratives. The results show that the uses of the *imparfait* versus *passé simple* depended massively on the inherent semantic characteristics of the predicates: the *imparfait* was used with non-resultative durative predicates (e.g., *monter, bouger, marcher*) and the *passé simple* with resultative punctual ones (e.g., *renverser, exploser, casser*). However, there was also a strong interaction between predicate types and their position when they were embedded within narratives. The non-resultative durative predicates were inflected with the *imparfait* at the beginning of the narratives and with the *passé simple* at the end. In contrast, position in the narratives did not affect the verbal inflections that were used with resultative punctual predicates. This effect was increasingly marked with increasing age. Further data collection will extend this research to spoken French, as well as to other languages within a cross-linguistic perspective.

Li Ping continued his dissertation work on the acquisition of aspect markers in Chinese. This research focusses on three problems: (1) children's categorization of verbs with respect to temporal features of events, (2) the acquisition of syntactic properties and lexical meanings of the aspect markers, and (3) the interaction between the above two in the acquisition processes.

Three sets of acquisition data (production, comprehension and imitation) were collected and analysed. A preliminary analysis of the comprehension and production data shows that there is a clear correlation between children's categorization of verbs and their use and understanding of aspect markers. For example, in the comprehension data, the perfective aspect marker *-le* is understood better with verbs that encode results than with verbs that encode only processes. In the production data, verbs that encode explicit results are exclusively marked with perfective aspect from the youngest subjects (3 year-olds). This suggests that in the acquisition of aspect the child pays attention to whether or not verbs incorporate results as part of their inherent meaning, and by the age of 3 the category for verbs of result is established with respect to the functions of aspect markers. However, other categories of verbs are not fixed until much later and the subjects showed no consistent pattern in their use of the aspect markers with these verbs. Some hypotheses concerning the acquisition of verb meaning and aspect (e.g. Bickerton, Slobin) are to be evaluated with reference to the available data.

B. Kaiser continued her dissertation research on the acquisition of French based on longitudinal data. She focusses on the development of the linguistic means that serve to express temporal concepts. Two French corpora (children 1;9 to 3;3 years old) were coded and prepared for detailed analyses.

The coding entailed developing a description for the colloquial spoken French that the child hears, which differs considerably from the written norm described in grammars. Many distinctions visible in the written form of a word disappear in spoken French: for the first conjugation for example, the ending [e] can represent the infinitive, the past participle, the imperative or the imperfect. First analyses of the data have however concentrated on the temporal values expressed by the child's initial, idiosyncratic verbal inflection: the verbal forms she uses can refer to future and past

events. They are not restricted to the expression of aspectual values as suggested by the 'defective tense hypothesis'.

W. Klein and C. Perdue continued the longitudinal analysis of the narrative discourse of untutored adult learners of Dutch, English, French and German. Analysis so far had concentrated on the structuring of the simple utterance (see Annual Report, 1987): the main 'push' in development (subject to minor cross-linguistic variation) had been identified as a communicative requirement to express certain (specifiable) contents which brought the constraints hitherto operative in a learner's variety into conflict, the learner then seeking linguistic means to overcome the conflict. Subsequently, reasons were sought for learners' complexification of their utterances.

The initial systematicity learners had achieved combined strategies of discourse organization with indicators of internal temporal properties of events to achieve the temporal structure of the narratives; this systematicity did not allow for the explicit backgrounding of actions, nor for the natural chronology of events to be reorganized: overcoming these limitations provided the main communicative motivation for the development of (varied) means of subordination, in order to:

I. frame protagonists' speech and thought;
II. provide clausal temporal contextualization for an upcoming utterance with *when, during* and their translation equivalents;
III. provide further attributes of a referent when a definite NP does identify sufficiently fully;
IV. express purpose or cause.

Contexts I.-IV. tend to correspond with breaks in the chronology of events.

The identification of these contexts led to a re-appraisal of learners' acquisition of verbal morphology: it had been assumed

(see Annual Report, 1987) that learners developed verbal morphology in order explicitly to signal temporal relations of anteriority, simultaneity or inclusion. In the data examined, however, verbal morphology co-occurred with subordination devices which themselves conveyed, sometimes in conjunction with adverbs, the temporal (and aspectual) meanings in question. Thus whereas the gradual spread of verbal morphology in learners' production could be identified, discursively (in contexts I.-IV.), and to a certain extent lexically (e.g., explicitly marked anteriority tends to occur on verbs which encode results), this spread was not **exclusively** motivated by the communicative requirements of the narrative task; a less categorical statement would then be that learners' attempts to match the target language input here, are generally evidenced in communicatively motivated contexts.

3.3 Discourse Organization

3.3.1 Referent introduction and reference maintenance in spoken narratives

M. Hickmann analysed several aspects of children's narrative organization, with particular attention to French children's uses of *dislocations*. This research is part of a large-scale project – carried out in collaboration with Profs. Liang (U. Leiden), Xu and Ye (U. Peking), and with the assistance of F. Roland (U. Paris V), H. Hendriks, and M. van Crevel – focussing on general versus language-specific factors in the development of discourse cohesion in English, French, German, and Mandarin Chinese (see previous Annual Reports). Previous preliminary analyses of a small subsample of French narratives (see Annual Report, 1985), indicated that the uses of nominals and pronouns in left- and right-dislocations (in bold letters in (1) and (2), respectively) versus

in other structures (in (3) and (4)) should vary systematically as a function of local continuities and discontinuities in coreference across clauses. Quantitative and qualitative analyses therefore compared how children mentioned referents in the following types of discourse contexts: (a) noncoreferential contexts, where the same referent had not been mentioned in the immediately preceding clause, and (b) coreferential contexts, characterized by immediate coreference and further differentiated as a function of the roles (subject vs. not subject) of the two coreferential NP's.

(1) **Le cheval il** saute par dessus la barrière
('The horse he jumps over the fence')
(2) **Il** saute par dessus la barrière **le cheval**
(3) **Le cheval** saute par dessus la barrière
(4) **Il** saute par dessus la barrière

The overall results show that, notwithstanding some overlap, pronouns, nominals, and dislocations had different distributions. Left-dislocations typically involved expressions in subject role which occurred in noncoreferential contexts, and to a lesser extent in coreferential contexts involving a change from nonsubject to subject roles. Right-dislocations were rare and mostly occurred in noncoreferential contexts with expressions in nonsubject role. With other structures, pronouns were most frequently used as subjects in coreferential contexts and nominals in other roles and in noncoreferential contexts. According to this overall distribution, it is possible to characterize the main function of left-dislocations as one of **topic-promotion** and the main function of pronouns as one of **topic-maintenance**, while nominals have residual functions. However, several developmental progressions were also found. Thus, from 4 to 7-8 years children use left-dislocations deictically for the introduction of new referents (and therefore inappropriately in relation to adult use). In contrast, the 10-11 year-olds have learned to avoid using them when the denoted referents are brand new and to narrow down their use for topic-promotion when discontinuities occurred in reference-maintenance. From a

cross-linguistic perspective the implications of these results for the relation between the notions 'subject' and 'topic' will be examined on the basis of further analyses of the English, German, and Chinese corpora.

In collaboration with M. Kail (U. Paris V and CNRS), Hickmann extended these developmental analyses of discourse cohesion in the context of a joint project focussing on narratives produced by French and Spanish 3 to 10 year-old children in two different situations: in Situation I the children and their interlocutor were leafing through a picture book together and therefore shared knowledge about the story content, while in Situation II the child's interlocutor was blindfolded and the child could not assume such mutual knowledge. Previous analyses had shown clear differences in the devices used by the French children to introduce referents across these two situations and across ages (for more details see Annual Report, 1987). Further analyses in progress focus on reference-maintenance in these narratives. Particular attention is placed on the influence of the contextual constraints imposed by the two situations on children's uses of referring expressions in dislocations versus other structures. In particular, it is hypothesized that dislocations might occur in a wider range of local coreferential and noncoreferential contexts when they are used deictically in Situation I than when they are used within discourse in Situation II. In addition, the analyses will also examine whether the nature of the predicate-argument relations encoded in the clauses, including the transitivity of the predicate, play a role in determining clause-structure variations in discourse at different ages.

3.3.2 Argumentation in written texts

During their stay at the Institute, M. Lambert and J. Arditty (U. Paris VIII) compared the production of argumentative texts in English, L2, and French, L1, by a group of intermediate to

advanced students.

The subjects had been presented with a similar task in each of these languages, with a three-week period intervening: the tasks allowed the comparison of overall discourse organization (ordering and ranking arguments, concluding, etc.) and more local phenomena such as evaluating or marking the degree of validity of individual sentences.

It was found that the subjects' strategies for overall textual organzation varied little between languages and that further, the expression of arguments as facts, and the interrelations between facts remained fairly constant. Where differences arose was that inappropriate forms occurred in the L2 when subjects attempted more modalized presentations of their arguments.

3.4 The Input Project

In the autumn of 1988, a new Institute Project was initiated: the Input project, coordinated by W. Klein, with P. Zwitserlood, B. Wenk, and C. Perdue (MPI), J. Liang (U. Leiden), and E. Kellerman (U. Nijmegen) as participating researchers. The aim of the project is to study the role of input factors in second language acquisition. The target language is Chinese, and the group of learners will consist of adult native speakers of Dutch. Three main domains of studies are formulated: 1) the segmentation of the acoustic input and the acquisition of phonology and phonotactic knowledge, 2) the early development of meaning, and 3) the development of elementary syntax. A series of pilot studies are currently in preparation to start analysis in the first two of these areas.

3.5 Language Acquisition Data Bases

The role of the Institute as the European centre of the Child

Language Data Exchange System (CHILDES) expanded during 1988. A complete update of the database was installed and an increasing number of requests for information and data from the database were handled by H. Feldweg. Several small workshops were held to make known the use of the transcription conventions as defined in the system and to introduce the set of analysis programs available for the data. A number of non-English corpora were added to the system under the auspices of the Institute, namely the Stern corpus provided by W. Deutsch (U. Braunschweig), route descriptions collected by Weissenborn, and a collection of second language acquisition data – transcripts from Dutch learners of English – gathered by N. Poulisse (U. Nijmegen). Finally, the first corpus of Dutch child language, provided by S. Gillis (U. Antwerp), was added to the database. Feldweg undertook the standardization of various transcription coding systems used at the Institute. However, it turned out that the 'Codes for the Human Analysis of Transcripts (CHAT)' were not entirely suitable for handling all the requirements of the various projects. Thus, some minor additions and modifications had to be made.

Several projects demanded analysis of data sets across linguistic categories, such as morphology, semantics, syntax, which had to be coded in one tier in order to be retrievable as one unit. As this technique generated rather long and unreadable coding tiers, Feldweg designed a coding scheme which allows the retrieval of scoped information from different tiers representing different linguistic categories by means of a program.

Since the major part of the data transcribed during the ESF project (see previous Annual Reports) was made available by the six local teams, Feldweg established the European Foundation Second Language Databank which became accessible to external users in the autumn of 1988.

3.6 Field Linguistics: Language Change and Dialectology

3.6.1 Tok Pisin

Work continued on the project "A sociolinguistic study of child language acquisition, creolization and language change in Tok Pisin (Papua New Guinea Pidgin English)". The data collected by S. Romaine (Oxford U.) and F. Wright (Merton College, Oxford) in 1986 and 1987 from 650 children between the ages of 5 and 17 in rural and urban areas in Papua New Guinea is still being transcribed and concordanced for analysis. An additional sample of written Tok Pisin is also being entered into the computer for comparison.

This year's work concentrated on some of the differences between spoken and written Tok Pisin, in particular, the rise of new short forms, especially in the younger generation of urban speakers, through processes of morphophonological condensation. Thus, tense/aspect markers like *save* and *laik* become *sa* and *la*. An analysis of the effects of lexical borrowing in certain semantic domains, e.g. names of animals and body parts, has also been begun. It has been found that borrowing from English, especially in urban areas, is undermining the iconic structuring of the lexicon in Tok Pisin. In pidgin languages metaphorical uses of body part terms like *ai-* - 'eye', *maus* – 'mouth' are an important means of extending a restricted vocabulary with limited syntactic means. In Tok Pisin *ai* and *maus* may be used not only to refer to body parts, but also to the lid of a pan, e.g. *ai/maus bilong pot/sospen* – 'lid of a pot'. Now the English term lid is replacing *ai* and *maus* in all but the most rural areas. Borrowing is disrupting the unity of a great many semantic fields which are linked by these productive metaphors. Analyses of relative clause formation strategies and the expansion of the phonological system have also been begun.

3.6.2 Gurinerdeutsch

B. Comrie (U. Southern California) and U.H. Frauenfelder started a project to investigate the syntax of the dialect of Bosco Gurin, an isolated German-speaking village in the Italian-speaking Swiss canton of Ticino. The project concentrates on word order properties within the verb complex (i.e. sequence of finite, auxiliary, and infinitival/participial verb forms in the clause), using a methodology that combines the study of transcribed natural text and elicitation by questionnaire. Gurinerdeutsch shares with most of Continental West Germanic the phenomenon of placing the verb-complex clause-finally (other than for the finite verb in main clauses). As generally in Swiss German, order within the verb complex is right-branching (e.g. *daß er muß können kommen* – 'that he must can come' – rather than left-branching as in High German *daß er kommen können muß*). Properties believed to be unique to Gurinerdeutsch, or at least not described in the literature for other dialects, are the possible positioning of an object after its verb within the verbal complex, though not after the verbal complex as a whole (e.g. *daß er hat lassen die Polizei kommen*); and the requirements that the particle *zu* be attached to the rightmost verb in the complex even though it belongs syntactically at a higher syntactic level (e.g. *um können zu kommen*, rather than the expected *um zu können kommen*). Given the intense theoretical interest surrounding word order, and the acquisition of word order, in Continental West Germanic languages, this work should be an important contribution to the Germanic data base.

3.7 Other Research

3.7.1 The acquisition of modality

During her stay at the Institute, S. Choi (San Diego State U.) also examined the acquisition of modality in Korean, looking in particular at the development of sentence-ending suffixes which denote various epistemic and deontic modal meanings, for example:

> Yonghi-ka Seoul-ul ttena-ss-CI.
> Yonghi-Subj. Seoul-Obj. leave-Past-CI.
> "IT IS CERTAIN that Yonghi left Seoul."

Her analysis showed that the first three sentence-ending suffixes to be productive in the children's speech denote different types of status of information: new/unassimilated information, old/assimilated information, and certainty of information. Modal suffixes expressing desire and intention were produced later. This casts doubt on the currently widely held view that epistemic modality is universally acquired later than other types of modality. Choi's work suggests that, while children may be quite late to acquire such notions as possibility and probability of proposition (e.g., 'It may rain'), they may nevertheless be sensitive from early on to other types of epistemic notions such as unassimilated vs. assimilated knowledge distinctions. Choi's future research in this area will include (1) studying later development of modality, (2) examining the discourse contexts in which the caregiver uses these forms, and (3) investigating the relations between particular verbs and modal suffixes, i.e. whether particular kinds of verbs tend to occur with particular modal suffixes.

3.7.2 Non-native speech judged by native speakers

B. Wenk's study of the judgmental behaviour of native speakers with respect to non-native speech, in collaboration with J. Edwards (U. California, Berkeley) discovered differential weighting of linguistic cues according to non-natives' supposed proficiency levels. Vocabulary cues were most influential at the early stages, whereas grammar and ultimately pronunciation cues gained in prominence at higher levels.

4. Language Disorders

The Language Disorders Group is mainly involved in the NWO Priority Project "Aphasia in Adults", which entered its second year of the second 5-years-period in 1988. Staff and affiliations are basically the same as in 1987. Additional subprojects within or connected with this Priority Project have been established; they will be described at their proper places without further specification concerning their status as **sub**projects.

The aphasia project's core interest continues to lie in the study of grammatical disturbances. As mentioned in previous Annual Reports, there is agreement among the members of the group with the assumption that the aphasic patient's performance is always the product of **two** factors, namely the underlying deficit and intervening adaptive strategies. The nature of the underlying deficit in agrammatism is considered to be computational rather than structural, having to do with the temporal organization of language processing.

Some of the investigations in 1988 deal more with finding out the precise characteristics of the deficit itself, some deal more with the exact nature of the adaptation, which is somewhat of a departure from the rubrique 'psycholinguistics' *stricto sensu*: however, they follow the logic of the topic and are genuine parts of the project. In general, the research plans for the second 5-years-period involve the application of new experimental paradigms. Intensive piloting of these experiments has been necessary. in particular with respect to their practical feasiblity with aphasic patients. This pilot phase is still not completely over, especially as regards investigations dealing with the emotional status of aphasics. These involve the application of tests which are standardized

for other clinical groups without language problems.

In addition to aphasia research, a report of investigations dealing with comprehension deficits due to hearing impairment is given, in 4.5 below.

4.1 Aphasia: "Loss of Automaticity" as the Underlying Deficit in Agrammatism

4.1.1. Grammar

A. Friederici specified the underlying deficit in agrammatism as the inability to retrieve, fast and automatically, the syntactic information encoded in closed class items. This hypothesis was elaborated in work by Friederici and L. Frazier (U. Massachusetts, Amherst), using a number of experimental approaches.

Computational space and syntactic parsing

Friederici and Frazier hypothesized that normal thematic assignment of a verb's arguments is only possible if sufficient resources are available to structure the input string as the individual items appear in time. The non-availability of these resources might cause agrammatic comprehension, due to a reduced capacity to hold the input information in the phonological buffer before structural assignment can be made. Under these circumstances, additional local structural cues should faciliate thematic assignment in agrammatism. To test this hypothesis, a sentence picture matching experiment was designed which varied number, form and position of the verb arguments in a sentence. The results from a group of agrammatic Broca's aphasics (N = 7) and paragrammatic Wernicke's aphasics (N = 5) reveal that both groups, but in particular Broca's aphasics, show a surprisingly good performance in thematic role assignment when arguments

are locally marked, but that the parsing system is less efficient when local markers are not available. These data suggest that agrammatic comprehension may become most evident when a particular computational space is required in order to guarantee correct assignment of all phrases.

Temporal constraints on syntactic parsing

The hypothesis that agrammatism is due to a computational rather than a purely structural deficit was further investigated by Friederici and K. Kilborn in a series of cross-modal priming experiments focussing on the temporal aspects of syntactic processing. In these experiments, subjects heard a Dutch sentence fragment consisting of a noun phrase and an auxiliary verb which provided strong syntactic contraints on the following word which was presented visually for lexical decision. In the critical condition, the target is a past participle verb form which forms either a grammatical or an ungrammatical continuation. As a baseline, visual targets were also presented in a no-context condition. Results for normal students and age-matched controls show (a) the typical context effect with faster decision times for words in context (collapsed over grammatical and ungrammatical continuation) than for words in isolation and (b) a grammaticality effect with faster decision times for words in a grammatical context than in an ungrammatical context. The findings from five agrammatic patients indicate (a) that agrammatics, unlike normals, show a context inhibition effect: decision times are faster when words are presented in isolation than when they are presented in context (collapsed over grammatical and ungrammatical continuation), but (b) agrammatics, much like normals, show a clear grammaticality effect with faster decision times for grammatical continuations than for ungrammatical continuations. The agrammatic behaviour was taken to reflect slow retrieval of the syntactic information encoded in closed class elements (auxiliaries, in this case).

In other words, structural information is available in principle (cf. the grammaticality effect), but too late to meet the the temporal constraints required for normal parsing (cf. the context inhibition effect). Whether this definition of the agrammatic deficit is congruent with the 'loss of automaticity' claim is now being tested by using slightly varied paradigms. Different interstimulus intervals (ISI) are used to evaluate whether the agrammatic behaviour is due to late-rise or fast-decay of structural information, and different instructions are used as a critical test for the cognitive impenetrability principle of syntactic processes inherent to the automaticity hypothesis.

Processing constraints across languages of different modality

A more general support for the hypothesis that agrammatism is due to a computational deficit defined as a mismatch of different information types in a given time window was sought by demonstrating its independence from a particular language modality. With this aim Friederici together with U. Bellugi and K. Emmorey (Salk Institute) started a project which compares normal and agrammatic parsing across spoken language and sign language. German was chosen as the spoken language to be compared with American Sign Language (ASL) because, much like ASL, it has a rich morphology. One of the core questions in this project is whether the temporal constraints to be met during parsing must be defined in absolute or rather in relative terms. As the temporal order of morphemes is different in ASL and in spoken language a comparison between the two provides a good testing ground for this question. The experiments designed investigate the effect of syntactic context on the recognition of words of different syntactic categories. In particular, the experiments in both languages use words whose stem morphemes are ambiguous in the sense that they are either nouns (*der Plan*, '*the plan*') or stems of verbs (*er plante*, '*he planned*'). These word forms were presented

in correct or incorrect contexts: *Plan* in a noun context, *plante* in a verb context, or vice versa. While in spoken German stem morphology and inflectional morphology are produced and perceived in that order, ASL expresses both at the same time (roughly, stem morphology as a given hand shape and inflectional morphology as a given hand movement). A group of normal student controls have been tested in German. The experiment used sentence material which provided either correct or incorrect contexts for a given noun or verb, as described above. The subjects' task was to monitor for a word immediately after the critical noun or verb. This word was an adverb in all critical trials. Filler trials had elements of other word categories as targets. As expected, normal subjects show longer monitoring times for adverbs that follow an ungrammatical context than for those following a grammatical context. Investigations with German speaking agrammatics are currently underway. Experiments with normal ASL speakers using a comparable paradigm are being piloted.

4.1.2 Generalization of the 'loss of automaticity' hypothesis?

In the context of the 'loss of automaticity' hypothesis, one question of generalizability that arises is: Does the loss of automaticity only hold for grammatical elements, or is it also valid for lexical-semantic elements? The work of P. Hagoort is by and large devoted to this problem. Hagoort continued his work on lexical semantic processing in aphasic patients, testing the claim that Broca's aphasics have automaticity problems in accessing the lexicon of open class items as well.

Semantic relations between lexical elements

Aphasic patients and normal control subjects performed a

lexical decision task on auditorily presented triplets, in which the target word was preceded by two primes. There were three inter-stimulus interval (ISI)-conditions: 100 msec, 500 msec and 1250 msec intervals between the members of the triplet. The normal controls showed the same priming effects in all ISI conditions. Both Broca's and Wernicke's patients showed significant priming effects in the 100 msec and the 500 msec ISI, but not in the 1250 msec ISI. The conclusion is that Broca's aphasics do not show any problem in accessing the lexicon automatically; the 'loss of automaticity' hypothesis cannot be generalized to lexical-semantic elements. Both patient groups lose priming effects with longer ISI's, indicating that they possibly suffer from a faster decay of activation in accessed lexical items.

In an off-line task, patients and control subjects were asked to judge the semantic relations between the primes being used in the lexical decision task. Wernicke's patients made significantly more errors than both Broca's patients and normal controls. This replicates the finding that Wernicke's patients do show more or less normal priming effects, indicating a normal organization of the semantic lexicon. However, they encounter severe problems in the processes underlying conscious semantic judgements.

Lexical ambiguities in context

In a next set of experiments, the time course of integration of lexical items into their context is being tested. This reflects the project's current interest in possible deviations of the temporal aspects of language processing in aphasic patients.

One experiment presents Noun-Noun ambiguities within different contexts biasing one of the meanings of the ambiguity. The sentence is followed by a target word that either relates to the high-frequency or to the low-frequency meaning of the ambiguity. In the experiment the ISI between the sentence and the target items is 100 msec in one version and 750 msec in the other

version. Both sentences and targets are presented auditorily. The task demands a lexical decision on the targets.

The second experiment has a similar design, but presents Noun-Verb ambiguities within syntactic contexts.

What is of interest is whether and when aphasic patients (especially agrammatic patients) are able to disambiguate the ambiguity given different types of context information (semantic and syntactic). The results of these experiments are being analysed.

4.2. Aphasia: Adaptation

4.2.1 Group differences?

The adaptation theory of agrammatism as developed by H. Kolk (U. Nijmegen) and C. Heeschen implies the assumption that the underlying deficit in agrammatism (*grosso modo* a symptom of Broca's aphasia) and in paragrammatism (*grosso modo* a symptom of Wernicke's aphasia) is the same and that the differences in their spontaneous language **production** are due to different ways of adaptation. This 'sameness' hypothesis received strong support from an experiment designed by H. Haarmann and Kolk. Broca's and Wernicke's aphasics, as well as normal control subjects, performed a Cloze procedure, which required them to speak aloud a grammatical morpheme that was missing from a sentence. All aphasic subjects performed almost without error on a pre-test which checked for the understanding of all content words used in the Cloze procedure. Overall performance, the order of difficulty between four free and three bound morphemes, as indicated by number of errors, the distribution of errors over several error categories and even the response times supported the hypothesis that both Broca's and Wernicke's aphasics suffer from the same underlying grammatical impairment in sentence production. To begin with, the absolute performance level was almost identical for both

patient groups. Furthermore, the order of difficulty between the various morphemic subcategories was the same for both Broca's and Wernicke's aphasics. Moreover, the distribution of errors over different error categories appears to be higly similar: substitutions within a given morphemic subcategory are much more frequent than substitutions across morphemic subcategories, or than content word substitutions. Thus, both patient types appear to be sensitive to the morphemic category type that has to be produced. Finally, both patient types take longer to produce substitutions than correct answers. The latter two results were interpreted as reflecting 'corrective adaptation', i.e. patients 'repair' the sentence representation by generating the sentence representation anew, overtly or covertly. Corrective adaptation costs time and increases the chance of a (more) correct answer. The assumption is made that patients have difficulties activating a complete sentence representation in one attempt.

4.2.2 Elliptic speech

The core of the adaptation theory of agrammatism is the assumption that the telegraphic style shown by Broca's patients is identical with elliptic speech used by normals though under strict pragmatic conditions. The assumption of the regularity of this telegraphic style was further supported by new findings of Heeschen who continued the highly detailed analysis of the spontaneous speech of telegraphic and non-telegraphic (paragrammatic) patients. He found: (1) in telegraphic style, the non-finiteness of the verb goes together with the absence of articles and vice versa (presence of articles in finite constructions: 93%; absence of articles in non-finite constructions: 97%). This finding is all the more significant if it is compared with the paragrammatic speech: there is no (or at least a weaker) mutual dependence of the finiteness or non-finiteness of the verb and the presence or absence of articles (presence of articles in finite constructions:

88%; absence of articles in non-finite constructions: 48%). (2) non-finiteness of the verb goes together with the absence of a grammatical subject and vice versa (presence of grammatical subjects in finite constructions: 95%; absence of grammatical subjects in non-finite constructions: 93%). Again, in the speech of paragrammatic patients, this regularity cannot be found (presence of grammatical subjects in finite constructions: 96%; absence of grammatical subjects in non-finite constructions: 22%). (3) Just as normals, the aphasic patients repair their speech errors from time to time. As demonstrated by Levelt (Annual Report, 1981), these repairs are subjected to certain wellformedness conditions which are very similar to the rules of coordination. The repairs of telegraphic speakers fulfil these syntactic constraints on the form of the string of words functioning as repair, while, once more, the paragrammatic speakers do not show this regularity (well-formed according to the coordination rule: telegraphic speakers 81%, paragrammatic speakers 58%).

Heeschen also conducted some pilot experiments using naming latencies as the dependent variable in order to demonstrate the regularity and normality of telegraphic/elliptic speech under experimental conditions. There was one stable finding: the central point of elliptic speech seems to be the non-finiteness of the verb. In order to clarify the nature of elliptic speech within a theoretical linguistic framework, M. Bierwisch, W. Klein, and Heeschen set up a small, informal working group

4.2.3 Why adaptation?

Any serious theory of adaptation requires the specification of the motivational factors for the development of a specific type of adaptation. A first step in this direction was the investigation of the average fundamental frequency (F0) of the speech of agrammatic and paragrammatic patients in various conditions

and situations (see Annual Report, 1985). In 1988, Heeschen, J.H. Ryalls (U. Montréal) and Hagoort extended this investigation by the inclusion of normal controls and a few more patients. The main point, however, was a radical change in the **logic of the interpretation** of the data. The questions were: (1) if Broca's patients are forced to give up telegraphic style and to try to produce complete sentences, is this experienced as stressful by the patients? (2) if the experimenter makes the test situation more formal than usual, is this experienced as stressful by the patients? The average F0 was taken as an indicator for psychological stress and it turned out that the average F0 of the Broca's patients was higher than that of Wernicke's patients as soon as the situation became more formal, and also if the Broca's patients were prompted into the formulation of complete sentences. Here we have a situation experienced as stressful for Broca's patients, but not for Wernickes's patients (as evidenced by comparison of the F0); **Why**? This 'why' could and still can be answered only by some informal considerations about the **function** of the symptom of the telegraphic style. However, a satisfactory explanation has to answer the following concrete questions: (1) Is the patient **realistic** with respect to his abilities and inabilities? (2) Does the patient **suffer** from his failures? (3) Does the experience of failure lead to a **depressive** emotional state with all its potential repercussions on the performance of the patients in various linguistic and non-linguistic cognitive domains? The hypothesis is that the agrammatic patient, whenever he tries to speak in complete, non-elliptic sentences, is exposed to an experience of failure, that is, he is aware of his failures (realism) and he suffers from them. If he continues to try to speak in complete sentences, he manoeuvres himself into a situation which is very similar to a learned helplessness situation (whatever his efforts are, he fails), which then can lead to a reactive depression. By regression to telegraphic speech, the patient can protect himself against this catastrophy (this sounds very "Goldsteinian" and is meant to do so). To test

all these complex assumptions, Heeschen tried using experimental paradigms and tests developed mainly within the framework of clinical psychology. This presents a serious methodological problem, in particular, if the tests are verbal. Nevertheless, Heeschen and collaborators (with the generous help of M. Hautzinger, U. Konstanz, and of H. Eyckman, U. Nijmegen) succeeded at least in the assessment of realism (by means of a two-alternative-forced-choice signal detection task with indication of confidence intervals) and in the assessment of depressive tendencies. The first results show that the distribution of depressive tendencies is not as clear as expected. However, this can also be taken as something positive: it testifies to objectivity, and objectivity is the greatest problem in the whole enterprise.

4.3 Computer Simulation of Aphasia

H. Haarmann has conducted a succesful computer simulation study of degrees of severity of agrammatic aphasia and the so-called "sentence complexity effect". Haarmann designed a computer model, SYNCHRON, which implements a theory that was first elaborated by Kolk and van Grunsven to explain agrammatics' failure to activate a sentence representation: they suffer from too slow an activation rate or too fast a decay rate of sentence-representational elements (a view also held by Friederici, *cum grano salis*; see above). The sentence-complexity effect arises because complex sentences take more time to process than simple sentences. Degrees of severity correspond to differences in the amount of change in activation or decay rate. SYNCHRON adds two further specifications to this proposal. First, activation or decay rate fluctuate stochastically according to a probability distribution whose mean changes but whose variance remains constant across degrees of severity. Second, a lack of synchrony between syntactic categories disturbs the activation of a hierarchical

phrase-structure representation. Several interesting simulation results emerged. First, a similar sentence-complexity effect across degrees of severity can only be simulated when phrasal categories but not when function word categories are affected by changes in mean activation or decay rate. Second, changes in activation and decay rate do not always have equivalent effects. Third, the relative difficulty of complex sentences compared to simpler ones increases as degree of severity increases.

4.4 Dyslexia

J. Bayer and R. de Bleser (RWTH Aachen) continued work on a case of deep dyslexia. Detailed morphological investigations have uncovered the possibility of giving a unified account of the patient's reading problems: It is argued that derivational morphology (including prefixes) enters semantic composition in the mental lexicon as long as semantic content is present. The semantics of inflectional morphology, as long as there is one, appears to be inert in the lexicon and takes its effect only at the postlexical stages of phrasal syntax or Logical Form.

4.5 Hearing Impairment

W.F. Sendlmeier continued his research on the speech perception of hearing-impaired listeners. He extended his auditory training programme for vowels – originally developed for the hard of hearing – to cochlear implant patients (CI-patients). In collaboration with the University Hospitals of Düsseldorf and Zürich the training material and training procedure were successfully tested for their appropriateness in post-surgery remedial work. The University Hospital in Zürich has begun to integrate Sendlmeier's vowel training procedure into their clinical training battery. The results once more confirm that it is possible to modify and op-

timize the listening strategy of handicapped listeners effectively, by using training material in which certain acoustic cues are selectively enhanced.

Sendlmeier carried out two consonant recognition experiments with hearing impaired subjects. One experiment focussed on whether it is possible to enhance certain speech cues for a better discrimination of the place of articulation feature in intervocalic stops, while in another experiment the relevance of different acoustic cues for the voiced/voiceless distinction in initial stops was investigated.

The place of articulation feature for stop consonants is subject to many errors in speech processing by hearing impaired listeners. This is why efforts to enhance the distinctive cues of these contrasts seem especially valuable. Attempts to improve the recognition of the first formant or – in a different approach – by narrowing the formant bandwidth of several formants in the same direction has not led to satisfactory results. Intervocalic stops were used in the present investigation, on the one hand, because the spectral information is represented twice (in the VC- as well as in the CV-transition) and, on the other hand, because the closure duration offers additional temporal information to the listener.

The modification of bandwidth, more precisely, the broadening of the first formant accompanied by a simultaneous narrowing of the F2- and F3-bandwidths, led to no noticeable improvement in the listeners' discrimination between /b, d, g/. But depending on the place of articulation, a change of the closure durations affected the identification of the stops. Especially for /b/, a clear improvement was obtained by lengthening the closure duration and a clear decrease in correct identifications was found by shortening it; for /d/ there was a tendency towards a better recognition after shortening the closure duration. The modification of the transitions of the second and third formants optimized the

recognition rate for /b/ and /g/ as the extremes of the transition continuum. This means that an increase in the steepness of the gradients enhances the place of articulation specific information.

In the second experiment, Sendlmeier investigated how far hearing-impaired subjects process the relatively robust feature 'voicing' differently from normal listeners. He produced twelve different stimuli from the German words *Deich*, *Teich* by using a splicing technique in which the cues 'burst', 'aspiration', 'VOT' (in the sense of the acoustic manifestation of the pure temporal aspect of VOT) and 'vowel-onset' were interchanged, deleted or added. Surprisingly, for both normal and hearing impaired listners, the VOT only played a minor role in the discrimination of the stimuli *Deich* and *Teich*. In view of these results, it seems hardly justified that voicing cues have largely been disregarded in the literature since the late sixties. The burst in *Deich* also played a minor role for both listener groups in recognizing the /d/ as a voiced stop. As long as no competing information was added to the vowel-onset of the /d/, the vowel-onset was sufficient for both listener groups to indicate the feature 'voicing'. A difference between the two groups was found when the burst of the /d/ was substituted by the burst of the /t/. In this case, a clear majority of the normal listeners heard a /t/, while the hard of hearing still recognized a /d/. Thus it seems that hearing impaired subjects pay more attention to the vowel onset than normal listeners. Starting from the stimulus *Teich*, both the burst and the aspiration were sufficient to evoke the judgement 'voiceless stop'. But again the burst played a less important role for the hearing impaired subjects. In general, the aspiration seems to play the dominant role in all listeners' judgements. The shift of attention from the burst to other cues like vowel-onset and aspiration for the hearing impaired listeners might be explained by the fact that the short burst which is close to the threshold is very often masked by noise in everyday life. Therefore, the effort of the hearing impaired to make use of the burst often fails, which

leads to a shift in the primarily used cues in the voiced/unvoiced distinction. The ability of individual listeners to recognize speech depends to what extent the hearing-impaired succeed in shifting their attention to more reliable cues. This differently successful modification of the perception strategies might be an explanation for the fact that hearing-impaired listeners with similar thresholds and similar superthreshold deficits show clearly different scores in speech intelligibility tests.

5. Other Activities 1988

5.1 Experimental Facilities – Activities of the Technical Group

5.1.1 Development of experimental facilities and laboratories

The research in the eye movement recording (EVM) laboratory was facilitated in several ways. An algorithm was developed that semi-automatically detects the line at which the eye is fixating. This algorithm is simple and gives quite satisfying results. The Technical Group programmed a new data base that is automatically filled with the help of special conversion programs that directly use the data generated by the analysis software. Since it uses the database management system ORACLE-DBMS, queries can be entered by scientists using certain standard forms and SQL.

A prototype of a universal preprocessor based on low cost VME-bus modules was built and applied to EVM data, such that the reduction of EVM data, the line detection and/or the detection of the location of the fixation can be calculated in real time.

Together with C.M. Brown and P. Hagoort the Technical Group developed for the event-related potential (ERP) laboratory PC-based user-friendly software for data acquisition and analysis with the following possibilities: acquiring potentials, displaying them on-line, combining them flexibly for various purposes and marking certain points of interest in the patterns interactively. The ERP laboratory is now a fully operational autonomous re-

search facility within the Institute.

The Speechlab Software was completed and is an user-friendly tool for all speech oriented work at the Institute.

For the support of experiments the Technical Group added two PDPs with modern graphic facilities, installed DMASTR on the ATs and programmed various new experiments using cartoon-like stimuli on the ATs. Conversion programs were developed that allow the use of pictures created with help of AUTOCAD on PDPs as well as on ATs.

Furthermore, the principle design characteristics of the next generation of experimentation software and hardware were worked out. A central concern is to increase the functionality of the set-up.

5.1.2 Cognitive modelling and AI techniques

The Technical Group offered an intensive course in PROLOG because this language is especially useful for modelling certain aspects of language behaviour. The Technical Group also installed TRACE and supported the use of TRACE for simulation studies.

5.1.3 Computer facilities

For general computation facilities 6 workstations were installed. These are mainly used for projects that include graphic interaction. New types of software, such as complex DTP-packages, were tested and will be used in the future. The testing of the usage of a conferencing system as a general tool for communication at the institute was started.

5.2 Projects involving Other Institutes

The Institute participated in several projects:

5.2.1 The Celex project: A centre for lexical information

As of 1 January 1986 the Max-Planck-Institut and the Interfaculty Research Unit for Language and Speech of the University of Nijmegen are housing the Dutch Centre for Lexical Information (CELEX). (See Annual Report 1987, p. 88-89 for participating Institutions and Steering Committee.) This national Centre has established computerized, multilingual, multifunctional lexical databases and offers these to interested institutions and companies via modern electronic access methods. CELEX also provides expertise in accessing and using computerized lexical information.

The lexical databases that have been established by CELEX over the past three years now include lexical information on orthography, phonology, morphology, syntax and word-frequency, both for Dutch and English. During 1988, special attention has been given to the collection of disambiguated word-frequency information for Dutch, and to the improvement of orthographic, phonological and syntactic information for English. Apart from this, much effort has gone into the design and implementation of a new user interface. This menu-driven interface, which was officially released in November 1988, enables (even novice) users to query the lexical databases in an elegant and simple manner.

In April and December 1988 the third and fourth issue of the CELEX Newsletter were sent to several institutions in Europe. This Newsletter enables research institutes and companies to keep track of new developments within the project.

In 1988 CELEX successfully applied for the official status of national *Centre of Expertise*. With this status, CELEX has the support of the Dutch Foundation of Scientific Research (NWO) and

of the affiliated Foundation of Computational University Support (SURF). As a consequence, CELEX has committed itself further to improve the quantity and quality of tools and services related to the provision of electronic databases with lexical information.

Because of this official recognition, CELEX received a new three-year government grant, covering the years 1989-1991. This grant enabled CELEX to re-install its project team, which now consists of two computer scientists, six linguists and one assistant. This team is enlarged from time to time with several part-time assistants and with post-graduate students of the Technical University of Eindhoven.

The project uses its own hardware and software facilities, i.e. three MicroVAX-II configurations running VMS, with ORACLE-DBMS as a database management system, and two VAX-stations 3100. At this moment these VAX's are connected to the EARN network (celex@hnympi52.bitnet) and to the national research network SURFnet. Through this SURFnet connection, which itself is or will be linked to most other interactive computer networks in Europe, it has become very easy to access the CELEX databases from other Universities and Research Institutes throughout the Netherlands.

5.2.2 The Language Universals project

This year saw the the appearance of the two main publications of the 2-year Project on Explanations in Universal Grammar (1983-1985, see Annual Report 1985, p. 77 ff.): J.A. Hawkins edited *Explaining Language Universals*, published by Blackwell, Oxford, and a special issue of *Lingua*, "Papers in universal grammar: Generative and typological approaches".

5.2.3 Project on 'Reading, word recognition and dyslexia'

During the academic year 1987-88, at the Netherlands Insti-

tute for Advanced Studies (NIAS) in Wassenaar, a project on word recognition, reading and dyslexia, sponsored by the Max-Planck-Institut, was organized and directed by G.B. Flores d'Arcais. The project involved a number of specialists in the area. It included a number of seminars and six workshops which took place in various Dutch universities and at the Max-Planck-Institut. A major event of the project was the International Conference on Comprehension Processes during Reading, held in Wassenaar and in Amsterdam from 27 to 30 June 1988 and organized by Flores d'Arcais together with K. Rayner (U. Massachusetts, Amherst) and D. Balota (U. St. Louis). Some sixty participants took part at the Conference, including several of the leading researchers in the field. As a result of the Conference, a book is being edited and will be published in 1989 under the same title as the Conference.

5.2.4 Test of language abilities in aphasics

The Institute participated in a project of the Instituut voor Woordblindheid (IWAL), financed by the Praeventiefonds, which aimed at developing and standardizing a test of everyday language abilities in aphasics. The ANTAT-test was successfully completed in the course of 1988 and will soon become commercially available.

5.2.5 Hand in hand: Communication for the deaf-blind

Together with the Nijmegen Institute for Cognition research and Information technology (NICI) and the Interfaculty Research Unit for Language and Speech (IWTS), both U. Nijmegen, and the Kalorama Hospital (director: Dr. P.G.A.M. Froeling) the Institute is involved in a project on the development of a communication system for deaf-blind patients, suffering from Usher's syndrome.

The communication of these patients, who are congenitally deaf-mute, and blind after puberty, is restricted to the haptile

modality. They and their interlocutor are able to communicate by finger-spelling into each other's hand.

Various techniques were explored to develop an artificial hand via which a typed text can be finger-spelled into the patient's hand, and a technical glove via which the patient's finger-spelled text can be typewritten.

5.3 Conferences, Symposia, and Workshops

5.3.1 Annual conference

A small, informal workshop on *Phonological encoding in speech production* was held from 31 October till 2 November. The following themes were addressed during the meeting: (i) Phonological encoding: an independent level of processing?; (ii) Mechanisms of encoding, in particular the complementary slot/filler and connectionist accounts; (iii) Phonological encoding of connected speech; (iv) Transcription, classification and storage of speech error data. Participants in the meeting were: K. Bock (U. Michigan, East Lansing), G.S. Dell (U. Rochester), Del Viso (U. Oviedo), Garcia-Albea (U. Madrid), M.F. Garrett (U. Arizona, Tuczon), and S. Shattuck-Hufnagel (MIT, Cambridge), and C. Heeschen, A. Lahiri, W.J.M. Levelt, A.S. Meyer, and H. Schriefers (MPI).

5.3.2 The Nijmegen Lectures 1988

S.C. Levinson (U. Cambridge) gave an impressive series of lectures in December 12-16. In the four *Lectures on Generalized Conversational Implicature* Levinson treated in depth the nature and typology of generalized conversational implicatures, and the issue of the semantics/pragmatics and pragmatics/grammar interface. Levinson also led a workshop on the same topic and, together with P. Brown (U. Cambridge), a workshop on their

politeness theory.

These Lectures were organized in cooperation with the Interfaculty Research Unit for Language and Speech (IWTS) of the University of Nijmegen by V. Ehrich, E. Huls, J. van Kuppevelt and W. Vonk.

5.3.3 Symposium "Perception and language"

On the occasion of the 50th birthday of W.J.M. Levelt, a symposium on "Perception and language" was organized on 17 May by G.B. Flores d'Arcais. The presentations at the symposium were all related to one of the areas of interest and of major achievement of Levelt's scholarly work. Papers were presented by R. Plomp (IZF–TNO, Soesterberg and Free U., Amsterdam), J.P. van de Geer (U. Leiden), C. de Weert, G.A.M. Kempen, R. Schreuder, and G. van Galen (U. Nijmegen), and M. Bierwisch, G.B. Flores d'Arcais, W. Klein, A.S. Meyer & H. Schriefers (MPI), and W. Vonk (MPI) & L.G.M. Noordman (U. Tilburg).

5.3.4 Workshop "Event-related potentials and language processing"

A workshop on "Event-related potentials and language processing" was organized by C.M. Brown and P. Hagoort at the Institute on 12 October. The workshop provided a forum to discuss the use of ERP measurements in language processing research, focussing on theoretical, methodological, and technical issues. Discussion sessions followed presentations by the four invited speakers: S.M. Garnsey (U. Rochester), A. Kok (U. Amsterdam), M. Kutas (U. California, San Diego), and F. Rösler (U. Marburg). Discussants for the day were: A.W.K. Gaillard (IZF, Soesterberg), G. Mulder (U. Groningen), Th. Schaap (IWAL, Amsterdam), M. Scherg (MPI, München), M.N. Verbaten (U. Utrecht), and Brown

and Hagoort (MPI).

5.4 Internal Lectures and Colloquia

A number of lectures were organized by the Institute's Colloquium Committee (V. Ehrich, K. Kilborn). Lectures were given by:

K. Bock (U. Michigan, East Lansing), B. Butterworth (U. College, London), C. Habel (U. Hamburg), B. Hayes (U. California, Los Angeles), H. van der Hulst (U. Leiden), K. Plunkett (U. Århus), G. Rauh (U. Wuppertal), K. Rayner (U. Massachusetts, Amherst).

Furthermore, many informal lectures and colloquia were given by long-term and occasional visitors to the Institute.

5.5 Teaching

The staff of the Institute taught courses of varying duration in the following Summer Schools and Universities:

Oxford U. (Romaine); Ruhr-U., Bochum (Meyer); Summerschool on Patholinguistics, Amsterdam (Hagoort, Schermer); U. Bonn (Sendlmeier); U. Brabant, Tilburg (Levelt, Meyer, Schriefers); U. California, Santa Cruz (Frauenfelder); U. Giessen (Friederici, Kilborn); U. Groningen (Hagoort, Zwitserlood); U. Heidelberg (Klein); U. München (Günther); U. Nijmegen (Dijkstra, Frauenfelder, Levelt, Meyer, Schriefers, Vonk); U. Verona, Italy (Bowerman).

5.6 Colloquia Presented

The following members of the Institute's staff presented colloquia at various institutions:

Bayer (Goethe-Institut, Amsterdam; MIT; U. Utrecht); Bowerman (Clark U., Worcester; U. Amsterdam; U. California, Los Angeles; U. Kansas); Comrie (U. Bielefeld; U. München; U. Oldenburg); Dasgupta (KUB, Tilburg); Frauenfelder (DRLAV – Paris VIII; MPI für Biophysikalische Chemi, Göttingen; MPI für Psychiatrie, München); Friederici (U. Montréal); Günther (Institut für Deutsche Sprache, Mannheim; U. Konstanz; Free U., Amsterdam); Heeschen (Dept. of Psychology, U. Konstanz); Hickmann (U. Paris VIII); Jongman (Washington U., St. Louis, Missouri); Lahiri (Stanford U.); Levelt (Haskins Laboratories, New Haven; Kernforschungszentrum Karlsruhe; U. Arizona, Tucson); Randall (Free U., Amsterdam; U. Amsterdam; U. Utrecht); Romaine (U. Southern California, Los Angeles); Schermer (Rudolf Mees Instituut, Rotterdam); Sendlmeier (IPO, Eindhoven); Sereno (Washington U., St. Louis, Missouri); Wenk (Centre Hospitalier, Université du Vaud, Lausanne; Free U. Amsterdam); Weissenborn (Ecole des Hautes Etudes en Sciences Sociales, Paris; U. Paris VII); Wittenburg (U. Peking).

5.7 Papers Presented at Congresses, Conferences, and Workshops

Arditty, J., and Lambert, M. "Argumentation et pratique d'une langue étrangère à un niveau avancé". Réseau Européen de Laboratoires sur l'Acquisition des Langues. Montreux, November.

Bassano, D., Champaud, C., and Hickmann, M. "Epistemic mo-

dality in French children's reported speech". 3rd European Conference on Developmental Psychology. Budapest, Hungary, June.

Bauer, S., Kommenda, M., Kubin, G., and Pounder, A. "The role of morphology within a German text-to-speech system". 3rd International Morphology Meeting. Krems, Austria, July.

Bayer, J. "Why cross-linguistic studies of aphasia now? Towards a linguistically explanatory neurolinguistics". 6th European Workshop for Cognitive Neuropsychology. Bressanone, Italy, January.

Bayer, J. "Directionality of government as a locality constraint for scope assignment". 11th GLOW Colloquium. Budapest, March.

Bayer, J. "Die Konfigurationalitätsfrage im Deutschen im Lichte von Sprachverarbeitungsdaten". Treffen der Gruppe 'Generative Gruppe im Süden'. Passau, June.

Bayer, J., and Bleser, R. de. "Morphological processing and the mental lexicon in a case of deep dyslexia". Conference on Grammar and Language Processing. Maryland, December.

Bayer, J., and Lahiri, A. "Bengali emphatic clitics in the lexicon-syntax interface". 3rd International Morphology Meeting. Krems, Austria, July.

Bayer, J., Lahiri, A., and Dasgupta, P. "The clitic /o/ and WH-in-situ in Bengali". Treffen der Gruppe 'Generative Gruppe im Süden'. Vienna, October.

Bierwisch, M. "Theoretische Grundlagen der Computerlinguistik". Konferenz der Deutschen Gesellschaft für Informatik. February.

Bierwisch, M. "Linguistik als kognitive Wissenschaft" (Plenarvortrag). 10. Jahrestagung der Deutschen Gesellschaft für Sprachwissenschaft. Wuppertal, March.

Bierwisch, M. "Mind your intuitions". Symposium on Perception and Language in honour of W.J.M. Levelt. Nijmegen, May.

Bierwisch, M. "Problems with fact nominalizations". Kolloquium 'Grammatik und Lexikon' des Zentralinstituts für Sprachwissenschaft der Akademie der Wissenschaften der DDR. Berlin, June.

Bierwisch, M. "A modular theory of affixation". 3rd International Conference of Morphology. Krems, Austria, July.

Bowerman, M. "Cognitive predispositions for semantic development". Workshop on Referential Communication and Processes of Categorization. Verona, Italy, May.

Bowerman, M. "The role of meaning in grammatical development: A continuing challenge for theories of language acquisition" (Keynote address). 13th Annual Boston University Conference on Language Development. Boston, Mass., October.

Comrie, B. "On identifying future tenses". 7th Groningen Grammar Workshop. Groningen, June.

Comrie, B. "Serial verbs in Haruai (Papua New Guinea) and their theoretical implications". Societas Linguistica Europaea Annual Meeting. Freiburg, July.

Dell, G.S. "Lesioning a connectionist model of speech production". 3rd Venice Workshop on Cognitive Neuropsychology and Connectionism. Venice, October.

Dijkstra, A. "Contacts of grapheme and phoneme representations in a bimodal detection task". 30. Tagung experimentell arbeitender Psychologen. Marburg, March.

Dijkstra, A. "Crossmodal contacts in the processing of letters and speech sounds". Workshop 'Gedächtnispsychologie und Informationsverarbeitung'. Tübingen, November.

Ehrich, V. "The influence of Aktionsarten on tense interpretation". Montague Colloquium Series. Amsterdam, February.

Ehrich, V. "Die temporale Festlegung lokaler Referenz". 10. Jahrestagung der Deutschen Gesellschaft für Sprachwissenschaft. Wuppertal, March.

Ehrich, V., and Vater, H. "Das Perfekt im Deutschen und Dänischen". 7. Groninger Grammatikgespräche 'Tempus - Aspekt - Modus'. Groningen, June.

Feldweg, H. "The Child Language Data Exchange System". DFG Kolloquium 'Spracherwerb'. Braunschweig, July.

Flores d'Arcais, G.B. "Studies in causality: The perception of braking". Symposium on Perception and Language in honour of W.J.M. Levelt. Nijmegen, May.

Flores d'Arcais, G.B. Discussion Paper. Conference on Comprehension Processes in Reading. Wassenaar and Amsterdam, June.

Flores d'Arcais, G.B. "The comprehension and semantic interpretation of idioms". 6th Australian Language and Speech Conference. Sydney, August.

Flores d'Arcais, G.B. "Semantic domain and associative relations in word recognition". 3rd Conference of the European Society for Cognitive Psychology. Cambridge, September.

Flores d'Arcais, G.B., and Saito, H. "Semantic activation and lexical decomposition in the recognition of complex kanji characters". 24th International Congress of Psychology. Sydney, September.

Frauenfelder, U.H. "Lexical segmentation in interactive activation models". 'Cognitive Models of Speech Processing: Psycholinguistic and Computational Perspectives'. Sperlonga, Italy, May.

Frauenfelder, U.H. "Activation and deactivation of phonological representations". 3rd International Morphology Meeting. Krems, Austria, July.

Frauenfelder, U.H. "Psychological constraints upon connectionist models: Exploring TRACE and alternatives" (poster). 'Connectionism in Perspective'. Zürich, Switzerland, October.

Frazier, L. "Parsing modifiers". Conference on Comprehension Processes in Reading. Wassenaar and Amsterdam, June.

Frazier. L., and Friederici, A.D. "Thematic analysis in agrammatic comprehension". Conference on Sentence Processing. University of Maryland and Johns Hopkins, December.

Friederici, A.D. "Language comprehension in aphasia: The availability of structural information versus time". 23rd Winter-Seminar on Molecules, Information and Memory. Klosters, Switzerland, January.

Friederici, A.D. "Grammatical processing and the brain". Brain Basis of Behavior Seminar Series. The Salk Institute, La Jolla, Ca., February.

Friederici, A.D. "Autonomy and automaticity in syntactic parsing: On the emergence of a cognitive module". 'Models of Mind'. Zentrum für Interdisziplinäre Forschung, Bielefeld, June.

Friederici, A.D. "Entwicklung kognitiver Strukturen bei Neugeborenen: Sprache". DFG Kolloquium 'Kognition und Gehirn'. Zentrum für Interdisziplinäre Forschung, Bielefeld, October.

Friederici, A.D. "Aspekte syntaktischer und semantischer Verarbeitung bei Präpositionen". Linguistisches Kolloquium 'Präpositionen'. Wuppertal, November.

Friederici, A.D., and Kilborn, K. "Aspects of syntactic priming in Broca's aphasia". 26th Annual Meeting of the Academy of Aphasia. Montreal, October.

Garnsey, S.M. "ERP's as a measure of sentence processing". Workshop on ERP's and Language Processing. Max-Planck-Institut für Psycholinguistik, Nijmegen, October.

Gfroerer, S. "The use of linguistic knowledge in reading: The case of capitalizing nouns in German". 38th National Reading Conference. Tucson, AZ, November.

Günther, H. "Ein Wort- und Paradigma-Modell der mentalen Repräsentation und Verarbeitung obliquer Wortformen". 10. Jahrestagung der Deutschen Gesellschaft für Sprachwissenschaft. Wuppertal, March.

Günther, H. "Die Grenzen freier Sprachproben und die Grenzen des Experiments in der Dysgrammatismusdiagnose". Kolloquium 'Dysgrammatismus II'. Bremen, June.

Günther, H. "The processing of oblique word forms in a word-and-paradigm model". 3rd International Morphology Meeting. Krems, Austria, July.

Günther, H., Gfroerer, S., and Bock, M. "Augenbewegungen und Substantivgroßschreibung". 10. Jahrestagung der Deutschen Gesellschaft für Sprachwissenschaft. Wuppertal, March.

Hagoort, P. "What is wrong with lexical-semantic processing in aphasia?". 6th European Workshop on Cognitive Neuropsychology. Bressanone, January.

Hagoort, P. "Temporal aspects of semantic priming in aphasia". Academy of Aphasia, 26th annual meeting. Montreal, October.

Heeschen, C. "Prevention of errors in aphasia". International Neuropsychology Symposium. Jerusalem, June.

Heeschen, C. "Interaction between aphasics and non-aphasics: Is there a change of the function of language?" Symposium 'Language Processing in Social Situations: The Issue of Mutuality'. 24th International Congress of Psychology. Sydney, Australia, August.

Hickmann, M. "Topics and subjects in discourse: An analysis of French children's narratives". 3rd European Conference on Developmental Psychology. Budapest, Hungary, June.

Hickmann, M., Liang, J., and Hendriks, H. "Référenciation et cohésion dans le discours de l'enfant: Une approche translinguistique" Réseau Européen de Laboratoires sur l'Acquisition des Langues. Montreux, November.

Jordens, P. "De V2-regel in het Nederlands en het Duits als eerste- en tweede taal". VU-taalkunde Dag. Amsterdam, January.

Jordens, P. "The acquisition of word order in L2 German". 4th International Conference on Second and Foreign Language Learning. Silesia, Poland, May.

Jordens, P. "The acquisition of word order in L2 Dutch and German". 13th Annual Boston University Conference on Language Development. Boston, Mass., October.

Kilborn, K. "Seeking a performance definition of second language fluency". 3rd Conference of the European Society for Cognitive Psychology. Cambridge, September.

Klaas, G., Reetz, H., and Wittenburg, P. "A universal preprocessor concept". KIP Meeting. Groningen, November.

Klein, W. "Text structure and referential movement". Workshop 'Text Coherence'. Bielefeld, January.

Klein, W. "Geschriebene Sprache – gesprochene Sprache". Kolloquium 'Verschwindet die Schrift?' des Bremer Senats. Bremen, January.

Klein, W. "Quaestio and the structure of texts". Colloquium 'Genetic Aspects of Dialogue'. Bad Homburg, February.

Klein, W. "Probleme des Spracherwerbs". Philosophisch-naturwissenschaftliches Kolloquium der Universität Mainz. Mainz, May.

Klein, W. "On spatial reference". Symposium on Perception and Language in honour of W.J.M. Levelt. Nijmegen, May.

Kutas, M. "How ERP's can be used as a measure of on-line language processing". Workshop on ERPs and Language Processing. Max-Planck-Institut für Psycholinguistik, Nijmegen, October.

Levelt, W.J.M. "Temporal correlation between pointing and speaking". 23rd Winter-Seminar on Molecules, Information and Memory. Klosters, Switzerland, January.

Levelt, W.J.M. "Some studies of lexical access at the Max Planck Institute for Psycholinguistics". Parasession on Dutch Contributions to Linguistics. Georgetown University Round Table on Languages and Linguistics. Washington, March.

Levelt, W.J.M. "Hochleistung in Millisekunden. Sprechen und Sprache verstehen". Festvortrag Jahrestreffen CVC.VDI-Verfahrenstechnik. Hannover, September.

Levelt, W.J.M. "Some processes in the phonological encoding of connected speech". Workshop on Phonological Encoding. Max-Planck-Institut für Psycholinguistik, Nijmegen, October.

Levelt, W.J.M. "Speaking: Some issues of lexical access". 1st Annual Drever Lecture. Edinburgh, November.

Levelt, W.J.M. "Symbolische en subsymbolische modellen van het menselijk gedrag. De connectionistische mode". Symposium Sociaal-Wetenschappelijke Raad, Koninklijke Nederlandse Akademie van Wetenschappen. Hoog-Soeren, December.

Li Ping. "Aspect and Aktionsart in Chinese: Evidence from psycholinguistics". 21st International Conference on Sino-Tibetan Languages and Linguistics. Lund, Sweden, October.

Machiels-Bongaerts, M.I.A., and Vonk, W. "Context effecten op de verwerking van ambigue woorden tijdens lezen". 11e Minisymposium over Lezen. Nijmegen, April.

Meyer, A.S. "Phonologische Enkodierung in der Sprachproduktion: Zur Kombination der Melodie und der metrischen Struktur eines Wortes". 30. Tagung experimentell arbeitender Psychologen. Marburg, March.

Meyer, A.S. "Phonologische Enkodierung in der Sprachproduktion". 36. Kongreß der Deutschen Gesellschaft für Psychologie. Berlin, October.

Meyer, A.S. "The time-course of phonological encoding". Workshop on Phonological Encoding. Max-Planck-Institut für Psycholinguistik, Nijmegen, November.

Meyer, A.S., and Schriefers, H. "Exploring lexical access in language production". Symposium on Perception and Language in honour of W.J.M. Levelt. Nijmegen, May.

Pechmann, Th., and Reetz, H. "Kritik einer Meßmethode – Zur Ungenauigkeit von voice-key Messungen". 30. Tagung experimentell arbeitender Psychologen. Marburg, March.

Pechmann, Th., Zerbst, D., and Reetz, H. "Die scheinbare Genauigkeit von voice-key Messungen". 36. Kongreß der Deutschen Gesellschaft für Psychologie. Berlin, October.

Perdue, C. "Utterance structure". 13th Boston University Conference on Language Development. Boston, Mass., October.

Perdue, C. "Complexification syntaxique et développement de la cohésion dans les productions d'adultes apprenant une langue étrangère". Réseau Européen de Laboratoires sur l'Acquisition des Langues. Montreux, November.

Pounder, A. "On reconstructing the dynamics of word-formation systems". International Conference on Historical Linguistics and Philology. Blazejewko, April.

Pounder, A. "On the status of conversion as a word-formation process". 3rd International Morphology Meeting. Krems, Austria, July.

Pounder, A. "Competition and selection in word-formation processes". 5. Essener Kolloquium. Essen, October.

Pounder, A. "GRAPHON: Ein System zur automatischen Sprachsynthese". Linguistischer Arbeitskreis. Köln, October.

Randall, J.H., and Carrier-Duncan, J. "Resultatives". 3rd International Morphology Meeting. Krems, Austria, July.

Romaine, S. "The typology of pigdin and creole languages in relation to their European superstrates". European Science Foundation Workshop on the Typology of the Languages of Europe. Rome, January.

Romaine, S. "Lexical change and variation in Tok Pisin". Georgetown Roundtable on Synchronic and Diachronic Approaches to Linguistic Variation and Change. Georgetown University, Washington, DC, March.

Romaine, S. "Borrowing in the lexicon in Tok Pisin" (Plenary speech). 1st International Conference on Language and Society. University of Hong Kong, Hong Kong, April.

Romaine, S. "Language standardization and some differences between spoken and written Tok Pisin". International Workshop for the Study of Language Standardization and the Vernacularization of Literacy. University of York, April.

Romaine, S. "Grammaticalization and degrammaticalization of the predicate marker in Tok Pisin". Symposium on Grammaticalization. University of Oregon, Eugene, Oregon, May.

Schermer, G.M. "De invloed van het Nederlands op Nederlandse gebarentaal". SWEDA, Workshop on Dutch Sign Language. Amsterdam, November.

Schermer, G.M. "(Gebaren)taalplanning en taalpolitiek". SWEDA, Workshop on Dutch Sign Language. Amsterdam, November.

Schermer, G.M. "Aspects of the lexicon and grammar of SLN". Euroaction, EEG-workshop for Deaf Teachers of Sign Language Courses. Amersfoort, November.

Schriefers, H., and Meyer, A.S. "Der Zeitverlauf des lexikalischen Zugriffs bei der Sprachproduktion". 36. Kongreß der Deutschen Gesellschaft für Psychologie. Berlin, October.

Sendlmeier, W.F. "Pädagogische Konsequenzen für Alphabetisierungsprogramme aus Ergebnissen der Grundlagenforschung". 7. Symposion 'Deutschdidaktik'. Bielefeld, February.

Sendlmeier, W.F. "Phonetische Dimensionen bei der perzeptiven Beurteilung von Wörtern". 30. Tagung experimentell arbeitender Psychologen. Marburg, April.

Sendlmeier, W.F. "Modification of strategies in feature extraction". 6th International Phonology Meeting. Krems, July.

Sendlmeier, W.F. "Optimierung von Plosivunterscheidungen für Hörbehinderte". 19. Jahrestagung der GAL. Passau, September.

Theunissen, H.E.J., and Vonk, W. "Contexteffect van script op woordherkenning: Activatie of integratie". 11e Minisymposium over Lezen. Nijmegen, April.

Vonk, W. "Rhetoric function of the linguistic marking of contrast relations". 10. Jahrestagung der Deutschen Gesellschaft für Sprachwissenschaft. Wuppertal, March.

Vonk, W. "Linguistic expressions of topic shifts and their role in discourse processes". 30. Tagung experimentell arbeitender Psychologen. Marburg, March.

Vonk, W. "Syntactic and semantic context effects in the processing of words during reading". Workshop on Comprehension Processes during Reading. Nijmegen, April.

Vonk, W. "Topic shifts and coherence devices". International workshop on Discourse Processing and the Representation of Coherence. Tilburg, September.

Vonk, W., and Noordman, L.G.M. "On the economic control in text processing". Symposium on Perception and Language in honour of W.J.M. Levelt. Nijmegen, May.

Vonk, W., and Noordman, L.G.M. "On the control of inference processes in text understanding". Conference on Comprehension Processes in Reading. Wassenaar and Amsterdam, June.

Weissenborn, J. "Zum Erwerb klitischer Pronomina im Französischen". 10. Jahrestagung der Deutschen Gesellschaft für Sprachwissenschaft. Wuppertal, March.

Weissenborn, J. "Syntax or discourse? Missing subjects in early French". 3rd European Conference on Developmental Psychology. Budapest, June.

Weissenborn, J. "The acquisition of clitic pronouns in French. Syntax or morphology?" 3rd International Morphology Meeting. Krems, July.

Weissenborn, J. "Null subjects in early grammars. Implications for parameter setting theories". 13th Annual Boston University Conference on Language Development. Boston, Mass., October.

Wenk, B. "Le rythme: de la musique de la langue et la langue de la musique". North Italy Conference on Early French Language Instruction. Asti, June.

Wittenburg, P. "Architektur neuraler Netzwerke". DB-Benutzertreffen der Max-Planck-Gesellschaft. Frankfurt, November.

Wittenburg, P. "Eine Einführung in Aspekte der künstlichen Intelligenz". VHS Kleve, December.

Zwitserlood, P. "Effecten van werkwoordscontexten tijdens gesproken-woord herkenning". Psychon Werkgemeenschap Taal en Geheugen. Utrecht, June.

Zwitserlood, P., Schriefers, H., Lahiri. A., and Donselaar, W. van. "De rol van de syllabe bij de waarneming van het Nederlands". Nederlandse Vereniging voor Fonetische Wetenschappen. Nijmegen, October.

Publications

Bates, E., Friederici, A. D., Wulfeck, B. B., and Juarez, L. A. (1988). On the preservation of word order in aphasia: Cross-linguistic evidence. *Brain and Language, 33*, 323-364.

Bates, E., Friederici, A. D., and Wulfeck, B. B. (1988). Grammatical morphology in aphasia: A reply to Niemi et al. *Cortex, 24*, 583-588.

Bayer, J. (1988). Rightward movement and the syntax of quantificational particles in German. In V. Rosen (Ed.), *Papers from the Tenth Scandinavian Conference of Linguistics: Vol. I* (pp. 73-87). University of Bergen: Department of Linguistics and Phonetics.

Bayer, J. (1988). Fortschritte der Syntaxtheorie. Anmerkungen zu Henk van Riemsdijk und Edwin Williams, *Introduction to the Theory of Grammar*, 1986. *Linguistische Berichte, 117*, 410-426.

Bierwisch, M. (1988). On the grammar of local prepositions. In M. Bierwisch, W. Motsch, and I. Zimmerman (Eds.), *Syntax, Semantik und Lexikon* (pp. 1-65). Berlin: Akademie-Verlag.

Bierwisch, M. (1988). Tools and explanations of comparison. *Journal of Semantics, 6*. 57-93 (Part 1) and 101-146 (Part 2).

Bierwisch, M. (1988). Review of G. Grewendorf, F. Hamm, and W. Sternfeld, *Sprachliches Wissen*, 1987. *Linguistische Berichte, 117*, 427-435.

Bierwisch, M., Motsch, W., and Zimmermann, I. (Eds.). (1988). *Syntax, Semantik und Lexikon* (Studia Grammatica XXIX). Berlin: Akademie-Verlag.

Bleser, R. de, and Bayer, J. (1988). On the role of inflectional morphology in agrammatism. In M. Hammond and M. Noonan (Eds.), *Theoretical morphology* (pp. 45-69). New York: Academic Press.

Bleser, R. de, Dronsek, C., and Bayer, J. (1988). Morphosyntactic processing in German agrammatism: A replication and revision of von Stockert/Bader (1976). *Cortex, 24*, 53-76.

Bos, H., Bouwmeester, A., Harder, R., Kendijan, J., Koolhof, C., Koolhof, K., and Schermer, G. M. (1988). *Basis-communicatie-cursus* [Cursusboek voor cursusleid(st)ers]. Amsterdam: NSDSK.

Bos, H., Harder, R., Schermer, G. M., and Stroombergen, M. (1988). *Notatie-systeem voor Nederlandse gebaren*. Amsterdam: NSDSK.

Bowerman, M. (1988). Inducing the latent structure of language. In F. S. Kessel (Ed.), *The development of language and language researchers: Essays in honor of Roger Brown* (pp. 23-49). Hillsdale, NJ: Erlbaum.

Bowerman, M. (1988). The 'no negative evidence' problem: How do children avoid constructing an overly general grammar? In J. A. Hawkins (Ed.), *Explaining language universals* (pp. 73-101). Oxford: Blackwell.

Dasgupta, P. (1988). The external reality of linguistic descriptions. *Canadian Journal of Linguistics, 33*, 345-365.

Dasgupta, P. (1988). Bangla quantifier postposing, unaccusative in situ, and the ECP. *Linguistic Inquiry, 19*, 691-698.

Dijkstra, A. (1988). Review of A. Garnham, *Psycholinguistics*, 1985. *Sprache und Kognition, 7*, 66-67.

Ehrich, V., and Vater, H. (Eds.). (1988). *Temporalsemantik. Beiträge zur Linguistik der Zeitreferenz*. Tübingen: Niemeyer.

Engelkamp, J., and Pechmann, Th. (1988). Kritische Anmerkungen zum Begriff der mentalen Repräsentation. *Sprache und Kognition, 7*, 2-11.

Flores d'Arcais, G. B. (1988). Language comprehension. In F. J. Newmeyer (Ed.), *Linguistics: The Cambridge Survey: Vol. III. Language: Psychological and Biological Aspects* (pp. 97-123). Cambridge: Cambridge University Press.

Flores d'Arcais, G. B. (1988). Elements of Gestalt Psychology in cognitive psycholinguistics. In N. Caramelli and G. Kanizsa (Eds.), *L'eredita' della Gestalt* (pp. 271-284). Bologna: Il Mulino.

Flores d'Arcais, G. B. (1988). Aspetti ecologici e applicativi della ricerca psicolinguistica. *Rassegna di Psicologia*, *4*, 321-337.

Flores d'Arcais, G. B. (1988). Syntactic processes during reading. In *Studi di psicolinguistica* (pp. 123-145). Padova: CLEUP.

Frenkenberger, S., Kommenda, M., and Pounder, A. (1988). Automatische Wortklassifizierung und Prosodiebestimmung im Sprachausgabesystem GRAPHON. In A. Lacroix, J. Paulus, and D. Wolf (Eds.), *ITG-Fachberichte: Digitale Sprachverarbeitung – Prinzipien und Anwendung* (pp. 207-212). Berlin: VDE-Verlag.

Frauenfelder, U. H., and Henstra, J. (1988). Activation and deactivation of phonological representations. *Proceedings of the 4th International Phonology Congress*, 10-13.

Friederici, A. D. (1988). Agrammatic comprehension: Picture of a computational failure. *Aphasiology*, *2*, 279-284.

Friederici, A. D. (1988). Neurobiologische Grundlagen kognitiver Funktionen. In H. Mandl and H. Spada (Eds.), *Wissenspsychologie. Eine Einführung* (pp. 469-487). München: Urban & Schwarzenberg.

Friederici, A. D., and Levelt, W. J. M. (1988). Sprache. In K. Immelmann, K. R. Scherer, Ch. Vogel, and P. Schmoock (Eds.), *Psychobiologie. Grundlagen des Verhaltens* (pp. 648-668). Stuttgart: Fischer.

Gfroerer, S. (1988). Phonologische Kodes in der visuellen Worterkennung. *Forschungsberichte des Instituts für Phonetik und Sprachliche Kommunikation der Universität München, 25*, 1-184.

Günther, H. (1988). *Schriftliche Sprache – Strukturen geschriebener Wörter und ihre Verarbeitung beim Lesen*. Tübingen: Niemeyer.

Günther, H. (1988). Sprachsystem, Schriftsystem, Lexikon – Bemerkungen zu einem Beitrag von Richard Wiese. *Deutsche Sprache, 18*, 271-281.

Günther, H. (1988). Oblique word forms in visual word recognition. *Linguistics, 28*, 583-600.

Günther, H. (1988). Falsche Plurale? *Sprachreport, 4*, 12-13.

Günther, H. (1988). The processing of oblique word forms in a word-and-paradigm model. *Wiener linguistische Gazette Beiheft, 8*, 7-9.

Günther, H., and Ludwig, O. (1988). Konzeption eines Handbuches "Schrift und Schriftlichkeit". *Deutsche Sprache, 18*, 82-89.

Günther, H., Ludwig, O., et al. (1988). Schrift und Schriftlichkeit – Konzeption eines interdisziplinären Handbuchs internationaler Forschung. *Forschungsberichte des Instituts für Phonetik und Sprachliche Kommunikation der Universität München, 25*, 185-223. (English translation, pp. 225-261.)

Hawkins, J. A. (Ed.). (1988). *Explaining language universals*. Oxford: Blackwell.

Hawkins, J. A. (Ed.). (1988). Papers in universal grammar: Generative and typological approaches [Special issue]. *Lingua, 74* (2/3).

Heeschen, C. (1988). Adaptation bei aphatischen Störungen. In W. Klein (Ed.), Sprache Kranker [Special issue]. *Lili: Zeitschrift für Literaturwissenschaft und Linguistik, 18*(69), 41-53.

Heeschen, C., and Kolk, H. (1988). Agrammatism and paragrammatism. *Aphasiology, 2*, 299-302.

Heeschen, C., Ryalls, J. H., and Hagoort, P. (1988). Psychological stress in Broca's versus Wernicke's Aphasia. *Clinical Linguistics and Phonetics, 2*, 309-316.

Jordens, P. (1988). The acquisition of word order in Dutch and German as L1 and L2. *Second Language Research, 4*, 41-65.

Jordens, P. (1988). The acquisition of worder in L2 Dutch and German. In P. Jordens and J. Lalleman (Eds.), *Language development* (pp. 149-180). Dordrecht: Foris.

Klein, W. (Ed.). (1988). Sprache Kranker [Special issue]. *Lili: Zeitschrift für Literaturwissenschaft und Linguistik, 18*(69).

Klein, W. (1988). Sprache und Krankheit. In W. Klein (Ed.), Sprache Kranker [Special issue]. *Lili: Zeitschrift für Literaturwissenschaft und Linguistik, 18*(69), 9-20.

Klein, W. (1988). The unity of a vernacular. Some remarks on "Berliner Stadtsprache". In N. Dittmar and P. Schlobinski (Eds.), *The sociolinguistics of urban vernaculars. Case studies and their evaluation* (pp. 147-153). Berlin: de Gruyter.

Klein, W. (1988). Varietätengrammatik. In U. Ammon, N. Dittmar, and K. J. Mattheier (Eds.), *Soziolinguistik. Ein Internationales Handbuch zur Wissenschaft von Sprache und Gesellschaft* (pp. 997-1006). Berlin: de Gruyter.

Lahiri, A., and Hankamer, J. (1988). The timing of geminate consonants. *Journal of Phonetics, 16*, 327-338.

Lahiri, A., and Hulst, H. van der. (1988). On foot typology. *Proceedings of NELS, 18*, 286-299.

Lahiri, A., and Koreman, J. (1988). Syllable weight and quantity in Dutch. *Proceedings of WCCFL, 7*, 217-228.

Levelt, W. J. M. (1988). Onder sociale wetenschappen. Toegelicht aan psychologie, economie en taalkunde. *Mededelingen der Koninklijke Nederlandse Akademie van Wetenschappen. 51*(2), 41-55.

Levelt, W. J. M. (1988). Working models of perception; Five general issues. In B. A. S. Elsendoorn, and H. Bouma (Eds), *Working models of human perception* (pp. 89-503). London: Academic Press.

Li Ping. (1988). The acquisition of spatial reference in Chinese. In P. Jordens and J. Lalleman (Eds.), *Language development* (pp. 83-99). Dordrecht: Foris.

Marslen-Wilson, W. D., Brown, C. M., and Tyler, L. K. (1988). Lexical representation in spoken language comprehension. *Language and Cognitive Processes, 3,* 1-16.

Meyer, A. S. (1988). *Phonological encoding in language production.* Doctoral dissertation, Nijmegen University.

Norman, D. A., and Levelt, W. J. M. (1988). Life at the Center. In W. Hirst (Ed.), *The making of cognitive science. Essays in honor of George A. Miller* (pp. 100-109). Cambridge: Cambridge University Press.

Praamstra, P., Hagoort, P., Schulte, B. P. M., Colon, R. E., and Wong-Chung, R. E. (1988). Wernicke's aphasia and auditory agnosia. *Clinical Neurology and Neurosurgery, 90,* 303-304.

Randall, J. H. (1988). Inheritance. In W. Wilkins (Ed.), *Thematic relations.* Syntax and Semantics Series, vol. 21 (pp. 129-146). New York: Academic Press.

Randall, J. H. (1988). Of butchers and bakers and candlestick-makers: The problem of morphology in understanding words. In A. Davison and G. Green (Eds.), *Linguistic complexity and text comprehension: A reexamination of readability with alternative views* (pp. 223-245). Hillsdale, NJ: Erlbaum.

Romaine, S. (1988). *Pidgin and creole languages.* London: Longman.

Romaine, S. (1988). Contributions from pidgin and creole studies to a sociolinguistic theory of language change. *International Journal of the Sociology of Language, 71,* 59-66.

Romaine, S. (1988). Historical sociolinguistics: Problems and methodology. In K. J. Mattheier (Ed.), *Handbook of sociolinguistics* (pp. 1452-1469). Berlin: de Gruyter.

Romaine, S. (1988). Pidgins, creoles, immigrant and dying languages. In N. C. Dorian, *Investigating obsolescence: Studies in language contraction and death* (pp. 369-383). Cambridge: Cambridge University Press.

Ryalls, J. H., and Behrens, S. J. (1988). An overview of changes in fundamental frequency associated with cortical insult [Review]. *Aphasiology, 2,* 107-115.

Schermer, G. M. (1988, November). Voor dovemans ogen. *Psychologie*, pp. 22-25.

Schermer, G. M., and Knoors, H. (1988). Het gebruik van gebaren binnen totale communicatie. In W. K. B. Hofstee and G. Lang (Eds.), *Nederlands Psychologisch Onderzoek 2* (Nederlands Instituut voor Psychologen 13) (pp. 155-167). Lisse: Swets and Zeitlinger.

Schermer, G. M., Bos, H., and Harder, R. (1988). *Handen uit de mouwen. Gebaren uit de Nederlandse gebarentaal in kaart gebracht.* Amsterdam: NSDSK.

Schriefers, H., and Pechmann, Th. (1988). Incremental production of referential noun-phrases by human speakers. In M. Zock and G. Sabah (Eds.), *Advances in natural language generation: An interdisciplinary perspective* (pp. 172-179). London: Pinter.

Sendlmeier, W. F. (1988). 'F2-Transition' und 'silent interval' als 'cues' für die Plosivwahrnehmung bei pathologischem Gehör. In W. Kühlwein and B. Spillner (Eds.), *Sprache und Individuum* (p. 138). Tübingen: Narr.

Sendlmeier, W. F. (1988). Primary perceptual units in word recognition. In H. Niemann, M. Lang, and G. Sagerer (Eds.), *Recent advances in speech understanding and dialogue systems* (pp. 165-169). Berlin: Springer.

Sendlmeier, W. F. (1988). Primäre Wahrnehmungseinheiten in der auditiven Sprachverarbeitung. *Linguistische Berichte, 115*, 207-213.

Sendlmeier, W. F. (1988). Hörtraining durch Merkmalsfokussierung. In B. Spillner (Ed.), *Angewandte Linguistik und Computer* (pp. 211-213). Tübingen: Narr.

Sendlmeier, W. F. (1988). Sprachverarbeitung bei pathologischem Gehör – zum Stand der Forschung. *Folia Phoniatrica, 40*, 218-243.

Sendlmeier, W. F., and Goldbeck, T. (1988). Wechselbeziehung zwischen Satzmodalität und Akzentuierung in satzfinaler Position bei der Realisierung von Intonationskonturen. In H. Altmann (Ed.), *Intonationsforschung* (pp. 305-321). Tübingen: Niemeyer.

Stutterheim, Ch. von, and Klein, W. (1988). Referential movement in descriptive and narrative discourse. In R. Dietrich and C.F. Graumann (Eds.), *Language processing in social context* (pp. 39-76). Amsterdam: North-Holland.

Weissenborn, J. (1988). Von der 'demonstratio ad oculos' zur 'Deixis am Phantasma'. Die Entwicklung der lokalen Referenz bei Kindern. In A. Eschbach (Ed.), *Karl Bühler's theory of language* (pp. 257-276). Amsterdam: Benjamins.