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PREFACE

Many of the interests and themes which characterized research at the Institute in 1981 were directly related to those of 1980 in each of the four major areas of investigation: language production, language comprehension, language acquisition, and language disorders. As in 1980, the research activities across these four areas focused in various ways on the relation between cognitive and linguistic processes and on contextual factors involved in such processes. In most cases, this research formed direct continuation of previous studies (described in the Institute's Annual Report 1980); in some cases, new related research projects were undertaken.

The most notable changes involved the Institute's research in language acquisition. The increased participation of various staff members in projects on second language acquisition, in particular the European Science Foundation's additional activity "The Ecology of Adult Language Acquisition", led to the decision to merge the Institute's first and second language acquisition research as much as possible. This decision not only involved some internal reorganization, but, more importantly, formed the occasion for an intensive four-week long summer workshop at the Institute. The aim of this workshop, directed by Professors D. Slobin, E. Clark, and B. MacWhinney, was to study the untutored acquisition of a limited set of linguistic devices by comparing first and second language acquisition data in a large variety of languages (see Section 3 of this report for more details and for a list of participants).

A further important event in 1981 was the decision of the Dutch Research Council ZWO to fund a long-term research project on "Aphasia in Adults". The project is a joint effort of Nijmegen University and the Institute, and has January 1982 as its starting date. With this new project, the Institute's research in language disorders, emerging since 1980, will undergo considerable development in 1982.

Willem J.M. Levelt

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RESEARCH IN PROGRESS

The first part of the paper discusses the theoretical background of the research. It reviews the existing literature on language production, focusing on the models proposed by Levelt (1989) and others. The paper then describes the experimental design and the materials used in the study. The results of the experiment are presented in the next section, followed by a discussion of the implications of the findings for the theory of language production.

The second part of the paper reports on the results of the experiment. It shows that the results are consistent with the predictions of the Levelt model. The paper then discusses the implications of the findings for the theory of language production. It suggests that the results support the idea that language production is a highly organized and controlled process. The paper also discusses the limitations of the study and suggests directions for future research.

The third part of the paper discusses the implications of the findings for the theory of language production. It suggests that the results support the idea that language production is a highly organized and controlled process. The paper also discusses the limitations of the study and suggests directions for future research. The paper concludes by summarizing the main findings and their implications for the theory of language production.

1. LANGUAGE PRODUCTION

As in the past year research in language production at the Institute has focused on determining the different components of the production process, their internal structure, and the interaction between them and various contextual factors. In this respect, the main themes of several studies have been to investigate the relationship between conceptual and linguistic processes, as well as to specify the nature of the processing units and the different types of processing strategies involved in repairs of speech errors and intonational patterning.

1.1 The interaction of conceptual and linguistic processes has been studied by Maassen and Levelt in a series of experiments where subjects produced descriptions of events consisting of moving geometric figures. The major finding was that, whereas the linguistic form of the sentences produced was contingent on the conceptual representation they expressed, the converse was not true. In the limited context of these experiments, it can be shown that conceptual processes cannot anticipate the order in which lexical elements are needed later on a linguistic level, so that they are "blind" to the linguistic requirements of a later stage. This result testifies to the relative autonomy of conceptual and linguistic processing in the production of speech.

The conceptual segmentation and ordering involved in production, as well as the mapping of conceptual structures onto linguistic ones, are at the center of a study by Ullmer-Ehrich on accident descriptions. Accidents are complex events with a complex temporal structure which needs to be reflected in verbal descriptions of accidents. The spatial setting in which a traffic accident takes place is often a crucial component in explaining why the accident happened at all. Descriptions of traffic accidents therefore need to be rather specific with respect to spatial information; hence, they provide a particularly interesting data base to investigate how speakers manage to link spatial and temporal information and how they use spatial and temporal deixis in doing so. In addition, a second aspect

of this study turned out to be of psychological and linguistic interest: accidents always have a complex history, in that there is a sequence of prior events that lead to what is finally referred to as an accident. Usually, this sequence of events contains (at least) one designated element which is considered to be the cause of the accident. Thus, the following questions arise: do speakers conceive of causes as having some particular status within the chain of prior events, i.e., do they distinguish the post hoc from the propter hoc, and how do they mark this distinction linguistically?

In order to address these questions, subjects were presented with a short film showing a light traffic accident and they were instructed to retell the film. There were three different experimental conditions: a) the film was presented with a simultaneous commentary referring to the cause of the accident and subjects narrated the film from memory; b) the film was presented as a silent movie and subjects narrated it from memory; c) the speakers themselves commented the film while it was presented as a silent movie. The data analysis is still in progress and results will be available in 1982.

Problems of discourse generation on the conceptual and linguistic level have also been addressed in a study by Levy. She continued her investigation of the formal ways in which characters in a narrative are referred to, relative to their thematic status as central or noncentral figures of the narration. Videotaped narratives are segmented - on the basis of such formal discourse properties as the distribution of coreferential expressions and the use of tense and aspect - into "paragraph" units centering around references to individual characters in the story. These higher-order discourse units, or "focus spaces", are interpreted as serving the communicative function of placing various characters in and out of focus as the narrative progresses. From the point of view of language comprehension, it is hypothesized that this type of discourse organization serves to facilitate the listener's interpretation of pronominal references to characters within each unit.

An examination of the specific formal devices used by each narrator indicates so far that characters tend to be created as focal with the use of explicit referring terms (e.g., proper names) and precisely co-occurring gestures, and subsequently maintained as focal with implicit forms (e.g., pronouns) and the absence of such gestures. Furthermore, characters are maintained as nonfocal with the use of explicit referring terms, even if

less explicit forms would be referentially successful.

From a communicative point of view, it is predicted that the listener's recall of specific events described in a given focus space will depend on the formal way in which characters were originally referred to within that focus space, e.g. on the narrator's use of specific referring terms and gestures. The hypothesis is tested by comparing each narrator's version of the story to a re-narration by the respective listener, with the analysis concentrating on the listener's recall versus omission of individual events, relative to the focal status assigned to characters involved in those events by the original narrator.

1.2 The relationship between the uses of linguistic devices in speech production and accompanying gestures is the object of an ongoing project by Richardson and Levelt. Focusing on deictic gestures and deictic expressions such as this or that, they are proposing to evaluate two alternative models of the speech-gesture relationship. The first is based on the assumption that speech and gesture are the products of two autonomous subsystems, while the second assumes a degree of coordination between the two processes. The validity of these models will be tested by determining which of them gives the best account of behaviour in a simple experimental situation in which a person makes "simultaneous" verbal and gestural responses to the onset of a visual stimulus. If there are factors which differentially affect the speed of processing in the two channels, the introduction of one or other of them should have different consequences depending on which model holds true. A Selspot system has been installed which allows to monitor the course of light-emitting devices fixed to points of arms and hands, and to establish the exact temporal relation between movements and various aspects of the speech signal.

1.3 Two major studies have focused on the nature of the linguistic processing units and strategies involved in production.

Levelt continued his analysis of speech repairs, with a data base consisting of about 850 tape-recorded repairs which were produced by subjects while describing abstract spatial networks. The theory developed earlier distinguishes between three major types of monitoring and corresponding repairs: monitoring for conceptual content, for appropriateness of expression (i.e., potential ambiguity, consistency of wording, etc.), and for error

(lexical, syntactic, or phonological mistakes). Appropriateness and error repairs are by far the most dominant ones in the sample. They are overtly distinguishable not only by the type of editing term used by the subjects ("sorry", "eh", etc.), but also by the way in which the speakers start again after the interruption and the editing expression: error-repairs are basically conservative in that they leave the original (erroneous) expression with as few changes as possible. In these cases, the only thing the speaker changes is the erroneous word(s), otherwise "replaying" parts of the original utterance. Appropriateness repairs, however, often ignore the original utterance: they tend to take the form of "fresh starts", i.e., new formulations that had not been used before.

Much effort went into statistical analyses of moments of interruption and linguistic types of restart. Though speakers can interrupt their speech at any place (within or between words, within or between constituents, etc.), there is now good statistical evidence that speakers prefer to complete words before stopping the flow of speech. Furthermore, a more important result is that speakers also tend to complete constituents before interruption. The statistical evidence shows unambiguously that this is not due to some form of "linguistic inertia" on the part of the speaker, but that it results from the fact that the monitoring system is more sensitive towards the end of constituents: the detection chance for "trouble" increases as the constituent comes to completion, but upon detection the flow of speech is immediately interrupted.

As for restarting, it turns out to be rather statistically empty to say that restarting respects constituent boundaries. Rather, restarting seems to be governed by a well-formedness rule for repairing which excludes repairs such as "Did he go left, uh he go right?", as opposed to "Did he go left, uh go right?". The rule not only turns out to have great predictive power with respect to repair types in the present data set, but also links the structure of repairs to the structure of (elliptic) coordinations. It seems therefore that very similar production processes are involved in repairing, coordinating, and presumably question-answering.

Similarly, the determination of linguistic processing units was at the center of some studies carried out by Jarvella. In this research, Jarvella first continued the linguistic analysis of a large corpus of Dutch utterances which speakers were asked to explicitly segment in varying degrees or not segment as they produced them in informal interviews. The analysis scores

each segment produced as to its apparent linguistic constituentness (e.g., word, phrase or clause of particular kind, etc.), provides a description of its internal structure, the presence and location of filled and unfilled pauses, the presence and number of any speech corrections made, and the presence and type of major (e.g., sentence) boundaries before, during, and after them. This analysis is currently in progress and its aim will be to capture generalities about production from distributional properties of the various linguistic features under investigation.

Jarvella conducted three further experiments in the same line of research. In the first one, maximal versus no segmentation of utterances was elicited in a situation where there was no visual feedback between the subject and the interviewer, to compare with previous data which were obtained in a situation where such visual feedback was present. One aim of this study was to determine whether interviewer feedback interacts with utterance organization and production strategies. Another aim was to ascertain whether the speakers' overt segmentation of their utterances at a high rate would be subject to other extraneous factors, or whether it would be relatively stable and therefore most useful for inferring the smaller constituents of speech output.

A third aim of this study was to obtain both a highly segmented corpus and a normal speech corpus from the same speakers under roughly identical circumstances, which could be compared in terms of factors such as speech rate, utterance content, and complexity, and therefore also provide some indication of how naturally speakers can divide their utterances into clear pieces if they are asked to do so. This manipulation was introduced by occasionally sounding a tone signal as subjects talked. The meaning of this signal was (1x) to begin speaking in clear segments at a high rate and (2x) to stop speaking in this way. In the intervening intervals, speakers were instructed to speak as they would in any other situation. The analyses of these data are currently in progress.

The other two experiments which were conducted by Jarvella aimed at obtaining some relatively independent estimates of the predictability of utterance segments. That is, rather than producing a linguistics-based analysis of segmentation directly, an intervening step was added. Subjects were shown transcripts of others' speech which in fact had been explicitly segmented by a marker syllable, but now with these markers removed. Their task was either to write slashes on the transcripts where they felt the

original speaker had probably divided his speech into discrete sections, or to read through the transcripts, first silently, then out loud, and to introduce such overt markers in their speech themselves. For each of about 20 original speakers, a selection of utterances was made, and presented to new subjects together with a brief statement of each utterance's context (e.g., what had been asked in an immediately preceding question). Forty new subjects performed both "reconstruction" tasks in counter-balanced order.

The data of interest are: (a) the original markers recovered by the new subjects and their linguistic context; (b) the locations of markers not recovered by new subjects; (c) the locations of new markers which were added to what the original speaker had in fact done; and (d) the locations where neither the original nor the new subjects placed markers. These comparisons will be made across all tasks, i.e., also within subjects. With respect to (c), the analysis already shows that, when pause locations are marked, readers often introduce markers redundantly, i.e., where the original speaker had not done so. It is expected that the accuracy of readers' hypotheses in doing these kinds of tasks reflect other perceptual biases which may help us go beyond the assumed harmony between speakers and listeners in message transmission/reception to conceivably important points of difference between them. Thus, divergences of type (b) as well as (c) might shed light on asymmetries between organizational principles used by speakers and their usual addressees, while convergences of types (a) and (d) might illustrate the common ground between them.

1.4 A third set of studies centered around the prosodic aspects of language production. Klein pursued his investigation of German intonation. In the context of this work intonation is understood to be an abstract patterning of utterances which in some way is associated with, or projected onto, the segmental structure. It is reflected by the pitch contour whose primary acoustic counterpart is fundamental frequency (F_0). Intonation is also indirectly reflected by other parameters, such as intensity, duration of segments (including pauses), etc. Only F_0 is considered so far. This is not to mean, of course, that intonation is F_0 . In a sense, F_0 is the shadow of a shadow, and its actual course is a more or less blurred reflection of intonational patterning. It is on this latter aspect of intonation that the study focuses, but to do so one has to face muddy reality. This research is

still in its heuristic stage and it is characterized by three general assumptions: (a) intonational patterning interacts with, but is not determined by syntactic structure; (b) intonation expresses functions, and any attempt to describe typical intonation patterns of a language without taking into account which functions they carry is almost pointless; (c) depending on segmental structure, a given abstract intonation pattern may result in very different projections of pitch contours.

At present, Klein is formulating a limited set of theorems which predict the exact pitch contour, if conditions are given. These conditions include: (a) the "thematic score" on which the given utterance operates, i.e., what is given, what is introduced first, what is replaced; (b) the validity claims the speaker wants to express; (c) the segmental structure of the utterance, in particular the distribution of lexically stressed and unstressed syllables.

Another project on intonation has been started by Tropp. The topic of this study is the coordination of intonation contour and syntactic structure, of which two central aspects were differentiated. The first one is the compatibility of intonation contours with segmental clause structure. Here it is primarily the delimitation effect of intonation that is investigated, namely the syntactic domain(s) on which a certain contour can potentially operate. The second aspect is concerned with the processing of intonation. An experimental design was developed in which the control of the processing of an intonation contour can be tested by comparing the intonation patterns of several sentences which were constructed so as to differ in syntactic complexity in various degrees.

1.5 Closely related to the research of this working group was the work of a visitor at the Institute, W. Wahlster (University of Hamburg), who investigated the role of an explicit partner model in the cognitive processes underlying the generation of definite descriptions. A computational model of this aspect of the noun-phrase generation process was developed and integrated into the natural language AI system HAM-RPM. When generating noun phrases to characterize specific objects with which the user of the AI system is not familiar, the system takes into account the existential assumptions, domain-related desires, and referential beliefs ascribed to the partner. The conversational setting studied was a hotel reservation situation, where the AI system takes the part of a hotel manager who tries to persuade the user to make a firm booking for a particular room.

2. LANGUAGE COMPREHENSION

Research in language comprehension at the Institute has addressed quite a number of different issues. The main theoretical concern of many studies has been the question of serial, autonomous versus parallel, interactive processing of phonological, syntactic, semantic, and pragmatic information in language perception. This work essentially continued lines of investigation initiated in the preceding years, focusing on processes of word recognition and anaphora interpretation.

In addition to this central topic several studies have been concerned with more specific aspects of word, sentence, and text processing in language comprehension, i.e., the role of inferences in reading and question-answering; semantic and pragmatic versus structural strategies in the interpretation of sentences containing unbounded dependencies; the organization of the mental lexicon in the case of homonyms; the interpretation of deictic versus intrinsic spatial expressions; and speaker-hearer coordination in the case of demonstrative references.

Parallel to this experimental work in language comprehension some studies have been carried out in the domain of formal semantics centering on the treatment of contextual parameters in this framework.

2.1 Word recognition has been the object of several major studies. In three sets of experiments in progress Marslen-Wilson investigated the processing events that take place, millisecond by millisecond, as a spoken word is recognized. The research is conducted within the framework of a "cohort" model of spoken word recognition, which claims that recognition of a word in isolation is mediated by the parallel activation, at the beginning of a word, of all the words in the language that begin with the same sound sequence, and that the word in question can be recognized as soon as it becomes uniquely distinguishable from all of the other words with which it shares its initial segments.

A first experiment conducted by Marslen-Wilson, Brown, van Haandel, and

Zwitserslood, still in progress, is testing the claim that many different word candidates are activated early in the word. To do this, sets of word-pairs were generated that only separated relatively late in the word - for example, the pair kapitein and kapitaal. Each subject heard one member of each pair, and associated with the word was a visual probe, that was related to either one or the other member of the pair. The prediction of the cohort model is that probes related to both members of the pair will be activated, irrespective of what the word will eventually become, so long as the probe is presented at a point in the word before it uniquely separates. For the pair above, this should apply to probes placed on the /t/ or earlier.

The research has necessarily also involved the evaluation of different experimental techniques for measuring the hypothesized activation processes. The Stroop colour interference paradigm proved unsatisfactory, since interference effects of any sort could not be obtained until 500 msec after the ends of the words. The task did not seem to be sensitive to any within-word effects. A second task, using naming latency, was more sensitive, but did not show any activation effects for the probe related to the member of the pair which the word did not become. Thus, probing before the /t/ on kapitaal produces facilitation of naming latency for the probe related to kapitaal but not for the probe related to kapitein. The third technique, a cross-modal lexical decision task, proved the most sensitive, and did show signs of activation of both potential word candidates before the separation point. Research now in progress is investigating the precise conditions under which the lexical decision task shows the most reliable effects. In addition, all of the stimuli have been tested in a gating task, to give a more precise estimate of the potential degree of activation of different word candidates at the probe points. The preliminary results suggest that, when these estimates are taken into account, the lexical decision results show clearer evidence for activation of both candidates, before but not after the separation point.

A second experiment by Marslen-Wilson, carried out in collaboration with K. Church (Dept. of Computer Science, Massachusetts Institute of Technology) is using an auditory lexical decision task to investigate the properties of on-line decision processes as a word is heard. The experiment taps, first, the effects of cohort size on the recognition process - does the number of possible words compatible with the input prior to the

separation point have an effect on the speed of the recognition decision. The second part of the experiment examines the effects of syllable structure and of allophonic variation on response time. These manipulations are designed to distinguish the types of information about the properties of the sensory input that are made available to the word-recognition system.

A third experiment by Marslen-Wilson is also investigating the nature of the input to the word-recognition process, and focuses on the sensitivity of word-recognition decisions to the acoustically different trajectories of phonemically identical vowels that terminate on different consonantal configurations. To do this, the experiment is using a successive comparison procedure, where subjects are asked to match, in a timed task, an auditorily presented sound sequence to a visually presented target.

Whereas Marslen-Wilson was mainly concerned with word recognition in isolation, Tyler, working in the same theoretical framework, started a series of experiments intended to verify the assumption that when a word appears in a normal discourse context then contextual constraints are assumed to interact with this process to bring the "recognition point" forward in the word.

A first experiment investigated this proposed interaction of contextual and sensory information within the word in the following way. Materials were constructed consisting of sentence pairs in which the first sentence of each pair made a subsequent target word either semantically predictable or not predictable. Moreover, the target word was preceded by either a strongly or weakly constraining syntactic context. The aim of the experiment was to determine how much of the word in each of these different contexts the listener needed to hear before identifying the word he was hearing. To achieve this, a gating paradigm was used. The data are in the process of being collected and the results will be available in 1982. In addition, Tyler has piloted a developmental study with 5, 7, and 10 year-old children, testing various modifications of materials similar to those outlined above for adults. Different versions of the gating paradigm were also tried out to maximize its potential use with young children. These results will also be available in 1982.

A second claim made by the cohort model was tested in a subsequent experiment - namely, the claim for the priority of bottom-up information during word recognition. This claim predicts that contextual constraints will not always be able to move the recognition point forward in the word.

Consider, for example, the case where a stem morpheme can take a number of different inflected forms. Unless there are strong contextual constraints, the listener will have to wait until he hears the inflection before identifying the word. The specific prediction here is that for inflected forms in weak contexts, word recognition decisions will require the same amount of sensory information as when the word appears in isolation.

For this study, stimuli consisting of sentences which contain specific target words are currently constructed. These targets consist of stems which take a number of different inflections thereby producing words of different form-classes. The sentence preceding the target word is always syntactically neutral in that it does not constrain the syntactic category of the target. Thus, the prediction is that even though the listener could identify the stem of the target before he hears the inflection on the basis of sensory and contextual information, he will hold off from making his decision as to what word he is hearing until he identifies the inflection and can thus determine the exact syntactic category of the target. Thus, there will be no difference in the amount of sensory information needed to recognize such targets in and out of context.

The recognition of inflected word forms has also been the object of a set of studies by Jarvella, G. Meijers (University of Tilburg), and G. Kempen (University of Nijmegen). They investigated the recognition of word stems and inflected word forms in Dutch. This research was intended to cast light on issues of lexical access in spoken word processing which have largely been ignored, and especially the question of whether both stem and grammatical morphemes are recognized from left to right, or word form is largely analyzable only once stem morphemes have been identified. Dutch verbs provide a useful contrast with English in this respect, since (as in German) many but not all past participles are inflected with a prefix *ge-* and it is often therefore possible in principle to know that a word one hears is a past participle before (or no later than) one can tell what verb it is a form of. In these studies, subjects heard one verb form (a particular past tense or past participle) followed by a list of words which made up a grammatical or random sequence. Their task was to listen for a second verb form in this list, and decide (in one experiment) whether it shared stem and/or form type with the earlier word heard, or (in another experiment) whether, in separate conditions, the stem and the verb form were the same or different. The results of both studies strongly suggest that Dutch verb

stems are recognized faster than a listener identifies what form of a verb he is hearing, while other differences found (e.g., between verb types) seem to be a function of what point in a spoken word - its beginning, the earliest place where a judgment might be unambiguously taken, or its end - is used to measure reaction time from. Theoretically, the work suggests a stage model of word perception, in which phonetically organized word list serves, together with a pre-morphological (a meaning-blind) analysis, to locate a word's stem, and the analysis is then checked after the stem information is found to determine the word's form. This model combines features of several previous theories, but its validity must be checked by further experimentation. Context (grammatical versus random), for example, did not have an effect, but in the sentences used, either verb form could occur at any decision point. There are environments which were not tested where this is not so, and it seems reasonable to see if the effects are replicated there as well. In order to get some idea of cross-linguistic validity, with appropriate changes due to language, the same kind of experiment is being designed in French, in which it will be tested both on native and non-native speakers.

2.2 A central aspect of text comprehension, the interpretation of anaphors, has been studied in on-line experiments by Marslen-Wilson, Tyler, and C. Koster. This research investigates the time-course of discourse integration processes, i.e., of the processes that integrate an incoming utterance with the listener's mental representation of the preceding verbal context. The experiment used a speeded naming paradigm, in which subjects heard a short story context, which ended in one of three possible continuation fragments. For example, the context story:

After the surgeon had examined the 12 year-old girl with the broken leg, he decided he would have to take immediate action. He had a lot of experience with serious injuries. He knew what he had to do next.

might be continued either by "He quickly injected..." "She quickly injected...", or "Quickly injecting...". Immediately at the offset of the fragment, a visual probe was presented - for the above example, either him or her. The subjects' task was to name this probe as rapidly as possible, and earlier research had shown that naming responses are slower to inappropriate

probes (for example, him would be inappropriate following "He quickly injected...").

The experimental materials contrasted, semi-factorially, three factors contributing to on-line discourse integration, and, hence, to the listener's perception of a probe as appropriate or inappropriate. These factors were the following: (a) the discourse focus - i.e., the individual most salient in the preceding context (the surgeon in the above example); (b) the information carried by the pronoun at the beginning of some of the continuation fragments; (c) the pragmatic plausibility of the verb-form used relative to different potential antecedents - in the above example, the verb inject more plausibly has the surgeon as agent than the young girl.

The results fully confirmed the hypotheses that had been advanced on the basis of earlier research. They showed, first, that each of the three factors played an immediate role in on-line integration. Second, they suggest that discourse focus was the "weakest" factor when pitted against the other two (b,c), whereas pronoun effects and the verb effects involving pragmatic inference are approximately equal in strength, tending to cancel each other out when the materials brought them into conflict. This is consistent with a more general view of language comprehension as an on-line integrative process, capable of "opportunisticly" using whatever sources of information were available, and playing them off against each other to achieve an integrated analysis.

A long-term research project by Tyler, M. Garrett (Massachusetts Institute of Technology) and J. Schweikert (Massachusetts Institute of Technology) was begun to address the same theoretical issue. The three major purposes of this project are: (a) to investigate the vexed and unresolved issue of the interaction versus autonomy of syntactic and semantic sources of processing information during the real-time comprehension of an utterance; (b) to determine the relationship between the processes involved in the comprehension of spoken and written language; (c) to solve a methodological issue. The assumption is frequently made in experimental psycholinguistics that all fast response tasks reflect the same comprehension processes, but in fact there is little evidence to support such an assumption. The study proposes to obtain comparison data from a number of different real time tasks on the same experimental materials to determine what aspects of the comprehension process each task is sensitive to.

With these three aims in mind, experimental materials of the following type were constructed:

Context 1: No one could see the bank robber's face

Context 2: No one could describe the old man exactly

Continuations:

A) NORMAL He was wearing a MASK which covered everything except his eyes

B) SYNTACTIC

ANOMALY He was wearing a very MASK which

C) SEMANTIC

ANOMALY He was wearing a CORK which

D) SYN + SEM

ANOMALY He was wearing a very CORK which

These test materials consist of sentence pairs, with the second sentence of each pair containing a target word. In the example given the target word is MASK. This target is predictable if preceded by Context 1 and not predictable if preceded by Context 2. There are 4 types of target-bearing sentences. In condition (A) the sentence is normal, in (B) the target is made syntactically anomalous by the inclusion of a local syntactic change, in (C) the target is replaced by a semantically inappropriate word, and in (D) the syntactic and semantic violations are combined.

These manipulations permit a fairly straightforward test of the autonomy versus interaction positions, since each makes very different predictions about the effects of syntactic and semantic anomalies in high and low predictability contexts.

Moreover, in order to obtain comparable real time processing data in both the auditory and visual modalities, the following on-line paradigms will be used: visual and auditory lexical decision, visual and auditory naming, mispronunciation/misspelling detection. So far, a number of pilot studies have been run. The data from the final version of the experiments are expected in 1982 and 1983.

2.3 The theoretical questions addressed in the above mentioned research have also been dealt with in a paper by Jarvella on the integration of linguistic and nonlinguistic information sources in sentence perception. (This work is to appear in a book on language understanding edited by Jarvella and Flores d'Arcais.) The paper contains a critical look at recent

theories of language perception, which do not adequately account for complementary influences of knowledge sources. It reviews information relevant to constructing a theory which can capture such forms of interplay, and presents two lines of research, one on spoken sentence understanding and one on forward-oriented constraints in reading.

In the first, subjects were asked to answer constituent questions about sentences they heard, and in the second, they were asked to continue printed sequences by making forced choices.

The experimental work illustrates two principles whereby pragmatic factors affect performance at at least one linguistic level: that focus and presupposition relations conveyed interact with general situational knowledge to affect the perception of words and their structural roles; that the recognition of grammatical agreements among sentence parts depends on other processing of the lexical items which carry any agreement markers present, and that this further processing itself may depend on extra-linguistic knowledge. The work reported also demonstrates that typical views of serial versus parallel processing in the current literature, and autonomy versus dependence among levels of processing, may make incorrect predictions in many interesting cases.

2.4 Research in text comprehension has also been conducted by Vonk who continued her studies of inferences in reading and question-answering. This research is done in collaboration with the Interfaculty Research Group on Language and Speech (L.G.M. Noordman) and is partly supported by a grant from Z.W.O.

In a first experiment inferences were studied that are involved in sentences expressing causal relations, e.g., "Connors used Kevlar sails because he expected not much wind," where one has to infer, given that Connors won the race, that Kevlar sails are advantageous when there is not much wind. The central assumption was that an inference process requires extra reading time. This process was studied by presenting a sentence (gap sentence) that requires an inference in two conditions; in one condition the sentence is preceded by the information that has to be inferred; in the other condition it is not. It was assumed that the reading time for the gap sentence decreases when the to-be-inferred information is presented previously. This was the case when the same wording as in the gap sentence was used. No such effect was obtained in the case of a different wording.

In another experiment a text had to be read and then questions answered about it. If inferences are not made during the reading process but during the answering process, the answering time of questions about the to-be-inferred information should be longer if this information is not explicitly stated in the preceding text. The results show that this was indeed the case. But approximately the same difference in answering time was also found between a question that was a paraphrase of a sentence in the preceding text and a question that was phrased in the same words as this sentence. Therefore one could claim that the inference is made during the reading of the text but that it is formulated as a paraphrase of the question. On the other hand, the difference in answering time between identically worded questions and paraphrastically worded questions disappeared after a delay, as had been predicted. But differences in answering time between questions about inferred information that had or had not explicitly been stated before remained under delay.

The conclusion is either that the inference process does not take extra time or, counterintuitively, that the reader does not make the inference while reading. This is contrary to some results obtained in the literature. The question now is what the systematic factors are that determine whether the inferences require time or not.

2.5 Further research in sentence comprehension has been carried out at the Institute by E. Engdahl (University of Stockholm). It centered around the analysis of unbounded dependencies in language, that is, constructions where a preposed constituent (a filler) is associated with an empty position (a gap) in the sentence. The grammatical function of the filler can in most cases not be determined until the gap is identified, as illustrated in: "Which book do you think John told Mary that he had put ___ on the table?" Engdahl investigated what parsing strategies people tend to use when they interpret sentences with such filler-gap dependencies. In particular she was interested in finding out to what extent people rely on semantic and pragmatic knowledge when they interpret sentences with multiple (hence potentially ambiguous) filler-gap dependencies and to what extent they use content-independent, structurally or procedurally definable interpretation strategies. Judging from an experiment carried out with speakers of Swedish, it appears that speakers prefer nested interpretations in the absence of strong pragmatic indications to the contrary.

2.6 In addition to this work, which centered on syntactic and semantic aspects of language perception, two studies have been more concerned with pragmatic strategies in the comprehension process.

Levelt did a small-scale study to test the effect on listeners of a speaker using spatial expressions in a deictic or intrinsic perspective. If a spatial description is given from a fixed (the speaker's) point of view, spatial expressions such as left and right are used deictically, which is quite different from an intrinsic use where perspective is determined by intrinsic relations between parts of the spatial pattern itself. It turned out that listeners had no difficulty interpreting deictic descriptions: they drew the patterns described correctly. However, intrinsic descriptions led to serious interpretation problems: speakers apparently tended to interpret them as deictic which led to characteristic errors in drawing performance. Deictic perspective seems to be the "default case" in comprehension. This is not surprising given the fact that deictic perspective, as opposed to intrinsic perspective, does not require any "deep" interpretation of the spatial scene.

Similarly, during a visit at the Institute, H. Clark (Stanford University) investigated demonstrative reference in collaboration with R. Schreuder (University of Leiden). In current theories of demonstrative reference, the referent (the object the speaker is referring to) is assumed to be identical to the demonstratum (the object the speaker is pointing at). Empirically, this is incorrect. In the theory being developed, the speaker and addressee attempt to coordinate with each other in the linking of the demonstratum with the referent via a "demonstrative function". This theory leads to new predictions about the comprehension (and use) of demonstrative reference, and some of these have already been confirmed.

2.7 Aspects of the organization of the mental lexicon have been studied by L. Colombo on visit from the University of Padova, in collaboration with Flores d'Arcais. She continued a project on polysemous Dutch prepositions with an experiment in which she used a lexical decision task with a priming paradigm. This experiment was designed to find out whether prepositions with different meanings are doubly represented in the mental lexicon. For example, the Dutch preposition door has the following two meanings: on the one hand, the spatial meaning corresponding to the English preposition through, used to refer to a path as in "De trein gaat door de tunnel"

("The train goes through the tunnel"); on the other hand, a "language-internally-referring" use, corresponding to the English preposition by, to mark the agentive-instrumental case, as in "De vaas werd gemaakt door de man" ("The vase was made by the man"). This experiment is currently in progress and results will be available in 1982.

Flores d'Arcais continued work on a project to test the hypothesis of automatic syntactic processing during language comprehension, even in the absence of specific syntactic information for understanding the sentence heard or read.

2.8 A last set of studies has been pursued by some visitors to the Institute in close contact with the Comprehension group, as well as with the other working groups. This theoretical work in formal semantics shares with the experimental investigations a concern for context phenomena.

A. ter Meulen (University of Groningen) continued her research on model-theoretic semantics developing partial models for fragments of English in which the dynamic aspects of the interpretation can be characterized. The first application of partial models was the model-theoretic account of the referential and attributive uses of definite descriptions. Other areas in which applications are being developed now are the interpretation of noun phrases as generalized quantifiers, a model-theoretic characterization of their scope and binding properties in a semantic theory of bound anaphora, pronouns, and variables.

S.-Y. Kuroda (University at San Diego) worked on the development of an indexed predicate calculus, starting from the assumption that sentences or their logical representation are to be interpreted not with respect to the whole real world or all possible worlds but with respect to smaller, occasional models or subspaces. In this respect, indexed predicate calculus (IPC) may be thought of as constituting a similar trend as situation logic and the theory of partial models, but it differs from these in that it incorporates the multi-world feature of semantic interpretation right into the syntax of formalized language (logical representations), by indexing predicate and constant symbols. From another perspective, IPC may be considered as an extension of the familiar idea of assigning coreferential indices to noun phrases in generative grammar. (It must be noted, however, that what concerned Kuroda was an extension of an idea, not a theory; the index assigned to a constant in IPC serves a different role as the coreferential index given to a noun phrase in generative grammar. The former determines the

coreference to a world (subspaces), the latter to an individual.) Apart from some straightforward applications to problems obviously involving contexts, such as the interpretation of a definite description, IPC turns out to provide a nice descriptive device for expressing scope ambiguities where the standard framework of predicate calculus fails due to apparent scope paradoxes. IPC thus provides a perspicuous description of ambiguities in intensional contexts. Another expected consequence of IPC (or of its intended use in natural language description) is to envision a more complicated formal ontology than assumed in the standard framework, which essentially amounts only to a set or a Cartesian product of sets. The leitmotiv is to simplify language (logical representations) and to elaborate on the structure of ontology. With this in mind, an attempt has been made to improve the semantics of sentences containing the verb "paint".

M. Pinkal (University of Düsseldorf) studied the ways of contextual specification for the semantic indefiniteness zones of natural language expressions. Actually, the general form of specification, as well as different limitations on the specifying process, were analyzed, rather than specific mechanism of making meanings more precise. Three general types of limitations had to be distinguished, which led to a subclassification of the domain of contexts into possible, natural, and proper contexts. These concepts were represented in a model-theoretic framework, and the object language was extended in such a way as to render possible the explicit description of specificative properties of natural language terms.

3. LANGUAGE ACQUISITION

Research in language development this year has involved a merging of interests in two major related areas: first language acquisition and second language acquisition. The studies which were carried out in both areas focused on children's and adults' production, comprehension, and awareness of a wide range of linguistic devices, such as referring expressions, prepositions, adverbs, connectives, and verbal devices for temporal, aspectual, and modal distinctions. Two central themes have characterized these various studies for both types of language acquisition: examining the role of contextual factors in the uses and interpretations of various linguistic devices, including interpersonal, other nonlinguistic, and linguistic aspects of the context, and making cross-linguistic comparisons in the study of specific developmental processes.

3.1 First language acquisition

In the area of first language acquisition, children's uses and interpretations of various linguistic devices were examined in terms of their implications for the ontogeny of referential skills and/or the ontogeny of organizational skills in discourse. A number of studies have analyzed children's comprehension and production of referring expressions, in relation to various types of contextual factors. These studies were of three types: those which focused on these expressions when they occurred as single object-descriptions in the presence of relevant nonlinguistic context, those which focused on these expressions in sentential contexts, and those which focused on these expressions when they were embedded in inter-sentential contexts, that is, in relation to previous and subsequent discourse.

3.1.1 Under the first type of study, Deutsch and Pechmann compared children's and adults' visual scanning strategies as they produced object-descriptions in the context of an array of referents. Eighteen 7 and 8

year-old Dutch children and a group of adults saw a series of slides, each representing a set of familiar objects which differed in terms of object-class, colour, and size in varying combinations. They were asked to choose any one object out of each set and to unambiguously communicate their choice to the experimenter; as they did so, both their verbal productions and their eye-movements were recorded.

The main goal for measuring eye-movements in this study was to determine the specific nature of the cognitive processes which accompanied the production of referential expressions. For example, eye-movements allow one to determine whether the speaker has scanned all of the objects in the context before beginning his description, as well as whether he fixated more frequently and for longer periods of time on objects which were more similar to the selected referent than on other alternatives in the array. They also allow inferences about the processes underlying the frequent self-corrections which occurred in these and previously collected productions, in order to determine whether they were related to the formulation process and/or to the ongoing comparison among alternative objects.

A preliminary analysis of the data revealed some striking and unexpected differences between children and adults. First, the children's scanning was relatively "exhaustive", in that they fixated practically all of the presented objects, while the adults' scanning was relatively "selective", in that they fixated only some of the objects. Second, children and adults also differed in terms of the temporal relationship between their visual search and their speech production. The children's processing was clearly "serial", that is, their production of the descriptions started after the completion of the visual search process, while the adults' processing was relatively "simultaneous", that is, there was a large temporal overlap between their utterance and their visual scanning of relevant alternatives, necessary to determine the features which discriminated the target referent from context.

Deutsch and Pechmann are planning more analyses to determine whether these differences in information-processing are related to the contextual adequacy of the referential expressions in any systematic way. In addition, further experiments will determine whether different task demands (e.g., free choice versus forced choice of the target referent) affect the relation between object-fixations and speech production. The preliminary results indicate that the analysis of eye-movements before, during, and after the

production of referential expressions offers a promising technique for specifying processes of developmental changes in language production.

In a related study, Braun investigated German children's comprehension of object-descriptions in the context of arrays of referents in order to determine whether they could take into account both quantitative and qualitative aspects of such utterances simultaneously. For this purpose, two types of descriptions were used, which differed in terms of both the number and the kind of object(s) they described. One type of description referred to one object and predicated of it two attributes (e.g., "a green-blue chair"), while the other type referred to two objects, and predicated of each one attribute (e.g., "a green chair and a blue chair").

Various experimental studies showed clear developmental differences in how adults and children of four, five, eight, and ten years understood descriptions of these types. One surprising finding was that only the children who had reached a very late stage of language development (around the age of ten) took into consideration both the quantitative and qualitative aspects of these utterances. At earlier stages, children often confused the two types of descriptions and the nature of these confusions varied with the particular task demands (e.g., drawing versus selecting the described objects).

Similar results were obtained in a metalinguistic task, in which children had to judge the appropriateness of these descriptions: children under the age of ten typically judged an utterance such as "a green chair and a blue chair" to be an appropriate description of a green-blue chair "because the chair is green and blue." These children concentrated upon the attributes mentioned in the descriptions, but neglected to consider whether they were predicated of one or two objects. Finally, the same results were found irrespective of the particular linguistic form of the descriptions (e.g., preposed adjectives, relative clauses, prepositional phrases, etc.). These results suggest that children's referential skills are not consolidated until relatively late in development and that young children's interpretation of referring expressions is very much dependent on the particular task situation.

3.1.2 Some studies have focused on the uses and interpretations of referring expressions either in sentential contexts or in larger discourse contexts. This research was concerned with the developmental processes

whereby children learn to establish linkages among anaphoric expressions and their coreferential antecedents in the linguistic context. With respect to some of the sentential constraints on anaphoric linkages, Deutsch and J. Koster (University of Tilburg) have pursued research begun in 1980 on Dutch children's interpretation of two types of sentence-internal anaphors: third person reflexive pronouns, such as himself or herself (zich in Dutch), in sentences such as "Peter's father washes himself," and third person nonreflexive pronouns, such as him and her (hem and haar in Dutch), in sentences such as "Peter's father washes him." Previous results clearly showed that 6 year-olds had less difficulties correctly interpreting the reflexive pronouns than the nonreflexive ones in the context of a sentence-picture comparison task.

Some follow-up experiments, in which the same task was used, specified this general finding in several ways. First, they showed that children were able to correctly interpret sentence-internal anaphors considerably earlier in the "positive" cases, namely when sentences and pictures matched, than in the "negative" cases, namely when they mismatched. This finding is compatible with the results of other developmental studies and with some theoretical claims made by Karmiloff-Smith and by Inhelder and Piaget, according to which "affirmative" knowledge is a precondition for children's ability to construct "negative" counter-examples. Second, these studies revealed a clear effect of gender marking on children's interpretation of nonreflexive pronouns: children made less errors with the masculine form than with the feminine form of these pronouns, indicating that they overgeneralized the unmarked masculine form. Third, a comparison between 6 and 7 year-olds showed that the younger children's interpretations were relatively "unstable": with homogenous lists of test-sentences, which contained either only reflexive pronouns or only nonreflexive ones, they applied a remarkably consistent strategy, interpreting reflexives correctly, and interpreting nonreflexives as reflexives; in contrast, with heterogeneous lists, which contained both types of sentences, many errors occurred in both directions. Finally, neither children nor adults used third person nonreflexive pronouns when producing single sentences describing the pictures.

One implication of these results for theories of language development is that children acquire different knowledge components, only some of which involve grammatical knowledge in its narrow sense. Sentences with reflexive pronouns are interpretable according to clearly deterministic principles

which govern the relationship between the pronoun and its coreferential antecedent. In contrast, the interpretation of sentences with third person nonreflexive pronouns is not so determined. Within the sentence-unit, the discovery of deterministic principles of anaphoric linkages is clearly easier for the child than the discovery of the relation between a nonreflexive anaphoric pronoun and its antecedent, since these pronouns function primarily as intersentential devices, marking relationships across utterances embedded in larger discourse contexts.

3.1.3 In comparison with this study of sentential constraints on anaphoric linkages, other studies have focused on children's uses and interpretations of anaphoric expressions in larger discourse contexts, that is, in relation to antecedent coreferential NP's across utterances in discourse. First, from the point of view of children's interpretations of anaphoric reference, Tyler followed up on earlier studies begun in 1980. Some post-hoc analyses of these earlier studies had suggested that young children's interpretations of anaphoric pronouns were strikingly affected by the relative animacy of potential coreferential antecedents in prior discourse. In order to determine whether this was in fact the case, Tyler ran a series of experiments with Dutch children between the ages of 5 and 10 years, using the same "mispronunciation detection task" which she had previously used. In this situation, children listened to short spoken passages and pressed a response key whenever they heard a mispronounced word. The mispronounced word was always derived from a word whose predictability depended upon successfully completing the anaphoric linkages between the sentence containing the word and the previous discourse context. For example, the word injection could be mispronounced as inpection in the following sequence: "The nurse told my father to come inside. She gave an injection..." In a number of studies using this paradigm, the animacy of potential antecedents was varied (human and inanimate), as well as their gender, and the order in which various entities were first mentioned in discourse (first versus second noun phrase). These studies are in the testing phase and the data will be available in 1982.

Second, from the point of view of children's production of cohesive devices in discourse, Karmiloff-Smith pursued the analyses of a previous large-scale experimental study of children's uses of presentative, existential deictic and anaphoric devices for marking the cohesive organization of discursive structure. The data consist of both French- and English-speaking 4 to 9 year-olds' narratives. The analyses made last year focused

on the organization of these devices in initial-sentence slot, indicating that they were governed by the thematic structure of discourse and showing developmental differences in children's ability to mark this structure in their discourse. This year, the analyses focus on children's uses of these devices in object-sentence slot, as well as on the function of children's uses of grammatical categories such as relative clauses and passives, as they pertain to discursive organization. In addition, Karmiloff-Smith has begun a joint project in collaboration with U. Bellugi (the Salk Institute of Biological Studies, San Diego), investigating children's uses of American Sign Language (ASL). Based on Karmiloff-Smith's paradigm, these analyses aim at determining which aspects of ASL serve local referential functions and which serve discursive functions.

In order to consider metalinguistic aspects of children's productions of referential devices, Karmiloff-Smith has also collected data from children's spontaneous repairs, spontaneous comments about language, and elicited justifications about language use, within the domain of referential expressions (particularly the indefinite/definite articles, possessive adjectives, and modifiers) in both English and French. The repair data show that children work towards organizing what are initially correct but isolated procedures, into linguistic systems. This behavior precedes by several years the child's capacity to give verbal explanations about such systems. The gradual formation of such systems enables the child to convey information, both by the use and by the non-use of linguistic markers in the same system, whereas earlier in development only the use of a given marker can be information-bearing. The fact that the child forms such systems well before being able to consciously reflect upon them shows that metalinguistic awareness as such is not necessary in language acquisition. However, Karmiloff-Smith argues that whilst explicit metalinguistic awareness has no specific function in language acquisition, it may have a function in general cognitive development in that when various aspects of human behavior are encoded in the same way, e.g., by language, then generalities may become salient for the child which were not obvious when the representations were in different codes, e.g. spatial, verbal and perceptual.

Similarly, Hickmann has continued some analyses of children's uses of discourse devices, which were begun prior to her arrival at the Institute in November. The data consist of a large corpus of narratives produced by English-speaking 4 to 10 year-olds and adults in a number of situations. The analyses focus on how referents were introduced in discourse, how

reference was then maintained to them as discourse unfolded, and how speech was reported when the narratives contained dialogues. Prior analyses showed developmental trends in all three of these aspects. First, with respect to referent-introductions, all children clearly presupposed animate referents on first mention more frequently than inanimate ones. However, the 7 and 10 year-olds introduced all referents more effectively than the 4 year-olds and, when animate referents were involved in dialogues, only the 10 year-olds systematically introduced them before quoting their speech. Second, with respect to reference-maintenance, all children tended to "orient" their discourse towards the more presupposed topical referents and all used highly presupposing devices (e.g., zero anaphors and pronouns) when mentioning referents in similar propositional roles across adjacent clauses, particularly in subject/agent roles. However, the 4 and 7 year-olds did not always use such highly presupposing devices when it was clearly possible to do so. Third, with respect to quotation devices, the 7 and 10 year-olds frequently "framed" reported speech events, that is, they used various linguistic devices to clearly demarcate narrated speech from narrative speech. In contrast, the 4 year-olds frequently did not use such devices when quoting speech, and also showed a clear preference for focusing on the dialogue-participants themselves rather than on their speech, e.g., describing them strictly in terms of nonlinguistic actions and internal states.

Fourth, with the 4 and 7 year-olds, these results characterized mostly the narratives which were elicited in situations where they had to spontaneously produce discourse devices, rather than to simply reproduce them, i.e., when the events to be narrated were presented to them in a mode which did not already provide them with the particular devices necessary for cohesive organization (pictures and films versus texts). In addition, when the referents/events remained present during narration (e.g., pictures), the 4 year-olds showed a preference for using clearly deictic devices (e.g., deictic predicating constructions), even if the addressee could not see the narrated content.

Hickmann's further analyses were concerned with two aspects of children's narrative organization: interactions among the devices discussed above and other devices, as for example, the order of mention of events and the uses of tense/aspect markings to narrate events which occurred prior to other events already mentioned in discourse (e.g., the older children's uses of pluperfect markings); the relationship between the mode of presentation and

the productions of cohesive devices, particularly as it relates to possible interactions between memory factors and discourse skills. On the basis of these analyses, further experiments will be carried out in 1982, investigating children's free verbal recall of narratives in which disruptions in cohesion will occur. These experiments are designed to determine whether children in different age-groups are sensitive to such disruptions (even if they might not be able to produce spontaneously the relevant cohesive devices), how they "repair" them, whether they are sensitive to interactions among devices and to clues in the texts indicating that disruptions have occurred. In addition, this research will also address the question of whether children are simultaneously sensitive to disruptions in the structural well-formedness of narrative content and in the well-formedness of intralinguistic relationships among cohesive devices in discourse.

3.1.4 Children's discourse organization was also the focus of two other studies, in which the uses of cohesive devices were analyzed in the context of tasks which required descriptions of complex spatial configurations. Weissenborn pursued an earlier study of children's productions when giving complex route-directions, analyzing their uses of linguistic devices for spatial reference. This research was particularly concerned with the fact that the acquisition of expressions for spatial reference has been investigated until now exclusively in contexts where spatial referents were located in the common perceptual field of the child and his interlocutor. In a cross-sectional study of 4- to 10-year-old German children's productions, Weissenborn investigated the uses of spatial prepositions and adverbs in contexts where there was no immediate perceptual support for the verbalizations of the children, that is, where the referents were situated outside the visual field.

On the basis of Piaget's theory of the acquisition of spatial concepts, a development in three stages was hypothesized: 1) nondeictic, topological expressions should be the first ones used; 2) then deictic, projective expressions should be used, but often inappropriately, because of insufficient linguistic contextualization due to cognitive difficulties in decentering; 3) finally, the rules of use of deictic spatial expressions in a displaced context should be mastered. The development underlying these stages can be characterized as a progression from deictic reference to anaphoric reference, the latter constituting an indispensable prerequisite

for discourse competence. Weissenborn's analysis of children's route directions in a large-scale spatial environment confirmed these hypotheses. A general conclusion from these results is that the study of lexical development has to take into account the whole range of crucial contexts of use which characterize particular linguistic devices in order to evaluate children's linguistic knowledge and to determine the factors which structure the acquisition process.

In a similar line of research, Ullmer-Ehrich collected large samples of children's room-descriptions, applying the same procedure which was used in a previous study with adults: children of 4, 6, 8, 10, and 12 years were asked to describe miniature rooms which consisted of spatially distinct clusters of furniture. The analyses of these data is currently in progress and focus on the following issues. First, some analyses focus on children's segmentation skills, to determine whether children, like adults, break up discourse into delineable units and mark these units as being separate discourse segments. Preliminary results show that segmentation seems to be the most difficult problem for children over all age-groups. Even 12 year-olds, who use almost the same linearization strategies as adult speakers, practically never mark segment-borders. Obviously, even at this age, children have difficulties taking the listener's perspective into account, in the sense that they do not give verbal cues that facilitate the listener's task of clustering the stream of information into memorizable parts. In addition, even 12 year-olds fail to make use of general knowledge schemata. Inherent parts of the room (such as walls, windows, and doors, i.e., those parts which constitute the blueprint of any room) are hardly ever introduced as reference points for locating individual pieces of furniture. Every individual item of the arrangements gets introduced by reference to some other individual item, which often makes the descriptions circular or insufficiently informative. This problem is reflected in children's rather idiosyncratic use of the definite/indefinite distinction.

Second, some of Ullmer-Ehrich's analyses focus on the acquisition of linearization strategies, addressing the question of how the development of discourse abilities proceeds from linearly disordered to fully organized descriptions. The intermediate stages of this development are of primary interest, as they are not only revealing with respect to the acquisition mechanism itself, but they also shed some light on the question of which

orienting factors are the most elementary ones for linearization (space, function, size, color, etc.). Preliminary results show that linearization seems to be worked out between the ages of 8 and 10. Whereas the younger children (4 to 6 years) simply list the objects they saw in more or less random order, children between 8 and 10 quite often show adult-like linearization patterns. However, lower-level linearization (mentioning individual pieces of furniture in systematic order) seems to be more difficult than higher-level linearization (introducing groups of furniture in systematic order). The lower-level strategies found in adults (SEQUENCING and GROUPING) do not appear before the age of 10. Children of 8 still follow a simple listing pattern on the lower linearization level. This listing strategy may be related to a particular formulation difficulty, since the data indicate that children of 8 still seem to be unable to use the relevant spatial expressions.

Third, Ullmer-Ehrich's analyses address the question of how spatial terms are acquired. Spatial descriptions given by adults often take the form of an imaginary tour. This tour-format has the effect that places are referred to as parts of events, making it possible to identify places by using spatial and/or temporal expressions. Adults make use of this possibility in a quite systematic way: they replace spatial deictics by temporal ones whenever the former would cause an ambiguity between the deictic and the intrinsic perspective. How do children learn to avoid ambiguities of this kind and how do they make use of the spatial/temporal opposition? Although, in general, spatial concepts are less abstract than temporal ones, one can assume that among the indexicals some temporal expressions (like then) are more elementary in actual discourse use than the corresponding spatial ones, in the sense that they are used with higher frequency at earlier developmental stages. The reason for this assumption is that - given the linearity of discourse - temporal deictics like then allow for a wider range of interpretations and therefore do not require the speaker to make the respective spatial relations very explicit in speech. How do children learn to use more explicit spatial terms like left and right? An answer to this question will be revealing with respect to how the child learns to take the listener's perspective into account and how (i.e., by which intermediate stages) he acquires the cognitively more complex concepts of secondary spatial deixis.

Preliminary results show that, as reflected in the simple listing

strategy mentioned above, younger children of 6 to 8 years hardly ever use any spatial expressions at all. Children of 8 years use spatial terms to express neighbourhood only (at and close by), but they practically never use dimensional prepositions, such as left/right of, which only appear at 10 years. In general, then, the data seem to show a high correspondence between discourse-specific failures and difficulties with particular formulation skills in all three areas of investigation.

3.1.5 As was already touched upon above, an important aspect of children's discourse organizational skills is their ability to use and interpret clause-linkages, for example through linguistic devices such as connectives relating either their own utterances, the utterances of another interlocutor, or the utterances across different speakers in discourse. Two studies have been concerned specifically with such linguistic devices. First, Flores d'Arcais has continued his experimental work on the development of semantic and lexical knowledge of function words, focusing with different techniques on Dutch children's knowledge of temporal connectives. The results showed a similar course of development with respect to these devices as previous studies: once more they showed a delay in the full mastery of temporal connectives as compared with other temporal items, such as adverbs of time which seem to be acquired much more readily.

Second, Weissenborn, in collaboration with M. Kail (Laboratoire de Psychologie Expérimentale, Paris), has continued a series of studies on the acquisition of contrastive connectives which were begun last year. These studies are in the scope of a more general concern at the Institute for making cross-linguistic comparisons of developmental processes in both first language and second language acquisition (see the Workshop on language acquisition below). Weissenborn and Kail's studies aimed at determining universal versus language-specific strategies and sequences in language acquisition, with a concern to specify the possible influence of the structure of the target language on the conceptual development of the child. They studied the early acquisition of contrastive connectives in languages which show different lexicalizations of common underlying concepts, such as English but, French mais versus German aber/sondern, Spanish pero/sino, etc. From the results of a preceding cross-sectional experimental study with older children (7 to 9 years) on the acquisition of French mais and German aber/sondern, it was hypothesized that total denial, which operates

on overt (surface) elements, should be acquired earlier than partial denial, which operates on covert, presupposed elements. In addition, it was hypothesized that denial of "other-utterances", namely denying the preceding utterances of another speaker across speaking-turns, should be acquired earlier than denial of "self-utterances", namely denying one's own preceding utterances within a speaking-turn. Both of these hypotheses were made on the basis of the relative cognitive complexity of different forms of denials across clauses in discourse. A first analysis of early French, English, and German data (from the age of 1;10 on) confirm the first hypothesis, but not the second one, in that there were large individual variations in the form of the first contrastive utterances used by young children. This research will be extended to other languages, such as Polish, Hebrew, and Hungarian, with the additional support of a two-year grant (1982 - 1983) from the University of Paris V "René Descartes".

3.1.6 In a somewhat different line of research, Bamberg, in collaboration with N. Budwig and A. Strage (Berkeley), has focused on creative and interactive aspects of children's spontaneous speech productions. This study was specifically concerned with how referring-and-predicating is embedded at a very young age in social interactive processes through which children conceptualize new experiences. For this purpose, metaphorical uses of speech were analyzed in a year-long longitudinal study of the play interactions of two 2 1/2 year-old girls. The analyses showed that the processes of metaphorization which were found in these young children's speech had at least the following three functions: 1) they were used to transfer "old" and most probably routinized experiences into new situations (the "conceptual" function of metaphor); 2) they were used as means of constructing shared understanding with unfamiliar playmates (the "negotiative" function of metaphor); and thereby, 3) to build up interpersonal relationships in the speech situation (the "communicative" function of metaphor).

3.2 Second language acquisition

3.2.1 Two research projects have dealt with issues involved in adults' second language acquisition. First, Stutterheim continued her study of the acquisition of German by Turkish guest-workers. The data for this study

were collected with a number of elicitation techniques in order to approach the language behavior of the informants through several "channels". The most important source of data consisted of free conversations, held in the home of the informants, where the speech situation was fairly natural. In these situations, there were typically two researchers, whose native language was either the first or the second language of the informant (L1: Turkish and L2: German). Preliminary analyses show that this combination elicited very interesting material concerning the following two aspects of the informants' uses of speech: on the one hand, "linguistic realization", or speech which was addressed to the German researcher and on the other hand, "underlying intention", or the explanations which were given to the Turkish researcher on the very same topic. A comparison between intentions and factual output in L2 showed that there was a high degree of reduction and distortion of the initial communicational aim due to linguistic constraints on the informants' speech. Topic selection and topic presentation were restricted and shaped by language deficiency, accounting for the stereotyped form of these conversations. Clearly, the restrictions in topics and "levels" of communication (concrete versus theoretical) have a strong impact on the possibility of building social relationships in conversation.

In addition, Stutterheim used other elicitation techniques focusing on the informants' production and comprehension of specific devices within the semantic areas of temporality and modality. The most interesting results were obtained with a "self-confrontation" task: whereby the informants were asked to translate their L2 utterances into L1, if possible the day after the first recording. Within this context, questions and discussions about the two languages showed that the informants' uses of L1 and L2 were strictly context-bound. They were unable to perform any task which demanded a theoretical approach towards language, although the linguistic material discussed had been used appropriately in conversation. This observation sheds some light on the acquisition process itself: "natural" L2 acquisition seems to be guided by pragmatic principles, whereby whole parts of speech are acquired in a "rote" fashion in relation to a particular situational context. Further evidence for this hypothesis was found in these data: informants used particular lexical items in their own speech, but could not understand the very same words in an unfamiliar context.

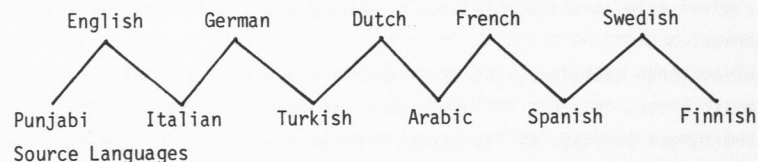
3.2.2 Second, the Institute has provided the central coordination for a large cross-linguistic project on second language acquisition. This research project, sponsored by the European Science Foundation, is directed by Klein and by Dr. J. Allwood (University of Göteborg) and coordinated by Perdue since his arrival at the Institute in September. It aims at providing at least partial answers to the following four broad questions. First, what are the psychological, social, and biological factors that determine the process and tempo of untutored language acquisition in adults, and how do they interact? Second, what are the structural properties of the language acquisition process itself? Given the cultural-cognitive development of adults, what communication devices are available to them at the onset of learning? What devices specific to the language are acquired, in what order, and at what rate relative to each other? Third, what factors regulate the overall acquisition tempo? That is, what factors accelerate it, slow it down, or possibly cause its virtual halt ("fossilization") at a level which is sometimes still very far from the language of the social environment? Fourth, in order to study these questions, it is necessary to determine what a learner's language looks like at a given time in the acquisition process and how it is used in daily interaction.

Given these questions, the project will consist of a longitudinal study of small groups of adult immigrant workers, who will have minimal knowledge of the target language at its onset, and relatively little schooling. Their progress will be observed over a period of 2 1/2 years by means of regular monthly interview and participant observations of their social environment. This main study will be completed by two smaller cross-sectional studies: (a) small groups with similar biographical characteristics will be interviewed at the start, in the middle, and at the end of the longitudinal study, so that some control may be kept on the effects that systematic observation of the longitudinal groups may have on the acquisition process; (b) "long residence groups" of immigrant workers who have been settled in the host country for five years or more will be interviewed and observed, in order to obtain a more complete picture of the nature of inter-ethnic communication in the country. As a starting point, the analyses will focus on the following main aspects of the informants' language, which tie in closely with those studied by other researchers at the Institute from the point of view of first language acquisition: understandings and misunderstandings in linguistic interactions, the thematic structure of the learners'

utterances, their different ways of referring to persons, place, and time, and some semantic processes in their vocabulary.

The full project will begin in May 1982, and will involve teams of researchers from five countries. Teams in Sweden (University of Göteborg) and Germany (University of Heidelberg) started pilot research early 1981 and will be joined by teams from Holland (University of Tilburg), England (National Council for Industrial Language Training), and France (University of Paris VIII) upon its completion. The pilot phase has served the purpose of testing methods of data collection and elaborating a Field Manual, which will provide primarily a theoretical and practical framework for the whole project, as well as a source of information for other researchers and organizations concerned with second language acquisition (it will be available in July 1982). The organization by language of the project will permit paired comparisons of the acquisition of one target language by speakers of two different source languages, as well as the acquisition of two different target languages by speakers of one source language. These target and source languages are shown below:

Target Languages



3.3 Workshop on language acquisition

Intensive cross-linguistic analyses were carried out during a workshop, which was held at the Institute from August 15 to September 13, and which was organized by D.I. Slobin, in collaboration with E. Clark and B. MacWhinney. This workshop dealt with many of the specific issues previously discussed, with a general cross-linguistic and developmental perspective. On the developmental plane, comparisons were made between first language acquisition and second language in childhood, and untutored second language acquisition in adulthood. The primary focus of the workshop was the acquisition of connectives, adverbial particles, and tense-aspect-modality systems as representing means for talking about objects and events beyond the immediate speech setting ("the not-here and the not-now"). The acquisition of these discourse devices for the expression

of displaced reference was seen as an essential step in the developing cognitive and linguistic competence of the child.

Participants brought data covering a span of languages and acquisition settings. The data were primarily in the form of transcriptions of natural interaction, with elicited and experimental data available in some cases. L1 data included: English, Finnish, French, German, Greek, Hebrew, Hungarian, Polish, Portuguese, Spanish, and Turkish. Child L2 data represented the acquisition of English (by Germans), French (by English-speakers), and Turkish (by an American). Adult L2 data consisted of German Acquisition by guest-workers from Italy, Portugal, Spain, and Turkey. The research strategy consisted of detailed analysis of speech corpora, attending to the interactive roles of learner and developed speaker in the construction of discourse, and attending to the interaction of form and function in different discourse genres (narrative, explanation, play, argument, etc.). Much of the workshop was spent in small groups, dealing with specific topics cross-linguistically, with weekly plenary sessions to discuss preliminary results. Four major research interests emerged during the participants' joint explorations in Nijmegen: contrast, contingency, topic elaboration, and past time. These different areas are described in detail below. The participants plan continuing collaboration on these issues in the coming several years. The table on page 50 gives a rough summary of the primary involvements of participants in each of the four areas, though the entire group was involved in providing data for cross-linguistic comparison in all areas.

3.3.1 Contrast. The concerns of this group arose from consideration of the development of means for specifying reference to objects and events. Children's early specifications often refer to repetitions (e.g., again, encore), additions and contrasts (e.g., autre, aussi, too), and the like. That is, one state of affairs is compared to another. Such comparisons often involve negation or denial. The group focused on two linguistic devices in particular: but and or. These terms show considerable cross-linguistic diversity, e.g., English but and French mais versus German aber/sondern (cf. above description of Kail and Weissenborn's study of these devices), they serve a range of discourse functions, and can be used both to relate the clauses of a single speaker and to relate clauses across the utterances of different speakers. The current task is to develop a

PARTICIPANTS*	LANGUAGE DATA**	RESEARCH TOPICS			
		Contrast	Contingency	Topic Elaboration	Past Time
A.A. Aksu	Turkish-L1		x		x
R.A. Berman	Hebrew-L1			x	
	English-ChL2			x	
M. Bowerman	English-L1	x	x		x
	Finnish-L1	x	x		
J.B. Bybee	Cross-linguistic				x
E. Cabrejo-parra	French-L1	x			
	Spanish-L1	x			
E. Clark	English-L1				x
	French-L1				x
W. Deutsch	English-L1	x			
N. Dittmar*	German. AdL2				x
S. Ervin-Tripp*	French-ChL2		x	x	
M. Kail	French-L1	x			
	Cross-linguistic	x			
A. Karmiloff-Smith*	English-L1			x	
W. Klein	German. AdL2				x
C. de Lemos	Portugese- L1		x		x
E. Lieven	English-L1			x	
B. MacWhinney	Cross-linguistic	x		x	
J. Meisel*	German-AdL2		x		x
T. Pechmann	Cross-linguistic	x			
D.I. Slobin	Turkish-L1		x		x
	Turkish-ChL2		x		x
	English-L1			x	x
M. Smoczyńska	Polish-L1	x	x		x
U. Stephanie	Greek-L1	x			x
C. v. Stutterheim	German-AdL2		x		x
L. Tyler*	Cross-linguistic			x	
J. Weissenborn	French-L1	x			
	Cross-linguistic	x			
H. Wode	English-ChL2				x
	German-L1	x			

*L1 = first language
 ChL2 = second language in childhood
 AdL2 = second language in adulthood

*3-week participation

The following individuals participated in the workshop for one week or less: E. Bates, G. Extra, H. Clahsen, G.B. Flores d'Arcais, M. Hickmann, K. Koepke, M.-L. Moreau, S. Strömqvist, V. Ullmer-Ehrich, E. Verhulst-Schlichting.

language-free typology of semantic and discourse functions of this domain and to map out its development in different languages. Kail, Slobin, and Weissenborn are planning further international experimental collaboration in this area. Pechmann is organizing cross-linguistic comparisons of the semantics and development of *or*; Deutsch is exploring the development of means of indicating possession.

3.3.2 Contingency. An interest in expressions of contingency (causal, conditional, hypothetical) arose from a broader concern with the development of means of referring to nonactual events. The group worked on a typology of utterances expressing physical causes, purposes, reasons, and conditions. Different grammatical devices are called into play in such expressions, in that causes are generally stated before results, while purposes and reasons are often offered as justifications following the statement of their effects. Languages differ considerably in the array of devices provided for such expressions. In addition, in both L1 and L2 acquisition, contingency is expressed by such means as sequencing without connectives, contrasting affirmative and negative statements, and the like, prior to the acquisition of the full syntactic means of expression. This area, like Contrast, provides rich opportunities for investigating interactions between form and function in development, and continuing cross-linguistic collaboration has been planned by Bowerman and Slobin, with input from the L2 studies as well.

3.3.3 Topic Elaboration. This group studied the development of discourse maintenance and structuring, concentrating their analysis on the child's elaboration of linguistically introduced topics and studying how the nature of adult "scaffolding" of conversation changes developmentally as children come to elaborate in more and more complex ways. In surveying cross-linguistic data over the age range of about 18 months to four years, the following phases of development of topic elaboration have been tentatively identified:

- I. (up to about age two) Children can maintain discourse through imitation and repetition, and by answering adult questions; but the extent to which they can elaborate upon a topic is extremely limited.
- II. (roughly 2;0 to 2;6) Beginning abilities to elaborate the propositional content of topics and reference to somewhat more displaced

topics.

III. (roughly second half of third year) Children's self-initiated elaborations begin to consist of more than one predication in a row and to be informative linguistically. They can be interpreted without reliance on present objects or shared knowledge. Overt markers of discourse cohesion begin to appear.

IV. (from about age three on) Children develop conversational devices for discourse cohesion, foregrounding and backgrounding, becoming "real conversational partners".

Berman, Karmiloff-Smith, and Lieven plan continuing collaboration to explore the generality of this developmental scheme and its sensitivity to: (1) various discourse modes, and (2) specific linguistic devices for cohesion, past reference, and contrast in various languages.

3.3.4 Past Time. This group explored a variety of issues dealing with narrative structure, report of past events, and the associated verbal and adverbial means of expression. Comparisons were made between adults and children in narrative structure and ability to locate and sequence events in time. De Lemos and Bybee summarized much of the work of this group in a cross-linguistic analysis of the development of backgrounding devices coded on the verb - an analysis which they plan to continue. They note that the use of backgrounding devices is sensitive to discourse type, with the following developmental sequence in children: (1) setting the stage for pretend play, (2) argumentative discourse, (3) fictive story telling, (4) narration of real past events.

On the linguistic plane, they chart a development in terms of devices for aspect and tense across a number of languages, proposing the following tentative stages:

- I. no distinction between states and events
- II. stative or atelic verbs distinguished from telic verbs by some limited grammatical devices
- III. stative and atelic verbs co-occur with backgrounding devices (e.g., imperfective aspect, relative clauses, past progressive) and telic verbs with foregrounding devices (e.g., perfective aspect, simple preterit)
- IV. backgrounding and foregrounding can be accomplished independently of the inherent meaning of the verb.

4. LANGUAGE DISORDERS

4.1 In the area of Language Disorders, the most important event in 1981 was the decision of the Dutch Research Council, ZWO, to support a long term project on "Aphasia in Adults". The official starting date of the project is January 1982, but much preliminary work already began in the course of 1981.

The grant is, among other things, intended to further the cooperation between the Institute and Nijmegen University, in particular its Inter-faculty Research Unit for Language and Speech (head: Dr. L. Noordman). The project was, therefore, planned as a joint research effort, involving especially the University's Neurological Clinic (head: Prof. B. Schulte), and several university staff (Prof. G. Kempen, Dr. A. Keyser, Dr. H. Kolk).

The project aims at bringing further together aphasiology and recent insights from linguistics and cognitive psychology. More specifically, it proposes to analyze aphasiological phenomena from the point of view of processing models developed for normal language comprehension and production. These models are themselves in part linguistically motivated. The envisaged theoretical interaction is two-way: on the one hand, theories of linguistic structure and psychological processes are expected to shed light on the internal organization of aphasic syndromes. On the other hand, aphasiological evidence should eventually provide important additional restrictions on possible psycholinguistic theories, theories which are at present almost exclusively based on research with normal adults.

The focal interests of the project are, firstly, the processing of open and closed class (including clitic) elements in a language; secondly, lexical access and word structure; and, thirdly, the relations between case, word order, and information structure. A central methodological consideration will be to distinguish between patients' performance in off-line and on-line tasks. Most of the research will involve cross-linguistic comparison between Dutch, German, and English.

An essential part of such a cross-linguistic approach is the availability

of completely parallel aphasia tests in all three languages. For this purpose, the Dutch standardization of the Aachener Aphasia Test (by W. Huber, K. Poeck, D. Weniger, and K. Willmes; Göttingen: Hogrefe, 1982) was begun. In November 1981, a training session was held at the Institute by R. de Bleser (from Aachen University). Approximately 21 co-workers of 17 hospitals in the Netherlands and in Flanders were trained in the application of the test. The results will be gathered and organized at the Institute and will be transferred to Aachen for statistical evaluation.

Several research appointments have been made in the project: A. Friederici will be mainly concerned with German-speaking patients; P. Eling will concentrate on Dutch, and M.-L. Kean, together with L. Tyler, will be centrally involved with English-speaking patients. The daily coordination of the project is in the hands of C. Heeschen.

4.2 One of the major themes of the research which was carried out during the year in the field of language disorders centered on particular aspects of discourse organization in comprehension and production. This first theme involved in various ways the issues mentioned above in relation to the ZWO project planned for 1982: on-line versus off-line processing, closed versus open class, and the informational or communicative properties of aphasic speech.

With respect to the distinction between on-line and off-line processing of speech, Friederici continued some earlier research on adult aphasics' syntactic and semantic processes in production and comprehension. Processing differences for syntactic and semantic information had been found in agrammatics' production, although not in their off-line comprehension performance. However, it seems plausible to assume that the same central linguistic components are responsible for both production and comprehension. Thus, it was hypothesized that the difference between the performances is due to different degrees of necessary syntactic processing in real time. If agrammatism can be described as the general inability to process syntactic information in real time, one would predict that comprehension should parallel production when measured on-line; that is, in an on-line comprehension task agrammatics should, in general, have greater difficulties with closed class than with open class items, and, in particular, they should react faster to those closed class items which carry semantic meaning than to those which are only used as syntactic markers. Their general ability

to process semantic information, that is, inter- and intrasentential context, should not be disturbed.

Friederici examined this question in some experiments with German-speaking agrammatics and normal controls. Word class, as well as the functional role within the closed-class, was varied in a word monitoring task. The sentence containing the target word was always preceded by a context sentence, which was either highly relevant semantically or not. As the normal controls, agrammatics showed a significant context effect for the relevant versus irrelevant context condition. Unlike normals, however, agrammatics showed faster reaction times to open class than to closed class items. They also demonstrated differences within the closed class; as in production, they had more difficulties recognizing those closed class forms that carry syntactic rather than semantic information. These results demonstrate that the agrammatics' deficit can be described as a general inability to process syntactic information in real time. Furthermore, they suggest that what is lost for agrammatics is not the form of a closed class item but rather its syntactic function. Friederici is planning a further comparison between agrammatics and children's ability to process open class and closed class items. It is predicted that children (7 years or younger) who do not yet have a clear concept of the functions of closed class items should perform similarly to the agrammatics. This work is currently in progress.

In addition, addressing specifically the question of on-line versus off-line processing from the point of view of comprehension, Tyler has begun piloting some of the studies planned as part of the ZWO project. In this pilot research, Tyler has been trying out various types of on-line word-monitoring tasks with aphasic patients in order to find the particular modification of this task which would be most appropriate for them. This research will be developed in 1982.

4.3 Another aspect of discourse organization involves the communicative principles governing the production of speech. With respect to these aspects of information distribution in the speech of patients with language disorders, E. Zurif (the Aphasia Research Center of Boston University School of Medicine and the Graduate Center of CUNY) was involved during a visit at the Institute in planning some studies in collaboration with Friederici and M. Garrett (the Massachusetts Institute of Technology). These studies

will assess whether Broca's and Wernicke's aphasic patients are capable of expressing distinctions in their speech between shared, previously established information and information that is new and to be focused upon. The task will be to have patients describe picture sequences in which actors, actions or objects either remain unchanged or are varied across the sequence. Pilot work with English speaking aphasics suggests that Broca's aphasic patients lexicalize variable (new) information much more frequently than unchanging (given) information. In contrast, Wernicke's aphasic patients appear not to show this distinction, and in addition, often fail to set up a specific antecedent referent before using pronouns. The goal of further studies will be to assess the generality of these phenomena across languages and their different manifestations in different languages.

Discourse organization in the area of aphasiology was also the main concern of Heeschen. After preparatory organizational work involving the establishment of contacts with hospitals in the area of Nijmegen, Heeschen started experiments dealing with the problem of linearization in brain-damaged patients. In these experiments, the patients have to describe some selected spatial networks, taken from previous work by Levelt. Furthermore, they have to order sentences describing single events on pictures. Each picture represents a coherent story and allows only a certain number of orderings of the sentences according to the general principle of linearization. The first preliminary results suggest that aphasics are not particularly disturbed in linearization (despite some other very severe language problems), thus supporting Levelt's position that linearization is not part of the linguistic system proper.

4.4 Finally, a few research projects currently in their initial stage should also be mentioned. First, in relation to discourse organization, Heeschen has begun investigating self-repairs in aphasic speech, using a large body of picture descriptions which he had collected in previous experiments. These self-repairs will hopefully provide some insight into aphasics' monitoring processes during speech production, about which nothing is known today. Second, during regular rounds made with Dr. Keyser at the Radboudziekenhuis, Heeschen has also been involved with patients having cortical problems other than aphasia. For example, one patient with a visual agnosia has been continuously tested over several months and

the present results suggest that he suffers from a genuine asymbolia. Third, Jarvella, in collaboration with S. Kelter (University of Berlin), has been planning to replicate in German, and with several refinements, previous studies which he has done in English on intonation, grammar, and basic speech acts.

OTHER ACTIVITIES 1981

1. ACTIVITIES OF THE TECHNICAL GROUP. The main projects of interest carried out by the Institute's technical group have been in the fields of automatic speech processing, automatic 3-dimensional analysis of gesture, automatic analysis of eye-movements, and special purpose electronics.

The group developed a set of real time pitch detectors based on short-term analysis and evaluated their performance. Techniques for harmonic-structure-analysis (Technical Note 81/1) and a modified product-power-spectrum algorithm (TN 81/4) have been implemented and can be used for research purposes. The possibility of automatically deriving linguistic measures, such as stress, from the corresponding acoustical parameters has also been investigated (TN 81/5). This work will be continued in 1982.

In addition, a powerful and convenient speech-editing-system (TN 81/2), including visual and acoustical control features and a special purpose function keyboard, has been realized. A simple "command language" serves as user interface.

In the area of eye-movement analysis a software package has been developed which incorporates algorithms for artifact detection (TN 81/6) and for the detection of both saccades and fixations (TN 81/7). The package also includes features which make it a very flexible tool for the analysis of eye-movements occurring during text reading. This work will be continued in 1982.

In the field of gesture analysis the software package which performs data acquisition, calibration, and 3-dimensional reconstruction has been improved and expanded. Further digital signal processing algorithms will be developed in 1982.

A stand-alone pulse-set unit was developed which allows a series of pulses to be placed with great accuracy (about 1 ms) at specified points in the speech record. The unit provides for visual monitoring of the process by means of an ordinary oscilloscope and is easy to use.

In cooperation with the Technical University in Berlin a low cost modular microprocessor system for operating experimental hardware has been designed and realized. This work has included the development of basic software such as experimental drivers, cross-software for program development on a host computer, and communication software.

2. ZWO/MAX-PLANCK PROJECT ON DESCRIPTIVE LANGUAGE. 1981² saw the completion of ~~two~~^{the third} of the four subprojects in the special ZWO/Max-Planck project on "Descriptive Language", which is jointly carried out by the Institute for Perception Research in Eindhoven, the Interfaculty Research Unit for Language and Speech of Nijmegen University, and the Institute. Completed

were the projects on anaphora and on descriptive language in children.

during 1982 was the subproject on child language which was located at the Institute of Psychology & Phonetics in the Netherlands.
3. JOINT PROJECT ON DEIXIS. In May members of the Institute met in Berlin with their colleagues of the Linguistics Department of the Free University to discuss progress in the joint project on deixis.

4. NEW BUILDING. Good progress was made in the planning of new housing for the Institute. Thanks to substantial support from Nijmegen University, conditions were realized for the planning of a new building at the University campus in the direct vicinity of Psychology, Linguistics, and Neurology. The building will, moreover, house the University's Interfaculty Research Unit for Language and Speech.

5. LECTURES AND COLLOQUIA. The Institute organized colloquia and lectures which were given by the following scholars:

T. Ballmer, E. Bialystok, A. Caramazza, M. Coltheart, R. Cromer, E. Engdahl, S. Fillenbaum, M. Garrett, J. Hawkins, M. Hickmann, M. Katzko, E. Keenan, I. Kracke, E. Mägiste, B. MacWhinney, R. Milne, R. Mulford, K. Patterson, L. Polanyi, T. Reinhart, M. Shatz, C. Sinha, I. Vogel, W. Wahlster, E. Zurif.

6. TEACHING. The Institute's staff taught courses of varying duration at the following Universities: Free University of Berlin (Bamberg, Stutterheim, Weissenborn); University of Göttingen and University of Mannheim (Deutsch); University of Heidelberg (Klein); Massachusetts Institute of Technology (Marslen-Wilson, Tyler); University of Nijmegen (Vonk).

7. PAPERS PRESENTED. The following papers were read elsewhere by the Institute's staff and fellows:

- M. Bamberg, "Metaphor and play-interaction in young children", 7th Annual Conference of the Association for the Anthropological Study of Play, Fort Worth, Texas, April.
- "The communicative functions of metaphor in young children", 89th Annual Convention of the American Psychological Association, Los Angeles, August.
- W. Deutsch, "Die Entwicklung referentieller Fähigkeiten", University of Tübingen, January.
- "Form and function in the development of reference", Child Language Seminar, University of Edinburgh, April.
- "Das Gedächtnis des Sprechers und das Gedächtnis des Hörers: ein Vergleich", University of Marburg, May.
- "Form and function in the development of reference", Stichting Taalwetenschappen, Annual meeting, Amsterdam, October.
- "The development of referential abilities", University of Amsterdam, December.
- E. Engdahl, "Interpreting sentences with multiple filler-gap dependencies", Max-Planck-Institut für Psycholinguistik, Nijmegen, October.
- "Topicalization and questions", Kolloquium Fachbereich Sprachwissenschaft, University of Konstanz, November.
- "Einige Skopusprobleme bei Konstituentfragen", Sonderforschungsbereich 99, University of Konstanz, November.
- "Fragen und Topikalisierung. Einige Probleme bei Direktinterpretation", Sprachwissenschaftliches Kolloquium, University of Düsseldorf, November.
- "Interrogative quantifiers", Centrale Interfaculteit, University of Amsterdam, December.
- "Interpreting sentences with multiple filler-gap dependencies", Cognitive Science Programme, University of Sussex, December.
- "Svenska data som prövosten för den allmänna syntax teorin", Föreläsning för Språkvetenskapliga sektionen, University of Stockholm, December.
- "The nested dependency constraint and pragmatic plausibility", LSA Annual Meeting, New York, December.

- G.B. Flores d'Arcais, "The role of syntactic information in language comprehension", XXIII Tagung experimentell arbeitender Psychologen, Berlin, April.
- "Syntactic processing and error recovery during reading", Conference of the European Group for Eye Movement Research, Bern, September.
- "The acquisition of semantic knowledge: the temporal connectives", XIX Italian Congress of Psychology, Urbino, September.
- A.D. Friederici, "Availability of prepositions in aphasia: effects of functional role", University of Amsterdam, May.
- "Levels of sentence processing and vocabulary types: evidence from aphasia", The Johns Hopkins University, Baltimore, Maryland, October.
- "Semantic and syntactic studies in aphasia", University of Maryland, College Park, Maryland, October.
- A.D. Friederici, P.W. Schönle & M.F. Garrett, "Syntactically versus semantically based computations: processing of prepositions in aphasia", Fourth European Meeting of the International Neuropsychological Society, Bergen, Norway, June.
- W. Gronlund, M. Schuler & P. Wittenburg, "A modular microcomputer system for experimental scientific laboratories", 1981 DECUS European Symposium, Hamburg, September.
- C. Heeschen, "Zur Repräsentation der Sprache in der rechten Hemisphäre", Technical University Berlin, June.
- "Recognition of semantic categories by aphasic patients", University of Nijmegen, December.
- C. Heeschen, A. Keyzer, H. Kolk, B. Schulte & W.J.M. Levelt, "A multidisciplinary approach to aphasia", Annual Meeting of Dutch Neurologists, Nijmegen, December.
- R. Jarvella, "Some studies of interaction in sentence perception", University of Nijmegen, February.
- "The structure of speakers' spontaneous utterances", University of Tel Aviv, March.
- "Speakers' segmentation of their own utterances", University of Göttingen, June.
- "Some interactions in sentence processing and their locus in perception", Technical University Braunschweig, June.
- A. Karmiloff-Smith, "Beyond the sentence in child language research", Developmental Psychology Colloquia Series, University of Sussex, January.
- A. Karmiloff-Smith, "Some nonlinguistic aspects of children's problem solving", Cognitive Studies Programme, University of Sussex, May.
- "Is the sentence the right unit of analysis?", Linguistics Department Colloquia Series, University of California at Berkeley, October.
- "Beyond the sentence in child language acquisition", Psychology Colloquia Series, Stanford University, October.
- "Metaprocedural operators as an explanatory notion in various aspects of children's linguistic and nonlinguistic cognitive development", Series of papers given to the Cognitive Science Seminar Series, University of California at Berkeley, October and November.
- "The function of metalinguistic awareness in language acquisition", Salk Institute for Biological Studies, San Diego, December.
- G. Klaas & P. Wittenburg, "Eye view monitoring in speech production tasks", Conference of the European Group for Eye Movement Research, Bern, September.
- W. Klein, "Ellipsis and intonation", Free University of Berlin, January.
- "Neue Untersuchungen zur Sprache ausländischer Arbeiter, University of Saarbrücken, February.
- "Presidential address", 3. Jahrestagung der Deutschen Gesellschaft für Sprachwissenschaft, Regensburg, March.
- "Pronoms personnels et problèmes d'acquisition", University of Paris-Vincennes at St. Denis, May.
- "Die Intonation von Fragesätzen", University of Munich, May.
- "Probleme der Satzintonation", University of Konstanz, June.
- "Intonation im Diskurs", Conference on "Probleme der Diskursanalyse", Institut für deutsche Sprache, Mannheim, June.
- "The ecology of second language acquisition", University of Passau, July.
- "Hören und Beurteilen", (Round table discussion), University of Saarbrücken, December.
- S.-Y. Kuroda, "Indexed predicate calculus", International Colloquium on Discourse Representation, Kleve, September.
- "The bi autonomy of syntax", University of Amsterdam, October.
- "Kant's categories and linguistic analysis", University of Göteborg, November.
- "Illocutionary force", University of Göteborg, November.
- "Japanese causatives and the bi autonomy of syntax", University of Stockholm, November.

- S.-Y. Kuroda, "Japanese causatives and the bi autonomy of syntax", University of Tübingen, December.
- "Indexed predicate calculus", University of Paris VII, December.
- W.J.M. Levelt, "Linearization in discourse", University of Gießen, January.
- "The speaker's linearization problem", Joint Symposium of the Royal Society and the British Academy, March.
- "Volgorde in de beschrijving van ruimtelijke patronen", University of Nijmegen, March.
- "Understanding spatial descriptions", European Psycholinguistic Association Workshop on "Mental Representations during Speech Understanding", Maison des Science de l'Homme, Paris, April.
- "Het lineariseringsprobleem van de spreker", University of Groningen, June.
- "Ellipsis and anaphora in spatial descriptions", Colloquium on "Meaning, Use, and Interpretation of Language", University of Konstanz, September.
- "Het repareren, uh herstellen van spraak", Psychologencongres 1981, Nijmegen, October.
- "Arranging for expression: the speaker's linearization problem", Brotherton lecture, Language and Speech Conference, University of Melbourne, November.
- "Repairing speech", Department of Psychology, University of Melbourne, November.
- W. Marslen-Wilson, "Sentence processing and discourse representation", European Psycholinguistic Association Workshop on "Mental Representations during Speech Understanding", Maison des Sciences de l'Homme, Paris, April.
- "Producing interpretable discourse", University of Utrecht, May.
- "Speech understanding as a psychological process", NATO ASI on Automatic Speech Analysis and Recognition, Château de Bonas, France, June-July.
- "Decision processes during spoken word recognition", Massachusetts Institute of Technology, October.
- "Activation processes during spoken word recognition", Massachusetts Institute of Technology, November.

- W. Marslen-Wilson & L. Tyler, "Central processes in speech understanding", Symposium on The Psychological Mechanisms of Language, The Royal Society, London, March.
- "Modelling human parsing strategies?", Sloan Conference on Modelling Human Parsing Strategies, University of Texas, Austin, March.
- A.G.B. ter Meulen, "Model theory and computational models", University of Amsterdam, January.
- "Partial interpretation", Technical University Delft, March.
- "Partial models for formal semantics", 3. Jahres Tagung der Deutschen Gesellschaft für Sprachwissenschaft, Regensburg, March.
- "Partial models for speaker reference", International Colloquium on Discourse Representation, Kleve, September.
- "Partial models for speaker reference", Colloquium on "Meaning, Use, and Interpretation of Language", University of Konstanz, September.
- "Situation semantics and dynamic interpretation", University of Groningen, October.
- "Models with complete information versus partial models", University of Nijmegen, December.
- Th. Pechmann, "Children's assignment of acoustic stress in referential communication", 13th Stanford Child Language Research Forum, April.
- "Neuere Untersuchungen zur referentiellen Kommunikation", University of Mannheim, November.
- C. Perdue, "Ecologie de l'acquisition des langues par des adultes: présentation d'un projet", Colloque sur le Bilinguisme, University of Neuchâtel, September.
- "Linguistic awareness and adult second language acquisition", University of Göteborg, September.
- M. Pinkal, "Präzisierungen, oder: Was ein Wort bedeutet", University of Nijmegen, April.
- "Vagueness and word semantics", University of Amsterdam, April.
- G. Richardson, "Aspects of developmental dyslexia", First Conference of the International Academy for Research in Learning Disabilities, University of Utrecht, August.
- "The analysis of temporal aspects of gestural movements using Selspot", Meeting of the Kontaktgroep Instrumentatie in de Psychologie, University of Nijmegen, December.

- L. Tyler, "The development of discourse mapping processes: the comprehension of anaphoric devices", Child Language Seminar, University of Edinburgh, April.
- "Processing utterances in discourse contexts", Northeastern University, Boston, December.
- V. Ullmer-Ehrich, "L'usage des prépositions indexicales dans un discours descriptif", 3ème Colloque Franco-Allemand de Linguistique Théorique, University of Konstanz, February.
- "Zum Gebrauch indexikalischer Lokalausdrücke in deskriptiven Diskursen", Colloquium "Semantik als Basis des Verstehens", Zentrum für Interdisziplinäre Forschung, Bielefeld, May.
- "Die Struktur räumlicher Beschreibungen", University of Münster, June.
- "Linearität und Indexikalität im Diskurs", Conference on Probleme der Diskursanalyse, Institut für deutsche Sprache, Mannheim, June.
- J. Weissenborn, "L'acquisition des prépositions spatiales: problèmes cognitifs et linguistiques", 3ème Colloque Franco-Allemand de Linguistique Théorique, University of Konstanz, February.
- "The ontogenesis of denials. A cross-linguistic study", State University of New York, Buffalo, October.
- "The ontogenesis of denials", University of Pennsylvania, Philadelphia, October.
- P. Wittenburg, "Digital speech analysis techniques - an overview", Annual KIP-Meeting, University of Nijmegen, March.
- "Mogelijkheden en grenzen van de communicatie in de natuurlijke taal", Institute for Computer Science, Enschede, October.

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- Dubois, C., C. Noyau, C. Perdue and R. Porquier: A propos d'une pré-enquête sur l'utilisation du français en milieu naturel par des adultes hispanophones. *GRECO* 13, 57-78 (1981).
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- Heeschen, C. and F. Reischies: Zur Lateralisierung von Sprache. Argumente gegen eine Überbewertung der rechten Hemisphäre. In: *Sprache und Gehirn*, R. Jakobson zu Ehren, Ed. H. Schnelle. Suhrkamp, Frankfurt/M. 1981, 41-58.
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- Klein, W.: Some rules of regular ellipsis in German. In: *Crossing the Boundaries in Linguistics. Studies Presented to Manfred Bierwisch*, Eds. W. Klein and W.J.M. Levelt. Reidel, Dordrecht 1981, 51-78.
- Klein, W.: Knowing a language and knowing to communicate. A case study in foreign workers communication. In: *Language Problems of Minority Groups*, Ed. A.R. Vermeer. Tilburg 1981, 75-95.
- Klein, W.: L'acquisition des pronoms personnels allemands par des travailleurs espagnols et italiens. *GRECO*, 13, 19-31 (1981).
- Klein, W.: Some remarks on Sanders' typology of elliptical coordinations. *Linguistics* 18, 871-876 (1980) [recte: 1981].
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