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PREFACE

The Max Planck Institute for Psycholinguistics is unique in the world, the sole major institution, dedicated to the study of the psychology of language. The breadth of research reported on here ranges from studies of the brain engaged in language tasks, to how babies learn the significant sounds of their first language, from multilingualism in the individual to the range of language diversity which the mental apparatus devoted to language has to cope with. These reports are necessarily brief and selective, and we welcome contact and visits from those interested in our research.

The year of report, 2006, saw major changes at the Institute. Our founding director, Pim Levelt retired from the leadership of the group devoted to the study of language production. Pim is such a strong intellectual personality, and such a fount of scholarship, brilliant insights and experimental designs, that we are delighted that he will continue to be present for a further two years, as he works on a book on the antecedents and history of psycholinguistics. However his project, 'Utterance Encoding', reports here for the last time.

Towards the end of the year, Pim's place as head of the production group was taken by Peter Hagoort, who also continues to head the Donders Centre for Cognitive Neuroimaging at Radboud University Nijmegen, assisted by David Norris. Peter, who won the Spinoza award the previous year, will bring a large group to the Institute, with an increasing emphasis on the underlying neurocognition that makes language possible. The Institute will equip new labs for ERP and virtual reality experiments, but the full impact of all the changes will show only in the next report. We are most grateful to the Dutch Ministry of Education, Culture and Science, who now generously contribute to our budget, thus making these developments possible.

During the year the DFG-funded project on the typology of sign languages came towards an end – the head of the group, Ulrike Zeshan has moved to the University of Central Lancashire, where she has permanent funding for a group to continue the research. The Institute continues its close association with her group, sharing facilities, data and students, and there is a section of the report that summarizes the work done.

We report our research in terms of the major projects in which the work of the Institute is organized. There have been significant changes in the project structure since 2005. By internal evolution, 'Space' and 'Event Representation' have merged into a new 'Categories' project, and there is a new acquisition project on 'Information Structure'. Our new director, arriving at the end of the year, announces two new projects, 'Production in Context' and 'Unification'.

Stephen Levinson

Nijmegen, March 2007

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CHAPTER 1

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Introduction

The Phonological Learning for Speech Perception project investigates how the phonology of language is learned, the role that phonological structure plays in the perception of speech, and the conditions under which existing phonological knowledge may be adapted as a function of listening experience. The project incorporates most of the research supported by Cutler's NWO-SPINOZA project "Native and Nonnative Listening", which maintains *inter alia* the two infant speech perception laboratories (one for behavioral and one for electro-physiological studies).

Research is here reported under four heads: (1) Learning a first phonology (the infant speech perception research); (2) learning a second phonology, later on (research on second-language [L2] listening); (3) using the first phonology (research on the influence of native [L1] phonology in speech perception), and (4) adjusting an already acquired phonology (research on the acquisition and re-tuning of phonological categories in adulthood).

Two Ph.D. theses were successfully defended from this project in 2006 (Eisner in March, Dietrich in May). Goudbeek's thesis was also completed and passed by the examiners; it will be defended in March 2007. Also to be defended in March is the completed and examined Ph.D. thesis of Van der Feest, a Radboud University thesis which becomes the second Ph.D. project to have been completed in the Baby Research Center infant speech perception laboratories (Dietrich's was the first). As of 2007, Broersma will leave the Institute to take up a VENI career development award at the Radboud U. Nijmegen. Her project, closely related to the Phonological Learning for Speech Perception themes, will investigate traces of a 'forgotten' first language in adult adoptees.

1.1 Learning a first phonology

1.1.1 The beginnings of vocabulary building: Cues for word segmentation

1.1.1.1 Transitional probabilities

Infants construct their very first vocabulary entries by recognizing and storing word forms which they have heard in speech input, and one of the most important current issues in language development research is how they manage to extract the words from continuous speech streams. Studies with artificial language input have demonstrated that eight-month-olds can rapidly extract information about syllable distributions, and use this information to infer likely word boundaries. It has been proposed that this ability plays an important role in the early word segmentation process. However, the artificial languages used in these studies are highly simplified – for example, such a language might

consist of four words of uniform length and syllable structure, while no natural language is ever so uniform. Moreover, there is no evidence so far that infants' ability to segment artificial languages using statistical cues alone can scale up to more natural language input. Johnson and Tyler (U. Western Sydney) took a first step towards examining this issue by assessing Dutch-learning eight-month-olds' ability to segment an artificial language containing four words of uniform length (CVCV) versus an artificial language containing two trisyllabic words (CVCVCV) and two bisyllabic words (CVCV; Annual Report 2005: 5). The transitional probabilities defining word boundaries were constant across the two languages. Eight-month-olds only succeeded at segmenting the language containing four words of equal length, suggesting that prior studies using highly simplified artificial languages may have overestimated infants' ability to track transitional probabilities between syllables.

In further experiments on this issue, Johnson and Tyler have replicated these findings with a new type of artificial language exhibiting a simpler statistical structure. Even when eight-month-olds were exposed to an artificial language that could be segmented by tracking simple co-occurrence frequencies ($p[AB]$) rather than the more complex conditional probabilities ($p[AB|A]$), the infants still failed to segment the language containing words of varying length. Since it has been suggested that for finding word boundaries younger infants rely on syllable distribution information to an even greater extent, Johnson and Tyler also tested 5.5-month-olds, using the same materials and paradigm. Once again, the infants easily segmented the language containing four uniform-length words, but failed to segment the language containing varying-length words. Together these studies suggest that the importance of syllable distribution information in recent models of developmental word segmentation may need to be reconsidered. When faced with the complexity and variation present in natural speech, infants may not be as receptive to syllable distribution information as previous results have implied.

1.1.1.2 Stress vs. transitional probabilities

The process of segmenting words from speech begins, for English-learning infants, between six and 7.5 months of age. In the earliest stages, infants are over-reliant on stress cues to word boundaries, and appear to assume that any stressed syllable signals a word onset. This strategy allows infants to make a fairly good first pass at segmenting the speech stream, since most English content words are indeed initially stressed. By 10.5 months, infants begin segmenting noninitially stressed words from speech. It is still not entirely clear how English-learning infants overcome their over-reliance on stress cues to word boundaries. One suggestion has been that they may realize that

transitional probabilities between syllables provide a more reliable cue to word boundaries than stress. Seidl (Purdue U.) and Johnson explored this issue by testing 11-month-olds' segmentation of an artificial language containing conflicting stress and transitional probability cues to word boundaries. The results showed that 11-month-olds, like eight-month-olds, weigh stress cues to word boundaries more heavily than transitional probability cues. Thus a greater reliance on transitional probabilities alone cannot explain the emergence of the ability to segment noninitially stressed words from speech. Rather, it seems more likely that this ability is driven by a growing awareness and integration of a wide array of segmentation heuristics (e.g. phonotactic, allophonic, and lexical information).

1.1.1.3 Noninitial stress

The results from Kooijman's Ph.D.-project showed the first ERP signature of word segmentation from continuous speech in seven- and 10-month-old Dutch infants (see Reports 2003-2005). In a further study on this project, Dutch 10-month-olds were tested on the segmentation of noninitially stressed bisyllabic words, i.e. weak-strong words. In each of 20 experimental blocks, infants were first familiarized with eight tokens of a weak-strong word such as *getij*. Next, they heard four sentences of which two contained the same weak-strong word or a strong-weak word with the same strong syllable (e.g., *tijger*); the other two (control) sentences contained weak-strong or strong-weak words which had not previously been made familiar. As in the previous experiments of this project, ERPs were collected throughout each trial, and were (a) analyzed across the Familiarization phase to assess the effect of increasing familiarity, and (b) compared for familiar versus control words in the Test phase.

In the Familiarization phase of the present study, in which the weak-strong words were presented in isolation, the ERPs showed an effect of increasing familiarity highly similar to that found with strong-weak words (Annual Report 2003: 4). When these weak-strong words were presented out of context, therefore, the infants processed the word forms as wholes (rather than, for instance only initiating evidence of recognition once the more salient strong syllable occurred) because the onset of this familiarity response had a similarly early onset in ERP time course as for the strong-weak words. The results in the Test phase, however, in which the same words were presented embedded in sentences, differed from the pattern previously found with strong-weak words. There was a significant recognition effect time-locked to the second syllable of the weak-strong words (e.g., *-tij*). Thus, the strong syllable seems to play a role in segmentation of these words from continuous speech. This finding is confirmed by the fact that the strong syllables in strong-weak words (*tij-* in

tijger) in the sentences elicited a small ERP response at onset of the strong syllable, even though the syllable is in fact part of a different word. Thus, the strong syllable alone is salient enough to trigger a small recognition effect. Further research is needed with older Dutch infants to establish at which point their segmentation skills have matured enough to recognize weak-strong words as wholes in continuous speech.

1.1.2 Acquisition of phonetic contrasts across dialect groups

In Van der Feest's (Radboud U. Nijmegen) Ph.D. project, mentioned above, Dutch-learning 24-month-olds were shown to be sensitive to voicing mispronunciations in word-initial stop consonants. For example, infants recognized the word *teen* 'toe' faster when it was pronounced correctly as *teen* rather than incorrectly as *deen*. Johnson and Van der Feest followed up this finding by asking whether Dutch-learning 24-month-olds also detect voicing mispronunciations in word-initial fricatives. This is a particularly interesting question in Dutch because in many parts of The Netherlands (including Nijmegen) the fricative voicing contrast is frequently unrealized (e.g., *sok* 'sock' and *zus* 'sister' are both pronounced with the same voiceless fricative onset). Two groups of participants were tested with the Preferential Looking Procedure. The toddlers in one group had two parents who originated from and lived the majority of their life in a region of The Netherlands where the fricative voicing contrast is no longer realized. The other group all had two parents who originated from and lived the majority of their life in a region of The Netherlands where the fricative voice contrast is still maintained. At the beginning of the experiment, all toddlers watched a two-minute movie narrated by a speaker from the south of The Netherlands (a region where the fricative voicing contrast is still maintained). After listening to the story, infants were tested on their ability to recognize fricative-initial words pronounced correctly (e.g., *sok*) or incorrectly (e.g., *zok*). None of the test items had been uttered in the story phase, but were uttered by the same speaker.

Regardless of whether or not their parents produced the fricative voicing contrast, all toddlers were faster to recognize correctly pronounced words than incorrectly pronounced words. These results are somewhat surprising in that they suggest that all Dutch toddlers, even those whose parents devolve all word-initial fricatives, are sensitive to the voicing of word-initial fricatives. A still unresolved issue is whether the same result would be obtained if the toddlers were not exposed to the same southern speaker before testing.

1.1.3 Acquisition of gender-marked determiners

In her final year M.Sc. project, under the supervision of Johnson, Van Heugten (Radboud U. Nijmegen) carried out two studies investigating the acquisition of definite articles by Dutch-learning toddlers. In the first study, Van Heugten used the Preferential Looking Paradigm to examine 19- and 24-month-olds' use of definite articles in online speech perception. In addition to replicating earlier work showing that toddlers under two years of age are insensitive to gender marking on determiners (Annual Report 2005: 6), Van Heugten also found that these same children recognized words faster when they were preceded by a real (*de* or *het*) as opposed to nonsense (*se*) article. This finding suggests that for Dutch learners, as for learners of English (Annual Report 2005: 4-5), determiners can aid speech segmentation. This simple effect is not an effect of grammatical gender; it appears long before Dutch children learn which determiner belongs with which noun. In English the effect has been attributed to frequency and phonological form (Annual Report 2005: 4-5). In the present case, both *de* and *het* facilitated segmentation of a following word equally well, despite the difference in the frequency with which the children had presumably heard them (*de* occurs three times as often as *het* in conversational speech).

In her second study, Van Heugten used the Headturn Preference Procedure to explore Dutch-learning toddlers' sensitivity to the nonadjacent dependency between the definite article *het* and the diminutive suffix *-je*. In the three experiments completed to date, neither 19- nor 24-month-olds have demonstrated any sensitivity to this dependency. This is surprising given that English learners exhibit sensitivity to a nonadjacent dependency (the verbal dependency between *is* and *-ing*) by 18 months of age. It is at least conceivable that the Dutch diminutive dependency is more difficult to learn than the English verbal dependency because it is more variable (for instance, because diminutive forms may occur with the plural determiner *de*).

1.2 Learning a second phonology, later on

1.2.1 Acquisition of novel vowel contrasts

The final experiment of Goudbeek's Ph.D. project completed the series of studies in which Spanish- and English-native listeners were presented with vowel contrasts from Dutch (Annual Reports 2003, 2004). His project demonstrated that the acquisition of novel auditory categories is affected by the distributional properties of the input, by the availability of supervision (feedback), but also, in the case of phonetic categories, by the relation of the new categories to the native phonology. In the cross-linguistic vowel study, Spanish and American English listeners were presented with novel categories

based on the Dutch vowels in *fut*, *feut* and *fuut* (where the distinction between *fut* and *feut* is primarily one of duration, the distinction between *fut* and *fuut* is primarily one of frequency, while the distinction between *feut* and *fuut* involves both of these dimensions). As in other experiments in Goudbeek's project (e.g., Annual Report 2005: 12), supervised learning proved significantly superior to unsupervised learning. All listeners clearly demonstrated sensitivity to the distributional information, but unidimensional contrasts always proved easier to learn than multidimensional. However, Spanish listeners, whose native vowel system contains no duration-based contrast, found categorization by frequency easier than categorization by duration. This pattern did not arise with American listeners, whose native vowel system makes more use of duration-based distinctions than the vowel system of Spanish does.

1.2.2 Perception of familiar phonetic contrasts in unfamiliar position

Broersma continued her studies (Annual Report 2002: 10) of Dutch listeners' perception of the English /v/-/f/ distinction in word-final position; /v/ and /f/ also contrast in Dutch, but not word-finally. Dutch and English listeners categorized /v/ and /f/ at the end of English nonwords. The fricatives were taken from a continuum ranging from a natural /v/ to a natural /f/ with nine intermediate sounds. All fricatives followed either a long vowel, which would be appropriate for a following /v/ in English, or a short vowel, which would be appropriate for a following /f/. Each participant heard only the long or the short vowel, so that vowel duration was uninformative and sometimes inconsistent with the information in the fricative. The results showed that native English listeners relied more on the misleading vowel duration cue than Dutch listeners did, so that Dutch listeners' responses were more categorical than English listeners' responses. However, analysis of the practice trials showed that Dutch listeners initially used vowel duration as much as English listeners did, but stopped using this cue after very few trials. By the end of the practice part (44 trials), the effect of vowel duration had fully disappeared from the Dutch participants' responses. The English listeners, in contrast, used vowel duration as a voicing cue throughout the experiment, and their use of the cue did not decrease. This pattern may arise because nonnative listeners are less certain about which cues to use than native listeners are, and thus more ready to adapt their listening behavior, or because native listeners find it hard to abandon usually reliable cues. In any case, it appears to be easier to learn to disregard uninformative perceptual dimensions in a nonnative language than in the native language.

1.2.3 Acquisition of novel phonotactic constraints

Ernestus and Hamann (Utrecht U.) investigated how adults acquire phonotactic restrictions in a new language. They designed an artificial language which incorporated two restrictions: a simple one (consonants cannot be sonorant) and a complex – albeit phonetically motivated – one (palatalized consonants must be followed by high vowels). Four experiments were carried out, each beginning with a training phase in which participants heard phonotactically correct words of the new language and saw pictures showing the meanings of these words. In a subsequent test phase, participants heard new words and indicated whether these were possible words of the language. In Experiment 1, the training phase consisted of 40 words presented twice. Participants provided the correct judgment (i.e., rejected the incorrect and accepted the correct words) for 82% of trials testing the simple restriction but for only 52% of trials testing the complex restriction. In Experiment 2, the training phase was lengthened, whereby half of the participants heard 40 words four times while the other half heard 80 words twice. This lengthening did not affect the learning of the simple restriction. However, hearing more words less often led to better performance on the complex restriction than hearing fewer words more often; apparently, generalizations are acquired more easily on the basis of a larger number of words. Experiment 3 tested the role of feedback. All listeners first heard 40 words twice. Half of them then heard another 60 phonotactically correct words; the other half heard 30 correct and 30 incorrect words and indicated whether each was phonotactically correct, with feedback in the form of subsequent presentation of the correct pronunciation. These two groups performed equally well in the test phase, indicating that this type of feedback does not improve learning. Finally, Experiment 4 was identical to Experiment 3, except that the palatalized consonants were replaced by phonetically unnatural sequences of obstruents followed by [r]. In this case the feedback training led to worse performance (53%, which was just above chance level, compared to 66% in Experiment 3), suggesting that unnatural restrictions are more difficult to acquire.

1.2.4 Perception of reduced forms in L2

Tuinman continued her Ph.D. project, which investigates how late bilinguals cope with the challenges of connected casual speech in their second language. An example of such a challenge is word-final /t/ reduction in Dutch which makes *kast* (cupboard) sound like *kas* (greenhouse). Perception studies have shown that German-Dutch bilinguals take the same factors into account as native listeners to compensate for this /t/-reduction, but fail to show a completely native-like pattern. For the morphemic /t/ at the end of verbs, Germans reported more /t/-codas than native listeners (Annual Report 2005: 7-8). Two

new production experiments investigated whether the perception results could be explained by corresponding patterns of /t/-reduction in Dutch and German for verbs and lexical items. The experiments were constructed in such a way that the 10 Dutch and 10 German participants performed exactly the same task in their native language. The first experiment examined /t/-reduction in verbs with a sentence generation task. Verbs in which the stem ended in either /n/ or /s/ were presented in full form (e.g. *rennen* 'run'); participants had to change the verb to the third person singular present (e.g. *rent* 'runs') in a sentence generation task. The second experiment tested /t/-reduction after /n/ and /s/ in proper names, using a blending task with nonexistent place names (e.g. *Toestwoud* and *Liekbeek* blended to *Toestbeek*). Both experiments successfully induced /t/-reduction in a laboratory setting. The results showed that Dutch speakers reduced the morphemic /t/ at the end of verbs more often than German speakers, but only for the /s/ context. For proper names, German and Dutch speakers showed similar reduction patterns. Together with the perception studies, these results imply that German-Dutch bilinguals have learned that in Dutch the morphemic /t/ is more often reduced than in German, especially after /s/, but they overgeneralize this knowledge about their L2 and thus fail to exploit available acoustic cues to the full.

1.2.5 Effects on lexical processing of phonetic misperception in L2

A cross-modal associative priming experiment, carried out by De Groot (U. Groningen) as part of a final-year project supervised by Broersma, investigated Dutch and English listeners' perception of English minimal pairs differing in the /æ/-/ɛ/ contrast (e.g., *flash* – *flesh*). This contrast has no counterpart in Dutch phonology. A previous experiment with the same minimal pairs had shown that for English listeners, presentation of one word led to the inhibition of the paired word, while for Dutch listeners the paired word often remained active (see Annual Report 2001: 10). In the current experiment, each word was presented at the end of a sentence the meaning of which clearly matched one of the two words only (e.g., '*The scars on the leg of the horse showed that the FLESH ...*'). Next, the listeners made a lexical decision about a word on the screen that was associated with that word (*flesh* – *MEAT*). However, the word actually pronounced at the end of the sentence was either the word matching the sentence and the visual target (*flesh*), the paired word that did not match the sentence and the visual target (*flash*), or an unrelated control word (*trick*). For English listeners, responses after the matching word were faster than after the control word, but responses after the paired word were similar to control. Thus, only the lexical representation of the word they actually heard remained active. For Dutch listeners, however, responses were faster after the word that matched the sentence, but slower after the paired word. Thus, when the

sentence context favored the spoken word, the correct word was recognized, but when the context favored the other word, both words remained active, which led to slower responses. Although the semantic bias from the sentence failed to override any pre-lexical ambiguity, the results suggest that the non-native listeners tried to use the sentence context to resolve the competition between hard-to-distinguish minimal pairs.

Broersma further continued her studies of embedded-word activation in L1 versus L2 listening. Previous results showed that for Dutch listeners to English, near-words like *daf* activated words like *deaf* (Annual Report 2001: 10), and such words were activated as effectively by near-words excised from a longer carrier word (e.g., *daf* from *daffodil*) as by real excised words (*deaf* from *definite*; Annual Report 2004: 11). Different patterns were found, as expected, for English listeners. In a new cross-modal priming experiment, Dutch and English listeners heard not excised portions, but the full carrier words containing a near-word (*DAffodil*) or a real word (*DEFinite*); as before, they made a lexical decision about the embedded word presented visually (*deaf*). For English listeners, neither type of carrier word facilitated recognition of the shorter word. Competition from the carrier word apparently led to deactivation of the embedded word. For the Dutch listeners, however, carrier words facilitated recognition of the embedded word. This was true both for carriers containing a real word (*DEFinite*) and for carrier words containing a near-word (*DAffodil*). Thus, not only did carrier words activate embedded words, which could not be sufficiently deactivated, but carrier words even activated words that were not actually embedded in them. These results again demonstrate the exacerbation of lexical competition in L2 as compared with L1 listening.

1.3 Using the first phonology

1.3.1 L1 phonemic repertoires and phonetic processing

Wagner continued her Ph.D. project on the role of the size and structure of the native phoneme inventory in phoneme perception. Previous experiments (Annual Report 2004: 8-9) have shown that listeners adapt phonetic processing to the requirements of the native phoneme repertoire, leading to language-specific patterns in how phonemes are identified. New comparisons between listeners with different native backgrounds were undertaken to seek general rules behind these language-specific patterns. Speakers of Catalan, Dutch, English, Polish, and Spanish detected phonemes in nonwords constructed from three vowels (/a, i, u/), three stop consonants (/p, t, k/), and two fricatives (/f, s/); these phonemes all occur in each language tested. For all listeners, stop consonants were detected faster than were vowels, which were in turn detected

faster than fricatives. These differences can be attributed to the acoustic properties of these phoneme classes, and hence to general differences in the auditory processing of rapidly changing versus steady-state sounds.

In addition, phoneme class size within phoneme repertoires affected detection speed and accuracy: more contrasts in a given class made detection of phonemes from that class slower and less accurate. Thus language-specific distributional effects can modulate differences between phoneme classes which stem from general acoustic properties. Dutch, for instance, has relatively many vowel contrasts and relatively few fricative contrasts; this proportional relationship affects the relation between these phoneme classes, over and above the general acoustic differences between vowels and fricatives. Speed and accuracy of phoneme identification is thus dependent both on language-general factors such as the acoustic properties of the phoneme class, and on language-specific factors such as the distribution of phonemes within each phoneme class. The language-specific patterns are further governed by an effect of the number of contrasts in the phonemic inventory.

1.3.2 L1 rhythm and speech segmentation (the rhythmic class hypothesis)

Listeners draw on native-language rhythm in segmenting speech; in different languages, stress-, syllable- or mora-based rhythm is exploited. The rhythmic class hypothesis proposes that languages with similar rhythmic structure will be processed similarly, irrespective of other relationships. Most studies addressing this hypothesis attempt to compare languages on metrics derived from measurements of speech materials. As previously described (Annual Reports 2001-2002), another approach is to examine whether perceptual effects observed in one language can also be detected in other languages with putatively similar rhythm. Such perceptual similarity has indeed been established by Cutler, Murty (U. York), and Otake (E-Learning Laboratory) for the rhythmically similar (but unrelated) languages Japanese and Telugu, both of which are said to display mora-based rhythm (Annual Report 2002: 8-9), and by Cutler with Kim and Davis (both U. Western Sydney) for French and Korean, which again are unrelated, but said to have syllable-based rhythm. Experiments in which Korean listeners heard Korean speech, and detected pre-specified target fragments, were described previously (Annual Report 2001: 8); the listeners displayed significantly higher accuracy for fragments which corresponded to word-initial syllables than for fragments which were smaller or larger than a syllable. Such a pattern of results has also been observed for French listeners, and is customarily interpreted as syllabic segmentation. In a new experiment by Cutler with Kim and Davis, Korean listeners performed the same task with French input. Again, their response accuracy showed the syllabic

pattern. Thus Korean and French listeners appear to command similar procedures for speech segmentation, in accord with the proposal that phonological structure affects listeners' speech segmentation, and does so similarly in languages with similar rhythm. These results further suggest that the segmentation difficulty often associated with listening to a nonnative language may not occur if the nonnative language is a member of the same rhythmic class as the native language.

However, segmentation difficulty also does not always appear across two languages from different rhythmic classes. Previous work by Otake showed that Japanese listeners misapply their native moraic segmentation procedure to French; but new results reported by Cutler, Kim, and Otake show that they do not misapply moraic segmentation to Korean even though it too is a language with syllabic rhythm. Japanese listeners presented with the Korean materials used in the Korean/French study were very good at detecting the specified targets, but their results in no way suggested application of moraic segmentation. The proposed explanation of the cross-language difference is that the phonemic sequences in the Korean input were too far from Japanese phonological legality for a match to native-language expectations to be possible. Thus it may be that listeners only draw on native segmentation heuristics when encouraged to do so by the structure of the speech input they are presented with. Where the phonological structure of a nonnative input affords a match to structural expectations from the native language, listeners are encouraged to apply the heuristics which have proved to make native speech recognition more efficient.

1.4 Adjusting an already acquired phonology

1.4.1 Retuning phonetic categories: Effects of training variability

When we listen to speech, we must adapt to each talker's idiosyncratic realizations of phonemes. Part of this adaptation is achieved by a lexically-driven retuning of phoneme categories, as previous research in this project has shown (Annual Reports 2001-2005). In part of his Ph.D. project, Stevens (Ghent U.) asked how stimulus-specific this perceptual learning effect is. One experiment replicated the original study of Norris, McQueen and Cutler (Annual Report 2001: 6). Flemish listeners made lexical decisions to stimuli including 20 /s/-final and 20 /f/-final words. One group heard the same ambiguous phoneme (halfway between /s/ and /f/) in all the /s/-words; a second group heard this sound in all the /f/-words. The first group subsequently categorized more sounds on an /s/-/f/ continuum as /s/ than the second group, confirming that listeners can retune phoneme categories using lexical knowledge. A second

experiment was identical, except that during exposure, a different ambiguous /s-/f/ sound was used in each lexical context. Under these conditions, no difference in categorization between the groups emerged. Other studies (e.g., Kraljic & Samuel, 2005) have shown, however, that lexical retuning can occur with exposure to a variety of ambiguous sounds. Thus, while there are conditions where lexical retuning emerges in response to a set of exposure phonemes, the present results show that it can also be specific to a single ambiguous sound.

1.4.2 Retuning phonetic categories: Effects of positional variability

For many consonants, pronunciation varies as a function of position in the syllable. Using the same lexically-guided perceptual learning paradigm as Stevens, Jesse and McQueen investigated whether lexically-guided adjustments of phoneme representations to the idiosyncrasies of a particular speaker are position-specific or generalize across syllable positions. In previous studies with this paradigm, the ambiguous sounds occurred in the same (coda or word-medial) position during both training and test, although transfer to coda position was also found when the position of the ambiguous sound during training was free to vary (Annual Report 2005:13). Jesse and McQueen examined the transfer of adjustments from phonemes in onset position during training to phonemes in coda position at test. In the training phase, listeners performed a lexical decision task which included a critical set of /s/-initial and /f/-initial words in which an ambiguous sound midway between /f/ and /s/ replaced the /s/ in the /s/-words for one group of listeners, and the /f/ in the /f/-words for another group. If adjustments generalize across positions, this training with onset phonemes should lead to the same results as previously produced by training with coda phonemes: listeners in the first group should show an /s/-bias in categorizing tokens from an /ɛs-/ɛf/ continuum, while listeners in the second group should show an /f/-bias. The size of the bias was compared to that previously found by Eisner for coda-to-coda generalizations using the same recordings of the /ɛs-/ɛf/ test continuum (Annual Report 2003: 8). The same speaker as in the Eisner study was used in the experiment. The size of the bias varied as a function of phoneme position: The bias was substantially smaller when learning had to be transferred across positions (onset to coda) than when phoneme position was the same at training and test (coda to coda). Furthermore, the bias was constrained to the sound in the continuum that was most similar to the ambiguous sound presented in training.

1.4.3 Perceptual learning: Effects of concurrent written input

Further extending this line of research on lexically-guided perceptual learning, Mitterer and McQueen investigated adaptation to an unfamiliar accent in an L2 by media exposure with added subtitles. Subtitles may facilitate adaptation to a new accent, if they allow listeners to interpret unfamiliar phoneme realizations. In the subtitles experiment, Dutch listeners watched videos showing either an Australian sit-com or excerpts from a British movie situated in Scotland; both had heavily accented English (Australian and Scottish, respectively). The video material was presented either without subtitles, with subtitles in English, or (only in the case of the Scottish English video) with subtitles in Dutch. In a subsequent test phase, all participants were tested on both accents; thus each group served as the other group's control. The test required listeners to repeat audio excerpts; these could be taken from the material presented in the relevant exposure phase, or from other material from the same speaker.

The results showed first that there was adaptation to the unfamiliar English accent independent of whether there was concurrent written input: all listeners exposed to either accent were better able to repeat audio excerpts spoken in the accent they had heard than in the other accent, and this was true even for previously unheard excerpts. Second, listeners who saw English subtitles with the Australian video were better at repeating excerpts that have been heard before than at repeating new excerpts, suggesting that the subtitles had assisted comprehension of the video. Third, listeners who saw Dutch subtitles with the Scottish video were as good at repeating previously heard excerpts as listeners with no or English subtitles, but were worse than these two groups on repeating new excerpts, suggesting that the Dutch subtitles reduced adaptation to the unfamiliar accent. This result obviously has considerable applied implications: It suggests that media exposure best facilitates L2 learning if users opt for L2 subtitles, thereby striking a balance between comprehending the movie or sit-com and tuning in to the possibly unfamiliar accent.

CHAPTER 2

DECODING CONTINUOUS SPEECH

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Joint research with other projects:

Phonological Learning for Speech Perception
Multimodal Interaction

Introduction

The Decoding Continuous Speech (DCS) project continues to examine how listeners crack the speech code. As in 2005, research has focused on three themes: segmental decoding (2.1), suprasegmental decoding (2.2), and lexical decoding (2.3). Continuous-speech processes, in particular reduction (where one or more segments can be partially or completely deleted from a word), have remained a major focus. Recent studies suggest that listeners use phonetic context (2.1.1) and contextual predictability (2.1.2) when decoding reduced forms of words, and have explored the role of lexical frequency in reduction (2.1.3). New lines of research concern the relationship between voice processing and segmental decoding. In particular, we have shown that voice discrimination may be determined, at least in part, by differences among speakers in how they produce particular segments (2.1.4), and that a component of the benefit that listeners have when they hear words repeated by the same speaker is due to within-speaker repetition of the individual segments of those words (2.1.5).

One important contribution of this research on segmental decoding is that it confirms the view developed in recent years in the DCS project that spoken-word recognition is modulated by fine-grained phonetic detail in the speech signal (e.g., residual information about a reduced segment, or voice-specific elements in speech sounds). Another key factor governing the phonetic form of any spoken utterance is the utterance's prosodic and intonational structure. Research on suprasegmental decoding has made progress in addressing how prosodic information influences comprehension of continuous speech. In particular, we have been examining how segmental and suprasegmental aspects of the speech signal are integrated during word recognition. There are therefore projects showing that prosodic factors affect how German listeners resolve lexical ambiguities created by voicing assimilation (2.2.1), that consonant duration in Italian modulates both segmental and suprasegmental decoding (2.2.2), and that infrequent intonation contours hinder comprehension (2.2.3). Other research under the suprasegmental heading has revealed which acoustic signatures of lexical stress Dutch listeners use when recognizing English words (2.2.4).

Words are the key to the speech code. Since words bridge the gap between sound and meaning, speech comprehension depends on word recognition. Lexical decoding thus lies at the heart of the DCS project and at the core of the research summarized in 2.1 and 2.2. One line of research on lexical decoding has continued to examine if listeners use lexical knowledge to compensate for

coarticulation between speech segments (2.3.1). Other work on lexical decoding has continued to examine the time-course of retrieval of different components of lexical knowledge during the comprehension process (2.3.2). Last but not least, computational work on lexical decoding has led to the development of a new version of the Shortlist model of speech recognition, one based on Bayesian principles (2.3.3).

Two Ph.D. projects were completed in 2006. Shatzman defended in April and Pluymaekers will defend in June 2007. Brouwer and Reinisch began their Ph.D.s in September and October respectively. Janse brought a three-year NWO-funded VENI project to the Institute; the project is on speech decoding problems in elderly listeners. In December, Ernestus left the Institute to lead a five-year EURYI-funded project on continuous-speech processes at Radboud U. Nijmegen.

2.1 Decoding segmental information

2.1.1 Use of following context in recovery from /t/ deletion

Mitterer and McQueen joined together two threads of previous research, one on the use of printed words in the visual-world paradigm (see Annual Report 2005: 21-22), and the other on perception of word-final /t/-reduction (Annual Reports 2004-2005). Previous production studies have shown that reduction of word-final /t/ is conditioned both by preceding and by following context, so that it is most likely to occur after /s/ and with a bilabial consonant in the onset of the following word. In previous perception studies using a simple phonetic-identification task, compensation for /t/-reduction seemed to take preceding context into account, but not following context. Mitterer and McQueen therefore investigated whether an effect of following context might appear if listeners do not focus on the acoustic details of the speech signal – as necessary in a phonetic-identification task – but instead on the interpretation of the sentence. Participants were presented with displays on a computer screen such as in the left panel of Figure 2.1 and with spoken instructions such as "*Klik op het woordje bul boven de ster*" ('Click on the word diploma above the star'). This instruction is temporarily ambiguous, because *bult* ('lump') may undergo /t/ reduction and thus sound very similar to *bul* in this context. The eventual target, however, is unambiguously specified by the prepositional phrase *boven de ster*, although, given this display, only the last word gives the target away with certainty. In the preceding window of uncertainty, listeners were more likely to look towards the word with a word-final /t/ if the positional preposition was *boven* – starting with a bilabial consonant that facilitates /t/-deletion – than when the preposition was *naast* ('next to'). This result is displayed in the right

panel of Figure 2.1, which shows the mean distance between the word with final /t/ (e.g., *bult*) and the position of the eye fixation on the screen. The vertical marks indicate the temporal unfolding of the instructions, showing that fixations moved closer to the words with final /t/ just after listeners heard the preposition *boven*. This indicates that listeners do take following context (as well as preceding context) into account when compensating for reduction of word-final /t/. Such findings are problematic for episodic models of word recognition, because such models leave little room for phonological context effects that span word-boundaries.

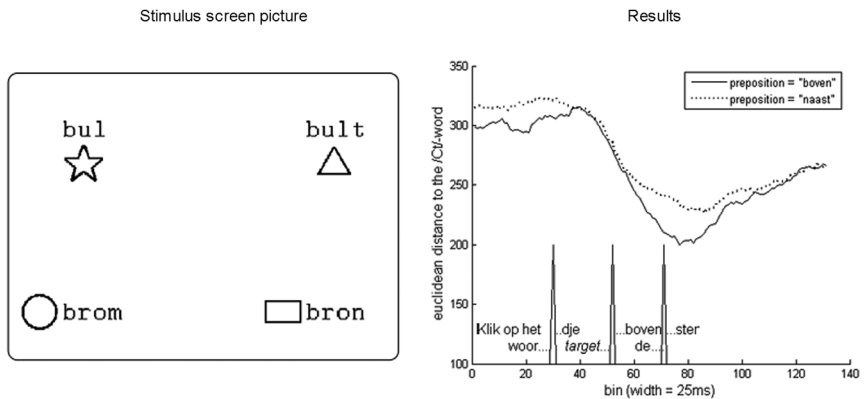


Figure 2.1: Example visual stimuli from the /t/-deletion study, and its results.

2.1.2 Frequency and predictability effects on reduction of Dutch affixes

Pluymaekers finished his Ph.D. project on the relationship between probability of occurrence and the reduction of affixes in spoken Dutch. As a follow-up to an earlier experiment (Annual Report 2005: 18), he conducted a production experiment in which participants had to categorize stimuli as nouns or verbs by means of a prelearned verbal response, which always contained the suffix *-lijk*. The frequencies of the stimulus words and the response words were manipulated independently. Acoustic analyses of the verbal responses showed that the duration of the suffix *-lijk* was shorter the higher the frequency of the response word. However, suffix duration was not affected by the frequency of the stimulus word. This shows that the effect of frequency on affix reduction is indeed related to the speech production process, rather than merely a result of the tendency, driven perhaps by perceptual processes, to make shorter responses when stimuli are higher in frequency.

In a separate line of research, Pluymaekers investigated whether words that have undergone durational and/or segmental reduction are recognized faster the more predictable they are given the following word. This research was motivated by the observation that, in speech production, higher predictability given the following word leads to more reduction. In two perception experiments, subjects were presented with four-word sentences in which the predictability of the reduced third word given the fourth word was manipulated. The production pattern was indeed mirrored in perception: Reduced words were recognized faster the more predictable they were given the following word. This was true even when the acoustic properties of the target words were strictly controlled. Another form of predictability arises from the morphological productiveness of an affix. A corpus study revealed that the duration of the /xh/-cluster in the Dutch suffix *-igheid* is longer the denser the morphological paradigm of the base word. This probably reflects the higher information load carried by suffixes occurring in dense morphological neighborhoods.

2.1.3 Lexical frequency in processing reduced words

Previous research has shown that words tend to be acoustically more reduced the higher their frequency of occurrence (Annual Reports 2004, 2005). Ernestus, Baayen (Radboud U. Nijmegen), and Hanks (Free U. Amsterdam) investigated the role of a word's frequency of occurrence in the comprehension of reduced words. For Experiment 1, a speaker recorded 36 pairs of Dutch phonologically similar words starting with one of four prefixes. One member of each pair was of high frequency and the other was of low frequency. Two versions were recorded for every word: a carefully articulated version and a version in which especially the prefix was highly reduced in a prescribed way (e.g., *ver-* was pronounced as *f-*). Because the speaker reduced the high-frequency words more than the low-frequency words, several splicing manipulations were applied to the recordings, crossing the prefix of the low-frequency member of a pair with the stem of the high-frequency member, and vice versa. Lexical decisions, measured from acoustic word onset, were faster for the carefully articulated versions than for the reduced versions, and faster for the high-frequency words than for the low-frequency words. Importantly, the durations of the words (reflecting above all acoustic reduction) were negatively correlated with the response latencies, especially for the high frequency words. The advantages accruing from high frequency and long duration apparently are not simply additive: The combination of the two leads to even faster word recognition. For Experiment 2, the same speaker recorded 127 words starting with one of 11 prefixes. She again recorded two versions: one at a low speech rate (little reduction) and one at a high speech rate (much

reduction). No splicing was applied to these words and frequency was treated as a covariate in the analysis. This lexical decision experiment replicated the findings from Experiment 1. The combined results show how frequency influences the identification of reduced words versus unreduced words: Higher frequency is less beneficial for reduced than for unreduced forms. In addition, they falsify the hypothesis that the frequency effect in production is listener-driven: Since listeners did not recognize reduced words more easily when the words were of a higher frequency, it cannot be that speakers allow themselves to reduce high-frequency words more than low-frequency words because of the listener. Speakers probably reduce especially high-frequency words simply because they have had more practice producing those words.

2.1.4 Voice discrimination based on speech sounds

Previous research on voice discrimination has primarily been concerned with the role of nonsegmental cues, such as fundamental frequency and speech rate. Perception of a voice, however, almost always entails perception of segmental content. It is therefore important to ask whether voice discrimination is at least in part based on voice-specific segmental information. As part of his Ph.D. research, Andics has run an experiment investigating this question. Dutch listeners were presented with Dutch CVC words pronounced by young male native speakers of Dutch with no recognizable regional accents. Segmental overlap between the words was systematically varied using the words *met*, *mes*, *mot*, *mos*, *let*, *les*, *lot*, and *los*. Presentation was blocked by word. Listeners had a one-back-task: They had to decide whether the voice they heard was the same as or different from the previous voice. Significant differences were found between words in hit proportion for different-voice pairs, suggesting that phonetic content influences voice discrimination performance. These differences were present in every phoneme position within the syllables. In onset position /m/ was more useful for successful discrimination than /l/, in vowel position /ɛ/ was more useful than /ɔ/, and in coda position /s/ was more useful than /t/. Acoustic measurements are being made to judge whether these benefits are caused by greater between-speaker variability in the articulation of the phonemes /m,ɛ,s/ than in the other three phonemes. This experiment also demonstrated that prototypicality is a stable property of a voice: When the listeners were randomly split into two groups, the voice discriminability ratings (as determined by hit proportion on different-voice pairs for each voice) across those groups showed a high correlation ($r > 0.88$). Correlational and multi-dimensional scaling methods suggest in addition, however, that segmental cues can influence the perceived prototypicality of a voice. That is, how discriminable people's voices are may depend on what they are saying.

2.1.5 Are voice-specific priming effects lexical or prelexical?

Jesse and McQueen, in collaboration with Page (U. Hertfordshire), investigated voice-specific priming effects. Previous experiments have shown that words have a greater recognition advantage when repeated in the same voice than when repeated in a different voice. This evidence has been taken as support for the claim that lexical representations are based on memory for individual exemplars. But some of these experiments failed to show reliable voice-specific effects on word recognition, and none of them fully addressed where in the lexical access process voice-specific priming arises. A new lexical decision experiment therefore examined the reliability and locus of voice-specific effects. Block 1 contained words and nonwords, half of each presented in a male voice, and half in a female voice, and with stimuli varying across four subject groups. Block 2 was identical across groups and included a set of words which (as a function of the contents of Block 1) were either same-voice repetitions, switched-voice repetitions, new words comprising re-orderings of phonemes used in the same voice in Block 1, or new words comprising previously unused phonemes. It was predicted that, if voice-specificity influences lexical access, lexical decisions to same-voice repetitions should be faster than to switched-voice repetitions, and that, if such a benefit exists and reflects storage of sublexical rather than lexical exemplars, the same-voice benefit for repeated phonemes in new words should be as large as that in word repetitions. Results showed a benefit for words repeated by the same speaker as well as for words consisting of phonemes repeated by the same speaker. This provides evidence for storage of sublexical exemplars.

2.2 Decoding suprasegmental information

2.2.1 Effects of prosodic structure on perceptual compensation for voice assimilation

Kuzla continued her Ph.D. project on the role of prosodic structure in the production and perception of devoiced word-initial fricatives in German. In this language, the difference between /f/ and /v/ distinguishes between words (e.g., /fain/ 'fine' versus /vain/ 'wine'). However, /v/ can be devoiced after /t/ across word boundaries, and this assimilatory devoicing may make recognition of the intended word harder. As Kuzla's previous research has shown (Annual Reports 2003-2005), prosodic structure constrains assimilatory devoicing in speech production, such that frequency and degree of devoicing are higher across word boundaries than across phrase boundaries. Listeners appear aware of this role of prosody in production, as they showed sensitivity to prosodic boundary size in their compensation for assimilation in a phoneme categorization task.

The perception of devoiced forms was further investigated in a cross-modal priming experiment. In contrast to phoneme categorization, cross-modal priming can provide insight into the on-line processing of potential lexical ambiguities caused by assimilation. Listeners heard, as primes, devoiced /v/-initial words in assimilation and nonassimilation contexts in two prosodic conditions (either a word boundary or a phrase boundary before the prime). Lexical decisions on /f/-initial target words were, as predicted, faster in non-assimilation contexts than in assimilation contexts, indicating that the /v/-initial lexical competitors were activated more strongly in assimilation contexts. This effect, however, was observed at prosodic phrase boundaries but not at word boundaries, where segment durations (or interstimulus intervals) may have been too short to allow for the emergence of compensation effects. Furthermore, at phrase boundaries, responses to /f/-initial targets, relative to an unrelated priming condition, were inhibited in assimilation contexts, but not facilitated in nonassimilation contexts. This suggests that /f/-initial words and /v/-initial words (due to residual acoustic cues to /v/) were activated in both contexts, but that this lexical ambiguity was resolved in favor of the /v/-initial words only in the assimilation contexts, due to perceptual compensation for assimilation.

2.2.2 Geminate and singleton consonant durations in Italian word recognition

Consonant duration is a correlate of prosodic structure and, as has been shown in a number of languages, acts as a cue to the location of word boundaries in connected speech. In Italian, however, consonant duration is the major acoustic correlate of the geminate-singleton segmental contrast. This feature therefore makes Italian an interesting test-case to investigate whether the same type of prosodic information might act at different levels of processing during spoken-word recognition. In an ongoing series of cross-modal fragment priming experiments (see Annual Report 2005: 23-24), Tagliapietra and McQueen have thus been examining whether consonant duration in Italian is used both as a suprasegmental cue to word boundaries and as a segmental cue that acts to distinguish words with versus without geminate consonants. In the latest experiment listeners heard utterances ending in word fragments such as "*Il titolo del libro era l'allie...*" ('The title of the book was the allie...'), and make lexical decisions to visual targets containing geminates (e.g., *ALLIEVA*, 'pupil'), presented at the acoustic offset of the prime fragments. The last consonant of each prime was cross-spliced with other tokens of long and short consonants of four different durations, taken either from word-medial position (long, true geminate: *allieva*, 'pupil'; short, medial singleton: *aliena*, 'alien') or from a word

boundary (long, false geminate: *al lieto*, 'to the happy'; short, initial singleton: *a lieto*, 'to happy'). Priming effects, relative to an unrelated prime condition, were stronger in the long than in the short consonant conditions, suggesting that Italian listeners use duration to distinguish words that contain either a geminate or a singleton. But priming effects were also stronger in the true-geminate condition than in the false-geminate condition, suggesting that Italians also use duration as a cue to the location of word boundaries.

2.2.3 Infrequent sentence intonation hinders word comprehension

In collaboration with Dainora (Massachusetts Institute of Technology), Braun and Ernestus continued their investigation into how intonation affects word comprehension for languages in which intonation does not distinguish between words. Their previous studies (Annual Report 2005: 25) showed that visual lexical decision following an auditorily presented sentence is slower when this prime sentence is presented with an infrequent intonation contour (imitated sine intonation) compared to normal intonation, but this effect of intonation was observed only when the reaction time (RT) to the previous trial was long (e.g., for a previous RT of 1800 ms, the effect of intonation was 70 ms, but this effect was reduced to 0 ms for a previous RT of 810 ms).

Based on these findings, Braun, Ernestus, and Dainora hypothesized that the effect of an uncommon intonation is more detrimental when listeners employ deeper processing. They tested this hypothesis in a follow-up experiment. Listeners first heard sentences with either a normal or imitated sine intonation and then performed a semantic-category judgment task, instead of lexical decision. The results showed that, independent of RT on the preceding trial, participants were 15 ms slower for sentences with an infrequent intonation contour compared to those with normal intonation. This pattern of results suggests that interpretation of the words in a sentence is mediated by the overall intonation contour. Since the effect of intonation is stronger for semantic tasks than for lexical decision, it is suggested that it results from the semantic integration of word meaning and intonation.

2.2.4 Acoustic signatures of lexical stress in English

Although English and Dutch have similar prosody, some differences have perceptual consequences. Lexical statistics show that considering lexical stress in spoken-word recognition removes a greater proportion of competitors in Dutch than in English (Annual Report 2005: 10-11). In consequence, Dutch listeners pay more attention to these cues, such that they actually outperform native listeners in identification of syllable stress in English (Cooper; Annual Report 1998: 7-8). Cutler and Wales (LaTrobe U.) undertook follow-up analyses

of the word pairs used in Cooper's identification experiment, as well as in cross-modal priming (Annual Report 2000: 10-11) and gating (Annual Report 1998: 8), in an attempt to discover which acoustic cues Dutch listeners exploit. Measures of the initial syllables of the pairs showed that the first syllables with primary stress (e.g., *mus-* from *music*) had significantly longer duration, higher F0 and greater intensity than the syllables with secondary stress (e.g., *mus-* from *museum*), and primary-stressed syllables also had a greater proportion of energy in the high-frequency spectral regions; however, the syllable types did not differ on measures of pitch or amplitude movement. The difference between the two initial syllables of each pair on the duration, F0 and intensity measures was indeed associated with the number of correct decisions made to each syllable by the Dutch listeners in the identification task. The F0 difference measure was also associated with responses in cross-modal fragment priming: the greater the difference in mean F0 between paired syllables, the longer Dutch listeners took to accept a secondary-stressed word (e.g., *MUSEUM*) after a mismatching primary-stressed prime (e.g., *mus-* from *music*). None of these effects were visible in native listener responses. The gating data did not produce a large enough response set to support similar correlation analyses. However, the priming and identification data both suggest that acoustic cues which distinguish primary- vs. secondary-stressed syllables in English are better exploited by Dutch than by native listeners.

2.3 Lexical decoding

2.3.1 Lexical involvement in compensation for coarticulation in fricative-vowel syllables?

Following his earlier investigation on phonological mediation of compensation for coarticulation in fricative-vowel syllables (Annual Report 2004: 15-16), Mitterer investigated to what extent the lexicon influences compensation for coarticulation. In the earlier work, it was shown that an ambiguous fricative is more likely to be labeled as /s/ than as /ʃ/ (as in Dutch *sjaal* or English *she*) if it is followed by the rounded vowel /y/ than if it is followed by the unrounded vowel /i/. This occurred irrespective of whether the perception of the vowel as rounded was driven by its acoustic make-up or by an accompanying visual display. That is, there was a nonauditory influence on compensation for coarticulation. Mitterer therefore now investigated whether there was also a lexical influence on compensation, specifically, whether lexically-driven perception of the vowel as rounded would lead listeners to perceive a following fricative more often as /ʃ/ (e.g., an ambiguous fricative occurring after the ambiguous vowel /ʔ/ at the end of the sequence /mɛnʔ/, where /mɛny/ is the

Dutch word *menu*, id., but /mɛni/ is a nonword). This was the case in a first experiment, in which there was an overall bias towards /y/-responses. When this bias was eliminated in a second and a third experiment, the lexical effect on compensation for coarticulation disappeared. But a lexical-identification shift on the vowel was still observed, so that vowels at end of /mɛn?/ were more likely to be identified as /y/. This indicates that existing reports of lexical effects on compensation for coarticulation need to be interpreted cautiously, and should be replicated independently.

2.3.2 The time-course of access to lexical information

McQueen and Huettig (Ghent U.) continued their series of eye-tracking experiments investigating the time-course of the retrieval of phonological, visual-shape and semantic information during spoken-word recognition. In one of the earlier experiments, Dutch listeners heard words in neutral Dutch sentences while their eye movements to pictures in a visual display were monitored. For instance, given a sentence containing the word *beker*, 'beaker', the display contained a phonological competitor (a beaver, *bever*), a shape competitor (a bobbin, *klos*), a semantic competitor (a fork, *vork*) and distractors with no phonological, shape or semantic relationship (an umbrella, *paraplu*). To boost looks to these competitors, a picture of the word mentioned in the sentence was not displayed. Shifts of visual attention to the phonological competitors preceded shifts to shape and semantic competitors. In a new experiment the relative timing of presentation of the visual displays and the critical spoken words was changed. Instead of the displays appearing at the onset of the spoken sentence, as before, they appeared only 200 ms before the critical words (e.g., *beker*). While there were still preferential fixations of the shape and semantic competitors, the pattern of fixations to the phonological competitors did not differ from that to the unrelated distractors. This change in results probably reflects temporal limitations in the retrieval of phonological information from the visual display (i.e., there was no time for participants to retrieve the name of the phonological competitor picture before that competitor became inconsistent with the speech material). These results thus confirm that eye movements during language-mediated visual search depend on a "tug of war" between matches between information extracted from the visual display and from the speech signal at three (phonological, visual-feature and semantic) levels of processing.

2.3.3 Shortlist B

Norris (MRC Cognition and Brain Sciences Unit, Cambridge) and McQueen have developed Shortlist B, a Bayesian model of continuous speech recognition. It is based on Shortlist (Norris 1994; Annual Reports 1994-2003) and shares many

of its key assumptions: parallel competitive evaluation of multiple lexical hypotheses, phonologically abstract prelexical and lexical representations, a feedforward architecture with no online feedback, and a lexical segmentation algorithm based on the viability of chunks of the input as possible words (the Possible Word Constraint; Annual Reports 1995-2002, 2004). Shortlist B is radically different from its predecessor in two respects, however. First, whereas Shortlist was a connectionist model based on interactive-activation principles, Shortlist B is based on Bayesian principles. Second, the input to Shortlist B is no longer a sequence of discrete phonemes; it is a sequence of multiple phoneme probabilities over three time slices per segment, derived from the performance of Dutch listeners in a large-scale Dutch gating study (Annual Reports 1999-2003). Simulations show that the model can account for key findings: data on the segmentation of continuous speech, word frequency effects, the effects of mispronunciations on word recognition, and evidence on lexical involvement in phonemic decision-making. The success of Shortlist B suggests that listeners make optimal Bayesian decisions during spoken-word recognition.

CHAPTER 3

UTTERANCE ENCODING

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Joint research with other projects:

Decoding Continuous Speech
Multilingualism

Introduction

In 2006, the members of the Utterance Encoding group have completed their projects in the language production group. The questions that have been addressed in their research cover a wide range of topics in language production, such as syntactic processing, morphological processing, and phonological processing. In addition, the work reported here shows the keen interest of the group to explore the intricate relationship between the language production system and other language processing mechanisms, such as reading or sentence processing.

Kempen developed a psycholinguistically inspired approach to the syntax of clause-level coordination and coordinate ellipsis in German and Dutch. Schiller continued his work on the *Masked Onset Priming Effect* in word naming, and extended it to the domain of picture naming. In addition, he continued his work on the processing of syntactic features in language production. Bien completed her Ph.D. project on frequency effects in the production of morphologically complex words, and Sprenger has begun to explore how far the *superlemma theory* of idiom production (Sprenger, Levelt and Kempen, JML, 2006) can be viewed as a more general theory of idiom processing, allowing its application to the domain of idiom comprehension.

3.1 Clausal coordination and coordinate ellipsis in a model of the speaker

In the linguistic literature on coordinate syntactic structures with the conjunction *and*, one often distinguishes four types of coordinate ellipsis: Forward Conjunction Reduction (FCR), Gapping, Backward Conjunction Reduction (BCR; also known as Right Node Raising), and SGF ("Subject Gap in Finite clauses with fronted verb"). In the examples, the presumed ellipsis sites are indicated by dots. At those sites, the elliptical conjunct "borrows" one or more constituents from the parallel conjunct.

- (1) *FCR*: The town [S where Jan lives and ... Piet often works].
- (2) *GAPPING*: Last year, Jan had an office in Leiden and ... Piet ... in Nijmegen.
- (3) *BCR*: Jan wrote one ... and Piet edited two papers this month.
- (4) *SGF*: Why did he change his mind and not ... come?

The main defining characteristics of the four ellipsis types are as follows. In FCR, the anterior and the posterior conjoined clauses each include an overt head verb (*lives* and *works* in 1), and borrowing is restricted to left-peripheral major constituents (in 1 only *where*). Gapping borrows all and only those major constituents that are noncontrastive, and this set must include the head verb (in

2): *last year, had* and *an office*). In BCR, the anterior conjunct borrows one or more – complete or partial – right-peripheral constituents from the posterior one (*paper* and *this month* in 3). SGF is defined as a clausal coordination where the anterior conjunct embodies subject-verb inversion (*did he* instead of *he did* in 4) and the posterior conjunct borrows the anterior clause's subject NP.

Kempen's psycholinguistically inspired approach to the syntax of clause-level coordination and coordinate ellipsis in German and Dutch argues that these ellipses arise at different stages in the production process. To illustrate, in case of Gapping, the conceptual content underlying the head verb of the clause is shared between conjuncts. This also holds for the thematic relations contracted by the verb, and for the mappings from thematic relations onto grammatical functions. Only some arguments or adjuncts need to be replaced or added – in 2 only possessor and location. This means Gapping can come into existence already during the Conceptual Encoding stage of sentence production. FCR ellipsis, however, can only originate in the next stage of sentence production – during Syntactic Encoding. This is because the linear order of the major constituents is a crucial determinant of the selection of ellipsis sites. The Syntactic Encoder does not process the conceptual content underlying the posterior conjunct "from scratch" but attempts to re-use, as much as possible, syntactic constituents forming part of the anterior conjunct (which was already syntactically encoded and linearized before). Going from left to right, it removes from output all re-used major constituents, until it hits upon the first newly encoded constituent. In example (1), the adverbial modifier *where* gets removed, and the Phonological Encoder only needs to process the remainder of the second conjunct (*Piet often works*).

Differential grammatical encoding has a wider scope than coordinate structures. It also underlies elliptical answers to questions (5), appositions (6), and comparative structures (7).

- (5) Q: Who is going to look after the cat? A: Peter today, Suzan tomorrow.
- (6) Steven likes skating better than Anne skiing.
- (7) I'm going to call up my daughters – Kate first, then Iris.

The two remaining types of clausal coordinate ellipsis – SGF and BCR – do not fit the notion of differential grammatical encoding. Kempen (in press) offers empirical evidence for alternative theoretical interpretations, arguing that these phenomena arise in sentence production stages preceding or following grammatical encoding: SGF as part of the formation of communicative intentions, BCR during the phonological encoding stage.

3.2 Orthographic processing in word and picture naming

Schiller continued his work on the Masked Onset Priming Effect (MOPE) in word naming (Schiller, JML, 2004). In a recent study, he found evidence in Dutch supporting the view that the MOPE has a phonological basis. Using the masked priming procedure, Dutch participants named words that started with the phonologically ambiguous grapheme <c> (such as *circel* /srkəl/ 'circle') or *cursus* /kursus/ 'course'), while visually masked primes were presented that had the same phonological and/or graphemic onset. Priming occurred whenever the prime's onset was phonologically consistent with the target (relative to a control prime consisting of percent signs). This was not the case for primes (e.g., *complot* /cɔmplɔt/) that were only orthographically but not phonologically consistent with the target (e.g., *circel*). The results suggest that the MOPE has a phonological basis (Schiller, PBR, in press). That is, consistent with the view of Kinoshita (PBR, 2000), the Masked Onset Priming Effect appears to be based on relatively late speech planning processes.

More recently, Schiller extended this work on the Masked Onset Priming Effect to picture naming. Participants were requested to name pictures while being presented with visually masked primes. According to the response competition view put forward by Forster and Davis (JML, 1991), the MOPE has its locus in the sequential computation of the target's phonology from its orthography. Forster and Davis claimed that the Masked Onset Priming Effect was due to the nonlexical grapheme-to-phoneme conversion. This would predict the absence of such an effect in picture naming, since pictures cannot be named via the nonlexical route. Schiller's results, however, showed that also picture naming produces a Masked Onset Priming Effect. This effect cannot be accounted for by Forster and Davis' proposal, but it is predicted by a speech planning account: The masked onset primes overlapped with the target names and activated segments, i.e. articulatory output units. This were also needed to name the picture, hence the visually masked word facilitated picture naming.

3.3 Processing of syntactic features in picture naming

Schiller extended his work on the processing of syntactic features in language production. This work centers around the gender-congruency effect, which arises when speakers have to generate a gender-marked noun phrase in response to a picture or written target, that is accompanied by a distractor with a different grammatical gender. In an earlier study, Schiller and Caramazza (JML, 2003) offered an alternative account for gender feature competition to account for the gender-congruency effect observed in languages where grammatical gender is marked on determiners that do not depend on the

phonological form of the noun referent (for instance, Germanic languages). Taking Dutch and German as examples, Schiller and Caramazza showed that gender feature competition is unlikely to be the source of the gender congruency effect. Instead, they suggest that the effect occurs at the level of word selection, when speakers need to select the correct word form (i.e., the correct determiner form) to make the appropriate articulatory response. Recently, the same authors (Schiller & Caramazza, LCP, 2006) supported their position with additional evidence from the production of diminutives in Dutch. Interestingly, all Dutch diminutives take the neuter gender determiner form 'het', creating the peculiar situation that a word like *tafel* ('table') takes the common gender determiner form 'de' in its standard form, but 'het' when produced in the diminutive form. Consistent with the determiner congruency hypothesis, neuter gender distractor words like *boek* (i.e. 'book') yielded faster response latencies for common gender targets like *tafel* when produced in their diminutive form than common gender distractor words.

More recently, Schiller in collaboration with Costa (U. Barcelona) demonstrated that free standing and bound gender-marking morphemes are retrieved following different selection principles. This view was put forward by Schiller and Caramazza (JML, 2003) and supported by Costa, Kovacic, Fedorenko, and Caramazza (JEP:LMC, 2003), but has recently been challenged by Schriefers, Jescheniak, and Hantsch (JEP:LMC, 2005). Using definite and indefinite determiner NPs in German, Schiller and Costa aimed to resolve this issue. They exploited the fact that the form of indefinite determiners in German depends on nouns' gender, which surfaces as a bound morpheme attached to the indefinite determiner (e.g., *ein Tisch* 'a table' vs. *eine Tür* 'a door'). Schiller and Costa compared the occurrence of a gender-congruency effect when participants named the same objects with an indefinite and a definite determiner NP in German while ignoring visual distractor words that either matched or mismatched the target in gender. As predicted by Schiller and Caramazza (JML, 2003) and Costa et al. (JEP:LMC, 2003), but contrary to Schriefers et al. (JEP:LMC, 2005), naming the pictures with a definite determiner NP produced a gender-congruency effect, whereas naming the same pictures with an indefinite determiner NP did not (Schiller & Costa, JEP:LMC, 2006). This result seems to support the idea that the retrieval of freestanding gender-marking morphemes is competitive, while the retrieval of bound gender-marking morphemes is not subject to competition.

3.4 Access to morphologically complex words in production

Continuing her Ph.D. project on the production of morphologically complex words with special attention to effects of frequency, Bien studied derivations and inflections.

She measured the production latencies of 124 Dutch adjectives (e.g., *deelbaar*, *krakerig*, *leerzaam*), which were derived from verbs, and 126 regular Dutch inflected verbs (e.g., *gedeeld*, *krakend*, *leer*) using a position-response association task. Participants first learned to associate target words with icons and were then prompted by the icons to name the associated word. Bien analyzed the latencies using stepwise mixed-effects modelling.

For both deverbial adjectives and inflected verbs, the surface frequency of a complex word was not a significant predictor for the production latency of either deverbial adjectives or inflected verbs.

Latencies of deverbial adjectives were named faster when a) their stems occur more often in the lexicon, b) there are fewer words that differ from the stem only in the first phoneme (neighbourhood), and c) there is higher cohort entropy over all words sharing the initial diphone.

Above mentioned b) and c) were also found for the inflected regular verbs, next to an inhibitory effect of inflectional entropy and a general disadvantage of prefixed inflections. With the prefixed forms taken out, there was a nonlinear effect of lemma frequency, which is the sum of frequencies of the inflected variants of a verb. Yielding shortest latencies for medium frequencies, this effect seems to replicate the lemma frequency effect in transparent noun-noun compounds (see Annual Report 2004: 27-28).

Taken together, the absence of surface frequency effects and the significant influences of stem properties suggest that the production of a deverbial adjective involves access to the verbal stem, which suggests on-line decomposition and not full storage of deverbial adjectives. When the to-be-produced word is an inflectional variant, the frequency distribution of all inflectional variants of that verb affects its production. Neighbourhood and cohort entropy effects reflect paradigmatic relations in the mental lexicon and suggest that all word forms influence the production of one specific word form.

3.5 Idiom representation and access in a shared mental lexicon for production and comprehension

Sprenger, in collaboration with Müller (U. La Laguna, Tenerife), continued her research on the processing of idiomatic expressions. According to the superlemma theory (Sprenger, Levelt & Kempen, JML, 2006), the syntactic structure of an idiom is stored in the idiom's superlemma. Assuming that the superlemma theory should – in principle – hold for both idiom production and comprehension, Sprenger and Müller took the syntactic nature of superlemmas as a starting point to explore the time course of idiom comprehension.

They were particularly interested in the consequences that slight syntactic changes in an idiom might have for the reader. They presented participants with idiomatic sentences in a biasing (idiomatic) context. For example: *hij sloeg de spijker op de kop* (he hit the nail on the head). In Dutch, the idiom requires two definite determiners (*de*). However, in two experimental conditions either the first or second *de* was replaced by its indefinite counterpart (*een*). In each case, the resulting sentence is still syntactically correct, but violates the structure of the idiom. As a result, it can only be taken literally.

Sprenger and Müller were interested at what point during reading such a violation will show an effect. In order to violate the syntactic structure of the idiom, the idiom representation (superlemma) needs to be activated. However, if the violation occurs early during the sentence (i.e., on the first determiner), not enough activation from the simple lemmas will have spread to the superlemma. Therefore, no immediate effect on processing is expected. In contrast, violations in a late position in the sentence (i.e., second determiner) are expected to be noticed right away, and to result in substantial processing difficulties.

To test these predictions, self-paced reading times were obtained in an online experiment. The results are shown in Figure 3.1.

In line with the predictions, the graph shows that readers are sensitive to the manipulation, and that the effect depends on the position of the violation in the sentence (early vs. late). In contrast to late violations (*a head*), early violations (*a nail*) do not show an immediate increase in reading latencies. Instead, they show a delayed effect that occurs after the second noun, which is the point of clause integration.

In a follow-up ERP study, the exact nature of the participants' reactions to the violations will be further specified.

Average effects

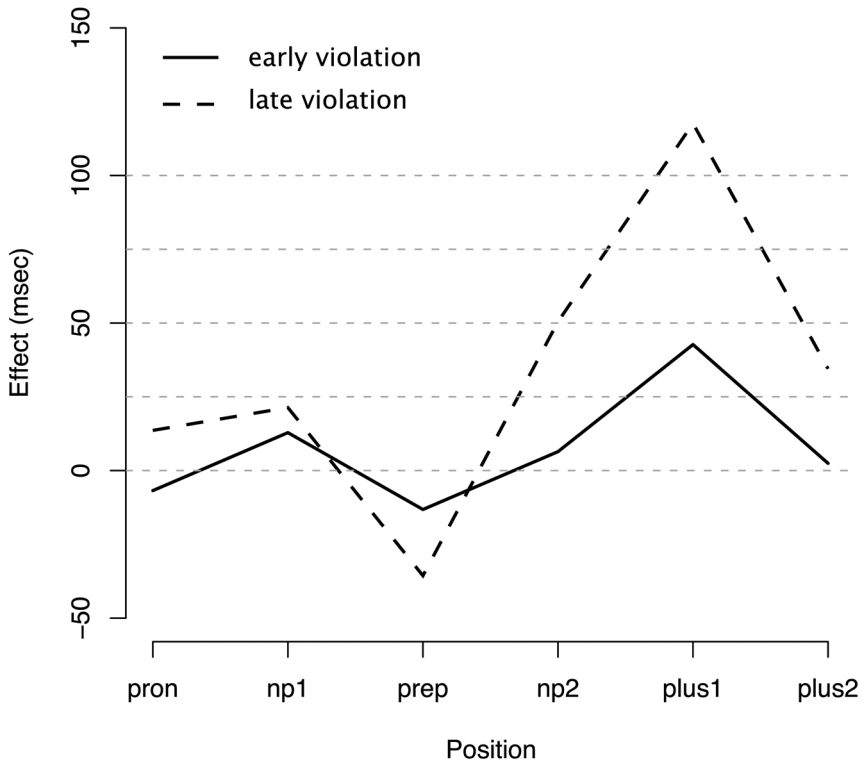


Figure 3.1. Average effects of an online self-paced reading experiment (Sprenger & Müller). See text for further details.

CHAPTER 4

MULTIMODAL INTERACTION

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Introduction

The Multimodal Interaction project investigates the structural and cognitive organization of human interaction. This means focusing on the structures and processes of language and cognition in the context of everyday language use: conversation. The empirical approaches are both field-based and lab-based, both descriptive and experimental. Much of the project's work involves analysis of video-recorded interaction. This introduces two major issues into the purview of linguistics and psycholinguistics. First is the multimodal nature of utterances: Our communicative actions in interaction consist not just of words and grammar, but also paralinguistic cues, hand gestures, eye gaze, etc. Second is the collaborative nature of sequences of utterances in interactional discourse. Conversation is linear yet multi-party, which means that any contribution an interlocutor makes will have to be coordinated with the contributions of others, in terms of both timing and content. This is responsible for a significant degree of the complexity in the production and comprehension of conversation. In addition to these issues of structure and processing in online interaction, the project is concerned with the role of interaction in the development of social cognition and acquisition of language (see section on acquisition).

A general hypothesis pursued in the project is that patterns of human interaction emerge from general principles of social organization. Culturally variant patterns are built on top of this. So, while language structure may vary significantly, usage may have universal properties. A key question is whether there are associations between language structure (e.g. clause-level syntactic structures) and cultural patterns of interaction.

4.1 Questions and their responses

A subproject is devoted to investigating questions in conversation across a wide range of often unrelated languages. A workshop was convened on 'Questions and their responses' (see Chapter 13.2 'Other activities'). This project confirms earlier suggestions that while all languages appear to have both wh-questions and yes-no questions, the nature of these can vary considerably. For example, the inventory of wh-forms can be small or large, and may or may not include, e.g. lexicalized 'when' or 'how' forms. As for yes-no questions, these may or may not be marked in the morphosyntax or in the prosody, and they may or may not be clearly distinct from tag-questions. Questions can be characterized in a multidimensional functional space, using parameters involving, for example, epistemic asymmetry between speaker and addressee, variable commitment to propositions, variable newness of information, and degrees of compulsion to treat the utterance as requiring an answer. Languages seem to carve this space in rather different ways, assigning special forms to different corners of it.

Questions, particularly interrogatives, have been a major topic in linguistics. However, relatively little of this work has been based on the study of questions as they actually occur in conversation. Traditional approaches to questions have been concerned mostly with the structure of the question itself rather than with the structure of the *sequence* that constitutes the question and its response. Once we begin to examine question-answer *sequences*, it is clear very quickly that the analysis of questions is not at all straightforward. Those utterances that are grammatically structured as questions often do not function as questions, and those utterances that function as questions are not necessarily grammatically structured as questions.

A standard assumption might be that if a person asks a question, that person lacks some desired piece of information, and presumes that their addressee can supply it. In terms of the epistemic asymmetry of speaker and addressee, this is the converse of a declarative utterance, where the speaker is supplying the addressee with some new piece of information.



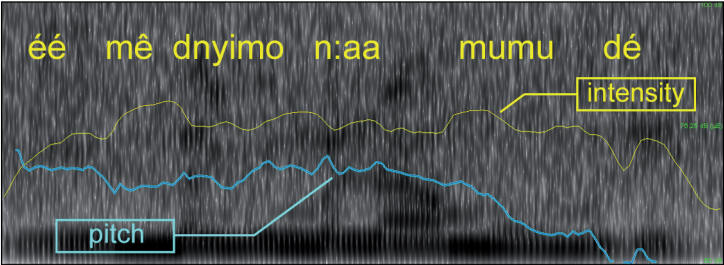
Figure 4.1. Epistemic gradients resulting from asymmetry of knowledge between speaker and addressee. For any proposition (for yes-no questions) or referent (for *wh*-questions), interrogative gradience arises when the speaker’s knowledge is less than the addressee’s (i.e., the addressee knows, speaker does not); declarative gradience arises in the opposite case.

If such an asymmetry of knowledge is sufficiently clear in the context, a speaker may effectively ask a question by simply making a direct statement, as long as the statement is about something that the addressee obviously knows more (or better) than the speaker (e.g. the desires or first-hand experiences of the addressee – e.g., if I am preparing coffee and I look at you, saying *You take cream in your coffee*). Statements which function as questions in this way are common in our corpora of natural conversation in a range of different languages. Linguists often insist that such statement-questions are obligatorily marked with rising intonation, but we found that these statement-questions

occurred very often with falling intonation (e.g. in English, Dutch, and Yélf Dnye). They acquire their interrogative meaning by purely pragmatic means. If it is independently clear from the context that the interrogative epistemic gradient applies (Fig 4.1, above), then a proposition need not be grammatically marked as a question in order to function as one.

Yélf Dnye, the Papuan language of Rossell Island under investigation by Levinson, has no morphosyntactic marking of polar (yes-no) questions. It also does not mark them prosodically in any obvious way (no single natural example has yet been found with rising intonation). Figure 4.2 shows a typical pairing of A's question and B's answer, with pitch and intensity traces superimposed on spectrograms. Notice how in the lexical content (superimposed on the spectrogram), pitch and intensity are all closely matched in question and answer. How then can B know that A's utterance should be taken as a question? Only, it seems, because A is making an apparent assertion about B's domain of expertise (B had been helping visiting biologists check traps).

A: “ee, they would go and check them again?”



B: “those things they would go and check them again”

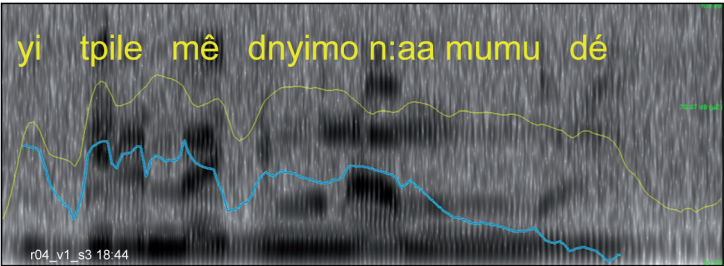


Figure 4.2. Lack of prosodic and morphosyntactic marking of yes-no questions in Yélf Dnye

The interest of this kind of example is the following: Like most languages, more than two thirds of all questions in Yélf Dnye conversation are yes-no questions. Yet, since there is no overt marking of these questions, to detect the

fundamental speech act or illocutionary force of these, the addressee has to compute whether the proposition expressed is or is not part of common ground, and if not, whether it is privileged information to speaker or addressee.

Tag questions are one (perhaps universal) strategy for coding yes-no questions. Enfield, P. Brown, and De Ruiter did a comparative investigation of tag questions based on conversation corpora from three languages and cultures: Dutch (Northern Europe), Lao (Southeast Asia), and Tzeltal Mayan (Mexico). Tag questions are formally similar to statement-questions (i.e., utterances which are formally statements but function as questions; see above). The difference is that with a tag question an explicit marker is tacked on to the end of the proposition – *You take cream in your coffee, do you?*. The question-marking element (*do you?* in this example) is heard by the addressee only after a complete proposition has already been articulated. This contrasts with inversion in English – *Do you take cream in your coffee?* – which signals from the very beginning that the utterance is formally a question. It might be that the maximal lateness of the tag slot allows a speaker to convert a statement into an explicit question at the last moment. But since statements can function as questions with no marking at all, the question becomes: if tags do not simply convert a statement to a question, what do tags really do?

Enfield, de Ruiter and P. Brown showed that the semantics of tag questions manipulate the epistemic dimensions of question-answer sequences in different ways. Tags can convey specific nuances of meaning concerning a speaker's epistemic stance toward the information being questioned, as well as evidential specifications concerning the source of a questioner's doubt. Tags may also convey information of an interpersonal-affiliational kind, making reference to the difference in knowledge between interlocutors, as well as the perceived likelihood that the answer will be 'yes' or 'no' (thus imposing a 'preferred' type of response on the addressee). Looking at both within- and across-language contrasts, the conclusions situate tags as a *semantic* strategy that speakers may employ in asking questions.

Stivers and Rossano addressed a puzzle in the domain of questions arising from the observation that grammatical structure is not a reliable guide to whether an utterance is intended as a question. Examination of conversation corpora shows that many statements are meant to be responded to as questions, and many interrogatives are not. Without grammar as a reliable guide, how does a listener know that an utterance is to be responded to as a question? Stivers and Rossano proposed that this problem can be better thought of not in terms of questions versus nonquestions, but in terms of the degree to which an

utterance puts pressure on a recipient to respond. On a scale of how *response-mobilizing* an utterance is, prototypical questions (e.g., I look at you and say *How old are you?*) are at one extreme end.

Stivers and Rossano examined multimodal conversational corpora in English and Italian and found evidence that the degree to which any utterance mobilizes or coerces a response is a function of a cluster of properties. Syntax is only one feature among a set, including prosody, gaze, the type of action being done by a speaker, and the epistemic gradient (see above). All of these are key resources a speaker may employ in building pressure to mobilize a recipient's response. The more of these elements an utterance has, the more likely it is to elicit a response. Utterances that function as questions typically combine many of these resources. Stivers and Rossano's evidence for this notion of a response-mobilizing cluster of features comes from 1) the typical presence of responses to the response-mobilizing elements in isolation; 2) the fact that most utterances we would think of as questions have several of these elements present; and 3) cases where recipients fail to respond initially, and speakers pursue a response by adding more of these resources to their next turn. For instance, a speaker who states something about his interlocutor (e.g., *You've got a meeting this afternoon at 3.00*) may be expecting her to respond. If he gets no response, he might then direct his gaze toward her, or add a tag question with interrogative syntax and rising intonation (*Don't you?*), or both.

Hoymann continued her Ph.D. research focusing on questions in the endangered language #Akhoe Hai//om, a Khoisan language spoken in Namibia. This research is conducted within the #Akhoe Hai//om project of the DoBeS program, funded by the Volkswagen Foundation, documenting the language and cultural practices of a small community in northern Namibia. In addition to general work on a sketch grammar, describing the phoneme inventory, the word classes and the morphology, Hoymann began analyzing the data on interrogatives collected in 2005. She participated in collaborative work within the Questions subproject. Preliminary #Akhoe Hai//om results reveal that two thirds of the interrogatives uttered in natural conversation are of the *wh*-question type and one third are yes-no-questions. This seems to contrast with most of the other languages in the Questions project that show the reverse distribution.

#Akhoe Hai//om has four main question words: *ham*, *tai*, *tae* and *mâ*. *Ham* and *tai* are used to ask about people. *Tae* and its derivations are used to ask about things and reasons. *Mâ* and its derivations are used to question place, time and manner. These question words can take suffixes that mark the person, gender and number of the "thing" being questioned.

tai-ba ra !âu?

Q:3SM PRES wait

'who is waiting?'

tae /hû-ba?

Q white:3SM

'what white person?'

There are two relatively less frequent interrogative markers: One is the phrase final question marker *kha*. The other is the word *bo* 'or' that can function as a tag question marker:

//haro-gu e bo /ui-gu e?

shoe:3PM TAM or stone:3PM TAM

'are they shoes or stones?'

/âna e bo?

smoke TAM or

'is there smoke?'

Research in the domain of questions and their responses continues, with a comparative corpus study based on a coding scheme developed by Stivers and Enfield. The coding scheme was piloted by project members with about 100 questions from conversational interaction in each of several languages for which we have conversation corpora (including Dutch, English, Hai||om, Italian, Lao, Tzeltal). Initial exploratory discussion was presented at the workshop on Questions and their Responses. This enabled subsequent final revision of the coding scheme. A larger comparative coding is currently under way in a broader set of languages.

4.2 Social intelligence and joint action

Enfield and Levinson convened a workshop 'Human sociality and the four fields' (see Chapter 13.2 "Other Activities"), coinciding with the publication of their edited volume *Roots of human sociality* (Berg, 2006). This extended their interdisciplinary project on human sociality by exploring its relevance to the four fields of anthropology (physical anthropology, archaeology, social anthropology, and linguistics).

Levinson's contribution further developed the idea that underlying human language abilities there is a largely independent capacity he calls the 'interaction engine'. It is this that can be observed in infants before language acquisition, and in those special cases, as in 'home sign', where no conventional language is available to draw on. In these cases, humans are able to communicate without established conventions, building communication systems from scratch (see de Ruiter's contribution below). Prime questions are: How does this work, and what

are the origins of such a capacity? Levinson argues that implicit, de novo communication relies on simulation of the other's comprehension, for which De Ruiter and collaborators now have some positive evidence, including brain localization of these processes. The question of the evolutionary origins of this infrastructure for human communication can be explored using the methods of biological anthropology and archaeology. For example, we can investigate all the species in our family, the Hominidae, and see how the ingredients essential to this kind of simulation can be traced across our nearest relatives, thus implying a gradual accumulation of the prerequisites over a 15 million year time

The evolution of the 'mind-reading' properties

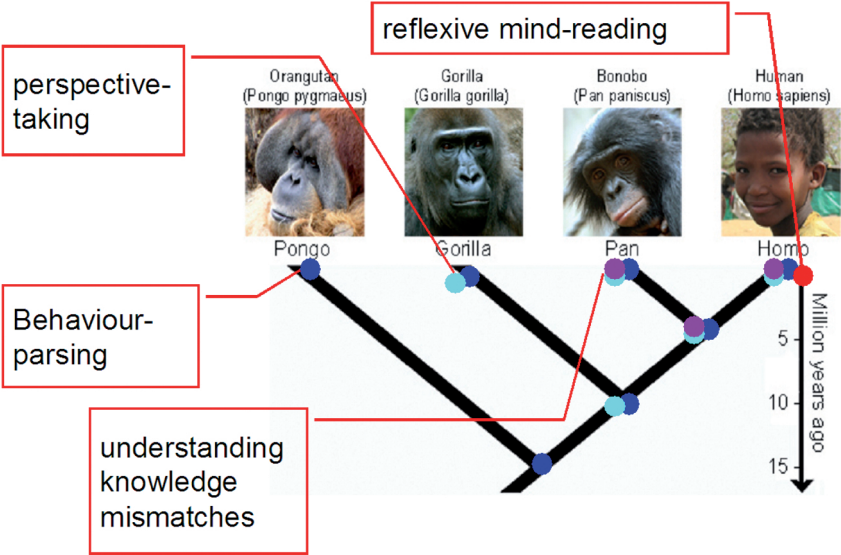


Figure 4.3: The evolution of the 'mind-reading' properties

To some extent it is also possible to trace increasing abilities of these kinds in our own genus *Homo* during the last 1 million years. For example, a crucial precondition to the human interational ability is cooperation, which is highly restricted in the other great apes. First traces of joint action, requiring cooperative meeting of the minds, can be detected for example in the Hunsgi Valley site in India, where *Homo erectus* quarried for handaxe material moving slabs of rock weighing one ton or more. A theory of this sort thus opens up the possibility of tracking the accumulation of these abilities in prehistory.

Enfield's contribution explored some implications of the interaction between two generic imperatives which individuals must endeavor to satisfy in any

conversational setting. An *informational imperative* demands that interlocutors must work to achieve referential convergence to a degree satisfactory for current purposes. An *affiliational imperative* demands that interlocutors must work to appropriately address and maintain the interpersonal relationship which pertains. Enfield explored ways in which these two imperatives are satisfied in the use of language in Lao conversation. In particular, when speakers use highly minimal, elliptical references, their success in achieving reference is a display of the social proximity of the individuals involved. This theme is developed in several contributions to the forthcoming volume on *Person reference in interaction* (Cambridge) edited by Enfield and Stivers.

De Ruiter investigated the cognitive infrastructure of human interaction, in collaboration with Toni and his group at the F.C. Donders Centre for Cognitive Neuroimaging. This is a continuation of De Ruiter's work supported by the EU-funded integrated project JAST (Joint Action Science & Technology). De Ruiter and colleagues developed the *Tacit Communication Game*, a communication task in which a 'sender' tries to communicate with a 'receiver' without using any conventional means of communication such as speech or gesture. All that senders can do to get their messages across is move geometrical figures around in a 3x3 grid which is visible to both players on a computer screen. In an fMRI study, scanning both senders and receivers participating in a Tacit Communication Game experiment, a small and well-defined area of the brain, the right posterior superior temporal sulcus, was active both in senders while they were thinking about how to get their message across, and in receivers trying to decode these messages. This finding supports the hypothesis that in order to make their messages understandable by receivers, senders *simulate* the intention recognition processes that take place in the receiver.



Figure 4.4. Overlap of brain activation in the right pSTS found in the generation (light blue) and interpretation (red) of communicative behavior.

Also in the context of the JAST project, De Ruiter and Lamers ran a number of experiments with a Joint Construction Task to study dialogue behavior during joint activities. The Joint Construction Task is an experimental computer environment in which two participants collaborate in constructing objects out of several parts (comparable to assembling do-it-yourself furniture). The computer environment automatically registers the subjects' assembling behavior. An important clue for subjects in cooperating is the location on the screen of their interlocutor's cursor, which can be used as a pointing device. The two main factors that were varied in the design were a) whether speakers could see their interlocutor's cursor and b) whether speakers knew that their interlocutors could see their (the speaker's) own cursor. It was found that in producing expressions referring to objects, people's formulations of messages take into account what they themselves can see, and not what their interlocutor can see. It appears that in dialogue, speakers presume that co-present interlocutors share the same visual field, even if they are repeatedly informed that this is not the case. This is characteristic of the kinds of 'fast and frugal' heuristics employed in many domains of cognitive processing (e.g. decision-making), supporting the view that the kinds of higher-level interactive intelligence (Levinson 2005) necessary for solving Schelling type games of mutual knowledge need not always be in operation during human interaction.



Figure 4.5. Subjects participating in the Joint Construction Task

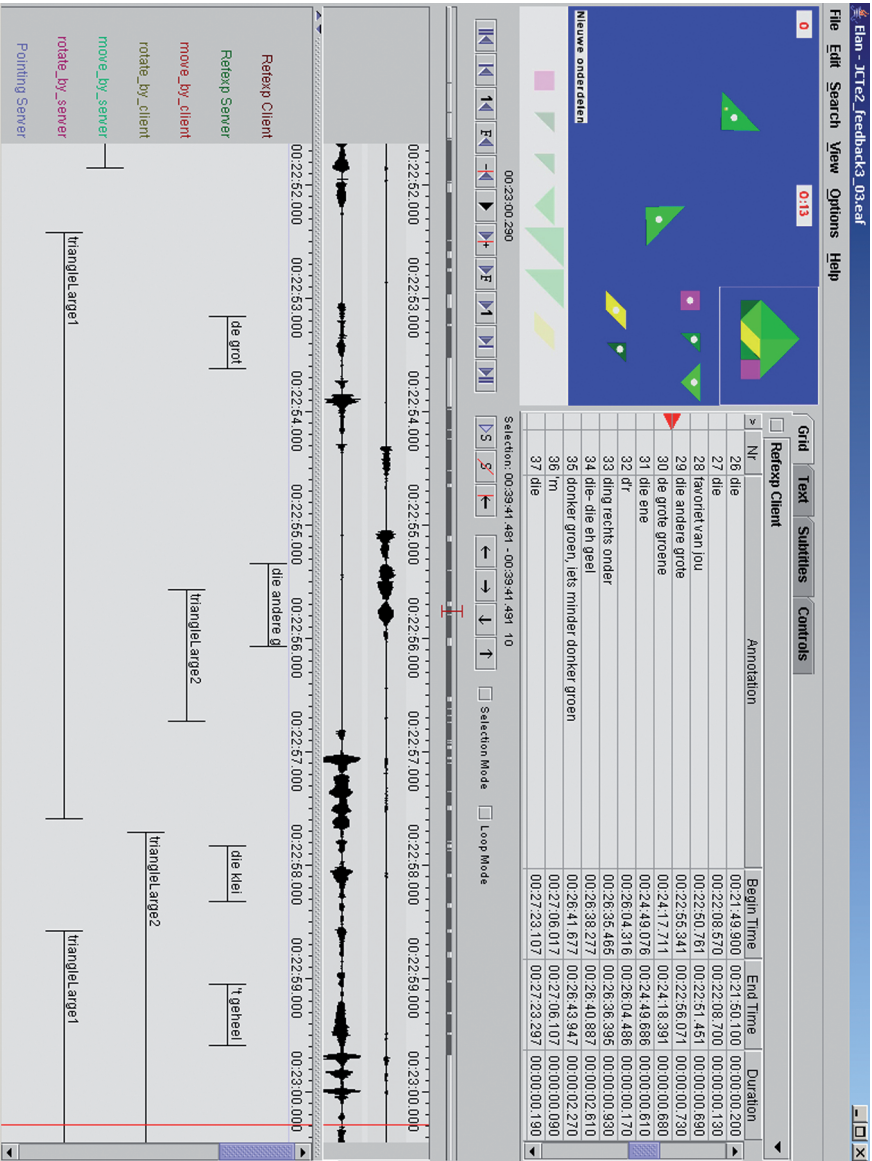


Figure 4.6. Transcription of Joint Construction Task data in Elan

Heinemann, with Lindström (U. Uppsala), examined activity transitions in co-present interactions. Their data, collected in Denmark and Sweden, consist of a corpus of video-recorded situations where one person is assisting another with a practical task, for instance attaching a strainer to a faucet, applying body lotion, making a drawing or putting curlers in hair. Heinemann and Lindström explored how parties come to an agreement that a task has been completed. They found that the person performing the task proposes completion with the particle *så*, or a variation thereof, such as *sådär* and *sådärrå* in Swedish and *sådan* in Danish. *Så* is originally a deictic adverb that can be translated as 'there' or 'like this'. Although it has evolved into a pragmatic particle, its deictic properties are still apparent and it is only through the particle's embeddedness in a temporal and physical context where the end of an activity is otherwise relevant that *så* can be understood as a proposal of task completion.



Figure 4.7. (A): Bente is applying lotion to Maren's back. (B): Bente proposes completion of this task with *så*. Her physical conduct is calibrated with her verbal proposal, so that her hand leaves Maren's back exactly at the point where her articulation of the word *så* is complete. (This is Maren's evidence that Bente is no longer engaged in applying lotion, since Maren cannot see what Bente is doing.) (C): Maren ratifies the proposal for completion with an expression of gratitude (*Tak* 'thanks'). (D): Now that ratification has been granted, Bente deposits the lotion, and then (E) initiates a new task.

These verbal proposals of completion are always accompanied by visible/physical activities that show the task is done. The form of these activities differs, depending on the task involved and whether the co-participant can see the activities performed by the person proposing completion. There is evidence in the behavior of the conversational participants that *så* is done not as a

declaration of completion but as a *proposal* of completion. In particular, *så* typically is responded to with either ratification or rejection. Heinemann and Lindström found that ratification typically takes the form of an evaluation of the performed task (e.g. *That's good*), or an expression of gratitude. If no ratification is immediately forthcoming, the speaker producing the original proposal for closing the activity pursues ratification (but with an orientation to the possibility that the task was somehow not treated as done properly).

Heinemann and Lindström's findings show that task completion is not a unilateral act, controlled by a single speaker. The successful development of such activity-closure sequences require close coordination between participants. Heinemann investigated how people manage the simultaneous carrying-out of multiple activities in a corpus of video-recorded interaction in Danish. Face-to-face interactions allow participants to be simultaneously involved in distinct activities, often through distinct modalities. Participants may, for instance, be engaged in drinking coffee, washing up, digging a trench or doing other visible/physical activities, while talking to each other on a completely unrelated matter. Heinemann found that participants monitor each other and withhold talk related to a physical activity until this talk can be delivered without competing with a simultaneously ongoing verbal activity. This pattern is so consistent that it can be found even in the behavior of very young children between the ages of 1 and 2-years (Kidwell and Zimmerman 2007). However, Heinemann found several exceptions to this pattern, where talk related to a physical activity was delivered in competition with – and interruptive of – the ongoing verbal activity. These exceptions consist of cases where the speaker comments on a co-participant's physical performance of an activity in order to get the co-participant to perform the activity differently (for instance pouring soda into a glass rather than drinking it from the can, or using a different towel for drying one's hands). These findings thus corroborate and extend previous studies of how corrections (or repairs) of *verbal* activities are distributed in interaction.

4.3 Turns and Sequences

Many of the phenomena of concern in this project relate to the collaborative organization of sequences of turns and larger units of speech or action in interaction.

Rossano continued his investigation into the structural organization of eye gaze in two-party conversation, developing his thesis that gaze behavior in interaction is better understood in relation to sequences and courses of action rather than in relation to individual turns of talk (see Annual Reports 2004, 2005). Gaze is a key resource for getting others to cooperate in the

development of specific courses of action in interaction. With an annotated video corpus of Italian conversation, Rossano documented when and how participants in a conversation use gaze to solicit responses, and display where they are in a course of action. When a speaker brings his/her gaze to a recipient during a silence following a first position action (e.g. following either a question like *Did you see him?* or an assessment like *It's delicious*), the speaker signals that a response by the other participant is due. This gaze typically results in a recipient supplying the required response appropriately and quickly. This does not mean that recipients produce a responsive action every time a speaker looks up at them. They produce such responses only in specific sequential environments like after a first pair part of an adjacency pair, after a joke, after a preliminary component of a turn-constructural unit (Lerner 1991, 1996) or after 'recognitional' referential expressions such as proper names. For each of these kinds of conversational moves, a relevant next action by the recipient is to produce a specific (kind of) response or a display of understanding. A function of the speaker's gaze toward the recipient is to increase the perceived relevance of response.



Figure 4.8. (A): Speaker on right of image (driving the car) makes an utterance which warrants a response from the speaker in the back but does not receive one. (B): in pursuit of the response, the driver directs his gaze toward his addressee, and thereby elicits the response (incipient laughter).

This shows that gaze does not simply regulate turn-taking mechanism (e.g. Kendon 1967, Duncan 1972), nor does it have a symbolic function (Bavelas et al. 2002). In these environments, gaze becomes an indexical sign that asks the recipient to consider what occurred before and to supply an appropriate response to that. It was also observed that gaze is usually deployed before other verbal pursuits, suggesting a possible scale of mechanisms for pursuing a response by another participant. This practice therefore provides a partial solution to the interactional problem of how a speaker obtains a response to a specific action.

Magyari started her work as a Ph.D. student in October 2006. Her project applies experimental methods to the study of conversation within the Multimodal Interaction project. She also contributes to the study of conversation by collecting natural conversations in Hungarian. As a first step in her studies she collected dual-track, natural conversations in Hungarian which are similar to telephone conversations (cf. De Ruiter, Mitterer & Enfield 2006). This conversation corpus provides a general measure of the timing of conversational floor transfer in Hungarian. The floor transfer offset (FTO) is defined as the difference between the time a current turn starts and the moment the previous turn ends. The distribution of these values is compared to the data of two other languages from different language families, Dutch and Lao, previously collected by De Ruiter and Enfield.

Enfield continued his research on everyday interaction among speakers of Kariì, a Vietic (Austroasiatic) language of upland Central Laos. In 2006, he collected further hours of video footage of conversation, and built the corpus of transcribed Kariì conversation up to approximately two hours. (See section on Mon-Khmer languages in Chapter 11 on 'Other Research'.)

4.4 Kata Kolok: a village-based sign language of Bali

De Vos started her Ph.D. project on the description of Kata Kolok, a village-based sign language in Bali, Indonesia. The project is part of large-scale investigations on the typology of signed languages being done at the International Centre for Sign Languages & Deaf Studies at the University of Central Lancashire. De Vos set up a field station for video data collection, processing, and annotation. Additionally, she collected data using several existing stimulus sets (Mouse stories, images of spatial arrays), to get initial insight in the language's use of sign space and real space.

Some initial observations were also made on child-directed signing in the village. Caretakers were observed to sign more slowly, repeat signs, and perform them in the child's visual field instead of the normal place of articulation. To encourage production by the child itself signs are performed on the child's body, or by molding the hands of the child to make the sign. This is similar to child-directed signing in larger, urban sign languages such as American Sign Language.

4.5 Acquisition of Interaction

P. Brown continued her work on comparative infant interaction, with further collection of videotaped natural interaction data as well as systematic time samples of caregiver interactions with 9-15 month old infants in two field sites:

Tenejapa, Mexico, and Rossel Island, Papua New Guinea (see Annual Report 2005). The goal of the project is to examine the initial stages of children coming into joint attention with others (cued by gesture, pointing, gaze) in culturally diverse environments, to see whether culturally variable interactional practices have an influence on infant's discovery of the 'referential triangle'. P. Brown also organized a one-day workshop with external collaborators on this project (see Chapter 13.2 "Other Activities").

CHAPTER 5
CATEGORIES AND CONCEPTS
ACROSS LANGUAGE
AND COGNITION

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Joint research with other projects:

Dynamics of Multilingual Processing
Multimodal Interaction

Introduction

The new project "Categories and Concepts Across Language and Cognition (CATs)" has emerged from the prior Space and Event Representation projects, and inherits some of the same focal questions: How does variation in linguistic concepts interact with the underlying cognition, as evidenced in child development and adult functioning? Unlike the earlier projects, CATs abstracts away from any specific domain and instead focuses more sharply on theoretical questions concerning the relationship between linguistic and nonlinguistic representations.

This project is particularly concerned with the nature of categories and concepts in language, in nonlinguistic perception and cognition, and the relationship between them. It focuses on the various congruencies and incongruencies across different levels of cognitive representation – perceptual, conceptual and linguistic. Language has to interact with a wide range of other representation systems – haptic, olfactory, auditory, visual, conceptual – if we are going to talk about the world. Why is it that language is good at describing certain states of affairs (how to get to the cinema, the kinship relation between my grandfather and me), but very limited in other domains (describing smells or faces, for example)? Why are certain perceptual modalities favored in linguistic categories, e.g. visual over haptic or olfactory?

As pointed out above, this project emerged from the prior Space and Event Representation projects. Therefore, this chapter still reports on research that started within these two projects. The first section reports on results of research on space in language and cognition. Section 5.2 reports on motion events and Section 5.3 on reciprocal events topics central to the previous Event Representation project. Section 5.4 introduces a new subproject investigating ethnobiological categories. In Section 5.5 preliminary investigations into "ineffable" categories are reported. Section 5.6 reports on Expressives, 5.7 on narrative and discourse.

5.1 Space in language and cognition

5.1.1 Landscape terms and place names

The Landscape subproject focuses on the linguistic and conceptual categorization of the geophysical environment. Members of the project completed a collection of articles investigating whether there are universal linguistic categories of landscape terms and place names in nine genetically, typologically and areally diverse languages, drawing on data from first-hand fieldwork (Burenhult, ed., special issue of *Language Sciences*, in press; see Figure 5.1). The work has revealed considerable variation within and across

languages in how systems of landscape terms and place names are ontologized, with interesting implications for practical GIS applications. For example, systems vary as to how categories are carved out and what it is that drives this categorization, how place names are generated and what entities receive such names. A major finding emerging from the work is that the geographical environment often lends itself to categorization according to prefabricated cultural or linguistic systems. Specifically, cultural themes or linguistic patterns are imposed on the environment to create, co-ordinate, subcategorize, or contrast landscape categories (see Annual Report 2002: 73-76, 2004: 70-73, and 2005: 64-67). Such systems form a level of representation which do not find any clear equivalent in existing semantic theory. The systems vary in how they are lexically expressed and are referred to generically as *semplates* (a blend of 'semantic templates'). Arguably, such semplates are significant as engines in the structuring of native conception and lexicon.

Although languages differ in how they categorize the landscape, all seem to have proper names for places. This shows the fundamental importance of places and landmarks, due no doubt in part to their central role in navigation, as explored in the next section.

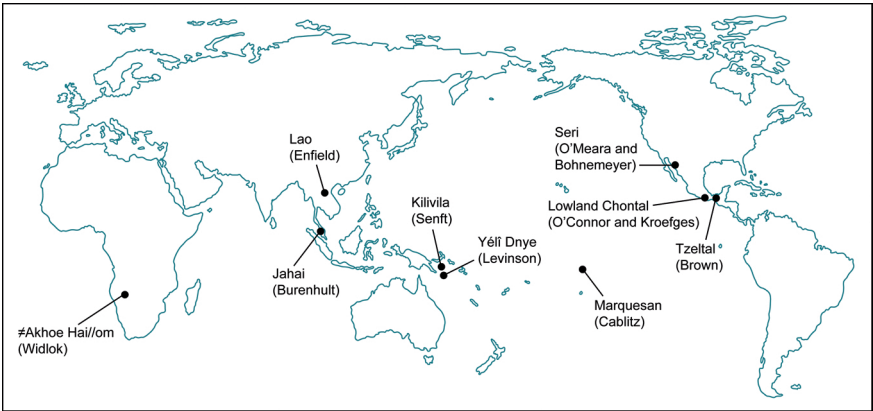


Figure 5.1: Languages and researchers represented in Language and landscape: geographical ontology in cross-linguistic perspective (Burenhult, ed., in press).

5.1.2 Space in Neurocognition (SpiN)

The SpiN research group (Janzen, Haun, with Levinson, Levelt, Van Turenhout, and Hagoort) examines the neural basis of spatial memory and spatial language. In two functional Magnetic Resonance Imaging (fMRI) experiments,

the group investigated consolidation effects of spatial memory and the neural correlates of route descriptions.

Janzen and Van Turenout continued their fMRI work on human spatial memory (using the facilities of the F. C. Donders Centre for Cognitive Neuroimaging). Two previous studies (Janzen & van Turenout 2004; Janzen, Wagensveld and van Turenout 2006) showed that the human brain automatically distinguishes between landmarks placed at navigationally relevant locations (i.e., decision points) and irrelevant locations (i.e., nondecision points). In a recent event-related fMRI experiment, Janzen and Van Turenout investigated memory consolidation of navigationally relevant landmarks, specifically the connection between hippocampal activity and navigational skill.

Sixteen participants viewed film sequences depicting tours through a virtual museum with objects placed at decision and nondecision points. To investigate consolidation effects, one film sequence was seen the evening before scanning (remote objects), and a second film the following morning, directly before scanning (recent objects). Event-related fMRI data were obtained during recognition of remote and recent objects in isolation. Participants also answered standardized questions about their navigational skills (the Santa Barbara Sense of Direction [SBSOD] scale).

To investigate effects of memory consolidation in the hippocampus, remote objects were compared with recent objects. No main effect of consolidation was observed in this region. To test whether an effect of consolidation in the hippocampus varies with navigational skill, a region of interest analysis was performed separately for the right and left hippocampus. The hippocampi were defined separately for each individual subject in anatomical scans and beta weights from these regions were obtained as a measure of signal strength. The regionally averaged beta weights were used to calculate the effect size of the 12 hour delay (beta weights of remote objects minus beta weights of recent objects). Participants' effect sizes were then correlated with their SBSOD scores. The delay effect size showed significant correlations with navigational skill for the right as well as for the left hippocampus (see Figure 5.2).

The correlation shows that participants with high navigational skill have a larger consolidation effect in the hippocampus. The results suggest an efficient connection between navigational ability and memory consolidation, which could support successful wayfinding (see also Epstein, Higgins, & Thompson-Schill 2005). That is, the better stored landmark information is in the brain, the better neural wayfinding mechanisms work.

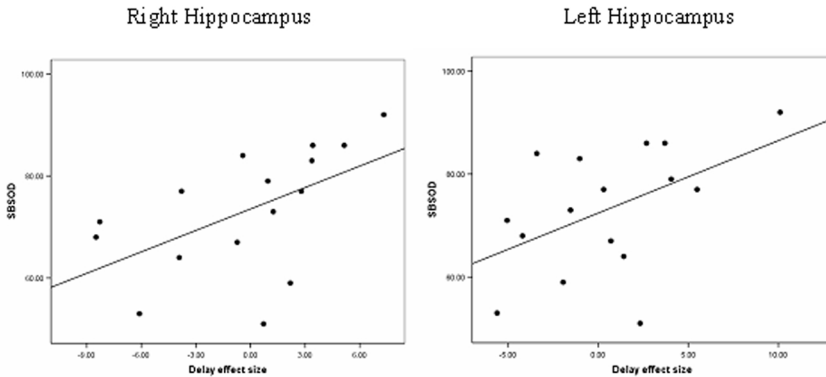


Figure 5.2: Correlation between subjects' SBSOD score and the effect size of the delay separately for the right (Pearson's $r = 0.537$, $p = 0.016$) and the left hippocampus (Pearson's $r = 0.489$, $p = 0.0275$).

Previous fMRI studies have investigated the navigational relevance of landmarks using virtual tours through different environments. In a new study (with Rohof, student from the Radboud U. Nijmegen) route descriptions were used instead. Sixteen participants listened to a route description with object names manipulated for cognitive salience (salient S or nonsalient NS) and object location (decision point D or nondecision point ND) (see Figure 5.3).

'Je rijdt dan het *stoplicht* tegemoet, het *oudste van Nederland!* Nu kom je op een kruising. Er staat een heel hoog *flatgebouw*, ik denk wel 17 verdiepingen, dus die zie je wel. Links van je is de *tandarts*, een praktische dat er nog niet zo lang staat. Je moet hier linksaf. Je gaat rechtdoor en na 300 meter zie je links een *cafetaria*, met een witte gevel. Je rijdt nu door.'



Figure 5.3: Part of the route description with a mapped representation next to it. The words that are used for salience manipulation are depicted in italic. (English translation: You drive towards the traffic light, the oldest one in the Netherlands! Now you arrive at an intersection. There is a very high apartment building right there, I think about 17 stories high, so you will see it. To your left is a dental practice, which has not yet been there very long. Here you should turn left. You drive straight on and after 300 meters you will see a cafeteria to your left, with a white frontage. Now you drive straight on.)

Inside the scanner participants were presented with spoken (same modality) and written (cross-modality) object names and asked to indicate whether they had heard the words in the previously learned route description. The spoken and written object names were presented in two separate blocks. Within each block the conditions (see Figure 5.3) were randomly intermixed. For the auditory presentation auditory noise was chosen as a low level baseline, in the written modality a series of seven consecutive x's were presented.

Comparison of all decision with all nondecision object names revealed increased activity in the right superior frontal gyrus. Analysis of these objects from the same (i.e., auditory) modality only revealed additional activity in the right middle temporal gyrus. All effects were independent of the salience of the object names. The results suggest that the temporal lobe is not only involved in the coding of navigational relevance for seen objects (Janzen & Van Turennout 2004), but also for object names. Future research is necessary to investigate whether object names learned and recognized within the same or different modality activate similar or overlapping brain areas.

5.1.3 Space in sign language

Perniss is completing her dissertation on coding within the spatial domain in German Sign Language (Deutsche Gebärdensprache, DGS). The dissertation examines the interaction between frames of reference, signing perspective, classifier predicates, and simultaneous constructions in the expression of location and motion events. Two types of discourse were analyzed: static scene spatial descriptions (of scenes containing between two and eight referents, both animate and inanimate) and event narratives (of short cartoon stimulus films featuring a personified mouse and elephant in different spatial settings). In this first systematic analysis of spatial expressions in German Sign Language, the dissertation investigates the limits in potential for iconic representation that the visual-spatial modality affords. The results show that spatial description in German Sign Languages cannot be explained on the basis of iconic principles alone, but that the form of spatial expressions (in particular, with respect to the use of signing perspective and classifier predicates) is shaped by linguistic and discourse constraints. In addition, the German Sign Language constructions were also compared to similar constructions in other sign languages (especially, Turkish Sign Language and Adamorobe Sign Language). The results from the cross-linguistic comparisons show that different spatial structures emerge in different sign languages, in spite of the iconic affordances of the modality. The findings are important with respect to claims that the visual-spatial modality drives similarity across sign languages in the spatial domain.

5.1.4 Spatial language potentiates spatial cognition

Özyürek collaborated with Gentner and Goldin-Meadow in a project funded by NSF and NIH investigating whether spatial language potentiates spatial cognition. In previous work Lowenstein and Gentner investigated how children solved a spatial mapping task (see Figure 5.4). Children were shown the location of a "winner" card in one box and had to find the winner, always in the same relative location, in a second box. In another version of the task – the cross-mapped version – children had the added difficulty of a competing object

match. Lowenstein and Gentner found that hearing children who heard the terms top, middle, and bottom were more accurate than "baseline" children who were not given these terms during the task. This difference was more prominent when the task involved a challenging cross-mapping rather than a simple mapping as can also be seen in Figure 5.4. This was taken as evidence that spatial language facilitates spatial mapping. In the current project this claim was tested more directly by investigating a group of children who do not have developed spatial language, namely children, who due to special circumstances of upbringing, were not exposed to a conventional language but invented their own gesture systems ("home sign"). Prior observation showed that these children did not invent spatial terms. 13 hearing and 13 home signing children who were matched in a separate spatial cognition task were given the same spatial mapping test in Istanbul (Turkey). The results show that compared to hearing children home signers had lower performance in the spatial mapping task. This finding provides more direct evidence that spatial relational language plays a central role in spatial mapping.

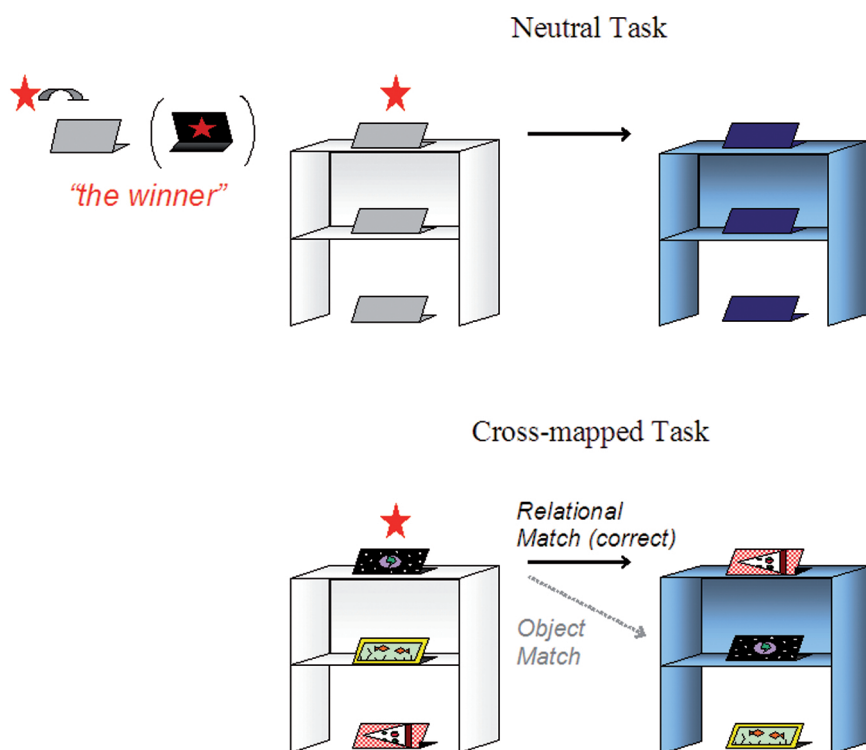


Figure 5.4: Apparatus for the spatial mapping task.

5.2 Motion events

5.2.1 The expression of motion events

5.2.1.1 Intrapatypological variation in the expression of motion events

Kopecka investigated intrapatypological variation in the expression of motion events in two satellite-framed languages, English and Polish (cf. Talmy 1991, 2000). Her study shows that the availability of the satellite-framed pattern does not predict the richness of the Manner verb lexicon or the variety of Manner components lexicalized in the verb (cf. Slobin 2004). Further, the availability of morphological and lexical resources, namely Path satellites and Manner verbs, does not predict their combinability at the clause level.

First, the lexical repertoire of Manner verbs is smaller in Polish (about 160 mono-morphemic verbs) than in English (several hundred verbs, cf. Slobin 2004). Furthermore, the types of fine-grained Manner components that Polish lexicalizes in the verb (e.g., *velocity*, *mode of motion*, *attitude of the agent*, etc.) are less diverse than those found in English. For example, English can conflate fine-grained semantic components such as *quietness* or *heaviness* in the verb (e.g., *to creep* and *to clomp*); Polish encodes these components periphrastically in adverbial expressions (e.g., *ić spokojnym krokiem* 'to walk with a quiet step' and *ciężko stapać* 'to step heavily'). To express a smooth and continuous movement from one place to another, English offers three verbs, *to glide*, *to slide* and *to slither*, whereas Polish offers mainly one, *pośliznąć się*. Moreover, English conventionalizes the use of vehicle names such as *bicycle* or *skate* as verbs; in Polish such a process, although possible, is not productive.

Second, the combinatorial possibilities between Manner verbs and Path satellites at the constructional level are different in Polish and English. Despite its similarity to English in encoding Manner in the main verb and Path in a satellite (a verb prefix, e.g., *w-biec* 'in-run', *wy-biec* 'run out'), Polish does not exploit its satellite-framed pattern as productively as English. In Polish the combination of Manner verbs and Path satellites depends on semantic and aspectual properties of the verb. For example, verbs encoding *slow*, *laborious* or *clumsy* motion (e.g., *leźć* 'to creep', *człapać* 'to shuffle') can combine freely with Path satellites, and occur in telic motion event constructions, whereas verbs encoding *aimless* motion (e.g., *bląkać się* 'to rove', *włóczyć się* 'to roam'), *leisurely* motion (e.g., *przechadzać się* 'to saunter', *spacerować* 'to stroll') or *impaired* motion (e.g., *kuleć* 'to hobble', *kuśtykać* 'to limp') cannot combine freely and be conceptualized as change-of-state.

The lexicalization processes (i.e. the type of fine-grained manner dimensions lexicalized in the verb) and the constructional semantics (i.e. the type of Manner

verbs able to combine with Path satellites) have a crucial impact on how Manner information is represented linguistically. While English can conflate fine-grained semantic notions in the verb and use such verbs in a motion event construction, Polish tends to distribute Manner information across the sentence in the main verb and some adverbial expression.

When a fine-grained semantic notion is not lexicalized in the verb, then Manner is distributed in two different lexical items, as is the case in (1) and (2):

- (1) *Potem w-szedł na palcach do domu, (...)*. [Kon 218]
 then in-walk.Pst.3Sg.M on tiptoe.Loc to house.Gen
 'Then he tiptoed into the house (...)'
 (lit. 'Then he walked on tiptoe into the house.')

- (2) *Skoczyliśmy na jednej nodze do szpitalnej kaplicy(...)* [Kon 54]
 jump.Pst.1Pl.M on one.Loc leg.Loc to hospital.Adj.Gen chapel.Gen
 'We hopped to the hospital chapel.'
 (lit. 'We jumped on one leg to the hospital chapel.')

And Manner information is also distributed when a Manner verb cannot combine with a Path satellite, as is the case in (3) and (4):

- (3) *Pies pod-biegł kulejąc (...)* [Kon 50]
 dog.Nom under-run.Pst.3Sg.M hobbling
 'The dog hobbled up [to me] (...).'

- (4) (...) *zataczając się pode-szła do płyty kuchennej* [Kon 91]
 Staggering Refl under-walk.Pst.3Sg.F to stove.Gen kitchen.Gen
 'She staggered to the kitchen-stove.'
 (lit. 'She walked to the kitchen-stove staggering.')

There is variation between languages in the sheer size of the manner verb lexicon, the range of manner components lexicalized in verbs, and the combinatorial flexibility of verbs with Path phrases – even between languages in the same typological group.

5.2.1.1 Speech and gesture in the expression of motion events

The expression of voluntary motion in French speech and gesture forms the basis of a different study by Gullberg, in collaboration with Hickmann (CNRS) and Hendriks (U. Cambridge). French, a verb-framed language, predominantly encodes Path in the verb (e.g. *monter* 'ascend') and expresses Manner less often. However, in complex constructions speakers can express Manner in the

periphery of a Path verb (e.g. *Il a traversé la route en courant* 'he crossed the road running') and Path in the periphery of a Manner verb (*Il a couru à l'école* 'he ran to school'). Gullberg and colleagues examine (1) how French adults and children aged four and six encode Path and Manner in speech and in iconic gestures; and (2) whether gestures are co-expressive with speech or are recruited to express other information, especially by children.

Data were collected using an experimental design for eliciting descriptions of voluntary displacements developed by Hickmann and Hendriks. The results indicate that when Path and Manner are equally relevant, children and adults alike chiefly talk and gesture about Path. Focus on Path alone was highest for downward motion. Expressions encoding only Manner occur in speech, with analogues in gesture, for crossing and Manner-salient events in all age groups. Verbal expressions simultaneously encoding Path and Manner (conflated) increased with age in speech – through lexicalization for upward motion (*grimper* 'climb up') or subordination – but their analogues in gesture decreased with age.

Gestures are predominantly co-expressive with speech at all ages, suggesting that children are not using gestures to encode information absent from speech. However, when the modalities are not co-expressive, adults gesture about Path while talking about Manner, whereas children gesture about both Path and Manner while talking about Path. The *increase* of conflated Path-Manner expressions in speech and the *decrease* of conflated expression in gestures across age groups suggests that children's representations undergo some reorganization as they try to gauge how to weigh the semantic components – and in which modality to express them.

5.2.2 Placement events

Work continued on the "Put and Take" project, coordinated by Bowerman, Gullberg, Kopecka, Majid, and Narasimhan and carried out in collaboration with the project Dynamics of Multilingual Processing (see Annual Report 2005: 83-85). This project brings together cross-linguistically comparable descriptions of both "putting" events (placement of an object to a location) and "taking" events (removal of an object from a location) from areally, genetically, and typologically diverse languages. Project members used a standardized set of videoclips to collect descriptions of placement events from 28 different languages (see Table 5.1 below). The linguistic data are compared quantitatively in order to investigate the range of variation and similarity across languages. Qualitative analyses also explore the distribution of spatial semantics at the clausal level and the lexical semantics of the verbs in these languages.

The first aim of the project is to investigate cross-linguistic similarities and differences in the encoding of placement events as compared to spontaneous motion events, e.g. whether the Path of motion is encoded in the verb or in a satellite to the verb (cf. Talmy 1985, 2000; see also Annual Report 2005: 86-88 for work on the typology of motion event expressions). Preliminary descriptive analyses show that languages vary in placement descriptions in complex ways. For instance, two satellite-framed languages such as Polish and Mandarin Chinese differ crucially in the type of constructions used to encode placement events and in the distribution of spatial semantics across the clause. Polish distributes spatial information across different grammatical items such as verb prefixes and prepositional phrases (including a preposition and a case marker). Verb prefixes convey Path and prepositional phrases indicate the Ground (i.e. either Source or Goal). The verbs encode Posture or Manner (*w-sadzić świeczkę do świecznika* 'in-sit candle.Acc to candlestand.Gen'). In contrast, in Mandarin Chinese, placement events are typically encoded with verb compounds, such as *fang4-xia4-lai2* 'put-descend-come'. As a whole, the verb compound conveys the core event of caused change of location of the located object (the Figure). Each component of the compound verb encodes only one aspect of this event. The first verb can be either a generic placement verb (*fang4* 'put', *na2* 'take') or a Manner verb of manipulation (e.g., *sai1* 'stuff', *reng1* 'throw'). The second verb encodes the Path of the transference (e.g., *jin4* 'enter', *chu1* 'exit'). A third verb, a deictic (either *lai2* 'come' or *qu4* 'go'), can optionally be added. Information about Source is encoded in a prepositional phrase (e.g., *cong2* 'from' + Source), which precedes the placement verb. Information about Goal can be encoded by a prepositional phrase (e.g., *zai4* 'at' + Goal) following the simplex placement verb (e.g., *fang4 zai4 wan3 li3* 'put at bowl inside') or by a relational noun phrase following the verb compound (e.g., *fang4-jin4 he2zi li3* 'put-enter box inside'). The patterns of distribution revealed by the preliminary analyses of placement descriptions suggest typological variation not only across satellite-framed and verb-framed languages, as shown by Talmy, but also within languages belonging to the same type.

The second aim of the project is to examine the extensional patterns of verbs used for the description of "putting" (Goal-oriented) and "taking" (Source-oriented) events and to explore their lexical semantics. Contributors investigate whether languages mark the same type of semantic distinctions for the two types of events, or whether there is a systematic asymmetry in favor of "putting" events (cf. Regier 1996). For most languages (e.g. Hai//om – a Central Khoisan language, Hindi, Polish, Tzeltal), finer-grained semantic distinctions are made in the expression of "putting" events than of "taking" events, but this

asymmetry is not attested in all the languages. For example, Yéí Dnye, a language isolate spoken in Papua New Guinea, exhibits symmetrical distinctions in the meaning of the verbs used for the expression of "putting" and "taking" events (e.g. 'put in a lying posture'; 'take from a lying posture'). This challenges the hypothesis that the expression of Goal-oriented vs. Source-oriented events is semantically asymmetrical.

Table 5.1: Put and take project: list of languages, researchers and their affiliation

Language	Researchers	Affiliation
Basque	I. Ibarretxe-Antuñano	U. Zaragoza
Dutch	A. Majid & M. Bowerman	MPI
English	T. Stivers	MPI
Hai//om	C. Rapold	MPI/Leiden U.
Hindi	B. Narasimhan	MPI
Hungarian	A. Andics	MPI
Jahai	N. Burenhult	MPI
Japanese	M. Ishibashi	U. Lumière Lyon 2
Kalasha	J.H. Petersen	U. Copenhagen
Kilivila	G. Senft	MPI
Kariì	N. Enfield	MPI
Kuot	E. Lindström	Stockholm U.
Kuuk Thaayorre	A. Gaby	MPI
Lao	N. Enfield	MPI
Lowland Chontal	L. O'Connor	U. Hamburg
Mandarin Chinese	J. Chen	C.S.U. Fresno
Moroccan Arabic	N. Nouaouri	MPI
Polish	A. Kopecka	MPI
Romansch	R. Berthele	U. Bern
Rotokas	S. Robinson	MPI
Savosavo	C. Wegener	MPI/K.-F.-U. Graz
Spanish	I. Ibarretxe-Antuñano	U. Zaragoza
Swedish	N. Burenhult, M. Gullberg	MPI
Swiss German	R. Berthele	U. Bern
Tamil	B. Narasimhan	MPI
Touo	M. Dunn	MPI
Tzeltal	P. Brown	MPI
Yéí Dnye	S. Levinson	MPI

P. Brown examined the semantic domain of placement and removal events in the Mayan language Tzeltal, analyzing the responses of 12 adult consultants to

elicitation videoclips depicting "putting" and "taking" events. She focused on the Tzeltal verbs used for describing these kinds of events, the other spatial vocabulary (directionals, relational nouns) principally implicated in the descriptions, and the constructions employed. Tzeltal has just one semantically general 'put' verb, *ak'*, which is even more general than English *put*, as it encompasses both 'put' (inanimate goal) and 'give' (animate recipient) meanings. There is also one general 'insert' verb: *otzes* 'enter-CAUS'. There are two relatively general 'take' verbs: *tzak* 'grasp in hand' and *lok'es* 'extract [lit.: exit-CAUS]'. In addition, there is a large repertoire of verbs that are not specific to placement events, but can be used either transitively to mean 'put into a particular spatial disposition' or statively to mean 'be in that disposition'. Many of these can make a second distinction, with the transitivized form used for 'putting' events and the bare transitive form with a directional for 'taking' events (for example, *pajchan* 'place it bowl-shaped sitting' = 'put' vs. *pach lok'el* 'carry/hold it bowl-shaped upright exiting' = 'take away'; *lejchan* 'place it flat-lying (of a 2D nonflexible object)' = 'put', vs. *lech bel* 'hold/carry flat-lying object awaywards' = 'take away'). About 70 distinct verbs were used for 'putting' scenes and 20 for 'taking' scenes. Directionals were often used to indicate the direction of the object's movement and were often the only overt indication that movement had occurred (e.g., 'grasp exiting', meaning 'take out of containment'). Directionals allow verbs that are not semantically 'put' or 'take' verbs to apply to placement scenes, for example *jop tal* 'pile [particulate things, e.g. handful of rice] coming' meaning 'put [them] down' vs. *jop bel* 'pile awaywards' meaning 'take [them] away'.

P. Brown found a limited role for the semantically general verbs (*ak'* 'give/put', *tzak* 'grasp/take', *otzes* 'insert' and *lok'es* 'take out'). Although *ak'* is a possible descriptor for 27 of the 35 "put" clips, it was actually the preferred response for only 7 (offered by at least half the speakers). Usually there was a preference for a more specific verb (of putting clothing on, putting things into liquid, setting objects of particular shapes down in particular orientations). This contrasts with treatment of the "take" events, where fewer verbs were used and the relatively general "take" verbs (*tzak* 'grasp in the hand', *lok'es* 'extract') were more widely applicable, suggesting that speakers construed the "take" events less readily in terms of the Figure/Ground spatial configuration associated with the event.

Gullberg and Narasimhan continued to investigate how children and adults encode placement events using "caused posture" expressions (e.g. *set*, *stand*). Their prior research showed that children (age 4 to 5) acquiring Tamil label events of horizontal versus vertical placement appropriately (using *nikka veyyii* 'make stand', *paDka veyyii* 'make lie'), whereas children acquiring Dutch make

systematic errors: they overextend *leggen* 'lay' to vertical placement events (e.g. standing a can on a table), and restrict *zetten* 'set/stand' to a subset of vertical placement events (Annual Report 2005: 83-85, Narasimhan & Gullberg, submitted). In 2006 they explored what Dutch children's gestures reveal about their understanding of verb meanings. Gullberg has previously shown that cross-linguistic differences in placement verb semantics are reflected in adult language-specific gestures (Annual Report 2003: 115-116). For example, French speakers using a general placement verb *mettre* 'put' typically encode only Path in their placement gestures (a spatial excursion of the hand with a lax hand or a pointing handshape). Gestures by Dutch speakers encode Path as well but also incorporate information about the shape of the placed object in handshapes reflecting the object-focus needed for appropriate verb selection: *zetten* for vertically-placed and *leggen* for horizontally-placed objects (Gullberg, submitted).

The new study compared how Dutch children (aged 4 to 5), relative to adults, talk and gesture about placement events in a video description task. The results show that four-year-olds produce only Path gestures whereas five-year-olds are more adult-like and also produce gestures with handshapes that incorporate objects. Interestingly, the gesture patterns match differences in verb usage in speech. Children who produce only Path gestures also overuse *leggen* 'lay', applying it to all events, including vertical placements. In contrast, children who produce object-incorporating gestures also appropriately distinguish these verbs in speech. Children's gestures reflect their current knowledge of verb semantics, with a focus either on motion alone or on object and motion together. Learning to gesture in an adult-like, language-specific way is thus partly related to learning the semantic distinctions of the target language.

5.3 Reciprocal events

Work continued on the "Reciprocals" project, coordinated by Gaby, Levinson and Majid in collaboration with Evans (U. Melbourne). The project aims to provide a description of the constructions available for expressing reciprocal events in different languages, as well as characterizing the semantic parameters that underlie the usage of those constructions (see Annual Report 2005: 88-90). A three-day workshop was held in April (see 'Other activities', Chapter 13.2), bringing together field linguists who have collected primary data using the reciprocals video elicitation task (Evans, Levinson, Enfield, Gaby, & Majid, MPI Field Manual 2004). The elicitation stimuli consist of 64 videoclips depicting a range of events. In the core reciprocal event, two participants perform the same action on each other simultaneously (e.g., two men hit each other at the same time). The videos vary the number of participants who take part in the event,

the configuration of participants who acted on one another, the specific event type and whether the event was simultaneous or not and acted on symmetrically or not. A volume is now in preparation which will report both language-specific patterns and typological generalizations (see Table 5.2).

Table 5.2: Reciprocal project: language, language affiliation and researcher information

Language	Language affiliation	Researcher
Khoekhoe	Central Khoisan	C. Rapold
English	Germanic	R. Nordlinger & P. Hurst
Indo-Pakistani Sign Language	Isolate	U. Zeshan & S. Panda
Mundari	Munda	N. Evans & T. Osada
Lao	Kam-Tai	N. Enfield
Mah Meri	Aslian	N. Kruspe
Jahai	Aslian	N. Burenhult
Yélf Dnye	Papuan Isolate	S. Levinson
Rotokas	East Papuan	S. Robinson
Savosavo	East Papuan	C. Wegener
Kilivila	Austronesian	G. Senft
Mawng	Iwaidjan	R. Singer
Kuuk Thaayorre	Pama-Nyungan	A. Gaby
Beaver	Na-Dene	D. Jung
Oluteco	Mixe-Zoquean	R. Zavala
Tsafiki	Barbacoan	C. Dickinson
Hup	Nadahup	P. Epp

5.4 Ethnobiology

A new subproject investigates ethnobiological categorization – how people classify and reason about the organic world. Universalists, in this domain, have argued that ethnobiological categories are organized taxonomically, correspond well to scientific biological taxonomies, and furthermore that these taxonomies are only marginally influenced by cultural practices (Berlin, 1992). Current research aims to explore ethnobiological naming and organization.

Burenhult, supported by a Volkswagen Foundation DoBeS grant, collected field data on ethnobiological categorization and taxonomy among Semang foragers of the Malay Peninsula. Preliminary results suggest that well-defined domains of animals and plants are not in much evidence, and that hierarchy from the point of view of scientific taxonomy involves at most two levels. Evidence from Jahai shows that names of animal and plant species may represent bottom nodes of

elaborate and multi-level alternative taxonomical hierarchies in which food categories form the highest nodes. Intermediate categories distinguish, for example, an 'edible fish' category from an 'edible animal' category, the latter being further categorized as 'hunted in trees' vs. 'hunted on the ground'. Animals that are not eaten by the Jahai do not form part of this hierarchy, which thereby excludes salient life forms like tigers, elephants and snakes. This alternative gastronomical system of semantic relations goes a long way to explaining the structure of other lexical phenomena, including eating verbs (which encode what is being eaten) and avoidance terminology (where taboo vocabulary for edible animals is structurally different from that of inedible ones). Moreover, an initial free-listing experiment involving animal names suggests that the alternative taxonomies may have some relevance to how memory is structured. Consultants tend to group inedible animals together, edible tree-dwelling animals together and finally ground-dwelling animals together.

In continuing documentation of the previously undescribed language Karì (Vietic, see "Research on Mon-Khmer languages" in Chapter 11.1.2), Enfield conducted focused elicitation of terms for flora and fauna. Elicitation involved a range of methods including free listing, forest walks, and focused use of flora/fauna field manual illustrations (in collaboration with Gérard Diffloth). The home range of the Karì is of special interest in terms of biodiversity. The Karì live in 3 villages (total population about 300) in the upper reaches of the Nakai-Nam Theun National Protected Area, near the Lao-Vietnam border in Khammouane Province, Laos. This area is listed by the World Conservation Society as having among the highest degrees of biodiversity in the world. The Karì show extensive knowledge of this biodiversity, being able to reel off hundreds of distinct species and variety terms. In addition to knowing the names of all these, the Karì are also highly knowledgeable about their referents. Enfield concentrated particularly on the extensive Karì indigenous knowledge of forest trees.

Levinson investigated three biological domains on Rossel Island, Papua New Guinea, where the language Yélf Dnye shows rather different patterns of categorization. In the first domain, trees, the language follows the expected pattern reported in the ethnobiological literature: names are mostly monolexemic and denote a basic level which closely matches the scientific level of genus. Of 140 tree names collected, 89% are simplex terms, and only 4% are true binomials of the kind *chii mbweedi* 'inland Heritiera, i.e. Heritiera trifoliata'. In the second domain, birds, most terms are also simplex, but now they denote at the species level. This may not be surprising, since there are only around 40 terrestrial bird species on the island. Nevertheless, some of

these species (e.g. three *Ducula* species of dove) are visually very similar, yet they are not categorially associated at the genus level, but rather individually named in unrelated ways. Only three confluations of biological taxa in one native term were found (e.g. two species in the *Egretta* genus). In the third domain, marine fish, the pattern was different again. Now the same individual species could have up to four distinct terms, according to the maturity of the specimen. For example, the Napoleon wrasse (*Cheilinus undulatus*) is called *d:êê vyono* when juvenile, *kpaapî tp:oo* when adolescent, *kpeekpee* when adult, and *dpuwo* in its final stage. Tropical fish indeed undergo great changes in color and shape over the life-span; nevertheless, Rossel people know these are all one species, even though they have no overall name for it. Of a sample of 170 fish names, 75% were monomorphemic, but the rest were not systematic binomials, they rather revealed a metaphorical mapping from bird-names and plant-names onto fish names (altogether around 20% of fish names are motivated in this way). For example, the sailfish tang (*Zebrasoma* species) has huge fins likened to the flaring buttresses of the *kpii* tree, and is thus called *kpii kn:ââ*, 'base of the *kpii* tree'. The conclusions are, first, that 'basic level' naming can be far removed from the level of scientific genus, where structural features tend to cohere. Secondly, the fish names show that ethnobiological names do not necessarily reflect a theory of biological essence – where shape and color diverge from essence, the naming may follow the shape and color categories, ignoring that these may be variants of the same species.

5.5 Ineffables

A group of subprojects cluster around the concept of "ineffability", categories that are difficult to put into words or difficult to standardize. For example, individual faces are very hard to describe in such a way that someone else could uniquely identify them, as are the taste of durian, or the smell of ozone. Here we find ourselves at the limit of the descriptive power of language. The reasons for this are not wholly clear. It could be that these domains are modular and encapsulated, so that the relevant cognition is inaccessible to language, perhaps because they are phylogenetically ancient parts of our cognition. Or it could be that in these cases, like emotion terms, taste and smell, the qualities referred to are subjective, making it hard to develop a "language game" with precise semantic rules. Cross-linguistic and cross-cultural evidence can play an important role in uncovering the answer to this puzzle by revealing whether there are language-specific "language games" according to cultural interest, or to the contrary, universal tendencies due to shared subjective sensations that can form the core of "natural categories".

5.5.1 Emotions

Emotion terms and facial expressions form one such interesting domain on which there has been significant research. On Darwin's (and more recently Ekman's) view, universal emotions and hard-wired facial expressions reflecting them, should yield clear universal categories – with predicted agreement across languages in terms for emotions and their expressions. Initial cross-cultural work has begun, using elicitation tools, such as Ekman faces illustrating allegedly universal basic emotions, and film stimuli demonstrating standard emotions based on English (an autism diagnosis tool developed by Baron-Cohen and associates).

Preliminary findings from Yélí Dnye, by Levinson and Brown indicate that there is not a coherent linguistic set of labels for emotions: there are only nouns for 'fear', 'joy', 'jealousy', and 'shock', verbs of fearing, being angry, hating, being surprised, and feeling shame, and general adjectival expressions for 'good' vs. 'bad' internal states. Other internal states can only be expressed by complex constructions, e.g. to express 'I love my children' one has to say 'my children's' throat parts are sitting on my throat', revealing that the throat is seen as the seat of the emotions. Neither the Baron-Cohen movies nor the Ekman faces were mapped by Rossel speakers onto these terms in an English-like way. Different exemplars of 'surprise' or 'fear' did not systematically map onto the nearest Yélí Dnye equivalent terms. For example the Ekman face intended to depict the universal expression of contempt was more often considered to indicate a 'good' internal state (similar to English *happy*). Most of the Ekman 'neutral' expressions were understood to depict distinctive emotions, e.g. either 'anger' or 'unhappiness'. One reason for these systematic mismatches may have to do with the cultural and communicative use of the face in Rossel Island culture – there are many conventional expressions with fixed conventional significance, e.g. nose-wrinkling indicates appreciation, and raised eyebrows indicate agreement. Facial expression is, for Rossel people, thus considered more a question of conventional deportment and signaling than an inadvertent display of inner feelings.

Enfield conducted preliminary exploration on facial expression and emotion terminology in Lao and Karì (both spoken in Laos). Building on earlier work on native terminology for different states of the face in Lao (Tai language family), Enfield piloted a Clark-style repeated director-matcher task, to see whether speakers would settle on preferred patterns of shorthand reference to faces in distinct expressional states. In some cases, speakers used native labels for the facial expression itself (e.g. *ñim4* 'smile'), and in others they referred to emotional states associated with such faces (e.g. *khù2 siø haj5* 'as if about to

cry'). This raises the possibility of general differences in how types of facial expression are freely described: some directly labeled, some denoted by the associated internal state, some denoted by what has precipitated the emotion, or what may result from it. In Kari, initial survey of linguistic resources for describing facial expressions showed that beyond a term for 'smile' (*hañq*, also meaning 'laugh'), there are few if any terms which directly label a facial expression as such. Descriptive devices such as 'sour face' or 'wrinkled face' were widely given. However, many of these kinds of evaluations of Ekman faces were surprising, for instance with 'neutral' faces being described as 'bad' or 'angry', and anger or contempt faces being described as 'normal' or 'relaxed'.

Senft also collected data on the expression of emotions in Kilivila, the language of the Trobriand Islands. Using the Baron-Cohen movie stimuli, Senft substantially expanded the documentation of the lexical inventory of Kilivila expressions for emotions (see Annual Report 1992: 113). The new data confirmed that Kilivila has a rich inventory of terms (nouns, verbs, adjectives and idiomatic expressions) to precisely refer to emotions and their expression. The Baron-Cohen elicitation tool revealed that the Trobriand Islanders refer to 15 out of 20 basic emotional states in more or less the same way as speakers of English do. These emotional states include analogues to English 'afraid', 'angry', 'sad', 'unfriendly', 'thinking', 'disgusted', 'kind', 'fond', 'sorry', 'hurt', 'happy', 'bored', 'excited', 'sneaky', and 'liked'. It was unclear whether the Kilivila characterizations of the remaining 5 basic emotional states corresponded well to the English descriptions. These emotional states encompass the following: 'sure', 'surprised', 'unsure', 'wanting', and 'interested'. Pilot results from these four languages suggest that further comparative investigation would be worthwhile.

5.5.2 Smell and taste

Smell and taste are further interesting domains for exploring the expression of ineffables in language. Humans have around 350 functional genes responsible for coding olfactory receptors. The relationship between the receptors and odors is not one-to-one, however – the same receptor can be activated by a number of different odorants. At the neuronal level, several subsystems are responsible for smell detection and discrimination. Contrary to popular belief – that people have a poor sense of smell – the average person can distinguish tens of thousands of different smells. But whether there is any systematicity across languages in how these smells are categorized linguistically remains a mystery.

Senft's preliminary exploration into the odorant lexicon in Kilivila reveals a few specific expressions (nouns and verbs) for the domain of smell in Kilivila:

'smelling' (-*sukwani*-), 'sniffing' (-*subuyalu*-), 'smell' (*maina*), 'good smells' (*maina bwena*, *maina simina*), 'bad smells' (*maina gaga*, *maina esigi*, *bogina*), and 'stinks' (*bogina*). As well as these general expressions there are a few more for the smell of specific entities (*bome'i tobaki* 'smell of tobacco'; *babayaina* 'bad bodily smell/odor'; *bulubulu* 'smell of fish and seafood'). All other Kilivila expressions for referring to smells found so far consist of the general term for smell (*maina*) and the name of the entity that is smelling (e.g., *maina lala* 'smell of flowers'). Here we also find a culture specific peculiarity: for Trobriand Islanders the bush does not smell, however, tape recorders, tapes and microphones do. This suggests that odor categories may be built based on cultural familiarities and preoccupations.

The underlying physiology of taste is far simpler, with just five types of receptor, namely those for sweet, salty, sour, bitter and umami (glutamic acid). It is possible therefore that these, and especially the first four, find universal recognition in languages.

A pilot test was conducted on Rossel Island, using the standard taste stimuli (sucrose, sodium chloride, citric acid, quinine, monosodium glutamate). First, terminology was explored in the language Yélf Dnye. The word for taste, *n:uu*, also covers any new experience, as in 'I haven't experienced the taste of war/sex/beef' – it is not clear if this is a metaphorical extension from taste, or a specialization of a more general word to the taste domain. The elicited terms for kinds of tastes are: *nj:iinj:ii* 'sweet, salty, flavoured' which covers e.g. honey, pig's blood, ripe bananas, imported sugar, soy sauce, or tomato sauce; *'nuwó'nuwó*, 'sour' covering lemons, unripe pineapple; *nduunduu*, 'bitter, biting' e.g. the taste of quinine or rum; *wiiwii* 'hurting', covering chili sauce, pure salt, raw clam, and *kinikini* 'greasy, fatty', covering nuts, coconut, pig, eel. Note that *nj:iinj:ii* (probably deriving from the word for sea-water, used for cooking) covers both sweet and salty things – things with desirable flavor (the converse *pwopwo* refers to unseasoned, unsweet or unsalty things). The interest in 'greasy' food stems from a diet very short of fat. Given the five basic taste stimuli, subjects agreed that sucrose was *nj:nj:ii*; pure salt was *wiiwii*; citric acid was *'nuwó'nuwó*; quinine was *nduunduu*; and glutamic acid was not easily described. Thus although the basic tastes are separated just as in English vocabulary, the extension of the terms in Yélf Dnye is along quite different lines, putting, for example, desirably salty and desirably sweet things in the same category.

Senft's initial investigations of taste expressions in Kilivila revealed that there is a general expression (noun and verb) to refer to taste (*komkona*, *-komkona-*);

that there are a number of more general taste qualifying adjectives (like, e.g., *sumakenia* 'sweet', *yayana* – 'bitter'); and that there are many adjectives that refer to and qualify more specific tastes (like e.g., *mutrus kegasisi* – the tobacco is bad, *mutrus kemanum* – the tobacco is good, *mutrus kepe'ula* – the tobacco is strong).

Enfield also investigated terms for taste in Lao and Karì. Despite being genealogically unrelated, the two languages show similar structure in the lexical semantics of taste, a result of areal diffusion. They have terms for a few core tastes:

	Karì	Lao	Core exemplar
'sweet'	<i>mbaat</i>	<i>vaan3</i>	sugar cane, honey
'sour'	<i>còòq</i>	<i>som5</i>	unripe fruit, lemon
'hot/spicy'	<i>har</i>	<i>phêt2</i>	chili
'salty'	<i>congq</i>	<i>khêm2</i>	salt

While these taste terms appear to map directly onto the meanings of familiar terms from English, their referential extension can be quite different. For instance, the term for 'spicy' can refer to the 'hot' taste of toothpaste, the term for 'sweet' can refer to onions.

In both languages, there are terms which do not have familiar equivalents in English, and which appear to invoke more than mere taste, but also some other kind of sensation (for instance, 'chalky' in the case of *còòq/faat5*, see below). (This is reminiscent of the common combination in the semantics of 'color' terms of not just hue but texture and other visual cues.) For example, both Lao and Karì have single terms (*man2* and *ntuu*, respectively) which refer both to 'oiliness' (as of pork fat) and 'starchiness' (as of cassava). Both languages show fine distinctions in unfamiliar sectors of the 'taste space'. These are tastes which may be glossed with the low frequency English word 'astringent':

	Karì	Lao	Core exemplar
'astringent' 1	<i>hùl</i>	<i>hùn2</i>	mint leaves
'astringent' 2	<i>heek</i>	<i>khùùn1</i>	small eggplant; <i>Solanum aculeatissimum</i>
'astringent' 3	<i>còòq</i>	<i>faat5</i>	unripe banana, strong tea

There is surprising sensitivity to taste distinction in other areas as well. Lao has two terms which at first glance seem to mean 'tasty' (*nua2*) and 'bland' (*caang3*). The former refers focally to the taste of monosodium glutamate, a common cooking ingredient. The term *caang3* is not the same as English *bland*, since its specific meaning is 'not salty' rather than without taste of any kind. It

is common for a Lao speaker to taste food which for the European taste is overwhelmingly spicy (from chili) and declare it to be *caang3* 'not salty (enough)'. For the European palate, it is surprising that the Lao speaker can discern any distinction in flavor through the chili.

5.6 Expressives in Semai

Tufvesson continued her doctoral research on Semai, a Mon-Khmer Aslian language spoken by approximately 25,000 people in the states of Perak and Pahang on Peninsular Malaysia. She conducts her fieldwork on the Semai dialect spoken in the Kampar basin in Perak state. Her work is divided into two main parts: a descriptive linguistic part and a more analytic part, the latter focusing on the word class of expressives.

The description of Semai phonology and morphology complements earlier limited documentation (see Diffloth 1972, 1977). Findings demonstrate a language with a rich vowel system; including short and long vowels as well as oral/nasal contrasts. As discussed by Diffloth, Semai exhibits productive affixal morphology. Initial results identify infixation and various types of reduplication in the verbal morphology.

Expressives exist in many Mon-Khmer languages as well as in other language families, but have rarely been examined in a cross-linguistic perspective. With detailed semantics, Semai expressives convey speakers' sensory and perceptual experiences and are often governed by speakers' first-person experience of a situation. Expressives constitute a distinct syntactic and lexical word class in Semai, and findings confirm distinct morphological processes of affixation and reduplication for these words (see Diffloth 1976). A sound symbolic, iconic identity of the expressives is evident in that related semantic forms correspond with systematic phonological changes and are equally congruent with morphological processes. Initial results point to large group of expressives conveying visual perception and experience. Descriptions of physical features of people and various movement patterns are common. Expressives conveying acoustic experience constitute the second largest group, often accounting for differences in pitch and loudness. Olfactory expressives appear to be the third largest group, conveying differences in, as well as intensity of, smell. The expressives that convey experiences of a haptic, emotional, and gustatory nature are less frequent.

5.7 Narrative and discourse

Hill started PhD work on a fieldwork-based documentation and description project on Umpila, Kuuku Ya'u and Kaanju. These language varieties are

mutually intelligible dialects which are spoken on the north-eastern coast of Cape York Peninsula in northern Australia, and have been classified as part of the Middle Paman subgroup of the Pama-Nyungan family (O'Grady, Voegelin and Voegelin 1966). This language group is moribund and scantily described, but there is an extensive resource of archival documentation material which has been collected over the last hundred years. This material will help situate Hill's investigation of the contemporary language in a context of language shift and obsolescence.

Hill's doctoral work will focus on exploring the ways in which narrative and discourse material is structured in the Umpila, Kuuku Ya'u and Kaanju language group. During the initial stages the primary foci have been (1) transcribing and analyzing contemporary and archival textual material, and (2) identifying and undertaking preliminary investigations on a number of features within this material. These initial explorations have examined the following: discourse functions and interactional goals of deictic reference; zero anaphora; discourse prominence; the relationship between discursive structures in monologic and collaborative narrative events; and the role of dislocated participant reference and tail-to-head linkage in text structuring.

This research is affiliated with a three-year major documentation project, *Documentation of five Paman languages of Cape York Peninsula* funded by the Hans Rausing Endangered Languages Project (based at SOAS, University of London). The project is a team effort by a number of linguists with prior research experience in the Cape York region, who are pooling knowledge and resources to undertake documentation work with the last generation of speakers of five languages: Kugu Muminh, Kuku Thaypan, Umbuygamu, Umpila, and Wik Ngathan.

CHAPTER 6
LANGUAGE PRODUCTION UNIT

Participants:

Jos van Berkum

Peter Hagoort

Marcel Bastiaansen

Karl Magnus Petersson

Introduction

November 1, 2006 was the starting date of the new director of this unit, Peter Hagoort. Activities in 2007 will consist of three main components: (i) hiring staff; (ii) building up new lab facilities; (iii) defining and starting up a new research programme. Each of these components will be discussed in more detail below.

6.1 Hiring personnel

The unit has 4 senior staff positions. Staff for these positions will be recruited throughout 2007. Staff members have been appointed already (Marcel Bastiaansen, Jos van Berkum and Karl Magnus Petersson). Remaining positions, as well as 3 Ph.D. positions will be advertised in the course of 2007.

6.2 Lab facilities

Two new laboratory facilities will be built up. The first lab that will be created is a fully operational facility for the recording of event-related brain potentials. This ERP lab will allow simultaneous recording from 128 electrode sites. Moreover, it will have the relevant stimulus presentation modalities for spoken and written language and for recording of spoken utterances. The ERP lab will be realized in the first half of 2007.

The second laboratory is a so-called virtual lab. Worldwide this will be the first lab of this kind for research on language production and comprehension. It is motivated by the fact that Hagoort's research unit will try to bridge the gap between the language-as-product approach and the language-as-action approach. This requires studying language production in the context of well-controlled environmental input and conversational settings. To this aim a virtual lab environment will be created in which the environmental parameters can be brought under rigorous experimental control. Ultimately, dialogue systems reacting in a controlled way to speakers' output will be part of this lab facility as well. The second half of 2007 will see the first steps in the implementation of this lab environment. In a first pilot experiment, we will parametrically manipulate the speed of the events that the speaker has to describe. The prediction is that this will influence grammatical encoding and lexical selection. The syntactic and lexical variation might decrease, and the number of fixed expressions might increase. The nature of the transition will tell us if speaking can be performed under relatively independent modes of operation, or whether the transition is gradual.

6.3 Research programme

6.3.1 Memory, unification and control

This general framework for understanding and producing linguistic utterances, developed by Hagoort in the past years, will be further developed and tested. The concrete experiments still have to be worked out. This will be done as soon as the first researchers are appointed. Work will be done by a combination of computational modeling (in collaboration with Kempen and Vosse), behavioral testing, and neuroimaging (in collaboration with Baggio, Kos, Menenti, Petersson, Willems).

6.3.2 Syntactic encoding

An fMRI experiment will be done which aims at determining the brain areas in which repetition suppression can be found in a syntactic priming paradigm. Repetition suppression allows more precisely than other imaging methods to read out the neural code that a particular area provides. This allows us to determine core components of the neural circuitry for syntactic encoding in speech production.

6.3.3 Artificial grammar learning

Continuing a line of research related to implicit artificial grammar learning we will conduct three follow-up experiments. The first is a combined artificial and natural language experiment, which aims at characterizing the combined effect of syntactic and semantic violations, (the so-called "syntactic boost"), in a 2 x 2 factorial fMRI design. In addition, the experimental design allows us to characterize similarities in the neural correlates of natural and artificial language processing in the same study population. The second follow-up experiment is an rTMS experiment and focuses on the causal role of the left inferior prefrontal cortex in the processing of artificial syntactic violations, which have been characterized in two of our previous fMRI studies of artificial grammar learning. Finally the third experiment focuses on the role of the caudate nucleus in artificial grammar processing. In this fMRI experiment, we investigate patients with early phase Huntington's disease (HD), a genetically well-described population with lesions localized to the caudate nucleus and compare these to matched normal controls. The overall relevance of these experiments is to clarify the overlap between natural and artificial grammar processing as well as characterizing the causal role of the left inferior frontal region and the caudate nucleus in artificial grammar processing.

6.3.4 ERP studies on language and discourse

ERP studies on language and discourse: The following ERP studies will be done in 2007: (1) completion of a large-scale ERP study on how readers

incrementally interpret value-laden opinion poll statements, and completion of a reading time study on discourse-based word-form prediction, (2) initiation of ERP studies on semantic illusions during language comprehension, on the processing of embedded words, and on metaphoric vs literal language comprehension in schizophrenics, (3) writing or co-authoring papers on completed work, notably on discourse-based prediction in reading and listening, on the neural substrate of establishing reference, on the interaction between semantic and referential processes during comprehension, on the semantic unification of embedded words, on personality differences in the use of pragmatic inferences during comprehension, on time-frequency EEG reflections of referential processing.

6.3.5 Oscillatory language-related brain activity

In previous research we have shown that modulations of rhythmic activity in EEG and MEG recordings, which are indicative of synchronization and desynchronization of networks in the brain, are related both to lexical retrieval operations (at the word level) and to syntactic and semantic unification operations (at the sentence level) during language comprehension. More specifically, there is some evidence suggesting that semantic unification operations involve networks synchronizing at gamma frequencies (around 40 Hz), while syntactic unification operations are captured in networks synchronizing at beta frequencies (around 20 Hz). Firmly establishing these initial findings would provide an important step forward in understanding the dynamics of neuronal network formation during language comprehension. The first step in this research plan therefore is to verify whether the initial findings can be confirmed in a larger-scale, fully within-subjects experimental design, using both EEG and MEG recordings. Another important goal for the coming period is to gather all international experts in the field of neuronal dynamics and language comprehension (initially in an expert meeting / workshop at the MPI in Nijmegen) in order to create a robust platform for the exchange of potential research topics, experimental findings, methodological approaches and other relevant expertise.

CHAPTER 7

INFORMATION STRUCTURE IN
LANGUAGE ACQUISITION

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Wolfgang Klein

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Joint research with other projects

Decoding continuous speech

The comparative study of L2 acquisition

Dynamics of Multilingual Processing

Introduction

The form in which some content, once selected by the speaker, is encoded in a sentence depends not only on the lexicon and the grammar of the particular language but also on the way in which the sentence is integrated into the information flow in on-going discourse. Regularities of this second type have always played a marginal role in the history of linguistic research. If dealt with at all, they were considered to be a part of rhetoric. To some extent, this has changed. In the 19th century, Henri Weil (1844) was the first to state that languages tend to order constituents according to the principle 'from old to new' – thus relating a structural device, word order, to the distinction between old/maintained/given information and new information. Georg von der Gabelentz (1868) pointed out that a distinction has to be made between those constituents which say what a sentence is about ("psychological subject") and those which predicate something about the former ("psychological predicate"). Although their ideas were taken up by a few scholars, such as Paul Bühler and members of the Prague School, more systematic work in the "information structure" of a sentence only started a few decades ago. This research, ranging from phonology to formal semantics, has steadily increased over the years, and it has now become the subject of extensive research at many places. It is surprising, therefore, that there is little systematic investigation of information structure in the learner varieties of children and adults. There is one major exception – the use of referential devices which differ in the degree of context dependence; thus, one and the same entity can be referred to by "an author – the author – Scott – he – 0", and the choice between these is partly determined by what has been said in earlier discourse. But first, work on these expressions is not primarily motivated by issues of information structure, and second, information structure shows up in many other devices, such as word order, intonation, special particles (e.g., "topic markers"), or special constructions, such as clefts.

In 2006, we began a new project which deals specifically with these devices and their interaction in learner varieties. It is cross-linguistic, and it includes first as well as second language acquisition. Among the various means which are typically used to encode information structure, priority will be given to word order, intonation, ellipsis and particles. Competing referential expressions and special constructions will not be excluded but will not belong to the core parts of the project. In what follows, first findings are presented. In sections 7.1 and 7.2, we report work on the influence of referent accessibility on children's use of word order (Dimroth and Narasimhan) and intonation (Herbst). In sections 7.3

and 7.4, we present work on the role of intonation to mark topic and focus in children and in adults (A. Chen).

7.1 Information status and word order in child language

Dimroth and Narasimhan investigated the relationship between information status and linear order in adults and three- and five-year-old children. Across many languages, adults prefer to order "given" information before "new" information. The "given-before-new" ordering preference is posited to have information processing value for adult speakers since prior mention of a referent facilitates earlier production of the accessible information (Wundt 1900, Bock & Irwin 1980, Levelt 1989). If similar considerations influence how children linearize their thinking for the purposes of speaking, referent accessibility should lead to a "given-before-new" ordering preference in children as well. In addition, the "given-before-new" ordering in adults' usage patterns constitutes input to children learning language, and may also lead to an early preference for the given-before-new ordering in children if they are sensitive to the correspondence between linear order and information status in the ambient language.

A referential communication task was employed in order to elicit descriptions of objects in contexts that are interactive yet controlled. Thirty-two children acquiring German (16 three-year-olds; 16 five-year-olds) and twenty-four adult native speakers of German participated in a game involving a picture-matching task. Participants were first shown an object (e.g., an egg) in a transparent, round container. An experimenter who could not see the container asked the question: *Was ist da drin?* "What's in there?" and the participant described the contents of the container. The experimenter repeated the participant's object description and identified the picture matching the object. The participant was then shown two objects in a container, one of which consisted of the object that had been described before (e.g. an egg and a bed), and asked again to describe its contents to help the experimenter find the matching pictures. The dependent variable was the order of object labels provided in the participant's response.

Findings show that adults prefer to order "given" information before "new" information as found in prior research (Figure 7.1). Children also have a consistent ordering preference, but surprisingly it goes in the opposite direction: "new" before "given". The same preference for the "new-before-given" order was found even at age five, suggesting that children's nonadult-like ordering bias persists well beyond the early stages of productive word combination.

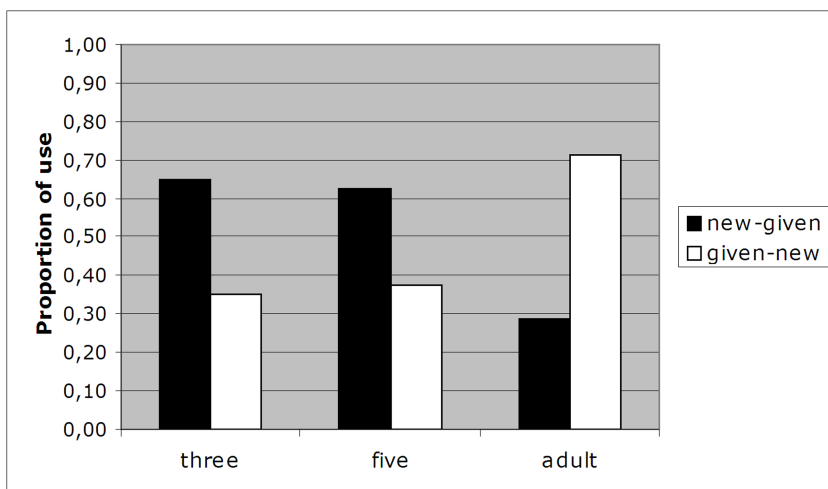


Figure 7.1: Use of "new-given" versus "given-new" order in 3-year-olds, 5-year-olds, and adults

It is possible that, in talking to their children (in contrast to other adults, caregivers may adopt a different strategy and foreground new referents by introducing them in the first position before mentioning previously labeled referents. Given children's sensitivity to patterns in the input it is possible that children's "new-before-given" preference is influenced by a similar preference in child-directed speech. In a second study, twenty-four adult caregivers (of children aged 2;5 to 6;1) were shown pairs of objects in a container, one of which had been seen and labeled by the participant earlier, and asked to provide object descriptions to the child. Each child was provided with a set of object pictures arranged in groups of three, and asked to point to the object(s) described by their caregiver. Results show that in addressing children, caregivers also prefer the "given-before-new" order. Therefore, children's preference for the "new-before-given" order does not reflect the preferred order in the speech produced by caregivers in the same types of communicative contexts.

The findings of the two studies demonstrate that the processing considerations influencing linear ordering in adults do not play the same role during the early stages of children's productive word combinations, but develop during later childhood. Nor do patterns in child-directed speech influence children's ordering preferences. Rather, other considerations, e.g. a novelty preference, may be influencing children's nonadult-like preference to order "new" information before "given" (Bates 1976, Baker & Greenfield 1988) even at age five.

7.2 The intonation of givenness in child German

As discourse proceeds, the information status of discourse referents changes from new (introduced for the first time) to given (introduced in prior discourse). It has been acknowledged in the literature that there are both different types and different degrees of "givenness" (e.g., Lambrecht 1994, Prince 1981). However, there is less agreement on how information status distinctions are reflected in intonation in adult language, and hardly anything is known about how children use intonational devices to mark such distinctions. Against this background, Herbst has started her PhD project on the use of intonation to signal the information status of referents in (narrative) discourse by children acquiring German.

In her study, Herbst is investigating the way recency of mention ('textual givenness') influences intonation in 5-year-olds, 7-year-olds, and adults. Participants were engaged in a story telling game (Figure 7.2) where they were asked to tell picture stories to a "naïve" listener who could not see the pictures. The target referents (animals) in these stories were presented in three conditions: new, immediate and distant, representing different degrees of givenness. In the "new" condition, the referent appeared for the first time in the story. In the "immediate" condition, the referent had occurred once in the immediately preceding picture. Finally, in the "distant" condition, the referent re-occurred after several intervening pictures.



Figure 7.2: Story telling game

On the phonological level, the types of pitch accents (shapes such as "fall", "rise" etc.) that speakers use in the different conditions were examined. First results indicate that 5-year-olds distinguish between new and immediate referents, with deaccentuation being the preferred pattern for immediate referents. These seem in turn to be intonationally differentiated from distant referents, indicating that these two information statuses are not realized as a single category 'given'. Further data analyses will also include phonetic

parameters such as pitch, duration and intensity.

7.3 Intonational realization of topic and focus in Dutch 4- to 5-year-olds

Chen continued her work on the intonational realization of topic and focus at the sentence level in child Dutch (Annual Report 2005). She examined how children use pitch accent types and deaccentuation to realize topic and focus and how they differ from adults. The topic and focus under investigation were realized as full NPs and were noncontrastive. A picture-matching game was used to elicit topic-focus structures as answers to WH-questions. Two variables were controlled for in the answer sentences: PRAGMATIC CONDITION (topic, focus), SENTENCE POSITION (initial, final), as shown in Table 7.1. Data were collected from children (aged 4-5 years, 7-8 years and 9-10 years) as well as adults.

	sentence-initial	sentence-final
focus	<i>Wie beschermt het bos?</i> 'Who protects the forest?' <i>De vos beschermt <u>het bos</u>.</i> ' The fox protects <u>the forest</u> .'	Wat eet de pad? 'What does the toad eat?' <i><u>De pad</u> eet een bes.</i> ' <u>The toad</u> eats a berry.'
topic	Wat eet de pad? 'What does the toad eat?' <i><u>De pad</u> eet een bes.</i> ' <u>The toad</u> eats a berry.'	<i>Wie beschermt het bos?</i> 'Who protects the forest?' <i>De vos beschermt <u>het bos</u>.</i> ' The fox protects <u>the forest</u> .'

Table 7.1: Experiment conditions in answer sentences.

Data from 4- to 5-year-olds and adults were annotated intonationally and analyzed. By and large, children and adults employed a similar set of pitch accent types (L*H, H*L, H*, !H*L, L*HL, H*LH, L*) as well as deaccentuation to mark the topic-focus distinction, though child-specific accent types were observed (i.e. H*L^HL, L*HLH). Further, children used deaccentuation more frequently in topic than in focus, like adults. That is, they used accentuation (any of the pitch accent types) more frequently in focus than in topic. This indicates children's sensitivity to the accentuation-focus and deaccentuation-topic associations. However, children and adults differed considerably in the intonation patterns that are most frequently used to realise topic and focus.

As shown in Figure 7.3, adults realized focus most frequently with H*L, independent of sentence position, in line with the literature on focus. However, they realized topic differently depending on sentence position. In sentence-initial position, topic, like focus, is mostly realized with H*L. In sentence-final

position, topic is typically deaccented. Deaccentuation was argued to be the default 'topic intonation' or the intonation of topic that children are supposed to acquire in the first place. Accentuation in sentence-initial topic was accounted for by rhythmic motivation. It has been suggested for English (Horne 1991, Terken and Hirschberg 1994) that accenting the pre-focal constituent in the same intonational phrase is rhythmically required. A subsequent perception experiment on melodic pleasantness with another group of Dutch adults showed that this is also true for Dutch.

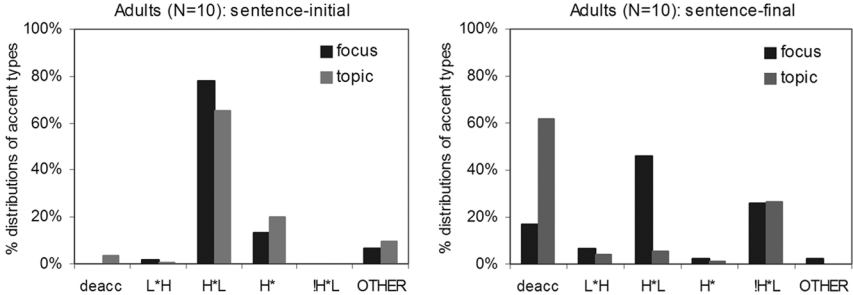


Figure 7.3: Mean % distributions of accent types in adult Dutch. OTHER includes H*LH, L*, and L*HL.

Children accented sentence-initial focus frequently using H*L and H*, like adults, as can be seen in Figure 7.4. But they exhibited a noticeably weaker preference for H*L over H* than adults. In sentence-final position, children used L*H and H*L with similar frequency to mark focus, showing no preference for H*L at all. Further, they accented topic frequently independent of sentence position. In sentence-final position, they used deaccentuation as frequently as L*H and H*L to realise topic. These findings suggest that children may treat deaccentuation, L*H and H*L as equally suitable intonation patterns to realise sentence-final topic. Taken together, results show that 4- to 5-year-olds have not acquired H*L as the typical focus accent and deaccentuation as the typical topic intonation yet. Possibly, frequent use of H*L in sentence-initial topic in adult Dutch has made it difficult to extract the functions of H*L and deaccentuation from the input.

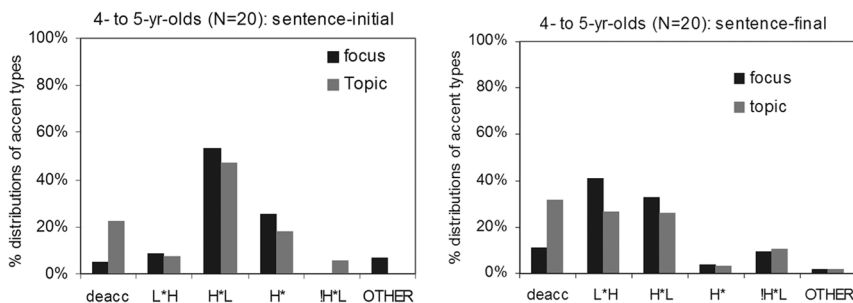


Figure 7.4: Mean % distributions of accent types in child Dutch. OTHER includes H**LH*, L*, L**HL*, H**L*^*HL* and L**HLH*.

7.4 Shaping the intonation of WH-questions: Information structure and beyond

Chen investigated how accent placement is pragmatically governed in WH-questions in adult spoken Dutch. To this end, a corpus of Dutch WH-questions was constructed and annotated for intonation and information structure. The corpus, selected from the Spoken Dutch Corpus (CGN), consists of 90 naturally occurring WH-questions (30 *when*-questions, 30 *what*-questions, 30 *why*-questions) in their original context.

In keeping with prior research (Lambrecht & Michaelis 1998), Chen found that accent placement on the focal WH-word is related to the information structure of the non-WH word part (Open Sentence or OS). When the entire presupposition in the OS has been ratified, the WH-word is nearly always accented. However, the WH-word is also frequently accented, in particular, in *why*-questions when the presupposition in the OS is not entirely ratified. This suggests that speakers may have motivations other than information structural ones to accent the WH-word. For example, speakers may accent the WH-word to signal a strong desire to obtain the information required via the WH-word.

Further, as predicted in prior work (Haan 2001), a ratified presupposition in the OS can be said with an accent if it is reintroduced to the discourse. However, the accent is not necessarily phonetically reduced relative to the accent on the WH-word. Moreover, accents were also assigned to a group of adverbs (e.g., *wel*, *toch*, *eigenlijk*, *precies*) in the OS. One effect that these accented adverbs seem to have on the hearer is that the speaker sounds more interested in finding out the answer than otherwise. In addition, the phonological constraint forbidding two adjacent accents within the same phonological phrase (Gussenhoven 2005) plays a role in shaping the intonation of the OS such that

the constituent immediately following the accented WH-word does not get accented even when information structure considerations dictate that it should receive an accent.

Taken together, these findings show that accent placement in WH-questions in spoken Dutch is governed not only by information structural principles but also by communicative motivations and phonological constraints.

CHAPTER 8
THE COMPARATIVE STUDY
OF L2 ACQUISITION

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Introduction

After many years of successful research, this project has now come to an end. It differed from other Institute projects in that only a small fraction of the actual work was done at the Max Planck Institute itself. Its role was in the first place to co-ordinate the joint research of a group of European research institutions. This cooperation will be continued in the form of a looser research network, still coordinated by our institute. This network will pursue the main ideas which were already characteristic of the project. The primary aim is the study of untutored second language acquisition from a comparative perspective that focuses on the following factors:

1. previous knowledge (L1 vs. L2 acquisition)
2. age (younger vs. older L2 learners)
3. language type (cross-linguistic comparisons)

Researchers in the project follow an approach in which the process of second language acquisition is not characterized in terms of errors and deviations, but in terms of the two-fold systematicity which it exhibits: the inherent systematicity of a learner variety at a given time, and the way in which such a learner variety evolves into another one.

This last report focuses on the work of the role of finiteness in learner varieties (8.1), where mainly previous knowledge and language type have been investigated. Some recent results on the impact of age on second language acquisition will also be presented (8.2).

Jolink, Kirsch, Verhagen, Schimke, Klein, and Dimroth carried out their work at the Institute. Ahrenholz, Jordens, and Pagonis are external collaborators of the project.

8.1 Finiteness

Traditionally, finiteness has been seen as primarily a morphological phenomenon: Verb forms that are inflected for tense, mood, person, number and (perhaps) other categories are considered to be finite, all others are considered as nonfinite. This is problematic, because the distinction between finite and nonfinite forms is also made when there is hardly any morphological distinction in the verb (as for instance in English). In addition, there are a number of syntactic, semantic and pragmatic phenomena which are clearly associated with finiteness. These include, for example, basic word order rules, the licensing of grammatical subjects and of expletive elements, constraints on gapping and other forms of ellipsis, nonspecific readings of indefinite noun phrases in nonfinite constructions, the temporal interpretation of verbal elements, the information structure and the illocutionary role of utterances. It

appears, therefore, that finiteness is not a mere fact of verb morphology but a grammatical category in its own right. Moreover, it plays a core role in the organization of utterances. Research from the finiteness project presented in the following subsection addresses some of its many facets. The focus is on previous knowledge and language type as comparative dimensions.

8.1.1 Finiteness in L2 Acquisition

Schimke continued her work on the development of morphosyntactic and semantic finiteness in native speakers of Turkish, acquiring German in an immersion setting. She ran a range of production and perception tasks with 41 learners. Based on their performance in production, participants were divided into a less advanced group, showing no systematic use of morphosyntactic finiteness, and a more advanced group which used morphosyntactic finiteness. A self-paced listening task was designed to test how these production differences are reflected in learners' processing. Results showed that the less advanced learners processed nonfinite syntax and morphology faster than finite syntax and morphology. The more advanced learners processed infinite syntax faster than finite, but there was no effect for morphology. Interestingly and in contrast to a native control group, none of the learner groups showed an interaction effect of syntax and morphology. These results suggest that learners start out with a preference for nonfinite morphosyntax not only in production, but also in perception. Moreover, this preference seems to disappear for morphology first and presumably for syntax later in their development. Finally, this suggests that the development in the two domains is independent at least as far as processing is concerned.

A core function of finiteness is the marking of illocutionary roles, in particular to mark assertive status. To test the development of this function, participants performed a picture selection task with pictures showing the performance of an action ("assertion picture") or leaving open whether an action was performed or not ("open picture"). Results showed that the less advanced learner group chose the "open" picture equally often for finite and nonfinite utterances, whereas more advanced learners and native speakers chose it more often for nonfinite than for finite utterances. The morphosyntactic development is thus associated with a change in the interpretation of finite versus infinite forms.

8.1.2 Finiteness in L1 Acquisition

Jordens investigated the acquisition of finiteness as a functional category. Earlier studies on the acquisition of Dutch have shown that finiteness plays an essential role in the development of the grammatical system in both L1 and L2 learners. In the initial stage, properties of finiteness are expressed with lexical means. That is, for the expression of illocutionary force learners make use of

lexical elements such as *ulle* (from *wil*, I want), *nee* (I don't want), *kanwel* (can), *kanniet* (cannot), *magwel* (may-indeed), *magniet* (may-not), *moet* (has to), *hoefniet* (does not have to). Spatio-temporal anchoring occurs with the use of adverbials such as *da* (from *daar*, there), *die* (that), *dan* (then), *nou* (now). The topic function is linked to the external argument which occurs in sentence-initial position. As the result of a developmental process, learners are able to find out that in the target-language system properties of finiteness are expressed with functional elements. That is, they discover that both illocutionary force and tense are expressed morphologically, while topicality can be expressed through word order (after the acquisition of the verb-second rule).

Both the grammatical system at the initial, lexical stage and the grammatical system at the functional stage are based on a Specifier-Head-Complement structure. A characteristic of learner utterances at the initial stage is the use of illocutive elements such as *mag* (may), *nee* (I don't want), and *wil* (I want) in (1), (2) and (3).

- (1) Jaja *mag* dop opdoen
 J may lid on-put
 'J is allowed to put the lid on'
- (2) Dit *nee* afdoen
 this no off-take
 'This, I do not want to take off'
- (3) Ik *wil* ook zitte
 I want too sit
 'I want to sit down too'

These examples illustrate that at the relevant stage, it is this illocutive element which occupies the head position, while the lexical verb with its internal argument serves as the complement. This means that the basic-utterance structure at the lexical stage is head-initial.

The complement is an attribute of the head. As such it is subject to selection restrictions which are determined by the lexical head. Lexical heads which are used for the expression of illocutionary force such as *volition*, *ability*, *permission* and *obligation* can only occur with event types that are categorized by the speaker as being under control (+Ctrl). Hence, these lexical heads select target-like verbal complements of which the external argument has agent function such as in (1), (2) and (3). Furthermore, as complements these verbal elements occur in utterance-final position. Event-types that are categorized by the speaker as not being under control (-Ctrl) cannot serve as the complement of a

lexical head expressing *volition, ability, permission* or *obligation*. They function as lexical heads, themselves. Thus, the possibility to use lexical expressions of illocutionary force determines a structural opposition between expressions referring to controlled types of events and expressions referring to non-controlled types of events. This opposition explains why there is a distributional difference between lexical verbal elements that occur utterance-finally, i.e. in complement position and lexical verbal elements that occur utterance-initially, i.e. in head position. Jordens' analysis of spontaneous Dutch learner data shows that the categorization of event types in terms of +Ctrl vs. -Ctrl and their distributional difference holds for both L1 and L2 learners. In utterance-final position target-like 'root infinitives' refer to event types that are categorized as agentive or +Ctrl, while in utterance-initial position, target-like 'finite' verb forms refer to event types that are categorized as nonagentive or -Ctrl. Given that the distribution of lexical verb-like elements can be explained on the basis of a categorization in terms of +/-Ctrl, morphological properties that make them appear 'nonfinite' or 'finite' may be irrelevant.

Jolink continued her dissertation project on the acquisition of the formal and functional properties of finiteness in Dutch. Longitudinal corpus data of 4 normally developing (ND) children and 2 SLI children were found to confirm earlier findings from Dutch diary data (Jordens 2002, Dimroth et al 2003): Both the ND subjects and SLI subjects first acquired lexical devices, such as particles and fixed modal constructions, to express assertion. Grammatical assertion markers, such as auxiliaries and morphologically finite main verbs, were acquired only later in development.

In spite of these similarities in the general development of the ND and SLI subjects, there were a number of differences on a more fine-grained level: one of the SLI subjects produced a higher percentage of agreement errors than the other subjects did. For the other SLI subject, the frequency of nonfinite verbs appeared to be related to discourse setting: he produced more nonfinite verbs during speech elicitation sessions than during free-play sessions. No such effect was found for the other children.

These findings indicate that SLI children's problems with the acquisition of finiteness do not concern the functional properties of finiteness, but rather the target-like morphosyntactic marking of these properties.

Kirsch investigated the usage of subject pronouns in a longitudinal case study on the acquisition of Russian as a first language. Although there is no agreement on whether Russian is a pro-drop language or not, it is clear that the subject pronoun can be left out in many contexts. Consequently, children's first

utterances with morphologically finite verb forms typically show pronoun omission. The first overt subject pronouns used by the two children under investigation occur with the past tense form. Only later are they acquired with present tense verb forms and only after that in analytical constructions. This acquisition pattern mirrors the order of the acquisition of morphological finiteness and reflects not only morphological complexity, but also the close relation of subject pronouns and finiteness. Russian marks person and number only on present tense forms. Past tense forms agree with the subject in gender but not in person. This means that the person is encoded in present tense forms but not in past tense forms. In child past tense utterances subject pronouns occur in varying word orders and persons. In contrast, the acquisition of subject pronouns with present tense verb forms and analytical constructions is stepwise. Only when the default word order SV(O) can be varied allowing the child to have a more flexible information structure of the utterance, are subject pronouns in plural or third person used productively.

8.1.3 Finiteness in relation to scope items

Verhagen continued her research on the acquisition of finiteness in Dutch as a second language. Previous studies have suggested that nonmodal auxiliaries lead to the development of finiteness and negation in Germanic languages: learners start out with pre-verbal negation and start using post-verbal negation only after the acquisition of auxiliaries (Becker 2005, Parodi 2000).

Data from an experiment were analyzed that confirmed this finding for L2 learners of Dutch at both the production and comprehension level. The experiment contained free and controlled production tasks (film retelling, picture stories, sentence imitation) and a reaction-timed judgment task (sentence matching). Participants were 57 Moroccan and 46 Turkish learners of Dutch.

The results support the idea that the auxiliary '*hebben*' ('to have') marks an important step in the acquisition of finiteness and negation: learners who produced '*hebben*' were found to use post-verbal negation, while other learners produced pre-verbal negation. Moreover, the results from the comprehension tasks showed that learners from the latter group had 'passive' knowledge of post-verbal negation with auxiliaries before they produced this type of negation. In other words, learners who did not yet use post-verbal negation or auxiliaries in production preferred post-verbal negation with auxiliaries in comprehension. Learners also frequently used constructions such as *hij is slapen* 'he is sleep' and *zij is steelt* 'she is steals'. A preliminary analysis of such constructions lead to the hypothesis that the *is*-verb complex helps learners establishing a proto-finite system, albeit differently for Moroccan and Turkish learners (proto-

morphology and proto-syntax, respectively). The experimental results described above indicate that it is the acquisition of *hebben* at a later stage, however, that helps learners of Dutch develop a fully finite system.

Winkler (HU Berlin) investigated the acquisition of finiteness and negation in first as opposed to second language acquisition. Previous empirical work on the L2 acquisition of German (Dietrich & Grommes 1998, Becker 2005) has shown a systematic correlation between the marking of finiteness and the placement of the negator in early learner varieties. Additionally, Dietrich & Grommes (1998) found that the marking of finiteness is clearly preferred in negated utterances as compared with utterances without a negator (see table 8.1).

Table 8.1

Learner variety	Learner	without NEG		with NEG	
		% + finite	% - finite	% + finite	% - finite
Pre-BV	Angelina	19,3	80,7	62,5	37,5
BV	Tino	42	58	100	-
	Marcello	59,3	40,7	63,6	36,4
Post-BV I	Tino	87,1	12,9	100	-
	Marcello	76,6	23,4	88,9	11,1
Post-BV II	Marcello	97,7	2,3	100	-

Table 8.1: Development of finiteness marking in negated and non-negated utterances in German L2 (Dietrich & Grommes 1998: 200).

Against the background of these findings Winkler analyzed the Caroline corpus, an extensive longitudinal study of the L1 acquisition of a monolingual German girl, available from the CHILDES-database. The results show that also in German L1 the marking of finiteness is realized significantly more often in negated contexts (see table 8.2).

Table 8.2

Stage	Age	without NEG		with NEG	
		+finite %	-finite %	+finite %	-finite %
1-5	1;06.13-2;03.10	30,6	69,4	72,3	27,7
1	1;06.13-1;10	9,1	90,9	-	-
2	1;11-2;00	7,2	92,8	50,0	50,00
3	2;01	18,5	81,5	72,0	28,0
4	2;02	41,8	58,2	70,4	29,6
5	2;03 (till 2;03.10)	82,8	17,2	88,9	11,1

Table 8.2: Development of finiteness marking in negated and non-negated utterances in German L1

Winkler argued that sentential negation functioned as a trigger for the establishment of the category of finiteness in both the acquisition processes of German L1 and L2. Furthermore, the developmental path for the investigated phenomena was worked out for L1 and L2: In a first step, a position for operators is established. Operators constitute a closed class within the early learner system. Typical elements of the operator class are negation words (NEG) and modal operators (MOD) represented by unanalyzed finite forms of modal verbs. In a second step, NEG and MOD are discovered to belong to different functional categories: the establishment of the syntactically fixed negation phrase (NegP) with NEG as its head leads to the reanalysis of MOD as finite modal verbs and thus as the carrier of the finiteness operator FIN. Finally, the position for FIN is worked out in a third step and the target-like morphosyntactic regularities for the expression of finiteness with all types of verbs are acquired.

The striking similarities exhibited in both developmental processes give rise to the more general idea that first and second language acquisition are guided by the same underlying mechanism(s).

In first as well as in second language acquisition, "little words" such as *only*, *also*, *already*, *still*, and *again* pose vexing problems for the learner. Their lexical meaning is not easy to grasp, and they interact in complicated ways with the sentence structure: there are positional constraints, and there are highly opaque scope properties. It is surprising, therefore, that children seem to master them at an early age; second language learners, by contrast, do have problems. However, most of these have to do with developing structural properties of the utterances in which such particles are integrated (Benazzo 2003, Dimroth 2002). This suggests that, some language-specific idiosyncrasies aside, these items are in fact lexically and structurally simple – it is just that we do not really understand their functioning as yet in fully fledged languages. In a new study, Klein examined the two particles *schon/noch* (roughly "already/still") in Standard German, in particular, their apparently complex scope behaviour and their interaction with focus. Like their counterparts in other languages, these two particles exhibit a wide range of usages. Thus, *schon* has a modal as well as a temporal usage; *noch* can express a sort of continuation, but it has also an "additive usage", which in English would have to be rendered by "another":

- (1) Er war noch krank. "He was still ill."
- (2) Er trank noch ein Bier. "He drank another beer."

There is no uniform analysis of these usages, and there is hardly any attempt to account for the scope properties of these particles. Compare, for example, the following sentences:

- (3) (a) Mozart war schon tot. (lit. "Mozart was already dead.")
(b) Schon war Mozart tot. (lit. "Already was Mozart dead.")
(c) Schon Mozart war tot. (lit. "Already Mozart was dead.")
- (4) (a) Mozart war noch krank. (lit. "Mozart was still ill".)
(b) Noch war Mozart krank. (lit. "Still was Mozart ill.")
(c) Noch Mozart war krank. (lit. "Still Mozart was ill.")

The (c)-variants, although entirely grammatical, are distinctly odd. The difference between the (a) variants and the (b)-variants is salient but not easy to grasp. Klein developed an analysis which naturally accounts for all of these variants. The general idea is as follows: A particle *P* divides the sentence in which it occurs into a nonscope part α and a scope part ω . In simple cases, α is that part which precedes the particle, and ω is that part which follows the particle; there are several complications which result from general properties of German syntax. The function of the particle is to relate the proposition expressed by $\alpha\omega$ to some other contextually relevant proposition $\alpha'\omega'$. Roughly, α' is " α at a later state" (*schon*) and " α at an earlier stage" (*noch*), respectively; ω' - the corresponding later/earlier property of α - can be identical with ω but it need not be. It is argued that (with one exception, modal *schon*), the various readings of *schon* and *noch* naturally result from the type of difference between ω' and ω , and from the type of order between the "earlier" and the "later" stage of α - does it reflect an order of the situations themselves or the order in which these are presented? The functioning of these particles does not depend on the focus structure of the sentence, as has often been assumed: particle as well as information structure contribute independently to the overall interpretation of the sentence. There is no "association with focus", as was often assumed in earlier research on these and other particles.

8.2 Second language acquisition at different ages

Besides a comparison of first and second language acquisition and cross-linguistic comparisons, the project also investigates the impact of an untutored learner's age at first contact with a second language.

Based on work by Bast (2003), Dimroth & Haberzettl (submitted), and Pagonis (in prep.), Dimroth conducted a corpus based survey study on word order and inflectional morphology in the untutored acquisition of German as a second

language by an 8-year old child and a 14-year old adolescent learner who had been exposed to roughly similar amounts of target language input (longitudinal DaZ-AF corpus, see Annual Report 2004: 115).

In order to test the hypotheses that the differences between child and adult second language acquisition affect (i) inflectional morphology more than syntax (Schwartz, 2003) and, within inflectional morphology, (ii) irregular items more than regular items (Birdsong & Flege, 2001), target language properties were selected from the domain of syntax (verb second, raising of finite verbs over negation) and inflectional morphology (subject-verb agreement, tense, noun plural, adjective-noun agreement), some of which are highly regular (adjective-noun agreement), some highly irregular (noun plural), and some regular in principle but with many lexical exceptions (subject-verb agreement and tense).

Whereas the child learner reaches the target language norm in syntax as well as in inflectional morphology, this is not the case for the adolescent learner. The predictions for age-related differences mentioned above hold only as a tendency. An analysis of outset, process and end state of second language acquisition reveals interesting differences between the two learners that are not predicted by these hypotheses. Both learners acquire verb raising, albeit in a different way. Moreover, the older learner often violated the German verb-second rule until the end of the observation period. When the initial position in the utterance is occupied by an adverbial, target-like subject-verb inversion occurs in free variation with utterances in which the finite verb is placed in third position. Some of the differences found in the domain of inflectional morphology do indeed concern irregular lexical exceptions, but highly regular inflections, e.g., adjective-noun agreement are involved equally. In order to understand which target language properties are likely to be affected by age, their formal and functional properties, as well as the role they play in the developing learner language have to be taken into account. Adjectival inflection is highly regular but also very complex (adjectives agree with number, gender and case of their head nouns and follow one out of three inflection paradigms depending on presence and type of determiner). It marks a syntactic relation between adjective and noun that always occur in adjacent position in this learner variety and therefore encodes redundant information. Language specific properties of this sort, involving the form and the function side, have to be taken into account when trying to come to a clearer understanding of age differences in second language acquisition.

In his project on the age factor, Pagonis (U. Heidelberg) studies the acquisition of German in two Russian sisters aged 8 and 14 (see Dimroth above), examining the plausibility of the Critical Period Hypothesis in comparison to a

motivation-based explanation. The main result can be summed up in three points:

First, the younger learner gets significantly closer to the target language in different areas of morphology and syntax than the older learner. This basically corresponds to the predictions made by the Critical Period Hypothesis.

Second, the younger learner's ultimate attainment does not reveal such an advantage in the lexicon: The older learner (onset after puberty) acquires the lexicon as comprehensively as her younger sister (onset before puberty), an outcome which cannot be explained by the Critical Period Hypothesis.

Third, and most interestingly, a detailed analysis of the acquisition process of the older learner reveals that her overall inferiority in L2 German cannot be attributed to a general lack of capacity to acquire the appropriate form-function-relations, as assumed by the Critical Period Hypothesis: Target-like word orders (V2, inversion, verb-last) are systematically observed in the older learner's utterances from early on; but she does not employ these structures as consistently as the younger learner. After 18 months of target language contact, deviant word order is still observed.

Thus, the older learner's weaker L2 competence does not reflect an inability to acquire form-function relations but to employ them appropriately. This speaks against the Critical Period Hypothesis and lends support to a motivation-based age factor model.

Ahrenholz (FU Berlin) began a longitudinal study on the development of syntactic structure in spoken language. The focus is on narrative competence in general; specific features include coherence devices, person reference, subject deletion, conjunctions, subordinate clauses, and lexical development. Participants are children in the third and fourth grades of elementary school who have been classified as needing remedial instruction. They include twenty-nine children with an immigrant background (L1 = Arabic, Bosnian, Kurdish, Polish, Russian, Turkish) and eight children with German as L1.

The study focuses on narrative story-telling, but the data collection also includes descriptions, instructions, and production in role-playing. The "Quaestio model" (Klein & von Stutterheim 1987) provides the theoretical framework. The acquisition of syntactic structures in German is examined with reference to both L1 and L2 acquisition. A key factor are the constraints on the placement of finite verbs. This includes the position preceding the finite verb and the verbal bracket when using modal verbs or tenses constructed with auxiliary verbs (1, 2), or separable verbs and the final position of verbs in subordinate clauses (2).

(1) AM1: und dann äm äm is er zu die treppe hoch gegangen.
and then is he to the stairs up gone
(girl, L1=Arabic, third grade, 8; 10)

(2) AJ1: und dann ist er wieder nach hause gegangen,
and then is he again at home gone
und hat er gesagt,
and has he said
danke dass du mir geholfen hast.
thank(you) that you me helped has
(boy, L1=Arabic, third grade, 9; 4)

Ahrenholz showed that if enough input and interaction in German is available for children with an immigration background these syntactic structures are acquired quickly at an early age and by age 8 no acquisition problems can be observed. Learner-specific utterances are observed only in children who came to Germany after already having started school and particularly involve difficulties with the acquisition of inversion in utterances in which the position preceding the finite verb is taken up by constituents other than the subject.

(3) KM1: dann der / diese junge geht auf dem eis.
then the / this boy goes on the ice
(girl, L1=Kurdish, fourth grade, 11; 8)

The finding that syntactic structures are acquired quickly during childhood (early L2) is largely supported by Thoma & Tracy (2006), Haberzettl (2006), Klages & Kaltenbacher (2006), and Jeuk (2006). If children start to learn German when they are around three or four years old, they generally acquire the basic syntactic patterns of German within 9–12 months, it takes adult learners several years to attain a comparable level of competence – if they reach it at all.

CHAPTER 9

THE DYNAMICS OF MULTILINGUAL PROCESSING

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Introduction

The Multilingualism project, headed by Gullberg and Indefrey and sponsored by a grant from the Netherlands Organization for Scientific Research (NWO), studies the processing of second and third languages (L2+) during first contact, during the acquisition period proper, and in the end state of high proficiency or functional bilingualism. These aspects of L2+ processing are explored using different methods, including reaction time and eye-tracking experiments, gesture analysis, and neuroimaging techniques (fMRI, ERP). The project is in part situated at the F. C. Donders Centre for Cognitive Neuroimaging.

In 2006, A. Brown completed and defended her dissertation on bidirectional cross-linguistic influences in the construal of motion events (see 9.3.3). FitzPatrick started his Ph.D.-research focusing on cross-linguistic effects on lexical access in sentence comprehension, following a master's thesis on the same topic (see 9.3.2).

9.1 The effects of exposure to an unknown L2+

Dimroth, Gullberg, Roberts, and Indefrey continued to examine the earliest perception and processing of input in an unknown L2. The aim of this study is to explore the adult learning mechanism by examining what information adult listeners can extract from rich, complex, continuous speech after minimal exposure, and to investigate the precise effect of item frequency, gestural deictic links between sound and context, and amount of exposure on word learning. Native Dutch listeners are exposed to a seven-minute weather report in Mandarin Chinese, a typologically unrelated L2, unknown to the participants (Annual Reports 2004, 2005). The weather report is naturalistic but controlled and includes a set of nominal, verbal, and functional target words that are either frequent (8 occurrences) or infrequent (2 occurrences). Half of the target words are also highlighted with gestures forming a deictic link to the referential content, i.e. the icons on the weather charts. We have previously demonstrated that adult Dutch listeners are able to extract word-related information from this continuous speech in an unknown language and recognize words after as little as 8 encounters if the word is highlighted by gestures, and also that they reliably assign meaning to bi-syllabic words after 16 encounters with gestures (cf. Annual Report 2005: 113-114).

In a new set of experiments we investigate whether adults can extract more fine-grained phonological information. Learners watched the weather report without any particular instructions as before, and then performed a lexical decision task on mono-syllabic words half of which were real words and half of which were nonwords. The results indicate that all Dutch learners guess

correctly that syllables with heavy consonant clusters (CCCV and VCCC, e.g. *spra*, *arsp*) are not Mandarin even without exposure. They are also sensitive to the position of lighter consonant clusters and reject syllable-final clusters like *ans*, but accept onset clusters like *sna*. However, exposure to the weather report does affect their judgements of CVC syllables. After only 7 minutes, they learn to correctly reject syllables like *gam* as impossible Mandarin words.

These results are in line with previous findings and bolster the notion that adult learners are capable of extracting remarkably fine-grained and abstract segmental information from complex, continuous input without any assistance.

9.2 The dynamics of the transition towards automatic processing of L2+

9.2.1 Neural correlates of L2+ syntactic processing

In research related to the study on the effects of first exposure, Davidson and Indefrey have launched a line of investigation on short term learning in Dutch learners of German. A common hypothesis in sentence processing research is that the functional architecture for grammatical processing is highly resistant to reorganization during adulthood. Recent work has shown some electrophysiological markers of grammatical discrimination in adult language learners after relatively short periods of training, but to date, electrophysiological measures of the learning mechanism itself are not yet well understood.

They hypothesized that Dutch learners of German would exhibit electrophysiological responses to German grammatical violations compared to controls after a short period of grammatical learning. Twenty Dutch native speakers classified German prepositional phrases presented serially as text at 500 ms inter stimulus intervals. Three types of violations were presented: Case, Gender, and Declension (see 1a-c; critical word underlined; each violation was paired with a corresponding control), over three phases: pre-test, training, and post-test. The pre-test and training phases took place on the same day within a single session, and the learners received both an instruction and feedback during the training phase, but not during the pre-test. The post-test took place in a separate session one week later. In all sessions, participants had to decide whether a phrase was grammatical in German or not, but only during training was feedback provided about the correctness of their decision.

- 1) a. *mit das kleinen Kind (Case)
 - b. *mit der kleinen Kind (Gender)
 - c. *mit dem kleinem Kind (Declension)
 - d. mit dem kleinen Kind (Control)
- 'with the small child'

During the pre-test, no electrophysiological differences were observed between violation and control conditions, and participants' classification performance was near chance. During the training and post-test phases, there was a greater negative potential to the Declension violation compared to its control in the time window of 300 to 500 ms after the critical word onset. No difference from control was observed in the Case and Gender violations in this window. In a 500 to 800 ms time window on the post-test the positive potential to the Case violation was greater than the control. Classification performance improved for all three conditions in the training and remained high in the post-test.

In addition to the violation effects, an error-related negative potential (ERN) was observed 120-150 ms after the response in the training and post-test, but not the pre-test. Learners with a larger magnitude ERN improved more from the pre-test to the post-test, suggesting that cortical network responsible for the ERN effect was also involved in grammatical acquisition in this experiment.

The violation effects suggest that rapid grammatical change can be observed during grammatical learning in adult learners, and the error-related negativity results suggest that feedback-related potentials can provide an electrophysiological marker of how this change occurs.

In a second experiment, we examined the responses of native German speakers for the same materials. Left anterior negativity (LAN) effects had been observed previously to case violations in a time window of approximately 300 to 500 ms. Importantly however, this effect was observed in sentence contexts in which a verb was present, whereas in the present experiment, only a preposition phrase was presented.

Statistical tests showed that for native speakers, all three violations were associated with a P600 violation effect on posterior electrodes, and in addition, Case and Declension violations were associated with a LAN violation effect in a 300 to 400ms time window on anterior electrodes. The Case violation effect was also present in an earlier (150 to 250 ms) time window on left lateral posterior sensors.

These results indicate that for native German speakers, a Case violation LAN effect can be observed in this paradigm (where no verb was present), and that a Case violation response can in principle appear within an early time window. More generally, the contrasting pattern of results for the native speakers and the learners suggest that although rapid changes in the electrophysiological response to grammatical violations can appear in L2 learners, these responses do not approximate native speakers early in the acquisition process.

9.2.2 Real-time processing of L2+ morphosyntactic features

Roberts and Verhagen piloted a new technique, the auditory sentence matching task (ASMT). Adapted from the reading paradigm, the ASMT aims to tap into hearers' grammatical knowledge without requiring them to make metalinguistic judgments. Participants hear pairs of sentences and decide whether or not the second sentence matches the first. As in the reading paradigm, we assume that identical pairs are matched reliably faster, if they are grammatical than if they are ungrammatical, since only a grammatical sentence can create a higher level structural representation against which to match the second sentence.

They first took materials (including word order violations) from established reading studies, and replicated the grammaticality effect with native German speakers. Following this, simpler items (in Dutch) were created, including word order violation sentences of (1a). Native Dutch speakers matched grammatical pairs (1a) approximately 100 ms faster than either of the ungrammatical conditions (1b and c), both of which elicited the same response times. Thus the method may be useful for investigating grammatical knowledge in low proficiency and/or untutored L2 learners.

- (1) a. Christine vraagt of haar vriendin het lied zingt.
b. *Christine vraagt of haar vriendin zingt het lied.
c. *Christine vraagt of haar vriendin het lied zingen.
'Christine asks if her friend sings the song.'

9.3 The interaction of L1 and L2+ processes in the proficient speaker

9.3.1 Interactions in multilingual syntactic processing

Roberts continued investigating L2 learners' on-line processing of constructions that differ syntactically between the L1 and the L2 with a study focusing on the processing of grammaticalized progressive aspect in the past. In the target language, English, ongoingness in the past is expressed via grammatical means (was/were + *-ing*). Three groups of L2 learners participated in the study, those whose L1 patterns are similar to English in this respect (French) and those whose L1 differs, with ongoingness expressed only via lexical means (Dutch, German). Should the learners' L1 influence their processing of English, we expected only the French group to perform like the native English control group.

The participants read, word-by-word, temporarily ambiguous sentences (1) and (2) in which a fronted adverbial clause contained a verb either in the past simple (1) or the past progressive (2). When English readers encounter verbs in the past simple, a direct object (DO) is expected, this is less the case with the progressive because the focus is on the activity *hunting*. This aspectual

difference has a behavioral consequence: a reader will be 'garden-pathed' in both sentence types, mistakenly interpreting the ambiguous noun phrase (NP) *the rabbit* as DO of the previous verb, however, there is much less commitment to this analysis in the progressive sentences because readers are ambivalent as to the presence of an object. Therefore, following disambiguation, recovery from misanalysis should be easier and thus processing should be faster in the progressive in comparison to the simple sentences.

(1) Past Simple, Garden-Path

As John hunted the rabbit escaped through the trees.

(2) Past Progressive, Garden-Path

As John was hunting the rabbit escaped through the trees.

All groups had difficulty processing the past simple Garden-Path sentences at the disambiguating verb *escaped*, continuing through to the end of the sentence, in comparison to non-garden-path control items (3). As predicted by the analysis above, this garden-path processing cost was smaller for English listeners processing progressive sentences (2 vs. 4).

(3) Past Simple, non-Garden-Path

As John hunted the rabbit it escaped through the trees.

(4) Past Progressive, non-Garden-Path

As John was hunting the rabbit it escaped through the trees.

An L1 influence in the L2 learners' on-line processing was found, when comparing the processing times for the progressive garden path sentence (2) with its non-Garden-Path control (4). The French, like the English, showed an asymmetry in their processing of the two sentence types; they had much less difficulty reading the past progressive sentences, with no difference in reading times between the garden-path (2) and the non-garden-path (4) conditions following disambiguation. In contrast, the German and the Dutch learners processed both sentence-types in the same way, with equally high reading times for both the past simple and progressive garden-path conditions (1 and 2) up until the end of the sentences. This suggests that they strongly preferred a DO analysis for the ambiguous NP, irrespective of the grammatical aspect of the previous verb, even those who were highly accurate in their production of simple and progressive forms as shown in a cloze test task. It seems, therefore, that if unavailable in the L1, successfully applying the past simple/progressive distinction may not automatically mean that learners have acquired the shift in focus observed with speakers of languages with grammaticalized aspect.

In another line of study, Schneider, under the supervision of Indefrey, continued her Ph.D.-research on syntactic processing and the transfer of first language (L1) mechanisms to the processing of the second language (L2) in multilingual speakers. The research question is whether the syntactic processing of L2 sentences will be differentially affected depending on the possibility of applying L1 mechanisms. Turkish learners of Dutch were chosen as participants for two experiments due to the differences in word orders between these languages. In Dutch, SVO is the standard word order in main clauses, while Turkish prefers SOV.

In a self-paced reading time experiment, L1 and L2 speakers read sentences in three different word orders, SOV (subject-object-verb), SVO and VSO. The assumption was that for Turkish learners of Dutch, word orders such as SVO and VSO would lead to processing difficulty and thus to higher reading times relative to SOV, if processing strategies are being transferred from the L1. Results show that the total reading time was not significantly different between the different sentence types for L2 speakers. For L1 speakers, there was a significant difference between the different sentence types with SOV sentences being processed significantly more slowly than both SVO and VSO sentences. This shows that for native speakers of Dutch, the frequency of occurrence of certain sentence types is not reflected in processing difficulty or ease since in Dutch, SOV is not the least frequent word order of the three word order types examined.

The same subjects also participated in an fMRI experiment using the same type of sentences. A preliminary analysis of the hemodynamic responses suggests stronger activation for SOV sentences compared to SVO and VSO sentence in Broca's area for L1 speakers while L2 speakers do not show this difference. Corresponding experiments in Turkish are currently being prepared in order to compare L1 and L2 processing.

9.3.2 Interactions in multilingual lexical access

Under the supervision of Indefrey, FitzPatrick completed his Master's Thesis on the effects of sentence context in L2 natural speech comprehension. Electrophysiological studies consistently find N400 effects of semantic incongruity in nonnative written language comprehension. Typically these N400 effects occur later than N400 effects in native comprehension, suggesting that semantic processing in L2 may be delayed compared to L1. In this study we were firstly interested in replicating the semantic incongruity effect using natural auditory speech, which poses strong demands on the speed of processing. Secondly, we wished to investigate whether a possible delay in

semantic processing might be due to bilinguals accessing lexical items from both their L1 and L2 (a more extensive lexical search). We recorded EEG from 30 Dutch-English bilinguals who listened to English sentences in which the sentence-final word was: (1) semantically fitting, (2) semantically incongruent, (3) initially congruent (i.e. semantically incongruent, but sharing initial phonemes with the most probable sentence completion within the L2), (4) semantically incongruent, but sharing initial phonemes with the L1 translation equivalent of the most probable sentence completion. We found an N400 effect in each of the semantically incongruent conditions. This N400 effect was significantly delayed to L2 words that were initially congruent with the sentence context. We found no effect of initial overlap with L1 translation equivalents. Taken together these findings firstly demonstrate that nonnative listeners are sensitive to semantic incongruity in natural speech, and secondly indicate that semantic integration in nonnative listening can start on the basis of word initial phonemes, and finally suggest that listeners may not access the L1 lexicon during L2 sentence processing.

9.3.3 Interactions in multilingual processing at the conceptual/ semantic interface

A. Brown completed her dissertation research under Gullberg's supervision investigating interactions between languages in the multilingual mind. The thesis focused on: a) whether an emerging L2 can influence an established L1, b) how such influence is realized, and c) whether there are parallel influences of the L1 on the L2. These questions were investigated in motion event construals, where cross-linguistic differences exist in speech and co-speech gestures. Narrative data were elicited from monolingual Japanese speakers, monolingual English speakers, and intermediate Japanese speakers of English (resident in Japan or the USA) in their L1 and L2.

Evidence of bi-directional cross-linguistic influence was found in (1) the expression of Path in speech, (2) the expression of Manner in speech and gesture, and (3) combinations of Manner and Path in speech and gesture. Overall, non-monolingual speech and gesture in L1 and L2 looked much more similar to each other than did the same aspects in the production of monolingual controls in English and Japanese. For instance, non-monolinguals used both verbs and adverbials to express Path and therefore produced significantly more mentions of Goal per clause than either monolingual Japanese or English speakers. This pattern held both in their L1 Japanese and in their L2 English. Further, with regard to the expression of Manner, non-monolinguals, both in their L1 and their L2, showed significantly less overlap between speech and gesture than monolingual Japanese, but significantly more overlap than

monolingual English speakers. Finally, concerning combined expression of Manner and Path, non-monolinguals produced single- and multi-clause frames expressing Manner and Path, in contrast to the single-clause frame preferred by monolinguals. In addition, in gestures, non-monolinguals displayed both character-perspective (sagittal and bi-manual with an enactment hand-shape) and observer-perspective (lateral and single-handed with no enactment hand-shape) in contrast to clear cross-linguistic differences in the monolinguals' preferences. Again, these patterns held in the discourse of non-monolinguals both in the production of their L1 Japanese and in their L2 English. In sum, nonmonolinguals behaved differently from native monolingual speakers of both their L1 and L2.

These results suggest convergence between linguistic systems in the multilingual mind. Convergence in this sense is distinguished from language loss, since production regarding motion event construal was not ungrammatical and was not affected by residence in the L2 versus L1 community. Therefore, in addition to well-known effects of the L1 on the L2, the L2 appears to influence the L1, even at intermediate levels of L2 proficiency.

In a related line of research Indefrey, Sahin, and Gullberg investigated the categorization of static topological relations in Turkish/Dutch bilingual speakers and monolingual Turkish and Dutch speakers. Elicited production data from the monolingual speakers showed differences between the Dutch and the Turkish system for ground objects with fixed topological relations (e.g. 'in the mouth') where Turkish uses a locative suffix rather than a topologically explicit postposition such as *iç* 'in', and 'on/above' relations which are distinguished in Dutch but not in Turkish. Both Turkish-dominant and Dutch-dominant bilingual speakers showed an influence of L2 on L1 using topologically explicit postpositions instead of locative suffixes in Turkish descriptions. Only Turkish-dominant bilinguals showed an L1 influence on their L2 in the description of 'on/above' relations, using the preposition *op* 'on' instead of *boven* 'above'.

9.3.4 Complex interactions in multilingual processing: Code-switching

Gullberg, Indefrey, and Muysken (Radboud U. Nijmegen) continued to examine code-switching, i.e., the switching from one language to another mid-utterance, in Papiamento-Dutch bilinguals. As previously reported, with the help of bilingual and code-switching experimenters, we have collected data from the same 21 Papiamento-Dutch bilinguals on several tasks progressing from interactive to individual settings, and from more naturalistic to experimental tasks (Annual Report 2004: 129). We have previously examined how structural constraints like the presence of finite verbs, and language dominance influence

switches between major constituents. We have also begun investigating how switches within constituents are affected by the language of functional elements inside the constituent as opposed to the language of a functional element outside the constituent, comparing the effect of determiners within noun phrases to the effect of finite verbs preceding the noun phrase.

In parallel to the experimental work, we have constructed the first multimodal corpus of adult Papiament-Dutch conversation available. The corpus consists of 5 four-party-conversations of half an hour each. Transcribed by native speakers of Papiament-Dutch, it is glossed and tagged for language and grammatical category using a coding scheme previously established for a Papiament-Dutch child-adult corpus (Vedder, Kook, & Muysken 1996).

The corpus is multimodal such that the transcription and annotations are linked to both audio and video files. The video data consist of two temporally synchronized streams of video showing two of the four participants. The corpus is implemented in the annotation tool ELAN (cf. Figure 9.1), which also has a search function allowing for searches across multiple files, among other things (cf. Annual Report 2005: 146-147). The possibility to search across multiple speakers for use of a particular form is of crucial theoretical and methodological importance to help establish whether individual word forms are in fact code-switches or established loans. Also relevant for validation purposes is the possibility to ascertain whether within-constituent switches in the experimentally elicited data are also attested in natural data. For instance, switches between adjectives and nouns by necessity violate word order rules in both languages, and are expected not to occur. When they *do* occur in elicited production, their validity can be verified in the conversation corpus. The corpus can be examined for a number of other issues including gesture production, prosodic features of code switches, etc. The corpus has been integrated into the MPI Browsible corpus and is publicly accessible via the MPI website at <http://corpus1.mpi.nl>.

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1:9.000 00:11:19.500 00:11:20.000 00:11:20.500 00:11:21.000 00:11:21.500 00:11:22.000 00:11:22.500 00:11:23.000 00:11:23.500 00:11:24.000 00:11:24.500

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gram@subject#3

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ts@subject#2

q@subject#2

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gram@subject#2

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0392

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100kay/2006

0393

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P	P	P	X
4	6	3	2

100kay/2006

0394

bo	ta	skhan	twes	maanden	du	3
you	are	here	two	mon-plu	so	3
P	P	P	N	N	Y	3
4	2	6	8	1	-3	7 3

100kay/2006

Figure 9.1: Example from the Papiamento-Dutch four-party conversation corpus. For each speaker, the tiers displayed are transcription, gloss, language, and grammatical coding.

CHAPTER 10

SIGN LANGUAGE TYPOLOGY

Participants:

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Collaboration with other projects:

Categories and Concepts across Language and Cognition

Introduction

In 2006, the Sign Language Typology Group continued its work on the documentation and the comparative cross-linguistic study of sign languages around the world. New group members worked on sign languages from Ghana (Nyst) and from Jordan (Hendriks). The group was based at the Max Planck Institute in the first half of 2006 and then moved to the University of Central Lancashire in Preston UK, where it re-established itself as the International Centre for Sign Languages and Deaf Studies in the Faculty of Arts, Humanities and Social Sciences.

10.1 Documentation of sign languages

In 2006, work on the sign language corpus focused on consolidating the corpus structure and on preparing for the group's move to the UK. Corpus manager Schwager worked with other group members on a comprehensive inventory of both primary data tapes and data in the Browsable Corpus.

The Sign Language Typology Group began a new major strand of research on the comparative study of sign languages in village communities, a research area that developed out of our previous work on Kata Kolok, a village sign language in northern Bali, in 2005. Because of the striking results and their importance for the development of the field of sign language typology, the research group launched a new subproject focusing entirely on the documentation of village sign languages. Village sign languages occur in village populations with an extraordinarily high incidence of hereditary deafness over several generations. Because of the continued presence of deaf people in such a village, a local sign language can develop in isolation from other signed and spoken languages. Village sign languages have many unusual structural features that differ from the better-documented urban sign languages (see Annual Report 2005 on the use of the sign space in Kata Kolok), and their sociolinguistic situation is completely different as well.

In addition to continuing work on Kata Kolok by Kanta, the Sign Language Typology Group worked on data from a second village sign language in 2006. As part of the cross-linguistic project on possession and existence, Nyst used data from her PhD research on Adamorobe Sign Language in Ghana. This is the sign language used in Adamorobe village, and the language is now endangered due to contact with the urban Ghanaian Sign Language.

On April 4-6, 2006, the Sign Language Typology Group hosted a workshop on "Sign languages in village communities". This was the first time that the very few existing projects on village sign languages were brought together, and the

workshop was attended by researchers working with signers from rural deaf populations in Bali, Thailand, Jamaica, Israel, Mexico, Ghana, and Surinam.

10.2 Cross-linguistic project: Possession and existence

The typological research project on the expression of possession and existence in sign languages continued in 2006. Zeshan and Perniss compiled data coming from co-researchers in several additional countries. The data were collected by co-researchers in a standardized way using the stimulus materials created by Zeshan and Schwager in 2005. Group members Nyst and Hendriks contributed data to the possession/existence project from Adamorobe Sign Language (Ghana) and Jordanian Sign Language respectively, and Perniss worked with Kanta on possession and existence in Kata Kolok (Bali).

The data collection phase for the project was completed at the end of 2006, and the final corpus includes data from 25 different sign languages (8 from Europe, 5 from the Americas, 4 from Africa and 8 from Asia). The next step will be the comparative analysis of all data.

On January 9-14, 2006, the Sign Language Typology Group hosted an international workshop on 'Cross-linguistic sign language research'. This workshop was organized in order to stimulate networking, exchange of information and research cooperation between sign language researchers, in particular with respect to researchers in countries where sign language research is only just beginning to establish itself, and researchers who are themselves deaf sign language users.

In preparation for the sign language typology database, the research group compiled data sets from a number of sign languages covering the initial target domains of the database, including colour terms, kinship terms, number paradigms, interrogatives, and negatives. Further work on the sign language typology database itself was put on hold until after the move to the UK.

10.3 Collaboration with other projects: Reciprocals

Zeshan and Panda continued their research as partners in a project headed by Evans (U. Melbourne) on the expression of reciprocals across languages. They contributed their analysis of data from Indo-Pakistani Sign Language to a forthcoming volume. Indo-Pakistani Sign Language (IPSL) is the only sign language represented in this collaborative project, and thus adds an important new perspective to the generalizations drawn from various spoken languages in the project.

IPSL has a reciprocal construction that applies to a particular class of transitive verbs as well as to an auxiliary. The reciprocal is formed by modifying the movement patterns of the verb/auxiliary sign. The construction can apply to a wide range of semantically reciprocal situations as long as they are symmetrical. Unlike in many spoken languages, however, it is impossible in IPSL to use a reciprocal construction for situations that denote the movement and/or location of entities, such as people following each other or sitting next to one another, or objects being in a spatial configuration with respect to one another. A different construction type known as 'classifier construction' is used for these situations, and they are incompatible with the reciprocal form. Due to the visual-spatial modality, IPSL reciprocals can take further modifications conveying a wide variety of complex spatial arrays. IPSL also has a substantial number of inherently reciprocal signs, which have developed from the productive reciprocal construction.

For the purpose of cross-checking the IPSL data with data from a different sign language, additional data from Turkish Sign Language were collected in 2006 using the same set of standardized stimulus materials.

10.4 Applied sign linguistics: Jordanian Sign Language

Hendriks and Kheysat developed a beginner's level course in Jordanian Sign Language in May 2006. The course will be used by our Jordanian partners for teaching Jordanian Sign Language in a more structured way and for training additional deaf people to work as sign language teachers.

CHAPTER 11

OTHER RESEARCH

Overview

- 11.1 Language documentation and field work
- 11.2 Natural logic of language and thinking
- 11.3 Neurocognition

11.1 Language documentation and field work

11.1.1 Documentation of #Akhoe Hai//om

This documentation project, funded by the VW DoBeS programme, completed its first phase of three years of research. The project, led by Levinson, consists of an interdisciplinary research team (Widlok, anthropology, Rapold and Hoymann, linguistics) that compiles an in-depth description and multi-media documentation of linguistic and cultural materials for #Akhoe Hai//om, a Khoisan language spoken by a group of hunter-gatherers in Namibia.

For this purpose the three project workers have now spent a total of 22 researcher/months in the field, collecting 242 hours of digital video recordings and compiling an electronic corpus of the #Akhoe Hai//om language, archived at the MPI in Nijmegen, currently consisting of more than 200 sessions (with metadata information) of material covering everyday conversation and activities, rituals and songs, group discussions, political meetings, games, story telling, oral history and a large spectrum of elicited language material on spatial language, interrogatives and the use of reciprocals and impositional verbs. The language documentation also includes a grammatical sketch of #Akhoe Hai//om and an electronic lexicon of (currently) 1914 entries, a collection of several hundred still photos, and complementary ethnographic data. Linguistic analysis of the material has been carried out with a focus on the use of the reciprocal (Rapold), the use and form of interrogatives (Hoymann), and on turn-taking in storytelling and the use of the unique kinship terminology (Widlok).

Syntactic tests revealed that contrary to the commonly held opinion, reciprocals in #Akhoe Hai//om (and Khoekhoe) are not verb derivators but reciprocal pronouns. Semantically, #Akhoe Hai//om features the cross-linguistically rather rare use of "fore-shadowed" reciprocal marking such as '*They give each other a cup*' to describe an asymmetric event where person A gives B a cup. This possibly reflects the mutualist hunter-gatherer interactional mode of the speech community. With regard to interrogatives, results indicate that of all grammatically marked question utterances in #Akhoe Hai//om two thirds are of the Wh-question type and one third are Yes/No-questions – the exact opposite of most languages represented at the MPI in Nijmegen and with repercussions for calculating the interactional "costs" of asking questions. In terms of ethnographic data "moral reasoning elicitation" showed how echoing and particularizing is being used to achieve consensus in moral discourse.

The #Akhoe Hai//om corpus that is now integrated into the electronic DoBeS database is multifunctional in that it allows both further anthropological and linguistic analyses.

11.1.2 Documentation of Mon-Khmer languages

Descriptive fieldwork and analysis of several languages of the Mon-Khmer language family (the major sub-branch of the Austroasiatic language family) was carried out by Burenhult, Enfield, and Tufvesson. This was in collaboration with visitors Gérard Diffloth and Samruan Wongjaroen.

Supported by a Volkswagen Foundation DoBeS grant, Burenhult carried out fieldwork in Peninsular Malaysia for a descriptive and documentary study of Semnam, a Central Aslian language spoken by some 250 resettled foragers in the Perak valley. Work has so far focused on the rich phonemic system of this hitherto undescribed language, as well as its phonotactic characteristics. As far as can be determined at present, Semnam has a phonemic inventory comprising 20 consonants and as many as 36 contrasting vowel nuclei (with a basic 3x3 system of simple vowel quality distinctions, plus diphthongs, cross-cut by length and nasality). The consonant system represents a typical Aslian pattern, while the numerous vowel distinctions form one of the most complex vowel systems of the Aslian sub-branch of Mon-Khmer. Burenhult also completed a survey of Northern Aslian languages and dialects spoken by groups of foragers in Perak and Kelantan (Peninsular Malaysia), collecting wordlists and basic grammatical and sociolinguistic data from varieties of Kensiw, Kintaq, Jahai, Menriq and Batek.

Burenhult and Diffloth collaborated in comparison and analysis of lexical data from several Aslian languages, especially Jahai and Semnam, with particular focus on animal and plant names.

Tufvesson continued her fieldwork and analysis on the form class of 'expressives' in Semai (Central Aslian), partly in collaboration with Diffloth in Nijmegen. She conducted large-scale data collection and field testing of a range of elicitation stimuli for expressives during a field work expedition in Malaysia. Associated with this work, she refined the analysis of Semai phonetics and phonology.

Enfield continued field work on Kariì, a previously undescribed Vietic language of upland Central Laos, concentrating on collection of vocabulary and conversational texts. The list of vocabulary items numbers around 3000, and about 2 hours of high quality video-recorded conversation has been transcribed. Further hours of video-recording will be transcribed in subsequent field trips.

The main advances in the analysis of Kariì grammar in 2006 concern phonology. This work was done in collaboration with Diffloth, both in Nijmegen and during a fieldwork stint in Laos in August 2006. Some typologically notable features of

the Kariì phonological system are: (1) Word structure: Any Kariì word has one stressed syllable. It may have two syllables, in which case the first will be unstressed, and reduced in other ways; (2) Vowels: The vowel system features a large number of contrasts: 18 long vowels, 12 short vowels, 3 diphthongs; (3) A register distinction: The high number of vowels is brought about by a thoroughgoing contrast between heavy and light registers – a binary parameter of register 'splits' each vowel into two; (4) Initial vs. final consonants: there are significantly more initials than finals. Initial stops show a three-way contrast in voice onset time, including a series of voiced implosives; (5) A terminance distinction: In word-final position, there is a systematic contrast between three types of terminance: voiced, voiceless, and checked (post-glottalized). This three-way distinction is realized for nonobstruents (see examples below); (6) The syllable-level features of register and terminance cross-cut, giving rise to six possible syllable types, structurally and historically comparable to tones: heavy checked, heavy voiced, heavy voiceless, light checked, light voiced, light voiceless. These features are understood to have set the stage for the process of tonogenesis hypothesized for Vietic languages such as Vietnamese and Muong. The Kariì facts are also of special relevance to the more general study of tonogenesis in Asia and elsewhere.

One feature of Kariì phonology is particularly unusual in the context of Mon-Khmer languages and Southeast Asian languages more generally. This is the three-way contrast in manner of articulation of final nonobstruents. Here are some examples of the contrast:

- (a) [tʰɔːj⁰] 'tail' [tʰɔːj¹] 'bowl' [tʰɔːj^h] 'follow'
 (b) [z¹ɑː⁰] 'turtle' [z¹ɑː¹] 'pig basket' [z¹ɑː^h] 'dry'

It is rare in Southeast Asia to find a systematic contrast between voiced and voiceless finals. Here is the full series of contrasts across the five types of non-obstruent finals:

- | | | |
|-----------------------|--|---|
| -V vs -V ^h | [z ¹ ɑː ⁰] 'turtle' | [z ¹ ɑː ^h] 'dry' |
| -j vs -j ^h | [tʰɔːj ⁰] 'tail' | [tʰɔːj ^h] 'follow' |
| -r vs -r ^h | [tɑːr ⁰] 'rapids' | [tɑːr ^h] 'to run out of workspace' |
| -l vs -l ^h | [dɑːl ⁰] 'to close off' | [dɑːl ^h] 'to bounce' |
| -w vs -w ^h | [cɑːŋw ⁰] 'green' | [z ¹ ɑː ⁰ ɓlɛːw ^h] 'four-eyed turtle: <i>Sacalia quadriocellata</i> ' |

11.1.3 Documentation of Yurakaré

The DoBeS project "The Documentation of Yurakaré" is dedicated to the documentation, description and analysis of the Yurakaré language, which is spoken in various scattered communities in the foothill area of the Andes in central Bolivia. The documentation project has as its objective to collect different types of Yurakaré language material, which will be archived at the MPI after processing. The project, headed by Levinson, started in June 2006. The project team consists of Van Gijn, Hirtzel, and Gipper, who is writing her dissertation as part of the project, focusing on the modal system of Yurakaré.

The major part of the first half year of the project consisted of an extensive field trip for all three members. One of the objectives of this first field trip was to set up the field situation, establishing contacts with the local indigenous organizations representing the speaker communities, and reaching agreement about the terms and conditions of the fieldwork. Having accomplished this, Van Gijn and Gipper went to their respective field sites to start data collection. Van Gijn spent four weeks in the community of Nueva Lacea on the Sécore River, and collected 54 hours of video material. Gipper spent six weeks in the community of San Pablo on the Isiboro River and collected 48 hours of video material. The collected data consist of different kinds of language material, such as narratives, ethnographic descriptions, natural conversations, and elicitation sessions. Hirtzel will start collecting data next year; this year he focused on organizational aspects of the field situation.

They furthermore set up their local office in Cochabamba, and started processing their data. They capacitated a Bolivian (Yurakaré) research assistant to use the computer programs. Vincent Hirtzel is currently still in Bolivia to work with the local assistant transcribing data.

11.1.4 Metadata Descriptions and Spoken Language Corpora

In an invited paper on the importance of detailed metadata descriptions in, and for, working with linguistic corpora presented at the Annual Meeting of the Institute for the German Language in Mannheim, Senft pointed out that working with corpora which document non-Indo-European languages immediately reveals how much culture specific knowledge is required to adequately understand the data. He illustrated this with a short excerpt from the documentation of gossip on the Trobriand Islands. Senft explained what a listener or a reader of this excerpt has to know to be able to follow the verbal interaction and to understand what is actually happening during this piece of conversation. He emphasized that the exploitation and interpretation of data presented in corpora essentially and indispensably depends on the detailed

explication of such culture specific information. This explication is given in metadata descriptions that must be provided for each document of any speech data corpus. The quality of every speech data corpus completely depends on the quality of its metadata descriptions.

11.1.5 Sahul

The European Science Foundation project "Pioneers of Island Melanesia" (see Annual Reports 2002–2005) came to fruition during the year, with the final preparation of full grammars of Savosavo (Ph.D. project Wegener), Rotokas (Ph.D. project Robinson) and Yélf Dnye (Levinson) and many descriptive and typological papers on these and other languages of Island Melanesia.

In 2006 Dunn, Reesink and Levinson began working on the project "Structural Traces of the Sahul Past", co-hosted with the Radboud University Nijmegen. This project continues the methodological advances in structural phylogenetics begun under the "Pioneers of Island Melanesia", and seeks to apply structural phylogenetic methods to languages spoken in the region the ancient Sahul continent. About 10000 years before present rising sea level broke Sahul into the two major landmasses to be seen today, New Guinea (Papua New Guinea and the Indonesian province of West Papua), and Australia. Each of these landmasses is thought to have one large family (Pama-Nyungan in Australia, and Trans New Guinea in New Guinea), and a group of unknown or unclear affiliation which shows a much higher degree of diversity (known as Non-Pama-Nyungan in Australia, and as non-Trans New Guinea Papuan in New Guinea). The Sahul project seeks to address a number of large questions in Sahul linguistics.

The unity of Trans New Guinea phylum

Work is underway to carry out structural phylogenetic and structural-geographic correlation analyses of the Trans New Guinea phylum to test the validity of this as a genealogical grouping. An expanded typological questionnaire has been developed (based on the questionnaire used in the Pioneers of Island Melanesia project), and by the end of 2006 Reesink has completed coding of 16 of the 20 Trans New Guinea languages to be used in the analysis.

Linguistic connections across the Tasman

The Tasman Strait, separating New Guinea and Australia, came into being circa 10000 years before present, making it plausible that there might be some deep genealogical connection between the languages of each side. The project is in the preliminary data gathering phase for this subproject. In December Singer (Radboud University Nijmegen) joined the Sahul project. She is working on the

Australian language component of the database (one questionnaire completed by the end of 2006).

The phylogenetic methods used during the Pioneers of Island Melanesia project (chiefly the 'Maximum Parsimony' method) are increasingly superseded by Bayesian methods of phylogenetic inference. Dunn has refined the analysis of East Papuan and Oceanic/Austronesian languages carried out in 2004-2005 using Bayesian methods and has found stronger evidence than previously for the ancient genealogical links between the East Papuan languages.

Bayesian phylogenetic methods use a relatively realistic model of evolutionary change (the complexity of which is up to the researcher) in a search of the vast space of possible histories to find the parameters of model (including a tree topology) that are most likely to have produced the observed variation amongst the taxa studied. The result of this search is a sample of equiprobable phylogenies; the statistical properties of this sample quantify the confidence in the different aspects of the phylogenetic reconstruction, and also allow conflicting phylogenetic signal (such as caused by contact induced convergence in languages) to be identified.

The results of the reanalysis of the Oceanic languages used as a test of the method in Dunn et al. 2005 is shown in Figure 11.1. Panel (a) shows the sample of Oceanic languages, along with their known family structure according to the comparative method. Panel (b) shows the consensus tree of the Bayesian tree sample, a tree constructed from all the bifurcations attested in more than 50% of the trees sampled in the Bayesian analysis. In this tree the Meso-Melanesian group is recovered, but the other two groups known from the comparative method are unresolved. Panel (c) is another view of the Bayesian tree sample, using a consensus network. The network shows a high degree of congruence with the comparative method tree. Mixed signal for the Sudest and Kaulong languages explains the lack of resolution of these groups in the consensus tree. Conflicting signal also accounts for the incorrect branching order of Taiof and the Nalik-Tungag group. Panel (d) shows a plot confirming the significance of the congruence between the comparative method tree and the Bayesian tree sample. The quartet distance is the measure of the similarity of two trees. Most of the Bayesian sample is more similar to the comparative method tree than almost any of a random tree set generated from the same number of taxa.

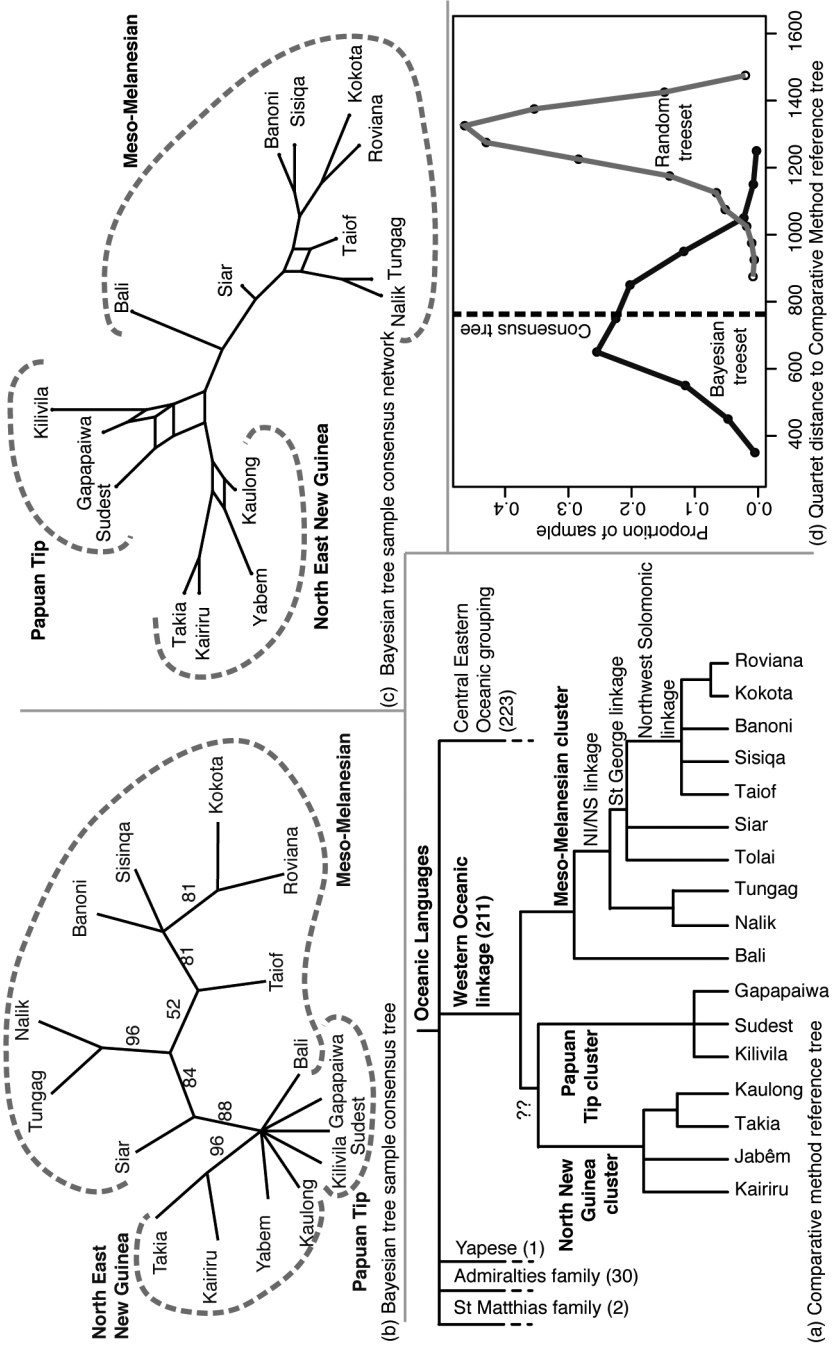


Figure 11.1: Reanalysis of Oceanic language sample using Bayesian phylogenetic methods

11.2 Natural logic of language and thinking

Seuren continued research into the question of natural logic of language and thinking, as set out in the Annual Report of 2005. The project started in the year 2000 and is now gradually coming to full fruition.

To summarize, the main tenets of the theory are:

- (1) The null set and the universe of all objects (so-called "extreme values") are not natural sets and do not occur in cognition, though there is a notion of a "contextually restricted universe of objects", which does correspond to a natural set. All standard set-theoretic definitions in which the notion "universe of objects" occurs should therefore be redefined for "contextually restricted universe of objects".
- (2) When humans think of two (or more) sets, they think of sets that are distinct: IDENTITY is not a natural relation between sets (though IDENTIFICATION is a valid natural operation).
- (3) The union of two (or more) sets is defined only for sets that are totally distinct, without intersection. This ensures that the cardinality of set A plus set B equals the result of the arithmetical operation of addition.
- (4) The subtraction of a set A from a set B is defined only when A is a proper subset of B. This ensures that the cardinality of B-A equals the result of the arithmetical operation of subtraction.
- (5) The intersection of two (or more) sets is defined only for sets that are partially distinct, so that intersection is always partial intersection.

It has meanwhile transpired that the (faulty) predicate logic of the Edinburgh philosopher William Hamilton (1860) and of the linguist Otto Jespersen (1917) results from the application of the principles 1-5. The (incomplete but not faulty) predicate logic of Aristotle (\pm 340 BCE) and its (faulty) completed version by Boethius (\pm 500 CE) result from the application of principle 1 ("the null set is not a set").

Seuren discovered that the French philosopher Abelard (early 12th cent.), reverting to Aristotle's original text, completed Aristotle's predicate logic differently from the way Boethius did it and more in Aristotle's spirit. He sacrificed the Conversions ("not-all" equals "some-not" and "not-some" equals "all-not") for one-way entailments (from "all" to "not-some-not" and from "all-not" to "not-some", but not vice versa). This makes the logic sound and provides an alternative to modern standard (Russellian) predicate logic. This Abelardian alternative is logically much more powerful than Russellian logic, in that the set of logical relations between expressions in the logical language is

much larger in Aristotelian-Abelardian than in Russellian logic, but less large than in the faulty Boethian logic, used from the 6th till the late 19th century. The difference ultimately resides in the fact that in Aristotelian-Abelardian logic a sentence like "All mermaids have a bank account" (where the set of mermaids is empty) is false, whereas in Russellian logic it is (counterintuitively) true. The role of Abelard in the history of logic has hitherto been totally unknown.

Seuren also found that expressions in standard Russellian logic are communicationally uninformative when the reference value of one of the terms is either the null set or the universe of all objects (the "extreme values" mentioned in 1), because, in those cases, the truth value of the whole expression is predictable on grounds of Boolean computation. Significantly, these reference values are excluded from "natural" human logic, and thus also from natural language, which has managed to eat its cake and have it by setting presuppositional conditions on the use of language.

11.3 Neurocognition

11.3.1 Morphosyntactic and narrative skills in Williams syndrome patients

Indefrey, in collaboration with Schmiedtova (U. Heidelberg), Lagers-van Haselen, Van der Geest (both Erasmus U. Rotterdam) and Hagoort investigated the development of morphosyntactic and narrative skills in 50 Dutch speakers with Williams syndrome (WS). Production data were elicited using the picture book "Frog, where are you?" (Mayer 1969). WS patients in three age groups and a group of patients who had been previously diagnosed as WS patients and displayed a phenotype similar to WS, but did not show the WS typical genotype (Pseudo-Williams syndrome, PWS) were compared to typically developing adult speakers of Dutch and typically developing Dutch children matched for cognitive age. The performance of WS patients of all age groups across a range of morphosyntactic, syntactic and narrative measures was at or below the level of the mental age matched TD children. This result does not support the widely held assumption of a dissociation of linguistic and general cognitive skills in WS. By contrast, WS patients used significantly more linguistic means to catch and maintain the listener's attention ('evaluation devices'). Increased use of evaluation devices was also the only linguistic or cognitive measure that distinguished WS patients from PWS patients and therefore seems to be related to the WS genotype.

11.3.2 Syntactic and prosodic comprehension in temporal lobe epilepsy patients

A number of functional imaging studies have shown activation of the anterior temporal cortex in sentence comprehension tasks. It is unclear, however,

whether this activation reflects a necessary role of the anterior temporal cortex in language comprehension. Indefrey, in collaboration with Kho, Ramsey (both Utrecht U.), and Hagoort investigated syntactic and prosodic comprehension in temporal lobe epilepsy patients before and after removal of the anterior temporal cortex. In half of the patients resection was performed in the language-dominant hemisphere as assessed with a intracarotid sodium amytal test. Syntactic and prosodic comprehension were comparable to healthy age-matched controls except for slightly reduced affective prosody comprehension. Postoperative testing showed that syntactic and prosodic comprehension did not change after removal of the anterior temporal cortex. These results suggest that the anterior temporal cortex is not indispensable for core language functions in temporal epilepsy patients.

11.3.3 Time-resolved analysis of fMRI data on sentence processing

Indefrey, in collaboration with Haller, Klarhoefer, Radue (all U. Basel), and Schwarzbach (F.C. Donders Centre, Nijmegen) examined the flow of neuronal activations during written language comprehension at the word and the sentence level using a time-resolved analysis of fMRI.

Because local differences in neurovascular coupling may confound a direct comparison of BOLD response onsets between regions, the temporal order of brain responses in different regions was assessed indirectly by increasing linguistic task demands in different conditions and comparing within-region BOLD response onset differences. In a hierarchical processing system, increasing task demands at lower processing levels induce delayed onset of higher level processes and consequently longer BOLD delay in corresponding areas. The analysis showed significant task-induced delay increases in two dorsal inferior frontal regions (BA 44, 45) but not in a ventral inferior frontal region (BA 47) and the superior temporal gyrus, suggesting that the latter two regions subservise earlier processing stages than the dorsal inferior frontal regions. The results are in line with suggested functional roles of the different language areas. The pattern of delay and duration increases suggests a cascaded but not strictly serial processing architecture.

CHAPTER 12

TECHNICAL GROUP

Introduction

- 12.1 Externally funded projects
- 12.2 Computer systems and networks
- 12.3 Experimental facilities
- 12.4 Electronics and audio/video facilities
- 12.5 Archive Management
- 12.6 Linguistic Applications
- 12.7 Other Activities
- 12.8 Collaborations

Introduction

The Technical Group's (TG) tasks lie in seven major areas: server systems; desktop systems, electronic lab; experiments; information and database systems; archive management; and archive software development. The first five include the routine work required to support our researchers in carrying out experiments and observational studies and in analyzing the acquired data. Archive management extended its activities increasingly more in the direction of "information management" and "workflow guidance" for the researchers, i.e., assisting from making the recordings until uploading the resulting recordings and annotations into the language resource archive. New statistics revealed that the archive has now grown to cover about 25 TB of data, an increase of about 10 TB in 2006. In total, the archive covers about 50 million annotations of language data, each of them existing of a sequence of words, that can be interpreted and that are accessible via the content search index.

Therefore, building and improving tools and frameworks for archive creation, management and advanced utilization was still one of the foci of TG's work. The support for the endangered-language documentation program DoBeS (Dokumentation bedrohter Sprachen) program, funded by the Volkswagen Foundation, remains the most important external funding for the TG. This program now includes thirty-seven documentation teams and the MPI has the role of archivist. Tools for this project have been extended and a few new tools have been added, so that the need for structural funds for maintaining the code base will become increasingly important.

12.1 Externally funded projects

In 2006, a number of externally funded projects continued (DAM-LR, LIRICS, CATCH, DoBeS). In the realm of the DoBeS program, tools such as LAMUS, ELAN, ANNEX and LEXUS were improved and extended (see section 12.6).

The Documentation of Endangered Languages archiving project (DoBeS) was extended with 5 new teams. Training courses allowed them to smoothly integrate into the program. Two training courses were given (June, October). Particularly the latter included many researchers from outside the DoBeS project, indicating a good appreciation of these courses. Our impression from the DoBeS program is that the knowledge about technical and archiving matters spreads, and DoBeS teams require less support in simple issues than in previous years. The DoBeS workshop held in June at the MPI, for instance, revealed that now more detailed issues such as "how to use the Genre element in IMDI" receive more attention. It seems that the documentations teams operate more easily and efficiently with the different tools that are available and

much better understand the importance of adhering to certain well-documented and schema-based formats.

Although the first fifteen documentation teams are close to officially finishing their work, only few formal agreements about access strategies could yet be signed. This indicates that this is still a considerable problem. Most of the resources are expected to be open for researchers and other interested parties.

A completely new web site for the DoBeS project was realized that received broad appreciation. In the framework of the DELAMAN (Digital Endangered Languages And Musics Archive Network) network of archives, we started to work on the language sites (http://www.mpi.nl/DoBeS/DoBeS_map_language_sites.kmz), which bring together all recorded languages for which there are resources in the various existing archives. With most of the DELAMAN members contributing, we expect to have a simple geographic mechanism via Google Earth, for example, to get an overview and to access resources from different languages. At the MPI, the Yélf Dnye language spoken on Rossel Island (close to East New Guinea) is used to exemplify the possibilities such a map can offer.

The EU-funded Linguistic Infrastructure for Interoperable Resources and Systems project (LIRICS) continued to implement standards for language resource management currently being discussed within the ISO TC37/SC4. The MPI team is now responsible for designing and building a new, more mature, version of the Data Category Registry (DCR) Service and implements the Lexical Markup Framework (LMF) with the help of its LEXUS tool and adapt its tools so that they can interact with the DCR service and to integrate the IMDI vocabulary into the DCR. All work has been completed successfully except the new development of the DCR service.

Finally, the TG is continuing its collaboration with a number of Dutch universities and cultural heritage institutions in the Continuous Access to Cultural Heritage (CATCH) projects. The project "Semantic Interoperability to Access Cultural Heritage" (STITCH) is working on advanced semantic web techniques to automatically map metadata concepts found in different ontologies that are used in the national Dutch library to describes and classify resources. First results show that automatic strategies of semantic mapping are still in an infant state. The "Charting the Information Landscape Employing Context Information" (CHOICE) project is working on aspects of automatically enriching poorly supplied metadata with the help of contextual information. In this project more pragmatic decisions were taken to build up useful frameworks that can help annotators to efficiently carry out correct classifications. Although the MPI cannot immediately take profit from these techniques, this will change in the coming years.

12.2 Computer systems and networks

The transition to the new Surfnet 6 Internet connection offering 1 Gbps capacity was finished by installing and testing a new router. With the new Nortel backbone and distribution switches, the MPI now has a completely upgraded network system that can cope with the new web and multimedia requirements.

After having changed the core server for the storage system in 2005, the focus in 2006 was on replacing the tape library. A new tape library ADIC 2000 was installed and successfully put into operation. The MPI now has a capacity of 400 TB based on the new and fast LTO 3 tape technology. With the now established maximum of 1.2 PetaByte, we do not foresee limitations for the the next five-year planning phase, even if new activities in the area of brain imaging are taken into account. To allow fast online access to all annotations and metadata, the fast online cache disk RAID system was extended to 5.5 TB. To also provide streaming media from an online cache, the RAID system of SATA discs was extended as well to now cover 18.6 TB. The whole storage system is controlled by the SAM-FS hierarchical storage management system. All 50 TB of user and archive data currently in the system were copied without any read/write problems within two weeks in November. The whole replacement operation was carried out transparently to the users, and, with the exception of some performance penalties, no access problems occurred. The backup system was also changed to support LTO3 technology and the smaller tape library ADIC 100.

In the domain of Linux servers, many changes took place as well. New servers were installed for a number of services such as EMAIL, DNS, ORACLE database, and the new PLONE/ZOPE based web-site of the MPI. For the three external archives that will collaborate with the MPI (Lund, Iquitos, Kiel), Linux servers were also set up, which included the necessary software components to support the archive, such as IMDI, LAMUS, AMS, and also ANNEX. These activities and the in-house processes required that system management took over responsibility for the proper configuration of web and application servers. Intensive discussions between system managers and developers were necessary to develop proper configuration settings and installation procedures. Problems were identified when deploying new application versions that were tested on the VMWare based test server or on the production server. It was concluded that VMWare despite all claims does not give the same conditions.

In the Windows domain, new and more powerful servers were installed and the management of the installation process was improved with the help of SMS. A separate VPN server supporting secure socket layer was installed to improve the

possibilities to log in to the MPI network from external places. All directors were equipped with a new type of Windows-based Smartphones that give access to email. To support these Smartphones, an Exchange server was configured to maintain shared agendas and support the push email concept. Incoming emails at the normal inbox are pushed via GPRS so that they can be efficiently handled on the Smartphones.

In general, all main components such as core network, storage system and application servers were replaced during the last two years.

12.3 Experimental facilities

The NESU software still has an important role at the MPI due to its proven timing accuracy. Actually almost all experimental setups including babylab, eye tracking, data glove or ERP experiments are controlled by NESU. With the building of NESU, it was the intention to allow users to design their experiments themselves with the help of graphical means and without intervention of and dependence on technical staff members. User networks have been established at the MPI since then, so that this early vision slowly becomes reality. With only two technical staff members, all experimental needs could be dealt with. NESU will be further maintained and applied in experiments.

However, due to the lack of a convincing hardware solution for non-MPI researchers, we could not offer NESU anymore to other institutions. Attempts with outsourcing the building of our electronic designs to a company failed, since the low number of boxes resulted in low commitments and errors in the setup. TG staff members, however, can only build boxes for use at the MPI. In addition, the TG tested a few boxes that were used with other well-known experimental software packages. It turned out that the designs were so that the TG could not recommend their usage for experiments with high accuracy requirements, for example.

A number of special experimental setups were developed such as a setup to register the displacement of an arm from a normalized position during interactions. Another setup is used to add spoken words to a large German lexicon. The setup consists of a small notebook equipped with a microphone, headphones, and a pushbutton. It allows a professional speaker to record a presented word, check its quality if necessary, and save it, leading to a high throughput. The setup also contains algorithms to time-warp a recording or to do automatic segmentation.

12.4 Electronics and audio/video facilities

The electronic lab mutated again towards becoming a resource for audio/video equipment, notebooks, PCs and auxiliaries, in particular all that is needed at the desktop and during fieldtrips.

26 field trips were prepared this year, that is, the equipment was selected in collaboration with the researcher, assembled, and tested to ensure that it is complete, and packed to make it ready for transportation. The field researchers were requested to make short reports about their experiences after their trip to reduce the number of errors and to evaluate new pieces of equipment. All used equipment was checked and cleaned when necessary. In 2006, another field equipment meeting with researchers and TG specialists was organized to make an evaluation and to scan the market for new equipment. In the audio sector, new types of recorders with solid state memory as the storage medium are being produced. The TG undertook considerable efforts to analyze their usability for field research. This revealed that not all models allow linear PCM encoding and have sufficiently good microphone amplifiers. A newly designed fact sheet gives a good overview about the different models to facilitate individual decisions. The situation is even more difficult in the video sector. In the consumer sector, smaller devices are produced that, in some cases, do not offer to connect an external microphone and are only able to record compressed sound. In addition, HDTV equipment is becoming more ubiquitous. This offers a large improvement in image resolution, but leaves much to be desired in other areas, such as sound compression. Tests revealed that some of the new file formats and codecs, which are used in these cameras, are not supported by the major software packages. Cameras from the semi-professional sector could be an alternative, but they are in general too heavy and too power demanding for fieldwork. So it is obvious that the market is in a phase of transition and that it is too early to make decisions for new models. Just as for auditory equipment, a fact sheet will be maintained to give a quick overview.

Much time was devoted to prepare the notebooks and to adapt them to individual wishes, reflecting a need for more standardization. In addition, many PCs were setup and configured to meet the needs at the desktops, however, a smooth transition towards notebooks as general desktop stations can be seen. In addition, advice about power management and storage management was given to institute researchers and DoBeS field workers. A new line of solar panel stations based on new foldable solar panels was bought and assembled. Some adapter electronics were produced to allow optimizing the cabling in the field.

12.5 Archive Management

Archive management is becoming one of the core businesses of the TG. It is in the center between researchers on the one hand and equipment, digitizing, and software specialists on the other. Archive managers are in close contact to the researchers and support the full life cycle of language resources - from their creation to their usage. Although researchers are more aware about tools, standard formats, and the needs of archiving, the proper integration of new material into the archive is still an unsolved issue. This is due to the time pressure for every researcher to come up with results on the one hand, and the easiness with which recordings can be made today, as well as the seamless digitization workflow lines at the MPI, on the other. Fieldwork in general leads to more recordings than can be analyzed and annotated. Researchers tend to select those fragments from all of their recordings that are of immediate interest for their research question. Only this selection will be treated properly in terms of archiving. The rest of the material is digitized but needs to be treated by archive management, i.e., proper structural extensions of the archive need to be created, proper metadata descriptions to be added, the quality of the digitization to be checked and the archive integration to be done. Archive management took over part of this curation role to preserve valuable data for future research.

Archive extension and maintenance has become more professional this year due to improved tools, archive crawlers, and check routines and in particular due to improved versions of the Language Archive Maintenance and Upload System (LAMUS) and its integrated access management system. As already indicated, the total amount of resources increased from roughly 15 TB to 25 TB in 2006. Some external corpora could be integrated into the archive such as Guanchet, Narranganset, Carib, Kammu, Slavonic Colour Lexicon, and the Dutch Bilingual Database. The curation was partly done by MPI's archive management. All offered DoBeS data were carefully checked and integrated, mostly in close collaboration with the documentation teams. Much time was devoted to checking and improving the details within the corpus, including a consistency check and correction of MIME types. Consequently, all metadata descriptions were adapted to be consistent with the file extensions. Also the language names and codes were checked, and corrected or added according the Ethnologue codes. For all annotated MPEG2 and MPEG1 resources, streamable MPEG4 versions were created to allow web-based access to the resources with a tool such as ANNEX. Many dead links - mostly references to not yet existing resources in metadata descriptions - were deleted or were corrected where the corresponding resources could be found. This semi-automatic work could only

be achieved by using efficient crawlers that traverse the whole archive systematically and by smart plug-ins.

Archive management organized a number of training courses to improve the knowledge about language resource creation, annotation, archiving, and analysis. In addition to the two DoBeS training courses at the MPI, training was given in linguistic departments in Lima and Iquitos. As already indicated, Google Earth was tested as another navigation platform for finding language resources. Users can easily jump from geographic maps to the IMDI browsing tree and to web-applications. Archive management also created a number of new web-sites and is responsible for creating manuals for the MPI tools, such as the new Language Archiving Technology (LAT) and the CLARIN web-sites. For all tools, new manuals were created and, in addition to the traditional texts, a number of animation clips were recorded to explain the major functions.

A new service from the TG emerged from the DoBeS project, which brings corpora back to where they were created. Two local archives were already setup that are synchronized with the MPI: At the university of Lund, a server was setup with all archiving software. In collaboration with researchers from Lund, some corpora were already integrated, so that they are now available via the web. At IIAP in Iquitos, a server was installed that currently stores the resources gathered by the "People of the Center" DoBeS project. This service is a collaboration between archive management, system management, and software developers.

12.6 Linguistic Applications

The Language Archiving Technology tool set was extended by new products such as ODIT and SYNPATHY and by new versions of well-known tools such as for the ISLE Meta Data Initiative (IMDI), ELAN, ANNEX, LEXUS, LAMUS, and AMS.

12.6.1 IMDI Infrastructure

The IMDI infrastructure turns out to be very stable and robust. In the process, it has become clear that IMDI has to evolve from a pure metadata domain for language resources into a more general registry mechanism for different types of resources such as lexica, lexical schemata, and lexicon component schemata as under development in ISO TC37/SC4 user-defined concept, and relation registry files. A metadata schema for lexica and lexical component schemata was developed, but a more flexible component will still be required. In addition to this new work, the HTML generation and the OAI PMH bridge were reprogrammed. An OAI PMH-based harvesting engine was added so that the IMDI domain also can incorporate other metadata records. AILLA metadata are

now extracted from an online database - this work was done in collaboration with the AILLA specialists. The IMDI infrastructure was extended to make it possible to handle unique and persistent resource identifiers as required in the DAM-LR project.

The OAI IMDI bridge was re-implemented. It now always delivers up-to-date metadata from the archive. Also it is possible for OAI service providers to use the PMH protocol to not only harvest DC and OLAC metadata but also IDMI metadata. As a test project, we created a bridge between metadata from the AILLA catalog and our archive's IMDI catalog - this was again done in collaboration with the AILLA specialists.

12.6.2 LAMUS Language Archive Management and Upload System

LAMUS turned out to become one of the most important developments, since it allows uploads into the archive in a controlled manner and thereby increases the speed of operation. Hence, much debugging and code optimization was carried out, so that LAMUS is more stable. It is also installed on the external archives that were setup, where it showed its robustness and proper integration with the IMDI infrastructure. Improved checks at upload time take care that no unwanted resource formats will be integrated into the archive. The archive crawler scans the linked IMDI domain, which is the primary source of all archive structure and metadata information, and creates the internal relational databases for querying. In addition, we made management operations more efficient in so far that only changed metadata files are processed.

Considerable effort was invested to make LAMUS Grid compliant as required in the DAM-LR project. Unique and persistent resource identifiers (URID) were introduced and the Handle System was installed to resolve them to physical paths. These URIDs can be stored in the IMDI metadata descriptions as well as the physical paths and the internal resource identifiers ensuring a maximum of independence from the operation of the Handle System. To make the use of URIDs possible, a MOVER component had to be added to LAMUS that takes care that all identifier records are kept updated. All users authorized to carry out manipulations in the archive are strictly requested to use this MOVER tool, instead of the normal file management tools coming along with operating systems.

In addition, the authentication and authorization mechanisms were extended with the Shibboleth components. This will allow users that are registered at another partner institute to access our resources. Thereby, our archive becomes part of a network of distributed archives. To integrate this smoothly with the existing authentication components, we created a new LDAP to house user info

for all users (internal and external) of our archive. The LDAP is kept synchronous with the existing Active Directory Service (ADS). All applications and middle-ware in need of authentication services use the LDAP falling back to ADS for authentication for local users since local circumstances do not allow storing the user passwords in the LDAP.

12.6.3 Access Management System

The DAM-LR project required an adaptation of the access management system. To accommodate several new requirements, the AMS system was adapted and the restructuring of the code was finished. These adaptations include the possibility to connect to the institutes LDAP/ADS authentication system, to allow users to specify access information at the level of a singular resource, and cope with individual users and not only groups.

12.6.4 ELAN Multimedia Tool

A new extension of ELAN is its capability to deal with time series data as produced, for example, by data gloves, eye trackers, EEG equipment, and so on. ELAN now has a synchronized time series viewer, channel selection, and ordering possibilities in case of multiple channel recordings and a feature to specify the input data format. To allow the visualization of such time series in synchronization with video recordings, it is possible to define synchronization parameters. This feature was developed in collaboration with the university of Nijmegen. Another extension allows the proper integration of search functionality on directory structures, which may include a large number of EAF files.

Additionally, a number of useful features were added: time sub-division is now possible with gaps between them, which is, for instance, important to deal with Media Tagger files properly. Moreover, the import components from CHAT and Shoebox were improved, and streaming media support was added. This now allows users to include media resources from an archive. Moreover, the waveform window now allows vertical zooming. Export to html now also supports an interlinearized presentation. Finally, the interaction with PRAAT, a sound analysis- and modification tool, was improved.

12.6.5 ANNEX Annotation Utilization

This web-based cousin of ELAN was extended considerably to allow seamless access to annotated media files in archives. Although it must be the intention to close the gap between ELAN and ANNEX stepwise, it seems that we will have to maintain two code bases and only can share certain components, since web-based and local designs differ considerably, and since ELAN as a locally operating tool has to be maintained

After having stabilized ANNEX as viewer tool, it was now extended to allow immediate annotation editing via the web. Users can request a workspace and modify annotations if they have the rights to do so. The modified annotation can be stored in the workspace or extracted as an EAF file - due to the enhanced representational power of EAF this needs to be done even if the input file was a CHAT or Shoebox file. Currently, ANNEX development is focusing on extending the annotation capability.

Much time was invested in the search feature to allow users to search on all or a selection of the archive contents. Currently, 50 million annotations annotated on 150.000 tiers are included in the index. These annotations come from EAF, CHAT, Shoebox, and plain text files, the latter having no identifiable structure. The solution chosen was to include the whole index in memory, leading to fast response times. However, the increasing number of annotations required increases in memory of more than 8 GB, therefore a new approach was carefully tested and developed where relational databases were applied. First tests showed that using a database turned out to be fast enough if certain user interface strategies were applied. For instance, the first hits are already displayed, and while the user is analyzing them, ANNEX carries on searching in the background to make the hit list complete.

12.6.6 LEXUS Lexicon Tool

LEXUS was offered as a stable version via the web and users are able to create workspaces and work with new or existing lexica. Some lexica were imported to the LEXUS framework and are now available via the web for authorized users. An open lexicon can be found when using the Language Sites framework under Google Earth and selecting the Yéllí Dnye language. For field linguists, it is still the preferred and natural framework to have the tools on their notebook. Therefore, effort was put into configuring an install procedure that takes care of all components that are required, including a relational database system and the Tomcat application server. In contrast to ELAN/ANNEX, it seems to be possible to maintain just one code base for both the local and the web-version.

LEXUS was adapted to meet the LMF standard as under discussion in ISO TC37/SC4. An important step was to allow the creation and the import of component schemata from open registries. First components, such as the one used to cover the Morphalou morphology, were generated. To flexibly operate with component schemata, the ODD framework from TEI was applied. This technique is now also used to create and store complete lexicon schemata and as a framework to store XML versions of the lexica. IMDI compliant lexicon metadata can be generated to incorporate LMF-based lexica in archives. A new schema for the registration and description of LEXO-Blocks (component schema)

was designed, but requires a redesign of the IMDI infrastructure to be properly included. A graphic interface was provided that allows to read in lexica into LEXUS that are in XML, even when no schema is provided. The import modules for CHAT and Shoebox lexica were improved; now also the Shoebox structure information is used to turn it into LMF based trees. APIs were defined and supported to access the ISO Data Category Registry and to allow web service based access to online lexica that are compliant with LMF.

Another new LEXUS component allows users to integrate two lexica into one. This can only be done semi-automatically to give the user control over the merging process. In addition, extensive debugging and code streamlining was done.

12.6.7 SYNPATHY Syntax Editor

A new graphical editing tool was developed that allows linguists to extract an utterance from an EAF file and to either manually build a syntax tree for this utterance, or to modify an existing syntax tree. Both actions are supported by graphical methods and controlled vocabularies. The program can create and read files that are in the widely-known TIGER format. The created files can be integrated in ANNEX visualizations, that is, the trees appear in a separate window when browsing through the annotations.

12.6.8 ODIT Ontology Editor

In collaboration with the MPI for Evolutionary Anthropology, an ontology editor was created that allows users to define and integrate linguistic concepts and to create relations amongst them with the help of a limited set of relation types (equivalent, upper class, lower class, fuzzy mapping). It allows the user to store concept definitions and relations in schema based XML files - yet there is no need to make use of the RDF framework. It is envisaged to register such resources containing concept and relation definitions in open registries, so that users can exchange such knowledge sources, manipulate them easily, and use them for their purposes.

12.6.9 ADDIT Data Enrichment Tool

The core parts of a data enrichment tool were implemented by using a relational database. The idea is to allow authorized users to add commentaries to web content or to draw links between different types of web-content. Web-content could mean an annotation generated by ANNEX, a lexicon part created by LEXUS, a multimedia fragment presented by these programs, a fragment of metadata presented by IMDI tools, or arbitrary web-sites. A basic schema for such commentaries was designed and ADDIT allows the user to create, store and manipulate them. To be able to archive such commentaries, snapshots can be generated as XML files, which can be integrated into the archive.

12.7 Other Activities

The head of the TG group remained a member of the Central Computer Committee of the Max Planck Society. In this function, he supported several activities important to the society as a whole and provided expert advice to a number of other institutes within the society.

The TG is part of the DELAMAN network and also participates in the publication of the Language Archives Newsletter (LAN).

12.8 Collaborations

- DoBeS Project *Dokumentation bedrohter Sprachen* – Tools and Infrastructure for the Documentation of Endangered Languages, funded by the Volkswagen Foundation.(www.mpi.nl/DOBES)
- LIRICS Project *Linguistic Infrastructure for Interoperable Resources and Systems* (EC funded) – Laboratoire Lorrain de Recherche en Informatique et des Applications (LORIA) Nancy, U. Sheffield, Instituto di Linguistica Computazionale (ILC) Pisa, Institute for Language and Speech Processing (ILSP) Athens , U. Barcelona and others.
- DAM-LR Project *Distributed Access Management for Language Resources* (EC funded) – U. Lund, SOAS London, Instituut voor Nederlandse Lexicologie (INL) Leiden.
- STITCH *Semantic Interoperability to Access Cultural Heritage* – Methods for mapping metadata vocabularies in particular big thesauri used in cultural heritage institutions – Royal Dutch Library (KB), Free U. Amsterdam.
- CHOICE *Charting the Information Landscape Employing Context Information* – Methods for enriching metadata descriptions created in cultural heritage institutions – Dutch Audiovisual Archive Hilversum, Telematica Enschede.
- MPG *Max Planck Society* – Methods for advanced ontology based utilization – MPI for Evolutionary Anthropology, Leipzig.

CHAPTER 13

OTHER ACTIVITIES

Overview

- 13.1 Honors/Awards
- 13.2 Workshops organized
- 13.3 Nijmegen Lectures
- 13.4 Formal Colloquia
- 13.5 The F.C. Donders Lectures on Cognitive Neuroscience
- 13.6 Presentations at conferences, congresses and workshops
- 13.7 Colloquia presented
- 13.8 Teaching

13.1 Honors/Awards

MIRJAM BROERSMA received the Innovational Research Incentives Scheme VENI grant of the Netherlands Organization for Scientific Research (NWO). She was also named "One of the hundred most promising women of the year 2007" by BLVD magazine.

MIRJAM ERNESTUS received a prestigious European Young Investigator (EURYI) award of 1.25 million Euros from the European Science Foundation for the project "Acoustic reduction in European languages". Mirjam Ernestus was also awarded a VIDI grant from the NWO for the project "Word comprehension in natural context: The role of listeners' expectations based on linguistic, phonetic, and visual cues". She was unable to accept this grant because of her EURYI award.

LAURA HERBST won the prize for the best poster presentation at the 1st interdisciplinary Max-Planck-Ph.D.net workshop in Cologne.

ALEXANDRA JESSE was awarded a 2-year German Research Foundation (DFG) grant for investigating the role of prosodic structure in audiovisual word recognition.

ELIZABETH JOHNSON received the "Early Career Travel Award" from International Society for Infant Studies and Japanese Baby Society (ISIS/JBS).

WOLFGANG KLEIN was awarded a long-term project "Digitales Wörterbuch der deutschen Sprache" at the Berlin-Brandenburgische Akademie der Wissenschaften. It will run over 18 years with initially four, then 10 full-time researchers. It includes a German pronunciation dictionary, which will be done in cooperation with the Institute. Wolfgang Klein was also awarded a project "Deutsches Textarchiv (DTA)" by the DFG, to be built up the Berlin-Brandenburgische Akademie der Wissenschaften. It is scheduled for seven years, with an annual budget of approximately half a million Euros.

HOLGER MITTERER and MIRJAM ERNESTUS received funding from The German Research Foundation (DFG) for their project: "The functional phonology of reduced forms".

WILLEM LEVELT received the Recipient Medal of Honor from the Netherlands Psychonomic Society. He was also awarded Honorary Membership of the Jonge Akademie (Young Academy) of the Royal Netherlands Academy of Arts and Sciences (KNAW).

13.2 Workshops organized

DAM-LR Workshop

Peter Wittenburg co-organized the DAM-LR Workshop in Lund in January where the partners of the DAM-LR project discussed Grid technology architectures and components.

Cross-linguistic Sign Language Research

Ulrike Zeshan, Waldemar Schwager, Sibaij Panda, and Pamela Perniss organized a workshop on Cross-linguistic Sign Language Research at the Institute in January.

DGfS Workshop "Spracharchive: Standards, Erzeugung und Zugang"

Together with Helen Aristar-Dry, Jost Gippert, Sophie Salfner, Romuald Skiba and Thorsten Trippel Peter Wittenburg organized the workshop on Language Archives: Standards, Creation and Access as part of the 28th Annual Meeting of the German Society for Linguistics (DGfS) in Bielefeld. About 40 people from linguistic and technology areas participated in this workshop about modern trends.

Reciprocals Across Languages

Nick Evans, Alice Gaby, Stephen Levinson, and Asifa Majid organized a workshop on Reciprocals Across Languages at the Institute, April 19-21. Presenters from the Institute were Niclas Burenhult, Connie Dickinson, Nick Enfield, Alice Gaby, Stephen Levinson, Asifa Majid, Sibaij Panda, Christian Rapold, Stuart Robinson, Gunter Senft, Claudia Wegener and Ulrike Zeshan. External presenters were Patience Epps (U.T. Austin), Nick Evans (U. Melbourne), Peter Hurst (U. Melbourne), Dagmar Jung (U. Cologne), Ekkehard König (Free U. Berlin), Nicole Kruspe (U. Melbourne), Rachel Nordlinger (U. Melbourne), Toshiki Osada (R.I.H.N., Kyoto), Ruth Singer (U. Melbourne), and Roberto Zavala (CIESAS-Sureste).

Gestures in Language Development

Marianne Gullberg and Kees de Bot (U. Groningen) organized a workshop on Gestures in Language Development, held at the U. Groningen, 20-22 April. The workshop was funded by the Netherlands Organization for Scientific Research (NWO). Invited presenters were Ulf Liszkowski (MPI MPI for Evolutionary Anthropology, Leipzig), Silvia Stefanini (U. Parma), Asli Özyürek (MPI Nijmegen), Sotaro Kita (Bristol U.), Shanley Allen (Boston U.), Reyhan Furman (Bogazici U.), Tomoko Ishizuka (U. California, Los Angeles), Elena Nicoladis (U. Alberta), Marion Tellier (U. Paris 7), Marianne Gullberg (MPI Nijmegen), Amanda Brown (Boston U./MPI Nijmegen), Keiko Yoshioka (Leiden U.), Virginia Volterra

(U. Rome), Kees de Bot (U. Groningen), and Adam Kendon (U. Pennsylvania/U. Naples Orientale).

Questions and their Responses

Jan Peter de Ruiter organized a workshop on Questions and their Responses, March 23-25, at the Institute. Presenters from the Institute were Penelope Brown, Aoju Chen, Nick Enfield, Stephen Levinson, Federico Rossano, Jan Peter de Ruiter and Tanya Stivers. External presenters were Herbert Clark (Stanford U.), Elizabeth Couper-Kuhlen (U. Potsdam), Stanka Fitneva (Queen's U. Canada), John Heritage (U. California, Los Angeles), Jerry Hobbs (U. of Southern California), Jerry Sadock (U. Chicago), and Marja-Leena Sorjonen (U. Helsinki).

Infant Interaction in Cross-cultural Perspective

Penelope Brown organized a one-day workshop in May on Infant Interaction in Cross-cultural Perspective, with the purpose of discussing data, preliminary findings and methods in studies of infant interaction in different cultural settings. Participants included Elena Lieven and Sabine Stoll presenting data from their study of Chintang infants (Nepal) and Ulf Liszkowski on infant pointing (all three from the MPI for Evolutionary Anthropology, Leipzig), Suzanne Gaskins (NEIU - Northeastern Illinois U.) presenting data on Yucatec infants, and several members of the MMI project.

Sign Languages in Village Communities

Ulrike Zeshan and Pamela Perniss organized a workshop on Sign Languages in Village Communities at the Institute in April.

Person Reference in Interaction

Tanya Stivers organized a panel on Person Reference in Interaction at the International Conference on Conversation Analysis in Helsinki in May.

Joint MPI-DANS-Big Grid Workshop

Peter Wittenburg organized the joint meeting where experts from the MPI, DANS and the Dutch BigGrid project discussed trends in Grid architectures and the next steps in the Dutch Grid initiatives in Nijmegen in May.

LREC 2006 Workshop Towards a Research Infrastructure for Language Resources

Peter Wittenburg was co-organizer of the International Workshop Towards a Research Infrastructure for Language Resources, in Genoa, in May. About 60 experts from various subdisciplines dealing with language resources were present at the workshop.

LREC 2006 Panel Perspectives for Ontologies in Linguistics

Peter Wittenburg co-organized a Panel about Perspectives for Ontologies in Linguistics at the LREC Conference 2006 in Genoa in May. About 250 international experts participated in this meeting to speak about realistic opportunities for applying ontologies in linguistic work.

Ontolex 2006 Workshop

Peter Wittenburg was co-organizer of the Ontolex 2006 Workshop that was organized in the realm of the LREC Conference 2006 in Genoa. About 50 lexicon and ontology experts participated in this meeting to talk about models to join lexical and ontological information and about using such joined information in real applications.

Summer Meeting on Corpus-based Research

In collaboration with Henk van den Heuvel, and on behalf of the Dutch Society for Phonetic Sciences, Mirjam Ernestus organized a one-day workshop Summer Meeting on Corpus-based Research at the Institute in June.

DoBeS Training Course June

Paul Trilsbeek, Jacqueline Ringersma and Peter Wittenburg organized a DoBeS Training Course in Nijmegen in June. Members of the Technical Group and external experts gave various presentations on technical matters related to the documentation and archiving of endangered languages. Most of the participants were members of DoBeS teams.

DoBeS Workshop

Paul Trilsbeek was co-organizer of the DoBeS Workshop in June in Nijmegen where about 35 participants from the DoBeS teams interacted about aspects in endangered languages documentation.

DAM-LR Workshop

Peter Wittenburg co-organized the DAM-LR Workshop in London in August where the partners of the DAM-LR project spoke about distributed authentication and authorization.

AMLaP 2006

James McQueen, Harald Baayen and Mirjam Ernestus co-organized the 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006), 30 August - 1 September. The conference brought more than 200 psycholinguists from around the world to Nijmegen. Talks were presented at the University, and the poster sessions were held in the Institute. Invited lectures were given by Gareth Gaskell (U. York) and Lawrence Barsalou (Emory U.). AMLaP 2006 was sponsored by the Institute.

The Neurocognition of Unification

Gerard Kempen and Peter Hagoort organized a symposium on The Neurocognition of Unification (August 29, at the Institute, co-located with AMLaP-2006). The symposium brought together more than 60 researchers interested in the (neuro)cognitive processes underlying the "binding" of various types of linguistic information, and of linguistic and non-linguistic information. Invited speakers were Colin Phillips (U. of Maryland), Gina Kuperberg (Tufts U.), Pienie Zwitserlood (U. Münster), Jos van Berkum (U. Amsterdam), Tessa van Leeuwen (F.C. Donders Centre), Tineke Snijders (F.C. Donders Centre), and Theo Vosse (F.C. Donders Centre).

Evidence for Learning: Views from Different SLA Research Paradigms

Marianne Gullberg, in collaboration with Aneta Pavlenko (Temple U.) and Pekarek Doehler (U. Neuchâtel), organized an invited symposium at the European Second Language Association Conference (EuroSla 16), Antalya, 13-16 September. The symposium was entitled "Evidence for Learning: Views from Different SLA Research Paradigms" and speakers were Marianne Gullberg (MPI), Florencia Franceschina (Lancaster U.), Christine Dimroth (MPI), Natasha Tokowicz (U. Pittsburgh) and Janet van Hell (Radboud U. Nijmegen), Simona Pekarek Doehler (U. Neuchâtel) and Johannes Wagner (U. Southern Denmark), and Vivian Cook (U. Newcastle).

CATCH Workshop

Hennie Brugman, Frank van Harmelen and Christien Bok organized the CATCH Workshop on use cases for CATCH integrators. Amsterdam, 22 September 2006.

DoBeS Training Course

Paul Trilsbeek, Jacqueline Ringersma and Peter Wittenburg organized another DoBeS Training Workshop in Nijmegen in October. Members of the Technical Group and external experts gave various presentations on technical matters related to the documentation and archiving of endangered languages. Most of the participants came from universities and institutes in Germany and the Netherlands.

Human Sociality and the Four Fields: A Wenner-Gren Panel

Nick Enfield and Stephen Levinson convened a panel on Human Sociality and the Four Fields: A Wenner-Gren Panel, at a presidential session at the 105th Meeting of the American Anthropological Association, San Jose, USA, Saturday November 18th. Presenters were Nick Enfield, Stephen Levinson, Leslie Aiello, Stephen Shennan, Peter Richerson, Richard Shweder, Maurice Bloch, Elinor Ochs, John Lucy and Michael Silverstein. The panel was sponsored by the Wenner-Gren Foundation for Anthropological Research.

DAM-LR Technical Meeting

Daan Broeder organized the DAM-LR Technical Meeting where the partners of the DAM-LR project discussed about technological details of Grid components in Nijmegen in November.

Dag van de Fonetiek 2006

In collaboration with the other members of the board of the Dutch Society for Phonetic Sciences, Mirjam Ernestus organized a one-day workshop "Dag van de Fonetiek 2006", in December at Utrecht U.

E-Humanities – an Emerging Discipline

Peter Wittenburg was co-organizer of a workshop about e-Humanities – an Emerging Discipline that was held in the realm of the 2nd IEEE International Conference on e-Science and Grid Computing in Amsterdam in December. About 40 experts from various humanities disciplines participated in this international workshop.

Americanist Workshop on Subordination

Rik van Gijn organized a workshop entitled "Americanist Workshop on Subordination" which took place December 15th at the MPI Nijmegen. MPI presenters were Rik van Gijn and Sonja Gipper in a joint presentation, and Swintha Danielsen. Other presenters were Katharina Haude (U. Cologne), Nathalie Böcker (U. Bonn), Katja Hannss (Stirling U./Radboud U. Nijmegen), Willem Adelaar (Leiden U.), Astrid Alexander (Leiden U.) Jesús Mario Girón (Free U. Amsterdam), Rafael Fischer and Eva van Lier (U. of Amsterdam).

13.3 Nijmegen Gesture Centre (NGC)

During the year, the Nijmegen Gesture Centre (NGC), coordinated by Asli Özyürek and Marianne Gullberg, hosted a series of talks in the framework of the Nijmegen Gesture Centre Lecture series. Speakers were Bencie Woll (U. College London), Keiko Yoshioka (Leiden U.), Virginia Volterra (CNR, Rome), Heather Brookes (Stanford U./Human Sciences Research Council SA), Martha Alibali (U. Wisconsin-Madison), Jurgen Streeck (U. Texas at Austin/U. Bielefeld), Sarah van Deusen Philips (U. Chicago) and Gale Stam (National-Louis U.).

13.4 Nijmegen Lectures

This year's Nijmegen Lectures were given by Paul Bloom (Yale U.). The title of the series was "Bodies and Souls". The series included three morning lectures: "Descartes' Baby", "But is it art?", and "Names for things". The discussants of the afternoon seminars were Pim Haselager (Radboud U. Nijmegen), Elizabeth Johnson (MPI Nijmegen), Marc Slors (Radboud U. Nijmegen), Shanley Allen

(Boston U.), Rob van Gerwen (Utrecht U.), Ulf Liszkowski (MPI for Evolutionary Anthropology Leipzig), Melissa Bowerman (MPI Nijmegen), Charlie Lewis (Lancaster U.) and Miranda van Turenout (F.C. Donders Centre). The lectures were organized in collaboration with the Interfaculty Research Unit for Language and Speech (IWTS) of the Radboud U. Nijmegen. The series was organized by Angelique Hendriks, Irene Krämer, Tanya Stivers and Nanjo Bogdanowicz.

13.5 Formal Colloquia

The Formal Colloquium Series 2006 was organized by the Colloquium Committee (Nick Enfield and Elizabeth Johnson).

January 23: PAUL STEVENS, U. Edinburgh, Koestler Parapsychology Unit: "Reconsidering parapsychology: just how controversial are the findings?"

February 14: DEBI ROBERSON, U. Essex: "Weaving different rainbows: relationships between culture, thought and color language."

March 28: GLENN SCHELLENBERG, U. Toronto at Mississauga: "Does music make you smarter?"

April 25: EVE CLARK, Stanford U.: "Early stages in the acquisition of meaning."

May 16: ROBERT BOYD, U. California, Los Angeles: "Ethnicity and the evolution of the tribal social instincts."

September 19 : ARIE VERHAGEN, Leiden U., Centre for Linguistics: "Usage and abstract syntax: meeting the challenge of 'long distance' WH-questions."

October 31 : MARK PITT, Ohio State U., Dep. of Psychology: "What's under the hood? Explorations into how connectionist models of language processing work."

November 7: ANN BRADLOW, Northwestern U., Dep. of Linguistics, Evanston "Understanding foreign-accented speech."

Many informal lectures were also presented by long-term and occasional visitors to the Institute.

13.6 The F.C. Donders Lectures on Cognitive Neuroscience

In the F.C. Donders Lecture Series on Cognitive Neuroscience, outstanding researchers in the field of brain and cognition present their work and ideas to a broad audience of scholars with a diversity of backgrounds, ranging from neuroscience to psychology and linguistics. The lecture series is jointly organized by the Max Planck Institute for Psycholinguistics and the Nijmegen Institute for Cognition and Information (NICI).

January 27 GERAINT REES , Institute of Cognitive Neuroscience, U. College London: "Neural correlates of human consciousness."

- June 30 DAN WEGNER, Harvard U., Cambridge (MA): "Authorship processing in the experience of agency: How do you know your actions are your own?"
- August 29 DAPHNE BAVELIER, U. Rochester: "Brain plasticity: Effects of altered experience on visual and language functions."
- September 22 EDVARD MOSER, Norwegian U. of Science and Technology, Trondheim: "Grid cells and spatial representation in entorhinal cortex and hippocampus."
- November 17 PATRICK HAGGARD, Institute of Cognitive Neuroscience, U. College London: "Voluntary action and conscious experience."

13.7 Presentations at conferences, congresses, and workshops

Aarts, E., Roelofs, A., & Van Turenout, M. "Neural correlates of endogenous and exogenous control in task switching." The 13th Annual Meeting of the Cognitive Neuroscience Society (CNS 2006). San Francisco, April.

Aarts, E., Roelofs, A., & Van Turenout, M. "Role of medial frontal cortex in endogenous and exogenous control in task switching." Workshop on Errors, Conflicts, and Rewards: "The role of medial frontal cortex in cognitive control and performance monitoring". Amsterdam, June.

Alt, S., Kemps-Snijders, M., Ringersma, J., & Wittenburg, P. "Digitale Ressourcen in den GSHS am Beispiel LEXUS." MPG GSHS Library Conference. Florence, November.

Bercelli, F., Rossano, F., & Viaro, M. "Clients' responses to therapists' formulations in cognitive and systemic therapies." The International Conference on Conversation Analysis (ICCA-06). Helsinki, May.

Berck, P., Bibiko, H.-J., Kemps-Snijders, M., Russel, A., & Wittenburg, P. "Language Archive Utilization." The 28th Annual Meeting of the German Society for Linguistics (DGfS). Bielefeld, February.

Bohnemeyer, J., Eisenbeiss, S., & Narasimhan, B. "Manner and path in non-linguistic cognition" [invited talk]. Kobe U., September.

Bowerman, M. "Are linguistic categories of space universal?" [Keynote address]. 4th International Conference on Geographic Information Science. Münster, September.

Bowerman, M. "Names for things" Panel Discussion, Lecture 3 by Paul Bloom at the Nijmegen Lectures Series. Nijmegen, December.

Broeder, D., & Wittenburg, P. "Architecture and components for an archive grid." DAM-LR Meeting. Lund, January.

Broeder, D., Claus, A., Offenga, F., Skiba, R., Trilsbeek, P., & Wittenburg, P. "Language Archiving at the MPI." The 28th Annual Meeting of the German Society for Linguistics (DGfS). Bielefeld, February.

Broeder, D., & Wittenburg, P. "Language archiving technology." IDS Conference on Language Processing Technology. Mannheim, March.

Broeder, D., & Wittenburg, P. "Methods for distributed authentication and authorization." DAM-LR Meeting. London, September.

Broeder, D. "Citing archived objects." The 4th Annual Meeting of the Digital Endangered Languages and Musics Archive Network (DELANMAN IV 2006). London, November.

Broeder, D., Van Veenendaal, R., Nathan, D., & Stromqvist, S. "A Grid of language resource repositories." The 2nd IEEE International Conference on e-Science and Grid Computing (e-Science '06). Amsterdam, December.

Broersma, M. "Learning to ignore a perceptual cue: Nonnative listeners outperform native listeners" [poster]. 151st Meeting of the Acoustical Society of America. Providence, RI, June.

Broersma, M. "Nonnative listeners rely less on phonetic information for phonetic categorization than native listeners" [poster]. The 10th Conference on Laboratory Phonology (LabPhon10). Paris, June/July.

Broersma, M., & De Groot, F. O. "Minimal pairs in nonnative listening: Meaning activation" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Brown, A. "Revealed as an L2 user: Features of L2 gestures in L1 production" [invited talk]. Gesture Workshop. Groningen U., April.

Brown, A., & Gullberg, M. "Effects of the L2 on the L1 in the expression of path in speech and gesture." European Second Language Association Conference (EuroSla 16). Antalya, September.

Brown, A., & Gullberg, M. "Changes in L1 encoding of motion after exposure to an L2." The 2nd International Conference of the German Cognitive Linguistics Association. München, October.

Brown, A. "Development of a mature L1: Impact of exposure to an L2." 31st Annual Boston University Conference on Language Development (BUCLD). Boston U., November.

Brown, P. "Minimal or nonminimal? Initial reference to persons in Tzeltal conversation" [invited talk]. MPI workshop on Questions and their Responses. MPI Nijmegen, March.

Brown, P. "Infant-caregiver interaction in two cultures: Rossel and Tzeltal." Workshop on Infant Interaction in Cross-cultural Perspective. MPI Nijmegen, May.

Brown, P. "Minimal or nonminimal? Initial reference to persons in Tzeltal." Panel on Initial Person Reference in Social Interaction, International Conference on Conversation Analysis (ICCA06). Helsinki, May.

Brown, P. "Arriba, abajo y a través de la tierra: Términos de paisaje, nombres de lugares, y lenguaje espacial en Tzeltal" [invited talk]. CIESAS-Sur, San Cristóbal de las Casas, Mexico, November.

Chen, A. "The comprehension and production of focus types by children from 5 to 11" [poster]. Latsis Colloquium on Early Language Development and Disorders. Geneva, January.

Chen, A. "Interface between information structure and intonation in Dutch wh-questions." MPI workshop on Questions and their Responses. MPI Nijmegen, March.

Chen, A. "Variations in the marking of focus in child language" [poster]. The 10th Conference on Laboratory Phonology (LabPhon10). Paris, June/July.

Chen, A., & Narasimhan, B. "Wh-question constructions in Dutch: The role of intonation and information structure" [poster]. The 4th International Conference on Construction Grammar. Tokyo, September.

Christoffels, I. K., Van de Ven, V., Formisano, E., & Schiller, N. O. "Speaking but not hearing: Sensory consequences of the monitoring of speech in the brain." Belgian Association for Psychological Science (BAPS). Liège, May.

Christoffels, I. K., Van de Ven, V., Formisano, E., & Schiller, N. O. "Speaking but not hearing: The sensory consequences of verbal feedback in the brain." Psycholinguistics in Flanders (PiF). Ghent, June.

Christoffels, I. K., Formisano, E., & Schiller, N. O. "Speaking but not hearing: A parametric fMRI study into the sensory consequences of verbal feedback" [poster]. Annual Human Brain Mapping Conference. Florence, June.

Christoffels, I. K., Formisano, E., & Schiller, N. O. "Speaking but not hearing: A parametric fMRI study into the sensory consequences of verbal feedback" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLAP 2006). Nijmegen, August/September.

Crasborn, O., Sloetjes, H., Auer, E., & Wittenburg, P. "Use of data gloves in gesture and sign language." The 12th ELSNET European Summer School on Language & Speech Communication. Hamburg, July.

Cutler, A. "Levels of processing speech" [invited presentation]. The 34th Bartlett Lecture. Joint Conference of the Experimental Psychology Society and the Dutch Psychonomics Society. Birmingham, UK, April.

Cutler, A. "The impact of vocabulary structure on spoken-word recognition." Human Communication Sciences Network Workshop on Human and Machine Speech Processing. Sydney, November.

Davidson, D. J., & Indefrey, P. "Joint time-frequency responses to grammatical and semantic violations in first and second languages." The 13th Annual Meeting of the Cognitive Neuroscience Society (CNS 2006). San Francisco, April.

Davidson, D. J., Hellwig, F. M., & Indefrey, P. "MEG correlates of grammatical learning in German learners of Dutch." Workshop on Linguistic and Psycholinguistic Approaches to Code-switching and Language Switching. Berg en Dal, May.

Davidson, D. J. "Short-term learning of German morpho-syntax" [invited talk]. Nijmegen Bilingualism Group (NBG), October.

Davidson, D.J., & Indefrey, P. "Grammatical reorganization within a day" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Dikker, S., & Indefrey, P. "Disentangling incremental and top-down parsing: Experimental evidence from VO/OV word order patterns in code-switching" [poster]. The 19th Annual CUNY Conference on Human Sentence Processing. New York, March.

Dikker, S., & Indefrey, P. "Incremental versus depth-first structure generation in sentence processing: Evidence from word order manipulations in code-switching" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Dimitriadis, A., Kemps-Snijders, M., Wittenburg, P., Everaert, M., & Levinson, S.C. "Towards a linguist's workbench supporting e-Science methods." The 2nd IEEE International Conference on e-Science and Grid Computing (e-Science '06), Amsterdam, December.

Dimroth, C., & Haberzettl, S. "Verbflexion in der L2 Deutsch: Warum sind kindliche L2 Lerner schneller fortgeschritten?" The 28th Annual Meeting of the German Society for Linguistics (DGfS). Bielefeld, February.

Dimroth, C. "Age related differences in the language learning capacities?" Workshop on The Expression of Temporality in Restricted Language Systems and Beyond. Netherlands Institute for Advanced Study (NIAS). Wassenaar, March.

Dimroth, C. "Evidence for learning in a 'learner varieties' approach" [invited panel]. European Second Language Association Conference (EuroSla 2006). Antalya, September.

Dimroth, C., & Starren, M. "L2 Corpora." EMLAR III Workshop on Experimental Methods in Language Acquisition Research. Utrecht Institute of Linguistics, November.

Dimroth, C. "Lernreihenfolgen im ungesteuerten L2 Erwerb des Deutschen bei Lernern unterschiedlichen Alters." Workshop "Kinder mit Migrationshintergrund. Empirische Befunde und Forschungsdesiderate." TU Berlin, November.

Dukers, A., & Ringersma, J. "GE: A flexible presentation platform for linguistic resources." The 4th Annual Meeting of the Digital Endangered Languages and Musics Archive Network (DELAMAN IV 2006). London, November.

Dunn, M. "Contact and phylogeny in Island Melanesia." Digital Humanities 2006. Paris, Sorbonne, July.

Dunn, M. "Contact and phylogeny in Island Melanesia linguistic prehistory." Genes and Language in East Asia and the Pacific Conference. U. Uppsala, December.

Enfield, N. "Population thinking and areal typology: Implications for language, culture, and cognition." 28th Annual Meeting of the German Society for Linguistics (DGfS). Bielefeld, February.

Enfield, N. "Social intelligence in language and interaction: New perspectives on the language-cognition-culture relationship The 4th International Conference on Construction Grammar. Tokyo, September.

Enfield, N. "Meanings of the unmarked: How default person reference does more than just refer." ICCA Helsinki, May.

Enfield, N. "Sketch of Kari, Vietic language of Laos Pilot Meeting for 3rd International Conference on Austroasiatic Languages, EFEO, Siam Reap, June

Enfield, N. "Human sociality: Interdisciplinary convergence on social interaction." 105th Annual Meeting of the American Anthropological Association. San Jose, November.

Eisner, F., & McQueen, J. M. "Stability over time in lexically-guided auditory perceptual learning." Joint Conference of the Experimental Psychology Society

and the Dutch Psychonomics Society. Birmingham, UK, April.

Ernestus, M. "Hij roeid en wandeld: Intraparadigmatic effects in spelling behavior." Taalkunde in Nederland-dag 2006. Utrecht, February.

Ernestus, M. "The role of morphology in spelling behavior." 5th International Workshop on Writing Systems. Nijmegen, October.

Ernestus, M. "Acoustic reduction in European languages" [poster]. European Young Investigators (EURYI) Ceremony. Prague. October.

Ernestus, M. "Acoustic reduction in European languages" [invited talk]. European Young Investigators (EURYI) Awards Symposium I. Strasbourg, November/December.

FitzPatrick, I., & Indefrey, P. "Lexical selection in L2 auditory sentence comprehension" [poster]. Workshop on Linguistic and Psycholinguistic Approaches to Code-switching and Language Switching. Berg en Dal, May.

Ganushchak, L., & Schiller, N. O. "Effects of time pressure and auditory interference on verbal self-monitoring." Belgian Association for Psychological Science (BAPS). Liège, May.

Ganushchak, L., & Schiller, N. O. "Effects of time pressure and auditory interference on verbal self-monitoring" [poster]. EPOS/NWO workshop on Errors, Conflicts, and Rewards: "The role of medial frontal cortex in cognitive control and performance monitoring." Amsterdam, June.

Gazendam, L., Malaisé, V., Schreiber, G., & Brugman, H. "Deriving semantic annotations of an audiovisual program from contextual texts." The 1st International workshop on Semantic Web Annotations for Multimedia (SWAMM 2006). Part of the 15th World Wide Web Conference, Edinburg, May.

Gazendam, L., Malaisé, V., & Brugman, H. "Accessing the GTAA thesaurus over the web" [poster]. ICT Kenniscongres 2006. Amsterdam, May.

Gazendam, L., Malaisé, V., Schreiber, G., & Brugman, H. "Deriving semantic annotations from contextual texts for the indexing of TV and radio programs" [poster]. Scientific ICT Research Event Netherlands (SIREN 2006) Conference. Utrecht, October.

Gijn, R. van, & Gipper, S. "Semantic and grammatical integration in Yurakaré subordination." Americanist Workshop on Subordination. MPI Nijmegen, December.

Gullberg, M. "What L2 learners mean: Gestures and placement events in advanced learner production." Workshop on Gestures in Language Development. Groningen, April.

Gullberg, M., Indefrey, P., & Muysken, P. "Band'i dje e vlaggetje colo cora: Towards the experimental study of code-switched sentence production in Papiamentu-Dutch bilinguals" [invited talk]. Workshop on Linguistic and Psycholinguistic Approaches to Code-switching and Language Switching. Berg en Dal, May.

Gullberg, M. "Handling discourse in a second language: Gestures, L2 learners, and grammar" [invited talk]. Workshop on Current trends in gesture research. Hatfield, June.

Gullberg, M., Dimroth, C., & Roberts, L. "Breaking and entering: First contact with a new language." The 5th Pacific Second Language Research Forum. Brisbane, July.

Gullberg, M. "What gestures reveal about placement verbs, event construal, and what L2 learners mean." The 2nd International Conference of the German Cognitive Linguistics Association. München, October.

Gürçanlı, Ö., Nakipoglu Demiralp, M., & Özyürek, A. "Shared information and argument omission in Turkish." The 31st Boston University Conference for Child Language Development. Boston, November.

Hagoort, P. "Hersenbeelden van de denkende mens." Lezing voor het Koninklijk Natuurkundig Genootschap te Groningen (KNG). Groningen, January.

Hagoort, P. "What ERPs reveal about the functional architecture of language processing." Lecture for the Centre for Developmental Language Disorders and Cognitive Neuroscience. U. College London, February.

Hagoort, P. "What makes humans unique?" Conference on Cognition: From molecules to mind. De Jonge Akademie (KNAW), Amsterdam, March.

Hagoort, P. "De electrofysiologie van taal." Lecture for the Dutch Association for Clinical Neurophysiology (KNF). St. Michielsgestel, April.

Hagoort, P. "The MUC (Memory, Unification, Control) model of language." Language & the Mind International Psychology Conference (VSPA 2006). U. of Amsterdam, May.

Hagoort, P. "The psychophysiology of meaning." The 6th Congress of the Federation of European Psychophysiology Societies. Budapest, June.

Hagoort, P. "De grenzen van het brein zijn de grenzen van weten en leren." Soeplezing, organized by the Netherlands Organization for Scientific Research (NWO). Den Haag, June.

Hagoort, P. "Language from a brain perspective." Symposium at the 5th Forum of European Neuroscience. Vienna, July.

Hagoort, P. "Singing in the brain." Lowlands University 2006. Biddinghuizen, August.

Hagoort, P. "Unification from a functional and neurobiological perspective." The Neurocognition of Unification (satellite symposium AMLaP). Nijmegen, August.

Hagoort, P. "De verbeelding aan de macht." Symposium for the opening of the Leiden Institute for Brain and Cognition (LIBC). Leiden, September.

Hagoort, P. "The memory, unification, and control model of language" [keynote lecture]. Discussion meeting on Mental processes in the human brain. Royal Society London, October.

Hagoort, P. "On Broca, brain and binding" [keynote lecture]. BMBF – Imaging Center Workshop on Brain Imaging of Cortical Networks. Frankfurt, November.

Hagoort, P. "The speaking ghost in the neural machine." The Neuroscience Seminar Series of the Erasmus Medical Centre Rotterdam. Rotterdam, December.

Heinemann, T. "Managing competing activities during the production of multi-unit turns." The 92nd Annual Convention of the National Communication Association (NCA). San Antonio, November.

Hellwig, F. M. "Native-like hemodynamic responses during sentence comprehension of Dutch learning Chinese students." TABU-Day 2006. Groningen, June.

Hellwig, F. M. "Reaction time latencies to words containing ambiguous suffixes" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Hellwig, F. M. "The spelling of the voiceless alveolar fricative in German." Workshop on Constraints on Spelling Changes. Nijmegen, October.

Herbst, L. "Children's use of intonation" [poster]. The 1st Interdisciplinary Max-Planck-Ph.D.-net workshop. Cologne, August.

Heugten, M. van, & Johnson, E.K. "The acquisition of articles by Dutch-learning toddlers" [poster]. The 31st Boston University Conference for Child Language Development. Boston, November.

Heugten, M. van, & Johnson, E.K. "Eye movements reveal 19-month-olds' sensitivity to definite articles" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Indefrey, P. "Early changes in neural response to second language processing" [invited talk]. Workshop on Neurophysiological and Educational Aspects of Language Acquisition. Dortmund, May.

Indefrey, P. "Reliable hemodynamic activation differences between first and second languages" [poster]. The 12th Annual Meeting Human Brain Mapping (HBM2006). Florence, June.

Indefrey, P. "Vom Gedanken zur Aussprache - Der Ablauf der Sprachproduktion im Gehirn" [invited talk]. Symposium Turm der Sinne 2006: Neuronen im Gespräch. Nürnberg, September.

Indefrey, P. "Early neural reorganization in second language sentence processing" [invited talk]. The 2nd Annual Rovereto Workshop on Bilingualism. Rovereto, September/October.

Janzen, G., Jansen, C., & Van Turennout, M. "Memory consolidation of relevant landmarks in good navigators: An fMRI study" [poster]. The 12th Annual Meeting of the Organization for Human Brain Mapping, Florence, June (Abstract appeared in *NeuroImage*, 31, Supplement).

Jesse, A. "Prosodic structure in audiovisual word recognition" [invited talk]. The 1st Annual Meeting of the DFG Framework program on Phonological and Phonetic Competence: Between Grammar, Signal Processing, and Neural Activity". Stuttgart, October.

Jesse, A., & McQueen, J. M. "Perceptual learning in speech: Position-specific prelexical adjustments?" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Joergens, S., Kleiser, R., Indefrey, P., & Seitz, R.S.J. "Language lateralization in stuttering: Gender effects during sentence processing" [poster]. The 12th Annual Meeting Human Brain Mapping (HBM2006). Florence, June.

Johnson, E.K., & Van Heugten, M. "The acquisition of function morphemes in Dutch." Symposium on The role of Function Words in Early Language Development. International Conference on Infant Studies (ISIS 2006). Kyoto, June.

Johnson, E.K. "How infants first solve the word segmentation problem" [invited talk]. Two-part lecture series presented at Korea U., Workshop on Experimental language research. Seoul, August.

Johnson, E.K., & Tyler, M. "The ecological validity of transitional probability tracking in infancy" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Johnson, E.K. "Raising a human: How experience shapes language development" [invited talk]. Workshop on Raising a Robot. Radboud U. Nijmegen, October.

Johnson, E.K. "Current methods in infant language research" [invited talk]. EMLAR III Workshop on Experimental Methods in Language Acquisition Research. Utrecht Institute of Linguistics, November.

Josephina, N., Gullberg, M., Indefrey, P., & Muysken, P. "A multi-modal corpus of code-switched conversation in Papiamentu-Dutch" [poster]. Workshop on Linguistic and Psycholinguistic Approaches to Code-switching and Language Switching. Berg en Dal, May.

Kemps-Snijders, M. "LEXUS, online software for converting lexicons to ISO LMF." The 7th Biennial AMTA Conference for Machine Translation in the Americas. Boston, June.

Kirsch, K. "Working cross platform: A case study in coding, sharing and analyzing corpora." 28th Annual Meeting of the German Society for Linguistics (DGfS). Bielefeld, February.

Klein, W., & Wittenburg, P. "Sprach Archivierungs Technologie." GW Conference on Computational Methods. Berlin, June.

Kooijman, V., Hagoort, P., & Cutler, A. "Word recognition in continuous speech by seven-month-old infants." CUNY Workshop on Online Methods in Children's Language Processing at the 19th Annual CUNY Conference on Human Sentence Processing. New York, March.

Kooijman, V. "Word recognition from continuous speech by seven-month-olds" [invited talk]. Department of Speech-Language Pathology, U. Toronto, March.

Kooijman, V., Snijders, T., Hagoort, P., & Cutler, A. "Word segmentation from continuous speech: The 'Foreign Language Effect'". The 19th Annual CUNY Conference on Human Sentence Processing. New York, March.

Kopecka, A., & Pourcel, S. "Understanding figures in conceptualizing motion." The 2nd Biennial Conference on Cognitive Science. St. Petersburg, June.

Kopecka, A. "Lexicalization of manner of motion: Typology and lexical diversity." The 5th International Conference of the Spanish Cognitive Linguistics Association (AELCO). Murcia, October.

Koppenhagen, H. & Schiller, N. O. "Lexical conflict processing during overt picture naming: an fMRI study." 5th Endo-Neuro-Psycho Meeting. Doorwerth, June.

Krauer, S., Varadi, T., & Wittenburg, P. "CLARIN – the next steps." Research Infrastructure Workshop at the LREC Conference 2006. Genoa, May.

Lamers, M., & Roelofs, A. "Interplay of Gestalt grouping principles, attention for action, and eye movements." Joint Conference of the Experimental Psychology Society and the Dutch Psychonomics Society, Birmingham, UK, April.

Levinson, S. C. "Enrolling other sciences in language documentation: Describing an isolate language, Yélf Dnye, in Papua New Guinea" [invited talk]. The 28th Annual Meeting of the German Society for Linguistics (DGfS). Bielefeld, February.

Levinson, S.C. "Questions about questions." MPI workshop on Questions and their Responses. MPI Nijmegen, March.

Levinson, S.C. "Reciprocals in Yélf Dnye, the Papuan language of Rossel Island." Workshop on Reciprocals Across Languages. MPI Nijmegen, April.

Levinson, S.C. "The 'interaction engine': A core ethology and its diverse manifestations." 105th Annual Meeting of the American Anthropological Association. San Jose, November.

Linden, M. van der, Indefrey, P., & Van Turenhout, M. "Perceptual and conceptual category representations in the human brain" [poster]. 12th Annual Meeting Human Brain Mapping (HBM2006). Florence, June.

Malaisé, V., Aroyo, L., Brugman, H., Gazendam, L., De Jong, A., Negru, C., & Schreiber, G. "Evaluating a thesaurus browser for an audio-visual archive." 15th International Conference on Knowledge Engineering and Knowledge Management Managing Knowledge in a World of Networks (EKAW'06). Prague, October.

Majid, A. "What the human body tells us about the human mind." Symposium on Cultural Impacts on Cognition. The 28th Annual Meeting of the Cognitive Science Society. Vancouver, July.

Majid, A. "Reasoning with language and reasoning without: Informational discrepancies in causal inferencing." Workshop on Formal Models for Real People. Amsterdam, September.

Majid, A. "Segmenting the body." Workshop on Body Representations and Multimodal Interaction. Paris, October.

Majid, A. "Universals of human body part nomenclature." The 105th Annual Meeting of the American Anthropological Association. San Jose, November.

Malaisé, V., Brugman, H., & Gazendam, L. "CHOICE@CATCH pilot project: A web browser for the GTAA thesaurus." CATCH Symposium. The Hague, January.

Malaisé, V., Brugman, H., & Gazendam, L. "A thesaurus browser at sound and vision." Amsterdam Cultural Heritage Exchange (ACHE) day. Amsterdam, March.

Menenti, L., & Indefrey, P. "The revised hierarchical model of bilingual memory and its neural implications" [invited talk]. The 5th Dutch Endo-Neuro-Psycho Meeting. Doorwerth, June.

Mitterer, H., & Ernestus, M. "What you hear is not what has been said: Early compensation for reduced /t/ in connected speech" [poster]. The 4th Conference on Mismatch Negativity (MMN) and its Clinical and Scientific Applications. Cambridge, April.

Mitterer, H., & Ernestus, M. "The functional phonology of reduced forms." The 1st Annual Meeting SPP 1234 (Sprachlautliche Kompetenz). Stuttgart, October.

Mitterer, H., Ernestus, M., & McQueen, J.M. "Wie Hörer spontane Sprache verstehen: Der Fall des wortfinalen /t/." [How listeners deal with connected speech: The case of word-final /t/]. Herbsttreffen Experimentelle Kognitionspsychologie. Braunschweig, November.

Narasimhan, B., Kopecka, A., & Özyürek, A. "Cross-linguistic variation in motion event encoding: Do constructions play a role?" The 4th International Conference on Construction Grammar. Tokyo, September.

Özyürek, A. "From gesture to sign: Is there a continuum?" Nascent Languages Workshop. Rockefeller Study and Conference Center, Bellagio, October.

Özyürek, A. "Neural correlates of speech and gesture comprehension" [invited talk]. Neurocognition of Gesture Workshop, MPI for Human Cognitive and Brain Sciences. Leipzig, July.

Özyürek, A. "How do our hands talk? Cognitive processes underlying speech and gesture production." The 5th Dutch Endo-Neuro-Psycho Meeting. Doorwerth, June.

Page, M., Jesse, A., & McQueen, J. M. "Exemplars: Lexical or sublexical?" Joint Conference of the Experimental Psychology Society and the Dutch Psychonomics Society, Birmingham, UK, April.

Panda, S. "Short course in applied linguistics: Literacy development." Workshop on Cross-linguistic Sign Language Research. Nijmegen, January.

Panda, S. "Short course in applied linguistics: Language acquisition and bilingualism." Workshop on Cross-linguistic Sign Language Research. Nijmegen, January.

Panda, S. "Short course in applied linguistics: Language instruction." Workshop on Cross-linguistic Sign Language Research. Nijmegen, January.

Ringersma, J., & Wittenburg, P. "From static corpora to dynamic collections." The 4th Annual Meeting of the Digital Endangered Languages and Musics Archive Network (DELAMAN IV 2006). London, November.

Roelofs, A. "The seduction in action." Nijmeegse Tweedaagse Kunstmatige Intelligentie. Radboud U. Nijmegen, October.

Rossano, F. "When the eyes meet: Using gaze to mobilize response." International Conference on Conversation Analysis (ICCA-06). Helsinki, May.

Rossano, F. "Gaze behavior in multi-unit turns" The 92nd Annual Convention National Communication Association (NCA). San Antonio, November.

Ruiter, J.P. de, Brown, P., & Enfield, N.J. "Epistemic dimensions of polar questions: Declarative questions and tag questions in comparative perspective." MPI Workshop on Questions and their Responses. MPI Nijmegen, March.

Schimke, S. "Finiteness and assertion marking in German and French." The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Schmiedtová, B., Indefrey, P., Lagers-van Haselen, G.C., Hagoort, P., Van Hagen, J.M., & Van der Geest, J.N. "Narratives by Dutch speakers with Williams syndrome." 3rd Williams Syndrome Workshop. Reading, July.

Schuhmann, T., Sack, A., & Schiller, N. O. "TMS in language production." 5th Endo-Neuro-Psycho Meeting. Doorwerth, June.

Schwager, W. "Word classes and morphological processes in sign languages." Workshop on Cross-linguistic Sign Language Research. Nijmegen, January.

Schwager, W. "Sign language research tools." Workshop on Cross-linguistic Sign Language Research. Nijmegen, January.

Senft, G. "'Ich weiß nicht, was soll es bedeuten...'" - Ethnolinguistische Winke zur Rolle von umfassenden Metadaten bei der (und für die) Arbeit mit Corpora" [invited talk]. Jahrestagung 2006 des Instituts für deutsche Sprache: Sprachkorpora - Datenmengen und Erkenntnisfortschritt. Mannheimer Stadthaus, March.

Senft, G. "To have and have not: Kilivila reflexives and reciprocals." Workshop on Reciprocals Across Languages. MPI Nijmegen, April.

Senft, G. "Linguistic documentation and the 'situational-intentional varieties' approach" [invited talk]. Oceania-seminar on Mapping the Pacific: Positions, Representations and Interpretations. Lysebu, Oslo, September/October.

Shatzman, K. B., & McQueen, J. M. "The activation of offset-embedded words: Evidence from eye-tracking and identity priming" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Seuren, P. "Natural logic and natural set theory." Conference on Quantification in Lexicon and Syntax. Brussels, June.

Seuren, P. "The linguistic reality of speech act operators." Annual Conference of the Societas Linguistica Europaea. Bremen, September.

Shi, R., Cutler, A., & Werker, J. "Phonetic encoding of functors and how functors facilitate word segmentation." International Conference on Infant Studies (ISIS 2006). Kyoto, June.

Stevens, M., McQueen, J. M., & Hartsuiker, R. J. "Perceptual learning of accent characteristics" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Stivers, T., & Rossano, F. "Mobilizing response." MPI workshop on Questions and their Responses. MPI Nijmegen, March.

Stivers T. "Alternative recognitionals in initial references to persons." Dutch Sociolinguistics Conference. Lunteren, March.

Stivers, T. "Alternative recognitionals in initial references to persons." International Conference on Conversation Analysis (ICCA06). Helsinki, May.

Stivers, T. "Modified repeats: One method for asserting primary rights from second position." Dutch Society for Phonetic Sciences Symposium on Corpus-based research. MPI Nijmegen, June.

Stivers, T. "Stance, alignment and affiliation during story telling: Nodding as a token of preliminary affiliation." American Sociological Association. Montreal, June.

Stivers, T., & Heritage, J. "Concordance in antibiotic prescribing: The role of online commentary." European Association for Communication in Healthcare. Basle, June.

Stivers, T. "Stance, alignment and affiliation during story telling: Nodding as a token of preliminary affiliation." National Communication Association. San Antonio, November.

Tagliapietra, L., & McQueen, J. M. "Singleton and geminate consonants in Italian spoken-word recognition." Conference on the Architecture of Language. Pisa, June.

Tuinman, A. "Overcompensation for /t/-reduction in Dutch by German-Dutch bilinguals." The 10th Conference on Laboratory Phonology (LabPhon10). Paris, June/July.

Tuinman, A., Mitterer, H., & Cutler, A. "Variable influence of grammatical context on identification of reduced /t/s." The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Tyler, M., & Johnson, E.K. "Testing the limits of statistical learning" [poster]. International Conference on Infant Studies (ISIS 2006). Kyoto, June.

Tyler, M., Perruchet, P., & Cutler, A. "A cross-language comparison of the use of stress in word segmentation." The 152nd Meeting of the Acoustical Society of America. Honolulu, November.

Verhagen, J. "The acquisition of the auxiliary 'hebben': The key to post-verbal negation in Dutch as a second language?" The 28th Annual Meeting of the German Society for Linguistics (DGfS). Bielefeld, February.

Verhagen, J. "Using auditory sentence-matching to investigate the processing of negation in L2 Dutch" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Verhoef, K., Roelofs, A., & Chwilla, D. "Dynamics of language switching: Evidence from event-related potentials in overt picture naming." The 13th Annual Meeting of the Cognitive Neuroscience Society (CNS 2006), San Francisco, April.

Verhoef, K., Roelofs, A., & Chwilla, D. "Dynamics of language switching: Evidence from event-related potentials in overt picture naming." Workshop on Linguistic and Psycholinguistic Approaches to Code-switching and Language Switching. Berg en Dal, May.

Verhoef, K., Roelofs, A., & Chwilla, D. "Dynamics of language switching: Evidence from event-related potentials in overt picture naming." The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Viebahn, M., & McQueen, J. M. (2006). "Mismatch beim lexikalen Zugriff: Das 'Visual-World-Paradigma' mit geschriebenen Wörtern." Tagung experimentell arbeitender Psychologen (TeaP). Mainz, March.

Willems, R. M., Özyürek, A., & Hagoort, P. "Visual and linguistic information in sentence comprehension: Overlapping neural correlates" [poster]. The 12th Annual Conference on Architectures and Mechanisms for Language Processing (AMLaP 2006). Nijmegen, August/September.

Willems, R. M., Özyürek, A., & Hagoort, P. "Similar neural correlates for integration of pictures and words into a sentence context: Evidence from ERPs and fMRI" [poster]. The 13th Annual Meeting of the Cognitive Neuroscience Society (CNS 2006), San Francisco, April.

Wittenburg, P. "Towards a research infrastructure for language resources and technology - an introduction. Research Infrastructure Workshop at the LREC Conference 2006. Genoa, May.

Wittenburg, P. "Trends in language archiving technology." COCOSDA Workshop at the LREC Conference 2006. Genoa, May.

Wittenburg, P., Broeder, D., Berck, P., Sloetjes, H., & Klassmann, A. "Language resource archiving supporting multimodality research." Workshop on Multimodal Corpora - from Multimodal Behaviour Theories to Usable Models. LREC Conference 2006. Genoa, May.

Wittenburg, P. "Perspectives for ontologies in linguistics - introduction to the LREC Panel." Panel about Perspectives for Ontologies in Linguistics. LREC Conference 2006. Genoa, May.

Wittenburg, P., & Broeder, D. "Technologies for an archive grid." Joint Meeting MPI-DANS-BigGrid. Nijmegen, May.

Wittenburg, P. "Language archives – essential pillars for eHumanities." Official DANS Opening. Den Haag, June.

Wittenburg, P. "DoBeS: News from MPI Team." DoBeS workshop. MPI Nijmegen, June.

Wittenburg, P. "Management aspects of research infrastructures." CLARIN Plenary Meeting. Budapest, November.

Wittenburg, P. "eScience Seminare - ist die MPG bereit für die Zukunft?" MPI - IT User Meeting. Berlin, November.

Wittenburg, P. "Anforderungen zur Langzeit-Archivierung." Gesellschaft für wissenschaftliche Datenverarbeitung Göttingen (GWDG) Workshop zu Methoden der Langzeit-Archivierung. Göttingen, November

Wittenburg, P. "Distributed access management for language resources." Gesellschaft für wissenschaftliche Datenverarbeitung Göttingen (GWDG) Workshop zu Methoden der Langzeit-Archivierung. Göttingen, November.

Wittenburg, P. "eHumanities - an introduction." Second IEEE International Conference on e-Science and Grid Computing. Amsterdam, December.

Zeshan, U. "Project management in international sign language research." Workshop on Cross-linguistic sign language research. Nijmegen, January.

Zeshan, U. "Sign languages in village communities". Workshop on Sign languages in Village Communities. MPI Nijmegen, April.

13.8 Colloquia presented

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

BIEN, H.: "Frequency effects in compound production." CLS Colloquium-series in Linguistics. Radboud U. Nijmegen.

BRAUN, B. "How to uncover the structure/phonology of intonation?" Phonetics Institute, Saarland U.

BROERSMA, M. "Speech perception in a second language." Language and Literacy Development across the Life Span (LANSPAN) Colloquium. Groningen U.

BROERSMA, M. "Triggered codeswitching: It exists and we can explain it" Workshop on Linguistic and psycholinguistic approaches to code-switching and language switching. Berg en Dal.

BROWN, A. "Consequences of contact: Synchronic change within individuals." Nijmegen Bilingualism Group. MPI Nijmegen.

BROWN, A. "Blending of typology: The case of acquisition." Department of Linguistics, Kobe U.

CHRISTOFFELS, I. K., Van de Ven, V., Formisano, E., & Schiller, N. O. "Self-monitoring of auditory feedback: The neural consequences of speaking but not hearing." U. of Amsterdam, Department of Psychology, Section of Psychonomics.

DIMROTH, C. "Struktur und Entwicklung elementarer Lernervarietäten." Ringvorlesung Zweisprachigkeit, U. Tübingen.

DUNN, M. "Computational approaches to contact-induced change in language history." U. Edinburgh.

DUNN, M. "Statistically evaluating the Central Solomons group of Greenberg's Indo-Pacific Hypothesis using randomization." U. Edinburgh.

DUNN, M. "Inferring linguistic prehistory from language structure in Island Melanesia". U. Stockholm.

ENFIELD, N. "Population thinking and 'areal linguistics': Implications for language, culture, and cognition." Institute Jean Nicod, Paris.

ENFIELD, N. "Speech-with-gesture 'constructions' as cognitive artifacts." Department of Linguistics, U. of California at Berkeley.

ENFIELD, N. "The elements of formulation: Meaning in speech-gesture composites, and in utterances generally linguistic anthropology." Working group, U. of California at Berkeley.

ENFIELD, N. "The paradox of being ordinary: Default person reference in Lao." Centre for Language, Interaction, and Culture." U. of California at Los Angeles.

GULLBERG, M. "Putting meaning into placement verbs: The development of semantic distinctions in Dutch children's speech and gesture." Lund U.

GULLBERG, M. "The dynamics of multilingual processing and input processing at first contact with a new language." U. New South Wales, Sydney.

GULLBERG, M., Dimroth, C., Roberts, L., & Indefrey, P. "De första minuterna med ett nytt språk: Vad vuxna inlärare kan göra med input." [The first minutes with a new language: What adult learners can do to input]. Lund U.

- GULLBERG, M., Dimroth, C., & Roberts, L. "What do you know after 7 minutes of exposure to a new language?" U. Bern.
- INDEFREY, P. "Berufsfeld Allgemeine Sprachwissenschaft." U. Düsseldorf.
- INDEFREY, P. "Compositional processes in first and second language processing." Radboud U. Nijmegen.
- INDEFREY, P. "Het mechanisme van taalproductie." Soeterbeeck Lecture, Tilburg.
- INDEFREY, P. "Neural correlates of compositional processes in first and second language processing." U. Potsdam.
- INDEFREY, P. "Psycholinguistik der Mehrsprachigkeit." Euregional Forum, Nijmegen.
- JOHNSON, E.K. "Early language acquisition: Decoding the speech signal." U. Toronto.
- JOHNSON, E.K. "Early language acquisition: Learning to extract words from the speech signal." U. California, Los Angeles.
- JOHNSON, E.K. "The acquisition of function morphemes in Dutch." U. Potsdam.
- JOHNSON, E.K. "A critical perspective on artificial language research." Symposium on Artificial language research with infants: Weighing the pros and cons. (co-organized by E.K. Johnson & J. Saffran) International Conference on Infant Studies (ISIS 2006). Kyoto.
- JOLINK, A. "The acquisition of finiteness in Dutch: A longitudinal case study with normally developing children and children with Specific Language Impairment." CLS Colloquium-series in Linguistics. Radboud U. Nijmegen.
- KIRSCH, K. "Finite linking in Russian L1." LSU Cognitive Science Brown Bag Series. Department of Psychology, Baton Rouge.
- KOOIJMAN., V. "Word segmentation from continuous speech: An ERP study." NET Symposium (Netwerk Eerste Taalverwerving). Amsterdam.
- KOPECKA, A. "From a satellite- to a verb-framed pattern: A typological shift in French and its impact on the representation of motion events in narrative." Kobe U.
- KUZLA, C. "Prosodische Struktur in der Produktion und Perzeption deutscher Frikative." Institut für Phonetik und digitale Sprachverarbeitung, Christian-Albrechts-U. Kiel.
- MAJID, A. "Parts of the body: Cross-linguistic categorisation." Institute of Cognitive Neuroscience at U. College London.

MITTERER, H. "Challenges of connected-speech processing: The case of word-final /t/." Leiden U.

ÖZYÜREK, A. "From gesture to language: How did a (sign) language emerge in Nicaragua?" Netherlands Institute for Advanced Studies (NIAS), Wassenaar.

ROELOFS, A. "Functional decomposition of word production and its control." Collège de France, Paris.

ROSSANO, F. "Gaze in face-to-face interaction." Department of Psychology, U. La Sapienza, Roma.

ROSSANO, F. "Gaze in face-to-face interaction." Department of Applied Linguistics, U. California, Los Angeles.

ROSSANO, F. "On sustaining vs. withdrawing gaze in face-to-face interaction." Department of Communication Studies, U. of Texas at Austin.

DE RUITER, J.P. "On turn-taking and intonation". Indiana U.

DE RUITER, J.P. "Turn-taking: the ultimate challenge for natural language processing." U. Aberdeen.

13.9 Teaching:

Members of the Institute taught at the following institutions:

BOWERMAN, M. "Language acquisition and semantic typology." Masters' program in Cognitive Neuroscience, Radboud U. Nijmegen.

BOWERMAN, M. "Topics in psycholinguistics: Semantic development in first language acquisition." Free U. Amsterdam.

CHEN, A. "Acquisition of intonation: Entertaining a universalist account." Masters' program in Cognitive Neuroscience, Radboud U. Nijmegen.

CHEN, A. "Intonation." Three-day intensive course at the MPI Nijmegen.

DIMROTH, C. "Bilingualer Erstspracherwerb." FB Sprach- u. Literaturwissenschaft, U. Osnabrück.

DIMROTH, C. & U. Stephany. "Zweitspracherwerb des Deutschen." FB Allgemeine Sprachwissenschaft, U. Cologne.

ENFIELD, N. "Semantics and pragmatics in a cross-linguistic perspective" Masters' program in Cognitive Neuroscience, Radboud U. Nijmegen.

ENFIELD, N. Seminar on "Meaning". MPI Nijmegen.

GULLBERG, M. "Language and gesture." Hauptseminar, U. Mannheim.

HAGOORT, P. Masters Program Cognitive Neuroscience 2006, Radboud U. Nijmegen.

INDEFREY, P. "The ins and outs of PET." Toolkit course, F.C. Donders Centre for Cognitive Neuroimaging, Nijmegen.

INDEFREY, P. "Hemodynamic methods in cognitive neuroscience" and "Brain activations in language production" Course on "Aphasia". Radboud U. Nijmegen.

INDEFREY, P. Course on "Advanced Cognitive Science." Roosevelt Academy, Middelburg.

JANZEN G. Lecture on "Spatial Ability", Radboud U. Nijmegen.

JANZEN G. "Neuroimaging" and "fMRI Data Analyses." (together with Miranda van Turenout). Masters Program Cognitive Neuroscience 2006, Radboud U. Nijmegen.

KIRSCH, K. & Jordens, P. Seminar: "Kindertaalverwerving." Free U. Amsterdam.

LEVINSON, S.C. "Semantics and pragmatics in a cross-linguistic perspective" Masters' program in Cognitive Neuroscience, Radboud U. Nijmegen.

MAJID, A. "Semantics and pragmatics in a cross-linguistic perspective" Masters' program in Cognitive Neuroscience, Radboud U. Nijmegen.

MCQUEEN J.M. "The mental lexicon: Auditory word recognition." Masters' Program Cognitive Neuroscience, Radboud U. Nijmegen.

NARASIMHAN, B. "Acquiring verb argument structure." Masters' Program Cognitive Neuroscience, Radboud U. Nijmegen.

DE RUITER, J.P. "Language processing in nature." Radboud U. Nijmegen.

ROELOFS, A. "Language 1: Perception and reading." Clinical Neuropsychology course lecture, Utrecht U.

ROELOFS, A. "Language 2: Production." Clinical Neuropsychology course lecture. Utrecht U.

ROELOFS, A. "Cumulative computational modeling in cognitive psychology." Validity of Models course lecture. Radboud U. Nijmegen.

ROELOFS, A. "Neural correlates of cognitive control." Brain and Behavior course lecture, Radboud U. Nijmegen.

ROELOFS, A. "Goal-directed behavior." Psychology in Action course lecture, Radboud U. Nijmegen.

ROSSANO, F. "Introduction to conversation analysis?" Department of Communication Studies. U. Bologna.

SCHILLER, N. "The mental lexicon" Masters' Program Cognitive Neuroscience, Radboud U. Nijmegen.

SENF, G. Seminar on "What is a good reference grammar?" U. Cologne.

SENF, G. "Semantics and pragmatics in a cross-linguistic perspective" Masters' program in Cognitive Neuroscience, Radboud U. Nijmegen.

STIVERS, T. Seminar on "Conversation Analysis." MPI, Nijmegen.

VERHAGEN, J. "An introduction to foreign and second language acquisition." BA course, Free U. Amsterdam.

CHAPTER 14

PUBLICATIONS

- Alphen, P. M. van, & McQueen, J. M. (2006). The effect of Voice Onset Time differences on lexical access in Dutch. *Journal of Experimental Psychology: Human Perception and Performance*, *32*, 178–196.
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- Bock, K., Butterfield, S., Cutler, A., Cutting, J.C., Eberhard, K.M., & Humphreys, K.R. (2006). Number agreement in British and American English: Disagreeing to agree collectively. *Language*, *82*, 64–113.
- Braun, B. (2006). Phonetics and phonology of thematic contrast in German. *Language and Speech*, *49*, 451–493.
- Braun, B., Kochanski, G., Grabe, E., & Rosner, B. S. (2006). Evidence for attractors in English intonation. *Journal of the Acoustical Society of America*, *119*, 4006–4015.
- Brink, D. van den, Brown, C.M., & Hagoort, P. (2006). The cascaded nature of lexical selection and integration in auditory sentence processing. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *32*, 364–372.
- Broeder, D., Claus, A., Offenga, F., Skiba, R., Trilsbeek, P., & Wittenburg, P. (2006). LAMUS: the Language Archive Management and Upload System. *Proceedings of the 5th International Conference on Language Resources and Evaluation (LREC 2006)* (pp. 2291–2294) [CD-ROM].
- Broeder, D., Offenga, F., Wittenburg, P., van der Kamp, P., Nathan, D., & Strömqvist, S. (2006). Technologies for a federation of language resource archives. *Proceedings of the 5th International Conference on Language Resources and Evaluation (LREC 2006)* (pp. 2291–2294) [CD-ROM].
- Broeder, D., & Wittenburg, P. (2006). The IMDI metadata framework, its current application and future direction, *International Journal of Metadata, Semantics and Ontologies*, *1*, 119–132.

- Broersma, M., & De Bot, K. (2006). Triggered codeswitching: A corpus-based evaluation of the original triggering hypothesis and a new alternative. *Bilingualism: Language and Cognition*, 9, 1–13.
- Broersma, M. (2006). Accident - execute: Increased activation in nonnative listening [oral]. *Proceedings of the 9th Conference on Spoken Language Processing, Pittsburgh* (pp. 1519–1522) [CD-ROM].
- Brown, P. (2006). A sketch of the grammar of space in Tzeltal. In S. C. Levinson & D. Wilkins (eds.), *Grammars of Space: Explorations in Cognitive Diversity. Language, Culture and Cognition* (pp. 230–272). Cambridge: Cambridge University Press.
- Brown, P. (2006). Cognitive anthropology. In C. Jourdan & K. Tuite (eds.), *Language, Culture and Society: Key Topics in Linguistic Anthropology* (pp. 96–114). Cambridge: Cambridge University Press.
- Brown P. (2006). Language, culture and cognition: The view from space. In S. Günthner & A. Linke (eds.), *Linguistics and Cultural Analysis*, [Special ed. of ZGL (Zeitschrift für Germanistische Linguistik)] (34: 64–86). Berlin: De Gruyter.
- Brugman, H., Malaisé, V., & Gazendam, L. (2006). A web based general thesaurus browser to support indexing of television and radio programs. *Proceedings of the 5th International Conference on Language Resources and Evaluation (LREC 2006)* (pp. 1488–1491) [CD-ROM].
- Budwig, N., Narasimhan, B., & Srivastava, S. (2006). Interim solutions: The acquisition of early constructions in Hindi. In E. Clark & B. Kelly (eds.), *Constructions in Acquisition* (pp. 163–185). Stanford, CA: CSLI Publications.
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