



2) Scientific content of the event

The school offered a broad and intensive range of mono-disciplinary and inter-disciplinary courses on issues related to the architecture of the mental lexicon, namely structure, meaning, acquisition, and processing of words.

Seventeen teachers provided through fourteen courses an informed synthesis of a variety of topics and approaches, with a view to promoting interdisciplinary methods of research and assessment for grammar architecture and language physiology. The main goal of thematic courses was to highlight some of the most recent and prominent activities in understanding and explaining the structure and the functioning of the mental lexicon. Methodological courses aimed at suggesting synergic ways to promote further progress.

Course abstracts

Thematic courses

Fundamental issues in Theoretical Morphology - Antonio Fábregas, University of Tromsø, Norway

The course offers an introduction to the current debate between Lexicalism and Neoconstructionism, with overviews of the main theories that have contributed to this debate (including I-syntax, Distributed Morphology and Nanosyntax). It mainly focuses on:

- (i) Lexicalism vs. Neoconstructionism: defining properties and main theories; the status of morphology and the lexicon in each theory.
- (ii) The relation between syntax and the lexicon. Endo-skeletal vs. exo-skeletal views of argument structure, event structure and grammatical categories.
- (iii) Morphology and syntax. Word formation processes, affix rivalry and affix ordering: how they are analysed in the main current morphological theories.

Issues in Morpho-phonology - Ingo Plag, University of Düsseldorf, Germany

This course is about the pronunciation of morphologically complex words. Traditional approaches to the role of sound structure in complex words have focused on phonologically conditioned allomorphy or morphologically conditioned segmental or prosodic alternations (such as stress shift, stress preservation, truncation, degemination, or syllabification in English). Such studies have detected interesting generalisations across sets of words but also exceptions to the observed regularities. These findings have given rise to highly influential theoretical models like like Kiparsky's (1982) Lexical Morphology and Phonology, and, underlying such theories, to far-reaching assumptions about



the modular organization of grammar. The general amount and the nature and significance of variation in morpho-phonological alternations, however, been seriously neglected.

In this course we look more closely at some recent empirical research that seriously challenges established theories of morphology-phonology interaction, the common distinction between lexical and postlexical phonology, and current theories of speech production.

Lexical semantics - Carita Paradis, Centre for Languages and Literature Lund University, Sweden

The purpose of this course is to acquaint students with the major issues dealt with in lexical semantics. It offers a brief overview of some current (and less current) lexical semantics theories with the main focus on work within the Cognitive Linguistics framework which has dominated theorising in lexical semantics since the end of the last century. Central to this approach is the meaningful functioning of language in all its guises and all its uses in discourse. Different empirical methods – corpus techniques as well as experiments – are used in order to arrive at a better understanding of what linguistic expression reveals about human cognition and how cognitive abilities give rise to patterns and structures in natural language use. Language is seen as a highly dynamic entity for which no absolute boundaries between the traditional areas of syntax, semantics, and pragmatics are assumed. The study of language becomes an exciting and challenging part of the study of human perception, cognition and interaction. The subject matter covered in the course includes the relationship between lexical items and conceptual structure, lexical semantic relations, such as polysemy, antonymy, metaphor and metonymy and the modelling of meaning for research in the field.

Semantics and Word Formation - Paolo Acquaviva, School of Languages and Literatures University College Dublin, Dublin, Ireland

This course deals with the complex relation between word meaning and word structure; more specifically, between lexical semantics and the structure of derived words. It first reviews the main questions and analytical approaches, showing how different conceptions of morphology and its place in grammar provide different answers to the questions of what constitutes the primitive semantic lexicon ('senses', basic concepts, encyclopaedic listemes) and what expresses them (morphemes, stems, abstract operations, full word forms). It then concentrates on issues of word-internal compositionality and on alternative views of lexical decomposition, particularly syntax-based ones which question the notion of lexicon itself. The discussion assumes some familiarity with the theory and the descriptive vocabulary of word formation, and with basic notions of syntax and semantics; it does not however assume familiarity with any formal framework. The discussion is based on empirical phenomena, to promote a direct engagement with linguistic facts.

The course offers an advanced overview of the morphology-semantics interface, complementing more traditional courses, and it provides a structured account of the language-internal evidence necessary for a linguistically informed approach to word meaning.



Topics of the lectures are:

- Short introduction into the relevant terms and concepts (free and bound morphemes, inflection, derivation and compounding, theories on morphology and lexicon)
- Why is there morphology? What is the role of morphology in parsing?
- Why are there different types of morphology (agglutinative, fusional)? Are there advantages or disadvantages associated with these different morphological types?
- Why do we have suffixes rather than prefixes?
- What happens when we hear or read complex words?
- The so-called Dual-Mechanism Debate on the status of inflectional affixes. Since the mid 80s the processing of inflectional morphology has been at the heart of the debate between two different approaches to human cognition: the symbolic and the anti-symbolic approach to mental computations (e.g. Rumelhart & McClelland 1986). According to the symbolic view of cognitive processing, inflected word forms are structurally composed out of component morphemes by application of a mental operation that combines morphemes displaying the right abstract features such as [+V] or [+PAST]. Hence, an English past-tense form such as inflected is composed by an operation combining the verb stem inflect[V] with a past-tense marker -ed[PAST]. Antisymbolic approaches assume instead that inflected forms are structurally non-compositional and are learned and stored as whole-word forms in an associative memory network.
- Are inflected word forms decomposed into stem and affix morphemes?
- What is the status of inflectional morphemes? Are they epiphenomena or entities stored in the mental lexicon?
- How do connectionist networks represent inflected word forms?
- How complex words and bound morphemes are represented in the mental lexicon?
- What is the evidence that bound morphemes have lexical entries?
- How does a lexical entry for an inflectional affix might look like?
- How are irregular inflected words stored in the mental lexicon?
- Is morphological processing universal? Or do different morphological systems lead to differences in morphological processing?
- Is morphological processing amodal? Or do visual and auditory morphological processing differ?

Aspects of bilingual lexical processing - H el ene Giraudo (Laboratoire Cognition, Langues, Langage, Ergonomie (CNRS), Toulouse 2 le Mirail University, Toulouse, France) & Madeleine Voga (Univerit  Paul-Val ry, Montpellier 3, France)

According to the theoretical view presented by Bybee (1985), morphology is the factor that clusters the lexicon and this organisation transcends languages. Such an organisation would therefore be reflected in bilingual and second language online processing, where morphology is the factor linking lexical representations.



We focus on two areas of the psycholinguistic literature: first, the cognate effect and the different circumstances under which it is (or isn't) observed, depending on linguistic materials, inter-alphabet, e.g. English-Dutch, or intra-alphabet, e.g. Greek-French, as well as priming directions. We will present several studies, many of which use masked priming, aiming to bring to the fore the precise role of morphology in the cognate effect, its implications for the bilingual lexicon, as well as the somehow neglected aspects of the domain, very promising for future research.

The second area concerns the L2-L2 direction of priming in advanced learners: Recent studies suggested that the computational component of morphological processing is impaired, a conclusion essentially based on data showing insensitivity in inflectional priming. From the other hand, studies focusing on the L2-L2 priming direction or comparing the performance of native and non-native reach the opposite conclusion

Methodological courses

Statistics for Newbies - Melanie Bell, Anglia Ruskin University, UK

This course provides a basic introduction to statistical principles and methods, with a view to building participants' confidence in reading and understanding linguistic studies that use such methods. Topics covered include: types of data, sampling, patterns of distribution, describing data, testing hypotheses, levels of significance, comparing groups for significant differences, and identifying significant relationships between variables. All examples use data and problems related to word structure, and are presented using the statistical software R. Additional tutorials provide an opportunity both to revisit the examples presented in class and to gain hands-on instruction in using the software.

Naive discriminative learning - Harald Baayen, Tuebingen University, Germany

Naive discrimination learning (NDL) is a computational approach to implicit learning (and especially implicit language learning), based on a set of formal principles that have proven fundamental to explaining basic learning effects in humans and animals. Unlike other computational techniques currently employed in psycholinguistics, NDL models scale up to learning from realistic samples of language, and can even simulate the effects of training on corpora of billions of words. These models have proven to be very useful in explaining a large range of phenomena in language processing, ranging from language acquisition and aging to modeling response latencies in lexical decision. The NDL model can also be used as a statistical classifier.

Theoretically, the NDL approach is highly compatible with formal, information theoretic approaches to communication, and another attractive property of NDL is that it can help explain why language is intrinsically sensitive to probability, without having to assume that linguistic processes rely on explicit counting, or that the mind contains a homunculus with an advanced degree in statistics.



The first session introduces the Rescorla-Wagner equations and the equilibrium equations for the Rescorla-Wagner model, familiarizing participants with the NDL package for R, which provides a toolkit for working with naive discrimination learning. The second half of this session will discuss key studies by Michael Ramscar and colleagues, and will illustrate how the NDL package can be used to construct the models and the associated predictions discussed in these papers. The data sets in this session will pertain mostly to language acquisition.

The second session provides an overview of how NDL has been used to help predict processing costs in visual lexical decision and eye-tracking, in word naming, and speech production. Data will cover mostly lexical processing in L1, but one modeling example of bilingual lexical processing will be presented as well.

Finally, examples of how NDL can be used as a classifier are discussed. The advantages of the "discriminative stance" as a theoretical perspective on language are illustrated by means of a detailed examination of the currently highly popular but misguided view that cognitive faculties would decline over the lifetime. The importance, for computational modeling, of selecting corpora that properly reflect the language experience of participants in experimental studies will also be highlighted.

Computational morphology for newbies: automata and hierarchical lexica - Gábor Prózszéky, Pázmány Péter Catholic University, Budapest, Hungary

Computational morphology is a general term for automatic approaches that identify or generate word structures of human languages. The main methods of the mostly used approaches are introduced in the course. As a formal background, some interesting results of automata theory and directed acyclic graphs are discussed first. Then, two important approaches to morphological analysis and generation— two-level morphology and unification-based morphology—are introduced in details with examples from several languages. Their expansions to various real-life applications that cause difficulties to the basic methods (search algorithms, proofing tools, etc.) are also discussed. The course deals not only with inflectional, derivational and compositional morphologies, but with topics like analogical approaches, morphological guessing, syntax-morphology interface, treatment of morphological ambiguities and some questions of morpho-graphemics. Traditional and feature-based lexical representations for the above morphological approaches are also discussed.

Connectionist architectures for lexical modelling - Claudia Marzi & Marcello Ferro (Institute for Computational Linguistics, CNR, Italy)

The course focusses on the computational simulation of biologically inspired neural architectures of the mental lexicon, which offer the possibility for an analytical study of the developmental and self-organising processes governing the acquisition of the morphological lexicon in different languages,



to reproduce a wide range of naturalistic conditions of both mono- and multi-lingual input exposure, and to shed light on the complex dynamics triggered by the acquisition of more than one language – either concurrently or deferred in time.

We firstly review connectionist architectures for lexical modelling, focusing on artificial neural network models ranging from classical supervised Multi-Layer Perceptrons (MLPs), where morphology acquisition is modelled as a one-to-one mapping task, to unsupervised Self-Organising Maps (SOMs), where emergent morphological patterns play an important role in word processing and acquisition. We then outline a particular variant of SOM, where an additional temporal connection layer encodes probabilistic expectations based on past experience on the assumption of the lexicon as a redundant store.

In the frame of this latter architecture, lexical modelling is addressed in terms of processing and storage dynamics, training parameters, incremental learning regime, and evaluation methods.

Obtaining behavioural data for lexical research - Emmanuel Keuleers, Ghent University, Belgium

The course begins with an overview of the most commonly used experimental methods in psycholinguistic research. We will cover lexical decision, naming, eye-tracking, and EEG. Next, we focus more deeply on how to set up methodologically sound experiments, with an emphasis on stimulus selection and factorial and continuous experimental designs. Finally, we discuss how to make (re)-use of existing behavioral resources and how to collect behavioral resources with re-use in mind. As an illustration, we will design and set-up an experiment to collect behavioral data online.

Neurolinguistic issues in lexical access and organisation - Mila Vulchanova, Norwegian University of Science and Technology, Trondheim, Norway & Vito Pirrelli, Institute for Computational Linguistics, CNR, Italy

The course provides an integrated view of the role of the perisylvian network in language processing and storage, based on recent neuroanatomical evidence of a bidirectional pathway from the Superior Temporal Gyrus (STG, or “Wernicke’s area”) to “Broca’s area” through the inferior parietal lobe (IPL, or “Geschwind’s area”). The network defines the neuro-cognitive substrate to the retention of sequences of linguistic units and orosensory goals for their vocalisation in working memory (Gathercole and Baddeley, 1989; Papagno et al., 1991). We introduce a model of the mental lexicon based on the principles of word storage and access. In particular, we explore the role of verbal working memory in lexical processing and acquisition, as a dynamic form of sensory-motor integration. Under this view, which is also exemplified and illustrated through computational models, integration of auditory-motor circuits ensures



maintenance/control of transient activation of long-term memory structures in the absence of external stimuli.



3) Assessment of the results and impact of the event on the future direction of the field

By bringing together experts of various scientific domains and different theoretical inclinations, the second NetWordS Summer school contributed to advance the current awareness of theoretical, typological, psycholinguistic, computational and neurophysiological evidence on the structure and processing of words, with a view to fostering novel methods of research and assessment for grammar architecture and language physiology.

The second NetWordS Summer School, together with the first one, contributed to promote training and development of a new generation of truly interdisciplinary young scientists (Phd students and post-docs) and gave momentum for new scientific partnerships. In addition, the two events together enabled to shape new ways of thinking that will be conducive to cross-disciplinary breakthroughs.

All electronic records of the school, from teaching materials to syllabi, lists of references and evening lectures are made openly available on the NetWordS website (<http://www.networks-esf.eu>) through an identification procedure.

The high level of participation and commitment witnessed in Trondheim is confirmed by the number of downloads of course materials from NetWordS website (statistics at 03.09.2014: 111 registrations and 1216 different folder downloads) and the overall amount of positive feedback received. In such perspective, a short questionnaire was distributed to the students to obtain feedback on individual courses and on the Summer School as a whole. The evaluation data have been collected and analysed by Ingo Plag, and a summary of the feedback on each course and on the summer school as a whole have been sent to teachers and organisers (see Figure 1 and Table 1).

The courses were very well received by the students. The written comments contained a lot of praise both concerning the quality of the teachers and their teaching. The students appreciated the range of courses, the overall organisation and the whole atmosphere. Everybody was also pleased with the interaction outside the classroom between teachers and students, and within the two groups.

In addition to the possibility to provide comments, the questionnaire contained three scalar questions on the quality of the teaching, the adequacy of the course levels and the learning effect. As illustrated in figure 1 and table 1, the students felt that they had learned a lot in what they



perceived to be courses of very high quality with a very adequate level of difficulty. Interactions of LEVEL with OVERALL QUALITY, ADEQUACY OF LEVEL and LEARNING EFFECT, respectively, turned out to be insignificant (ANCOVAs). In other words, the quality, the adequacy of the level and the amount of learning were the same across courses of different levels. This feedback on the adequacy of the course levels can be interpreted in such a way that the decision to offer “basic” and “advanced” courses proved to be very helpful.

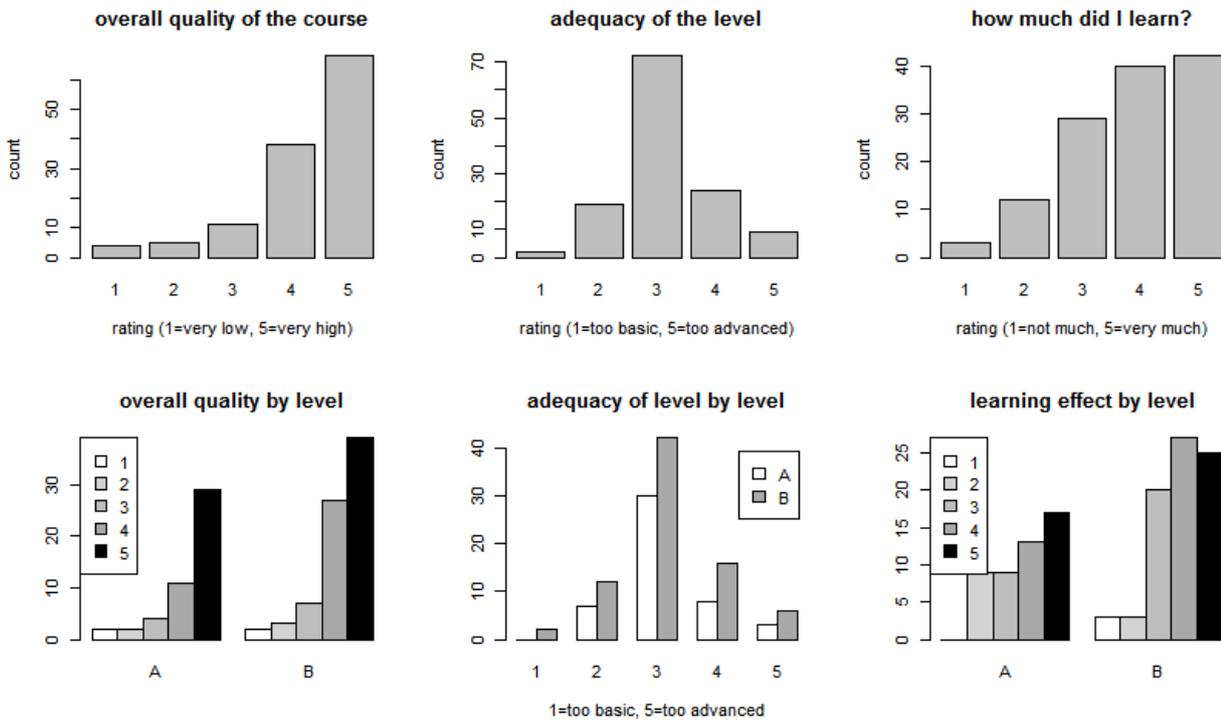


Figure 1: Distribution of student ratings

Table 1: Overview of feedback		
	median	mean
overall quality	5	4.3
adequacy of level	3	3.2
learning effect	4	3.8

Timetable

Thematic courses

Time	Monday (4th)	Tuesday (5th)	Wednesday (6th)
09:00-09:30	Opening session Room: KA11		
09:30-11:00	Fundamental issues in Theoretical Morphology Room: KS12	Fundamental issues in Theoretical Morphology Room: KS12	Fundamental issues in Theoretical Morphology Room: KS12
	Issues in Morpho-phonology Room: MTS11	Issues in Morpho-phonology Room: MTS11	Issues in Morpho-phonology Room: MTS11
11:15-12:45	Lexical semantics Room: KS12	Lexical semantics Room: KS12	Lexical semantics Room: KS12
	Semantics and word formation Room: MTS11	Semantics and word formation Room: MTS11	Semantics and word formation Room: MTS11
12:45-14:30	Lunch break	Lunch break	Lunch break
14:30-16:00	Morphology in language contact Room: KS12	Morphology in language contact Room: KS12	Morphology in language contact Room: KS12
	Morphology acquisition Room: MTS11	Morphology acquisition Room: MTS11	Morphology acquisition Room: MTS11
16:00-16:30	Coffee break	Coffee break	Coffee break
16:30-18:00	Morphological processing Room: KS12	Morphological processing Room: KS12	Morphological processing Room: KS12
	Aspects of bilingual lexical processing Room: MTS11	Aspects of bilingual lexical processing Room: MTS11	Aspects of bilingual lexical processing Room: MTS11
18:30-20:00	Milena Žic Fuchs Plenary lecture Room: KA11		H.R. Baayen Plenary lecture Room: KA11

Methodological courses

Time	Thursday (7th)	Friday (8th)	Saturday (9th)
09:30-11:00	Statistics for newbies Room: MTS11	Statistics for newbies Room: MTS11	Statistics for newbies Room: MTS11
	Naïve Discriminative Learning Room: KS12	Naïve Discriminative Learning Room: KS12	Naïve Discriminative Learning Room: KS12
11:15-12:45	Computational morphology for newbies: automata and hierarchical lexica Room: MTS11	Computational morphology for newbies: automata and hierarchical lexica Room: MTS11	Computational morphology for newbies: automata and hierarchical lexica Room: MTS11
	Connectionist architectures for lexical modelling Room: KS12	Connectionist architectures for lexical modelling Room: KS12	Connectionist architectures for lexical modelling Room: KS12
12:45-14:30	Lunch break	Lunch break	Lunch break
14:30-16:00	Obtaining behavioural data for lexical research Room: MTS11	Obtaining behavioural data for lexical research Room: MTS11	Obtaining behavioural data for lexical research Room: MTS11
	Neurolinguistic issues in lexical access and organisation Room: KS12	Neurolinguistic issues in lexical access and organisation Room: KS12	Neurolinguistic issues in lexical access and organisation Room: KS12
16:00-16:30	Coffee break	Coffee break	Coffee break and closing session
16:30-18:00	Tutorial	Tutorial	



5) LIST OF PARTICIPANTS

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