

# Summer school

## Human Language: From Genes and Brains to Behaviour

Holthurnsche Hof, Berg en Dal  
July 3-14, 2016



**LANGUAGE**  
in **INTERACTION**



**NWO**  
Netherlands Organisation for Scientific Research

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# 1. WELCOME

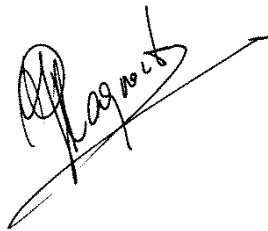
Dear participants and speakers,

Welcome to the 2016 Summer school of the Language in Interaction Consortium.

At this summer school an overview is provided of the language system at all relevant levels of organization. For the participants this will provide a preview of a volume on Human Language: From Genes and Brains to Behaviour, to be published by MIT Press.

Next to the scheduled presentations, there is ample opportunity to interact with students and staff, and to work on your own ideas in connection with other participants. I count on your active contributions during the discussions and at the informal gatherings.

I hope this summer school will be an enlightening experience, an enrichment of your knowledge, and in all other aspects a memorable event.

A handwritten signature in black ink, appearing to read 'P. Hagoort', written over a diagonal line that extends from the bottom left towards the top right.

Peter Hagoort

Director of the Summer School

Director of the Language in Interaction Program

## 2. TIME SCHEDULE

### Week 1:

#### Sunday July 3: 19.30 hrs Welcome reception

#### Monday July 4: Cognitive architectures by James McQueen & Antje Meyer

- 9.00- 9.10 Peter Hagoort: Welcome
- 9.10- 9.30 James McQueen: Cognitive Architectures
- 9.30-10.45 Ray Jackendoff: Mental Representations for language
- 10.45-11.00 coffee/tea break
- 11.00-12.15 Asli Özyürek & Gerardo Ortega: Language in the visual modality: Co-speech Gesture and Sign
- 12.15-13.15 lunch
- 13.15-14.30 Ardi Roelofs: Speaking
- 14.30-15.45 Sally Andrews: The cognitive architecture of reading: The organisation of an acquired skill
- 15.45-16.00 coffee/tea break
- 16.00-16.45 General Discussion: Hot topics
- 16.45-18.15 PhD joint projects
- 18.30-20.00 3 course dinner
- 20.30-22.00 Lindy Hop workshop

#### Tuesday July 5: The development of language by Caroline Rowland & Evan Kidd

- 9.00- 9.30 Introduction by Caroline Rowland & Evan Kidd
- 9.30-10.45 Sarah Kucker: How to learn a word and build a vocabulary:  
The dynamic coupling of words and referents in real and developmental time
- 10.45-11.00 coffee/tea break
- 11.00-12.15 Shanley Allen & Heike Behrens: Morphosyntactic development
- 12.15-13.45 lunch
- 13.45-15.00 Michael Skeide: The ontogeny of the cortical language network
- 15.00-16.15 Vicky Chondrogianni: Bilingual development: input and maturation
- 16.15-16.30 coffee/tea break
- 16.30-18.00 Roundtable discussion: The way forward in language development research
- 18.30-20.00 Buffet style dinner

#### Wednesday July 6: Poster session & social event

- 9.30-12.00 Poster session
- 12.00-13.00 Picknick with Lunch (bags) & cycling to social event in Groesbeek or centre Nijmegen
  - Option 1: 13.30-17.15 Golf clinic in Groesbeek (25 persons)
  - Option 2: 14.00-17.15 Laser Game in Nijmegen (25 persons)
- 18.00-20.30 BBQ at Golf resort in Groesbeek (all)

### **Thursday July 7: The functional neurobiology of language by Nina Dronkers**

- 9.00- 9.30 Introduction by Nina Dronkers
- 9.30- 10.45 Nina Dronkers: Lexical semantics and the MTG
- 10.45-11.00 coffee/tea break
- 11.00-12.15 William Marslen-Wilson: Sentence comprehension
- 12.15-13.45 lunch
- 13.45-15.00 Peter Hagoort: Beyond the core networks of language
- 15.00-16.15 Vitória Piai: Electrophysiology measured over the scalp and intracranially:  
Examples from context-driven word production
- 16.15-16.30 coffee/tea break
- 16.30-18.00 Interactive tutorial on aphasia
- 18.30-20.00 Buffet style dinner

### **Friday July 8: Communication with and before language by Ivan Toni & Stephen Levinson**

- 9.00- 9.30 Introduction by Ivan Toni & Stephen Levinson
- 9.30- 10.45 Stephen Levinson: The Interaction Engine hypothesis
- 10.45-11.00 coffee/tea break
- 11.00-12.15 Federico Rossano: Ontogenic development of gestural communication
- 12.15-13.45 lunch
- 13.45-15.00 Herb Clark: Iconic communication
- 15.00-16.15 Ivan Toni: Creation and control of mind-oriented movements
- 16.15-16.30 coffee/tea break
- 16.30-18.00 Interactive session on communication
- 18.30-20.00 Buffet style dinner
- 20.30-22.00 Pub quiz

### **Week 2:**

### **Saturday July 9: Neuroanatomy of language by Peter Hagoort**

- 9.00- 9.30 Introduction by Peter Hagoort
- 9.30- 10.45 Christian Beckmann & Koen Haak: The language connectome
- 10.45-11.00 coffee/tea break
- 11.00-12.15 Elia Formisano: The speech ready organization of the human auditory cortex
- 12.15-13.45 lunch
- 13.45-15.00 Nicola Palamero-Gallagher: Receptor expression in Broca's and Wernicke's regions
- 15.00-16.15 Peter Hagoort: Towards team science
- 16.15-16.30 coffee/tea break
- 16.30-18.00 PhD joint projects
- 18.30-20.00 BBQ

### **Sunday July 10: Poster session & social event**

- 9.30-12.00 Poster session
- 12.00-13.15 Picknick with lunch bag & cycling to social event in centre Nijmegen
- 13.15-17.30 MuZIEum and City tour
- 18.00-20.30 Dinner at "De Stadstuyn"

### **Monday July 11: The genetics of language by Simon Fisher**

- 9.00- 9.30 Introduction by Simon Fisher
- 9.30- 10.45 Timothy C. Bates: Mapping genes involved in reading and language skills
- 10.45-11.00 coffee/tea break
- 11.00-12.15 Clyde Francks: The genetic bases of brain lateralization
- 12.15-13.45 lunch
- 13.45-15.00 Sonja Vernes: Neuromolecular approaches to language
- 15.00-16.15 Wolfgang Enard: A genomic perspective on language evolution
- 16.15-16.30 coffee/tea break
- 16.30-18.00 Panel discussion: Impact of new genomic technologies on the language sciences
- 18.30-20.00 Buffet style dinner
- 20.30-22.00 Musical Jam Session

### **Tuesday July 12: Animal models of language by Carel ten Cate & Constance Scharff**

- 9.00- 9.30 Introduction by Carel ten Cate & Constance Scharff
- 9.30- 10.45 Steffen Hage: Primate vocalizations
- 10.45-11.00 coffee/tea break
- 11.00-12.15 Buddhama Kriengwatana: Speech perception: what do nonhuman animals have to say?
- 12.15-13.45 lunch
- 13.45-15.00 Constance Scharff & Mirjam Knörnschild: Genes relevant for vocal learning, speech and language:  
Insights from animal models
- 15.00-16.15 Carel ten Cate: A comparative overview of artificial grammar learning abilities of animals
- 16.15-16.30 coffee/tea break
- 16.30-18.00 Open discussion session
- 18.30-20.00 3 course dinner

### **Wednesday July 13: Modeling language by Willem Zuidema**

- 9.00- 9.30 Introduction by Willem Zuidema
- 9.30- 10.45 Bart de Boer: Computer models of the evolution of speech
- 10.45-11.00 coffee/tea break
- 11.00-12.15 Frank Keller: Cognitive models of syntax and sentence processing
- 12.15-13.45 lunch
- 13.45-15.00 Stefan Frank: Neural network models of language acquisition and processing
- 15.00-16.15 Stella Frank & Raquel Alhama: Bayesian models of natural and artificial language learning
- 16.15-16.30 coffee/tea break
- 16.30-17.30 Phong Le & Willem Zuidema: Vector-based and neural models of semantics
- 17.30-18.00 General discussion
- 18.30-20.00 Buffet style dinner with presentation PhD joint projects

### **Thursday July 14: Language and information in the world by Antal van den Bosch & Piek Vossen**

- 9.00- 9.30 Introduction by Antal van den Bosch
- 9.30- 10.45 Alona Fyshe & Leila Wehbe: Language processing: Mapping neural activity to language meaning
- 10.45-11.00 coffee/tea break
- 11.00-12.15 Luc Steels: The robot language learner
- 12.15-13.45 lunch
- 13.45-15.00 Walter Daelemans: The robot stylometrist
- 15.00-16.15 Emiel Krahmer: The robot writer
- 16.15-16.30 coffee/tea break
- 16.30-18.00 Parallel demonstrations of computer programs
- 18.00-20.00 Closing BBQ

## Poster sessions

### Wednesday July 6: 9.30-12.00

Luis Miguel Berscia: The Babel Problem: Variation in Shawi Grammar

Hans Rutger Bosker: Our own speech rate influences speech perception

Dick van den Broek: Spiking Neural Networks for Semantic Processing

Merel Burgering: Perception of vowels and sex of speaker: a comparative study on auditory categorization

Linda Drijvers: Gestural enhancement of degraded speech comprehension engages the language network, motor and visual cortex as reflected by a decrease in the alpha and beta band.

Nicole Eichert: Language-driven anticipatory eye movements in virtual reality

Nikki Janssen: Logopenic variant of primary progressive aphasia – Case report

Dilay Karadoller: Effect of Language Modality on Development of Spatial Cognition and Memory

Jana Krutwig: Perception and production interactions in non-native speech category learning

Andre Marquand: Are you normal? Probabilistic normative models for neuroimaging

Izabela Przezdziak: Mapping the cortico-hippocampal connectivity gradient in single subjects using resting-state fMRI

Marpessa Rietbergen: Cognitive Control over vocal and manual output: Examining the influence of response modality on updating, inhibiting and shifting.

Joe Rodd: How to slow down and speed up: controlling speech rate

Daniel Sharoh: Investigation of Depth-Dependent BOLD During Language Processing

Irina Simanova: Decoding of concepts within and across semantic categories.

Lot Snijders Blok: Genomics of speech and language disorders: the next generation

Stephanie Theves: Tracking the emergence of hierarchical concept representations

Lara Todorova: Effects of linguistic priming on face gender perception

Tobias Winner: Recipient Design and Perspective Taking in Communicative Pointing

Shruti Ullas: Lexical and lip-reading information as sources of phoneme boundary recalibration

**Sunday July 10: 9.30-12.00**

Samira Abnar: Emergence of Language in a Population of Deep Neural Nets

Midas Anijs: Investigating the shared functions of language-related genes using human neurons

Julia Berezutskaya: Low-level Encoding of Continuous Speech Perception in ECoG High Frequency Band

Bohan Dai: Pure linguistic interference during comprehension of competing speech signals

Robert Deckers: The smallest software particle

Paolo Devanna: Digging deeper in next generation sequencing data: identification of functional non-coding variants that contribute to neurological disorders (an SLI case study).

Frank Eisner: Specialised memory systems for learning spoken words

Fabian Heim: The Neglected Side of FoxPs - How does FoxP1 affect auditory perception?

Dieuwke Hupkes: Can Sequential Neural Networks Solve Hierarchical Tasks? - Processing Arithmetics as a language using sequential and tree based networks.

Sara Iacozza: Processing the language of In- versus Out-group members

Lisette Jager: The first steps towards an analysis of how brain potentials can reflect second language acquisition potentials.

Arnold Kochari: Perceiving using analog magnitude representations, and communicating using vague adjectives

Alessandro Lopopolo: Mapping the Lexical, syntactical and phonological information of naturalistic language stimuli in the brain using Markovian models.

Valeria Mongelli: Can we combine meanings without knowing it? Exploring relations between semantics and consciousness.

David Neville: Geometries of conceptual spaces

Iris van de Pol: Computational models of Pragmatic Communication

Shuang Song: The influences of early language development on school-age Chinese literacy ability

Rene Terporten: The Influence of Context Constraints on a Language Network

Chara Tsoukala: Uncovering the mechanisms of language switching using computational modeling

Marvin Uhlmann: Dealing with the problem of two: temporal binding in sentence understanding with neural networks



### 3. PRESENTATION OF SECTION EDITORS & SPEAKERS

#### Monday July 4: Cognitive architectures by James McQueen & Antje Meyer

**Prof.dr. James McQueen**

**Donders Institute – Centre for Cognition, Radboud University**



James McQueen is professor of Learning and Plasticity at Radboud University Nijmegen. He is a member of the Centre for Cognition in the Donders Institute for Brain, Cognition and Behaviour, and a member of the Behavioural Science Institute. He is an affiliated researcher of the Max Planck Institute for Psycholinguistics.

McQueen's research focuses on learning and processing in spoken language: How do listeners learn about the sounds and words of their native and non-native languages, and how do they recognise sounds and words? Questions about speech learning concern not only initial acquisition processes (How are new words integrated into the lexicon? How are novel phonological contrasts learned in a second language?) but also ongoing processes of adaptation (How do listeners tune in to different forms of speech, such as that spoken with a foreign accent?). Questions about speech processing focus on the problems of continuous speech recognition (How are words recognised in spite of the variability in the speech signal? How is speech segmented into discrete words?). These questions are answered using behavioural (e.g. reaction time; eye-tracking), neuroscientific (EEG, fMRI) and computational methods. McQueen takes a multi-disciplinary perspective on psycholinguistics, combining insights from experimental psychology, phonetics, neuroscience and educational science. McQueen seeks ways in which knowledge about how sounds and words are learned in native and non-native language to improve language education (e.g. second language vocabulary teaching, learning nonnative speech sounds, and literacy education).

For a list of his publications, please see: <http://www.mpi.nl/people/mcqueen-james/publications>

**Prof.dr. Antje S. Meyer**

**Max Planck Institute for Psycholinguistics**



Meyer is a professor (bijzonder hoogleraar) at Radboud University and a director of the Max Planck Institute for Psycholinguistics in Nijmegen.

Meyer is an experimental psychologist. She has worked on various aspects of psycholinguistics, in particular on word and sentence production and the relationship between visual-conceptual and linguistic processing. Her current research is primarily directed at understanding the relationships between comprehension and production processes and the origins of individual differences in linguistic skills in adults.

Whereas most experimental work in psycholinguistics has been carried out with students, Meyer and her team make every effort to engage speakers and listeners with more diverse backgrounds in their research. Through their active engagement in research, participants obtain a better understanding of psycholinguistics and research in general.

Personal website: <http://www.mpi.nl/people/meyer-antje>

**Prof.dr. Ray S. Jackendoff**  
**Tufts University**



Ray Jackendoff received his Ph.D. in linguistics from MIT in 1969. His research centers around the system of meaning in natural language, how it is related to the human conceptual system, and how it is expressed linguistically. This has led him to a cognitive approach to traditional philosophical issues of inference and reference, embodied in his theory of Conceptual Semantics. In developing this approach, he has worked on the conceptualization of space, on the relationship between language, perception, and consciousness, and, most recently, on the conceptualization of such socially grounded concepts as value, morality, fairness, and obligations. In addition, in exploring how concepts are expressed in language, he has developed new models of the architecture of the human language faculty and its evolution.

Jackendoff is also a classical clarinetist, performing frequently in recital and chamber music in the Boston area. Through his musical interests, he has collaborated with composer Fred Lerdahl on a theory of musical cognition modeled on generative linguistics. The 25th anniversary of their book *A Generative Theory of Tonal Music* was celebrated in 2008 with conferences in Paris and Dijon and also at Tufts.

Ray Jackendoff has been President of both the Linguistic Society of America and the Society for Philosophy and Psychology. He is a Fellow of the American Academy of Arts and Sciences, the American Association for the Advancement of Science, the Linguistic Society of America, and the Cognitive Science Society. He has had fellowships at the Center for Advanced Studies in the Behavioral Sciences and the Wissenschaftskolleg zu Berlin, and has been a member of the External Faculty of the Santa Fe Institute. He holds honorary degrees from the Université du Québec à Montréal, the National University of Music in Bucharest, the Music Academy of Cluj-Napoca, the Ohio State University, and Tel Aviv University. He was awarded the 2003 Jean Nicod Prize in Cognitive Philosophy, and he is the 2014 recipient of the David E. Rumelhart Prize, the premier award in the field of cognitive science.

Personal website: <http://ase.tufts.edu/cogstud/jackendoff/>

**Abstract: Mental Representations for Language**

After clarifying what might be meant by “mental representations for language,” I sketch the basic levels of linguistic representations: phonological, syntactic, and semantic/conceptual structures, in their roles in both words and sentences. I outline some of the major schools of thought on the formal characterization of these representations, and I present some of the challenges that the nature of mental representations for language pose for psycholinguistics and for theories of neural computation.

**Prof.dr. Asli Özyürek**

**Centre for Language Studies, Radboud University**

**Max Planck Institute for Psycholinguistics**



### **Research interests**

My research in general investigates the relations between the language, (neuro)cognition and communication. I use our ability to use visual-manual modality an expressive medium (in both spoken (with gesture) and signed languages) as a novel window into understanding universality versus diversity of language structure, conceptualization of experience during language production and comprehension and language development and cognition

To answer this question my research program proceeds in 4 different strands:

**1) Co-speech gestures (used by hearing communities):** What do gestures we use tell us about representations evoked during language use in context ,language processing and comprehension? To answer this question I conduct research on

- Cross-linguistic comparison of gesture use in context as well as in bilinguals (narratives, dialogue)
- Role of gesture in language development and cognition
- Neuro-(cognition) of gesture and speech comprehension

**2) Sign Languages (used by deaf communities):** What role does visual-spatial modality play in structuring language? To what extent the structures and patterns of language use we see in spoken languages are universal and to what extent are they specific to using either a spoken or visual language as in sign language? How does language (expressed in a certain modality) shape our thought?

- Expressions and use of space in different sign languages (e.g., [Turkish Sign Language](#); Dutch Sign Language)
- Comparison of acquisition of spatial language in deaf children learning a sign language and hearing children learning a spoken language
- Relations between signing/speaking and cognition in in bimodal bilinguals and deaf children who had late language exposure in their lives

**3) Emerging language and communication systems:** What do emerging language systems (i.e., emerging sign languages, homesign systems, artificial communication systems created in the lab) tell us about our ability to communicate and think without language as well as language creation?

### **4) From manipulable action to communicative actions**

How do we distinguish non-communicative practical actions from communicative actions (i.e., gesture, language)- a unique human ability. To what extent communicative intentions play a role in action versus gesture comprehension? What are the links between actions and gesture and signs during language development?

Personal website: <http://www.mpi.nl/people/ozyurek-asli>

## Dr. Gerardo Ortega

Centre for Language Studies, Faculty of Arts, Radboud University



Gerardo's research explores different aspects related to the acquisition and processing of sign languages. He has explored how iconicity has an impact on the acquisition of a manual phonological system by hearing adults. He has also investigated how different types of iconicity influence the acquisition of a sign language by deaf children. His research has looked at Mexican Sign Language (LSM), British Sign Language (BSL) and Turkish Sign Language (TID) under a range of experimental paradigms. He was recently awarded a Veni NWO grant for the project 'The role of gesture during the acquisition of a sign language as a second language'. In this collaborative project with Ash Özyürek, he will use behavioural and electrophysiological

methods to investigate how gesture and iconicity influence the production and perception of Sign Language of the Netherlands (NGT) in second language learners.

Personal website: <http://www.ru.nl/mlc/people/dr-gerardo-ortega/>

### **Abstract: Language in the visual modality: Co-speech Gesture and Sign**

As humans, our ability to communicate and use language is instantiated not only in the vocal modality but also in the visual modality. The main examples of this are sign languages and (co-speech) gestures used in spoken languages. Sign languages, the natural languages of Deaf communities, use systematic and conventionalized movements of the hands, face, and body for linguistic expression. Co-speech gestures, though non-linguistic, are produced and perceived in tight semantic and temporal integration with speech. Thus, language—in its primary face-to-face context (both phylogenetically and ontogenetically) is a multimodal phenomenon. In fact visual modality seems to be a more common way of communication than speech -when we consider both deaf and hearing individuals. Most research in language, however, has focused mostly on spoken/written language and has rarely considered the visual context it is embedded in to understand our linguistic capacity. This talk give a brief review on what know so far about what the visual expressive resources of language look like in both spoken and sign languages and their role in communication and cognition- broadening our scope of language. We will argue, based on these recent findings, that our models of language need to take visual modes of communication into account and provide a unified framework for how semiotic and expressive resources of the visual modality are recruited both for spoken and sign languages and their consequences for processing-also considering their neural underpinnings.

**Prof.dr. Ardi Roelofs****Donders Institute - Centre for Cognition, Radboud University**

The goal of my research is to understand the relationships among language, attention, and the brain. To this end, I have adopted a multi-methodological approach that combines measurements of behavioural response time and accuracy, eye tracking, neurophysiological recordings (EEG, MEG), hemodynamic neuroimaging (fMRI), genetics, and computational modelling. Behavioural performance is assessed in terms of mean response time and characteristics of the shape of response time distributions. For example, I examine the role of attention in typical and developmentally impaired speakers, in particular, children with primary developmental language disorder. Also, I address acquired language disorders (aphasia) as a result of stroke and neurodegenerative diseases. My research is guided by, and aims to further develop, the WEAVER++ computational model of attention and language performance and its recent extension called WEAVER++/ARC, which synthesizes behavioural psycholinguistic, functional neuroimaging, tractographic, and aphasiological evidence.

Personal website: <http://www.socsci.ru.nl/ardiroel/home.htm>

**Key publications:**

- Roelofs, A. (2014). A dorsal-pathway account of aphasic language production: The WEAVER++/ARC model. *Cortex*, 59, 33-48.
- Aarts, E., Roelofs, A., Franke, B., Rijpkema, M., Fernandez, G., Helmich, R., & Cools, R. (2010). Striatal dopamine mediates the interface between motivational and cognitive control in humans: Evidence from genetic imaging. *Neuropsychopharmacology*, 35, 1943-1951.
- Roelofs, A., Van Turenout, M., & Coles, M. G. H. (2006). Anterior cingulate cortex activity can be independent of response conflict in Stroop-like tasks. *Proceedings of the National Academy of Sciences USA*, 103, 13884-13889.
- Roelofs, A. (2003). Goal-referenced selection of verbal action: Modeling attentional control in the Stroop task. *Psychological Review*, 110, 88-125.
- Levelt, W.J.M., Roelofs, A., & Meyer, A.S. (1999). A theory of lexical access in speech production. *Behavioral and Brain Sciences*, 22, 1-38.

**Abstract: Speaking**

It is generally assumed that three major types of processes underlie speaking: conceptualization, formulation, and articulation. Conceptualization processes generate messages, which are conceptual representations to be verbally expressed. Formulation processes use a message to retrieve appropriate words and to build a syntactic structure, which is used to generate a phonetic plan for the utterance. Articulation processes execute the phonetic plan, which yields overt speech. During conceptualization, formulation, and articulation, a speaker monitors progress on these processes. I will provide details on these processes and representations, and discuss key evidence from behavioral studies measuring response time and accuracy, eye tracking, electrophysiological recordings, hemodynamic neuroimaging, tractography, disorders, and computational modeling. Converging evidence from multiple methods is discussed with the idea that if evidence from multiple sources is in agreement, the conclusion can be strong even if each method has its weaknesses. Moreover, some major past and current controversies will be mentioned. Finally, I will indicate how speaking relates to comprehension and other cognitive systems, including memory and attention.

**Prof.dr. Sally Andrews**

**Faculty of Science, The University of Sydney**



My research is based in cognitive psychology but integrates theories and methods from the domains of computer science, philosophy and neuroscience – the fields that define the discipline of cognitive science. As an individual researcher, and in collaboration with students and researchers from a range of disciplines, I have used a variety of methodologies to investigate the architecture of the reading system and the relationship between written language processing and other cognitive skills such as object identification and mathematical computation .

The central goal of my research is to understand lexical processing and its relationship to reading skill: how do skilled language users represent and retrieve their knowledge about the words; how do these cognitive capabilities develop; and how does lexical processing contribute to reading skill. My research has focused primarily on English, but I have also collaborated in research projects comparing speakers of different languages to determine how the characteristics of

different writing systems, and their relationship to phonology and semantics, influences language processing. My research group is currently exploring the attributes that define expert reading by investigating individual differences among skilled adult readers and how they modulate early lexical retrieval processes and the interaction between word recognition and comprehension.

Personal website: <http://sydney.edu.au/science/people/sally.andrews.php>

#### Selected publications:

Andrews, S. (2006). *From Inkmarks to Ideas*. Hove UK: Psychology Press.

Andrews, S. (2015). Individual Differences Among Skilled Readers: The Role of Lexical Quality. In Alexander Pollatsek, Rebecca Treiman (Eds.), *The Oxford Handbook of Reading*, (pp. 129-148). Oxford: Oxford University Press

Veldre, A., Andrews, S. (2015). Parafoveal lexical activation depends on skilled reading proficiency. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 41(2), 586-595.

Andrews, S., Lo, S. (2013). Is morphological priming stronger for transparent than opaque words? It depends on individual differences in spelling and vocabulary. *Journal of Memory and Language*, 68(3), 279-296.

Andrews, S., Hersch, J. (2010). Lexical Precision in Skilled Readers: Individual Differences in Masked Neighbor Priming. *Journal of Experimental Psychology: General*, 139(2), 299-318.

#### **Abstract: The cognitive architecture of reading: The organisation of an acquired skill**

Reading is a cognitively engineered skill that was a late development of our species and is acquired slowly, and relatively late in children's development. The architecture of the reading system has been shaped by the intersecting constraints of the language and writing system, and the neural and cognitive mechanisms involved in representing and processing text. We briefly overview evidence that skilled readers rely on a staged processing architecture supported by a modular orthographic lexicon and discuss a set of converging reading-specific and domain-general cognitive constraints on learning, memory retrieval, attention and working memory that contribute to the emergence of this structural and functional organisation. Selected examples of models of word identification, reading and discourse processing are briefly described to illustrate the solutions that have been proposed to address the various constraints and consider how they align with the modular processing architecture.

## Tuesday July 5: The development of language by Caroline Rowland & Evan Kidd

**Prof.dr. Caroline Rowland**

**Institute of Psychology Health and Society, University of Liverpool**



Caroline Rowland is a professor in the Institute of Psychology Health and Society of the University of Liverpool.

Caroline Rowland's research focuses on how children acquire language, with a particular interest in grammar and in assessing how the child's environment promotes and shapes language growth. She is a Co-Director of the ESRC LuCiD Centre ([www.lucid.ac.uk](http://www.lucid.ac.uk)), series editor for the Trends in Language Acquisition (TiLAR) book series and an associate editor for the Journal of Child Language.

Caroline Rowland is currently leading the Language 0-5 Project within the ESRC LuCiD Centre. This project follows 80 English-learning children from 6 months to 5 years of age to build a comprehensive picture of language development from the very beginning through to school readiness.

Personal website: <https://www.liverpool.ac.uk/psychology-health-and-society/staff/caroline-rowland/>

**Dr. Evan Kidd**

**Research School of Psychology, The Australian National University**



Evan Kidd is an Associate Professor in the Research School of Psychology at The Australian National University, Canberra, Australia.

Evan Kidd's research is in psycholinguistics and developmental psychology. His current research interests include morphosyntactic processing and development, the cognitive processes underlying individual differences in language acquisition and language processing, and the role of symbolic play in language and socio-cognitive development. He has conducted research on a number of languages, including English, German, Italian, Finnish, Cantonese, and Persian.

Evan Kidd is a Chief Investigator in the ANU-led ARC Centre of Excellence for the Dynamics of Language. He is currently an Associate Editor for *First Language*, and is on the editorial board of *Journal of Child Language*.

Personal website: <http://psychology.anu.edu.au/about-us/people/evan-kidd>

**Dr. Sarah Kucker**

**Callier Center for Communication Disorders, the University of Texas at Dallas**



Sarah Kucker is currently an independent Postdoctoral Fellow at the Callier Center for Communication Disorders at the University of Texas at Dallas. Starting fall 2016, she will be an assistant professor of psychology at the University of Wisconsin Oshkosh.

Sarah Kucker earned her Ph.D. in Psychology (Developmental Science) from the University of Iowa where she worked primarily with Larissa Samuelson and Bob McMurray.

Sarah Kucker's research generally examines associative learning processes, particularly word learning and category development from a dynamic systems perspective. She is also interested in how and where language learning trajectories break down in children with language disorders or delays.

Personal website: <https://www.utdallas.edu/slcc/people/postdoc.html>

**Abstract: How to learn a word and build a vocabulary: The dynamic coupling of words and referents in real and developmental time**

Words are at the crux of human communication but word learning is not a simple process, especially for young children. Learning is not guaranteed just by hearing a new word - a child must both process the word in real-time to respond appropriately, as well as integrate the new word into the lexicon over a longer timescales. Children are surprisingly good at this, however, despite their small stature and immature cognitive systems. Decades of work have proposed reasons why. Some studies proposed ways to constrain the word learning space such that learning could unfold in-the-moment of exposure. Other studies, however, demonstrated that learning accumulates slowly over multiple exposures. And, new research suggests that word learning may not be predictable at all, but the pathways that lead to success in learning shift over development. In the current review, I tackle how and when the process of word learning unfolds with a particular eye toward the multiple timescales and pathways over which sounds and meanings are associated. Critically, the evidence suggests that word learning cannot be fully understood by only examining how a child maps a single word to a single object at one point in time. Rather, word learning ought to be framed as a coupling of multiple sources of information that dynamically changes over time to create optimal moments for learning for an individual.



### Prof.dr. Shanley Allen

#### Faculty of Social Sciences, University of Kaiserslautern



Shanley Allen is Dean and Professor of Psycholinguistics and Language Development at the Faculty of Social Sciences of the University of Kaiserslautern.

Shanley Allen did a BA in Hispanic Studies and a PhD in Linguistics at McGill University in Montreal, Canada. She then held a research position at the Max Planck Institute for Psycholinguistics in Nijmegen. Before moving to Kaiserslautern in 2010, she was Associate Professor of Applied Linguistics and Education at Boston University, USA. She is currently Series Editor of the *Trends in Language Acquisition Research* book series published by John Benjamins Publishers, and is on the Editorial Board of the *Journal of Child Language*.

Her research program focuses on the effect of crosslinguistic differences in morphosyntactic structure on first language development, and on how the two languages of a bilingual or second language speaker influence each other during processing. She specializes in the acquisition of Inuktitut (Eskimo) morphosyntax, as well as on discourse-pragmatic effects on argument realization, and has recently turned to investigating discourse expectations in bilingual sentence processing.

Personal website: <https://www.sowi.uni-kl.de/psycholinguistics/team/professor-dr-shanley-em-allen/>

### Prof.dr. Heike Behrens

#### German and English department, the University of Basel



Heike Behrens is a full professor of "Cognitive Linguistics and Language Acquisition Research" with a joint affiliation in the German and English department at the University of Basel. Heike Behrens specializes in first language acquisition where she takes a cognitive-developmental perspective and works with large databases.

Heike Behrens did her Staatsexamen and MA in English and German at the University of Kiel, and her PhD at the University of Amsterdam. She held research positions at the Universities of Braunschweig and Cologne, and the Max-Planck-Institute for Psycholinguistics in Nijmegen and the Max-Planck-Institute for Evolutionary Anthropology at Leipzig, and spent a year as a visiting scholar at the University of California at Berkeley. Before coming to Basel in 2005, she was professor of German Linguistics at the University of Groningen in the Netherlands.

Personal website: <https://engsem.unibas.ch/departement/people/staff/profile/profile/person/behrens-1/>

#### **Abstract: Morphosyntactic Development**

In this session, we provide an overview of the current understanding of morphosyntactic development with a focus on more recent findings. We start with a brief history of early approaches to morphosyntactic development, largely focusing on the development of particular structures. Then we highlight more current approaches based on data from processing studies and cross-linguistic work, research on morphosyntax in interface with other areas of language, and the role of interaction. We then turn to the question of the nature of generalization and how this concept has been crucial in shaping our understanding of the trajectory of morphosyntactic development. In addition, we discuss how children learn to integrate various sources of information and the insight that provides into morphosyntactic development. Finally, we conclude by summarizing the main themes and proposing promising directions for the next stages in research.

## Dr. Michael Skeide

Dept. of Neuropsychology, Max Planck Institute for Human Cognitive and Brain Sciences



Michael Skeide's research is focused on the brain neural basis of normal typical and impaired development of language and literacy.

Personal website: <http://www.cbs.mpg.de/staff/skeide-11219>

### **Abstract: The ontogeny of the cortical language network**

In this talk, I will introduce a neural blueprint of language acquisition, to explain where, when and how the developing brain masters the language processing steps that are carried out by the adult brain. I will argue that the currently available cognitive neuroscience literature suggests that language acquisition can be roughly subdivided into two main developmental stages. In the first stage extending over the first 3 years of life, the infant rapidly acquires bottom-up processing capacities, which are primarily implemented bilaterally in the temporal cortices. In the second stage continuing into adolescence, top-down processes emerge gradually with the increasing functional selectivity and structural connectivity of the left inferior frontal cortex.

## Dr. Vicky Chondrogianni

School of Philosophy, Psychology and Language Sciences, the University of Edinburgh



Vicky Chondrogianni is Lecturer in Bilingualism at the School of Philosophy, Psychology and Language Sciences of The University of Edinburgh. Her research focuses on cross-linguistic aspects of acquisition and processing in typically-developing monolingual and bilingual children and in children with language impairment, addressing questions such as: What is the relationship between production and (on-line) comprehension/processing in impaired and unimpaired monolingual and bilingual children? How is this relationship affected by cross-linguistic differences in the target grammatical system? How can the comparison between different modalities inform us about the underlying nature of development and processing? Vicky is also interested in the interplay between cognitive abilities, such as executive functions, and language abilities in typically-developing and language impaired children.

Personal website: <http://www.ppls.ed.ac.uk/people/vicky-chondrogianni>

### **Abstract: Bilingual development: Input and maturation**

Bilingual or multilingual children constitute an increasing learner population across the world, yet most of the research on language development focuses on monolingual children. The examination of bilingual children is important as it can help us answer questions regarding the make-up of the human cognitive system, the role of child-external factors such as input quality and quality in language acquisition, as well as how child-internal factors such as age of exposure influence the course and rate of development in the two languages of the bilingual individual. The purpose of the talk is to answer the following questions by reviewing state-of-the-art studies on bilingual development: (i) how are languages differentiated in the bilingual brain, (ii) how do input and age of bilingual exposure interact and affect the degree of crosslinguistic influence as well as (iii) the course and rate of language development, and (iv) in what way can bilingual development inform us about the make up of the language capacity and its relation to other cognitive systems? In answering these questions, we will review experimental studies on both simultaneous and sequential bilingual children across a wide developmental range, from infancy to adolescence, and we will focus on different language areas, i.e. phonology, morphology, syntax and vocabulary.

## Thursday July 7: The Functional Neurobiology of Language by Nina Dronkers

Prof.dr. Nina F. Dronkers

Center for Aphasia & Related Disorders

Department of Neurology, University of California, Davis



Prof.dr. Dronkers' research and clinical interests have always focused on understanding the speech, language, and cognitive disorders that occur after injury to the brain. She and her colleagues have worked extensively with individuals who have aphasia to understand the relationship between areas of the brain affected by injury and the speech and language disorders that ensue. Using novel methodologies, Nina Dronkers and her colleagues have isolated numerous brain regions that play critical roles in the processing of speech and language, as well as how these relate to other cognitive skills. Her latest work involves analyzing the structural and functional connections that contribute to language and cognitive

processing through advanced work with diffusion and resting state functional neuroimaging.

Personal website: <http://www.ebire.org/aphasia/dronkers/>

### **Abstract: Lexical semantics and the MTG**

In this lecture, we will discuss the contributions of the posterior middle temporal gyrus (pMTG) to lexical processing. In particular, lesion studies involving individuals with brain injuries who have difficulty with single word comprehension and production will be reviewed. We will see how lesions to the pMTG and underlying white matter result in the most severe deficits in lexical semantics and how these structures feed into networks that support higher level language functions.

Prior to this lecture, I will present a tutorial on aphasia, a language disorder that occurs after an injury to the brain. Here, we will examine the many ways in which aphasia has taught us about how the brain processes language. We will view several videos of individuals with aphasia who exhibit very different deficits and discuss how their brain injuries have affected their language abilities.

**Prof.dr. William Marslen-Wilson**

**Centre for Speech, Language and the Brain, Dept. Psychology, University of Cambridge**



William Marslen-Wilson has an international reputation in psycholinguistics, cognitive psychology, and cognitive neuroscience. His early research revealed the remarkable dynamic properties of human speech comprehension, showing that speech is literally understood as it is heard. The resulting “Cohort” model of spoken-language understanding has had a major influence on the study of language from the 1970s onwards. His current research interests are in the cognitive science and neuroscience of language, using interdisciplinary neuroimaging and multivariate analysis techniques to identify the neural processing streams that support the immediate interpretation of spoken utterances and written words. This research brings together neuroimaging (EMEG, fMRI), behavioural, and neuropsychological data from contrasting

languages (such as Arabic, Russian, Chinese and English) to determine the specific properties of human language as a neuro-cognitive system, in its broader neurobiological and evolutionary context. He has worked at the University of Chicago and the University of Cambridge, and was Co-Director of the Max Planck Institute for Psycholinguistics in Nijmegen in the mid-1980s. He joined Birkbeck College, London in 1990 before becoming Director of the MRC Cognition and Brain Sciences Unit in Cambridge (1997-2010) which he developed into one of the strongest European centres for cognitive neuroscience. He is now based in the University of Cambridge, where his research has chiefly been supported by an ERC Advanced Grant. He was made a fellow of the British Academy and the Academia Europaea in 1996, and has been Honorary Professor of Language and Cognition at the University of Cambridge since 2002.

Personal website: <http://www.neuroscience.cam.ac.uk/directory/profile.php?wmarslen>

**Prof.dr. Lorraine Tyler**

**Centre for Speech, Language and the Brain, Dept. Psychology, University of Cambridge**



Lorraine Tyler heads an interdisciplinary research group which uses multimodal imaging to develop neurocognitive models of language function. A critical aspect of this research is to relate patterns of brain activity in healthy people with those in brain-damaged patients, to determine the essential neural properties involved in spoken language comprehension. The team also works on neural plasticity, asking whether neurocognitive functions are capable of reorganization and flexibility following brain structural changes seen during healthy aging and brain damage. Much of this research has been published in recent papers in *Brain*, *Cerebral Cortex*, *PNAS*, *Neurobiology of Aging*, and *Journal of Neuroscience*. Another main research strand involves visual object

processing. The goal here is to develop a biologically plausible neurocognitive account which explains how objects are transformed from visual inputs into meaningful entities along the ventral object processing stream. This work has been recently published in *Trends in Cognitive Sciences*, *Cerebral Cortex*, *Journal of Neuroscience*, *Journal of Cognitive Neuroscience* and *Cognition*. Lorraine Tyler is also the PI on the Cambridge Centre for Ageing and Neuroscience project (CamCan; <http://www.cam-can.org/>). CamCan is a University-wide consortium, funded by the BBSRC, to study “The Resilient Brain” -how age-related changes in brain structure and function relate to patterns of preserved and declining cognitive functions with age. This work has recently been published in the *Journal of Neuroscience*, *Neurobiology of Aging*.

Personal website: <http://www.neuroscience.cam.ac.uk/directory/profile.php?lkyler>

**Abstract: Sentence Comprehension**

Human speech comprehension is a process remarkable for its immediacy and rapidity. The listener interprets an incrementally delivered auditory input, on time scales of around 200-250 msec, in terms of a complex multi-level representation of relevant linguistic knowledge, modulated by the pragmatic context of speaking and more general knowledge of the world. Here we consider what is required to construct an explanatory neurobiological account of this remarkable human-unique set of capacities. We argue that such an account will have three main components. The first focuses on the real-time flow of neuro-computational activity that underpins the comprehension process. To answer the critical what, when, and where questions about this process requires the use of imaging techniques that can provide spatio-temporally resolved data about this neural activity, combined with multivariate analysis techniques. The second seeks to locate language comprehension as an evolutionary, neurobiological process, distinguishing between human-unique neurocognitive processes supporting language function and evolutionarily conserved systems and processes that can be traced back to our primate ancestors. The third component argues that systematic cross-linguistic investigation of the neural systems and processes supporting language comprehension is also scientifically essential. We need to engage with the immense diversity of human language, and the implications of this diversity for the neurocognitive mechanisms involved. While the implementation and integration of these three components is far from being achieved in current research, we believe that such a project is no longer out of reach.

**Prof.dr. Peter Hagoort**

**Max Planck Institute for Psycholinguistics**

**Donders Institute - Centre for Cognitive Neuroimaging, Radboud University**



His research focuses on the neurobiological foundations of the human language faculty. He investigates how the brain regulates language production and language comprehension. As one of the first Hagoort combined psychological theory with neuroscientific models. He also pioneered research on the interaction between speech and gestures and the role of attention in information structure aspects of language. Hagoort also studies linguistic disorders as a result of aphasia, dyslexia and autism, and how linguistic and non-linguistic information (e.g. gestures) are integrated.

His ideas have influenced the field substantially. Peter Hagoort places much emphasis on the communication of research to a wider audience, He is involved in the public debate on the functioning of the brain and has set up several websites on the topic of language. As an example, please visit [www.hettaligebrein.nl](http://www.hettaligebrein.nl).

He is programme director of the Language in Interaction consortium and editor of the MIT volume 'Human Language: From Genes and Brains to Behaviour'. Authors of this volume are presenting their chapter at this Summer school.

Personal website: <http://www.mpi.nl/people/hagoort-peter>

**Abstract: Beyond the core networks of language**

Speakers and listeners do more than exchanging propositional content. They try to get things done with their utterances. For speakers this requires planning of utterances with knowledge about the listener in mind, whereas listeners need to make inferences that go beyond simulating sensorimotor aspects of propositional content. For example, the statement "It is hot in here" will usually not be answered with a statement of the kind "Yes, indeed it is 32 degrees Celsius", but rather with the answer "I will open the window", since the listener infers the speaker's intention behind her statement. I will discuss a series of studies that identify the network of brain regions involved in audience design and inferring speaker meaning. Likewise for indirect replies that require conversational implicatures, as in A: "Did you like my talk?" to which B replies: "It is hard to give a good presentation." I will show that in these cases the core language network needs to be extended with brain systems providing the necessary inferential machinery.

## Dr. Vitória Piai

Donders Institute – Centre for Cognition, Radboud University

Radboud University Medical Centre



Vitória Piai is a senior researcher at the Donders Centre for Cognition and Radboud University Medical Centre.

Her research focuses on language function in healthy and neurological populations, such as stroke, brain tumour, epilepsy, and neurodegenerative disorders (e.g., dementia, Parkinson's). She uses a range of behavioural and neuroimaging methods and pays special attention to the intersection of language and other functions, such as executive control, (semantic) memory, and motor control in the case of speaking.

Her approach is bi-directional. On the one hand, she uses models from cognitive neuroscience to better understand language function in neurological populations. One of the main goals of this approach is to develop novel diagnostic tools and methods to

improve language capacity in patients.

On the other hand, she uses observations of the breakdown of language and/or communicative abilities following brain insult to obtain unique insights informative for cognitive (neuro)science models.

Her main interests are:

- language use in context, the intersection between language and semantic memory;
- frontal and temporal lobe interactions in language use, hippocampal contributions to language;
- neuroplasticity, interhemispheric connections and functional lateralisation, brain stimulation

Personal website: <http://www.vitoriapi.ai.com/>

### **Abstract: Electrophysiology measured over the scalp and intracranially: examples from context-driven word production.**

In the first part of this lecture, I'll talk about how we measure signals intracranially, how they differ from signals measured over the scalp, and what the common steps are for analysing this type of data.

In the second part, I'll give two examples of electrophysiological studies investigating context-driven word production. The first study employed scalp EEG to address the impact of left temporal-lobe stroke on context-driven word production. The second study employed intracranial EEG to assess the relative contribution of medial temporal structures, to context-driven word production.

## Friday July 8: Communication with and before language by Ivan Toni & Stephen Levinson

Prof.dr. Ivan Toni

Donders Institute – Centre for Cognitive Neuroimaging, Radboud University



Ivan Toni is professor of Motor Cognition at Radboud University Nijmegen. Ivan Toni's research focuses on understanding the cerebral mechanisms supporting the integration of rules and perceptual processes into the sensorimotor machinery. He studies how the brain generates movements designed to change the physical environment, as well actions designed to induce desired mental states in other agents. His working hypothesis is that both types of actions are organized and selected according to perceptual and conceptual knowledge, with abstract knowledge influencing sensorimotor processes at the earliest stages of movement planning. These issues are empirically addressed in both healthy and pathological human brains, using non-invasive neurophysiological techniques (functional Magnetic Resonance

Imaging, Magneto-Encephalography, Transcranial Brain Stimulation) and computational methods. The approach is pervasively multi-disciplinary, combining neurophysiology, experimental psychology, and cognitive science.

Ivan Toni is keen on translating knowledge from neurobiological mechanisms into clinical opportunities, exploring compensatory mechanisms in movement planning and action control in both neurological and neuropsychiatric disorders.

For a list of his publications, please see:

<http://scholar.google.com/citations?hl=en&user=YNMaEfoAAAAJ>

### **Abstract: Creation and control of mind-oriented movements**

As with many other core human abilities, intentional communication appears a fairly straightforward phenomenon, at least until we interact with other humans having communication deficits, or until we try to build artificial cognitive agents that can effectively deal with the pervasive ambiguity of human communicative signals. It has often been assumed that these communicative abilities ultimately rely on coding-decoding of symbols whose meaning is already shared across communicators, neglecting that using those symbols requires a computational mechanism powerful enough to mutually negotiate them. In this talk I will elaborate on the neural mechanisms supporting the human ability to rapidly generate and understand novel shared symbols. I will describe empirical evidence suggesting that the selection of communicative actions is independent from the operations of the language system, strongly dependent on dynamically updating shared conceptualizations of a signal's use, and supported by a computational overlap between selection and recognition of a communicative behaviour in communicators and addressees, respectively.



**Prof.dr. Stephen C. Levinson**

**Max Planck Institute for Psycholinguistics**

**Donders Institute for Brain, Cognition and Behaviour, Radboud University**



Stephen C. Levinson is codirector of the Max Planck Institute for Psycholinguistics, and Professor of Comparative Linguistics at Radboud University Nijmegen. He is the author of over 288 publications on language and cognition, including *Politeness* (CUP), *Pragmatics* (CUP), *Presumptive Meanings* (MIT), *Space in Language & Cognition* (CUP), and has (co-)edited the collections *Grammars of Space* (CUP), *Language Acquisition and Conceptual development* (CUP), *Culture and Evolution* (MIT), *Roots of Sociality* (Berg) and *Turn-Taking in Human Communicative Interaction* (Frontiers Media). His current research is focused on the cognitive foundations for communication, and the relation of language to general cognition. He is a fellow of the British Academy and the Academia Europaea and holder of an ERC Advanced Grant.

Personal website: <http://www.mpi.nl/people/levinson-stephen>

**Abstract: Interactional foundations of language: The Interaction Engine hypothesis**

Along with complexity, the extent of the variability of human language across social groups is unprecedented in the animal kingdom, and we need to understand how this is possible. An underdetermined innate basis is plausible, but there is no consensus about what it is (other than vocal learning and the vocal apparatus), or how it would make it possible to learn varied languages. An alternative, and potentially complementary, explanation suggests that there is a set of communicative instincts and motivations that together make it possible for the infant to bootstrap into the local language, whatever it may be. Some evidence for this is as follows. First, the organization of informal interactive human communication – the core niche for language use – looks much less variable than languages. Thus all language users in this niche take rapid turns at talking even though the speed of this is highly demanding. Similarly, all users avail themselves of the same mechanisms for repairing miscommunication, and use the same restricted system for building coherent dialogues. Second, long before infants have any linguistic knowledge, they take part in ‘proto-conversations’ that exhibit these same universal organizations. Third, where normal spoken language is not accessible to individuals (as when they are profoundly deaf), they still share the same communicative infrastructure. Finally, there are some signs of phylogenetic parallels in other primates. If this is correct, Darwin’s characterization of language as “an instinct to acquire an art” may have its root in communicative instincts as much as specific instincts about language structure.

**Dr. Federico Rossano**

**Department of Cognitive Science, the University of California, San Diego**



Federico Rossano is Assistant Professor in the department of Cognitive Science at the University of California, San Diego. He has authored publications on psychotherapeutic interactions, joint attention and voice following in human infants and non-human primates, the development of property concerns, social norms, value perception and distributive and procedural justice in human ontogeny, gaze behaviour in face-to-face interactions in different cultures, gesture ontogeny and the development of communicative signals in baby non-human primates. His current research adopts a comparative perspective on social cognition and is focused on the development of communicative abilities in human and non-human primates

Personal website: <http://www.cogsci.ucsd.edu/research/profile/511/>

**Abstract: Ontogenetic development of gestural communication**

In this talk I address two crucial aspects of gestural communication in non-human primates: how gestures are acquired/developed and how similar is their use when compared to human communicative behaviour.

There is general agreement among researchers that nonhuman primates gesture in sophisticated ways (Tomasello & Call, 2007; Pollick & de Waal, 2007) and that their vocalizations are less flexible and less under intentional control than their gestures. However, the process by which apes acquire gestures is an issue of debate. One of the central questions in this debate is whether apes acquire species-typical gestural repertoires, with little individual innovation (the “biological inheritance” hypothesis) (e.g., Genty et al., 2009), or whether they develop gestures individually through the ritualization of particular social acts (the “ontogenetic ritualization” hypothesis) (e.g., Tomasello, 1996). Similarly, the similarities and differences between the mechanisms that support the gestural communication of great apes and humans language are still under-investigated.

In this talk, I address three issues related to these debates: 1. Is great apes’ gestural repertoire innate or learned (and if so, how)? 2. Is the structure and timing of human social interaction fundamentally different from great apes social encounters? 3. What does language change in terms of communicative possibilities?

**Prof.dr. Herb Clark**  
**Stanford University**



Herbert H. Clark is Albert Ray Lang Professor of Psychology Emeritus at Stanford University. He is author of several books on language use, including *Psychology and Language* (with Eve V. Clark), *Arenas of Language Use*, and *Using Language*. He is also author of over 200 journal articles and chapters in both psychology and linguistics. Clark was a John Simon Guggenheim Fellow and a fellow at the Center for Advanced Study in the Behavioral Sciences. He was elected to the American Academy of Arts and Sciences and to the Royal Dutch Academy of Arts and Sciences. He has also received a lifetime achievement award from the Society for Text and Discourse and an honorary doctorate from the Université de Neuchâtel.

Personal website: <http://web.stanford.edu/~clark/index.html>

**Abstract: Iconic communication**

In everyday discourse, people communicate not only with *symbols* (e.g., words, sentences, head nods, thumbs-up) and *indexes* (e.g., pointing, positioning things, saying “I” or “here”). They also communicate with *icons*—with actions and objects that are physical analogs of what they signify. (The notions of symbol, index, and icon are due to the philosopher C. S. Peirce.) Most accounts of communication have focused on symbols and indexes to the exclusion of icons. Depicting (the use of icons), however, is a basic method of communicating: it is on a par with describing-as (the use of symbols) and indicating (the use of indexes), but is based on a fundamentally different mode of thinking. Depictions can be used on their own, as in demonstrating a tennis serve, but they are often (1) embedded as component parts of utterances (as in quotations), (2) indexed by phrases within utterances (as with the gesture for “I caught a fish *this long*”), or (3) adjoined to words or phrases as non-restrictive modifiers (as with wrinkling the nose over *disgusting* in “I think liver is *disgusting*”). I will take up how depicting works, and how it is different from describing and indicating.

## Saturday July 9: Neuroanatomy of language by Peter Hagoort

You can find Peter's profile on page 22.

### Prof.dr. Christian Beckmann

#### Donders Institute – Centre for Cognitive Neuroimaging, Radboud University



Christian Beckmann is PI Statistical Imaging Neuroscience at the Centre for Cognitive Neuroimaging of the Donders Institute at Radboud University Nijmegen. He is a Senior Research Fellow at the Oxford Centre for Functional Magnetic Resonance Imaging of the Brain (FMRIB), Oxford, UK.

His research focuses on developing novel computational methods for data understanding & fusion in cognitive and clinical neuroimaging domains that will enable creation of advanced tools for the integrated modelling of multiple neuroimaging, behavioural and biological modalities in order to develop sensitive, robust and specific markers of brain function in health and disease. Research in the SIN group focuses on establishing resting-state functional

connectivity (rfMRI) analysis from BOLD fMRI measures as a means for understanding functional organisation and communication in the brain. Christian is widely acknowledged for developing methods for image analysis, machine learning and imaging statistics.

Personal website: <http://www.ru.nl/english/people/beckmann-c/>

### Dr. Koen Haak

#### Donders Institute – Centre for Cognitive Neuroimaging, Radboud University



Koen Haak works as a Postdoctoral Researcher on Brain Networks and Neuronal Communication in the Statistical Imaging Neuroscience research group of Prof.dr. Christian Beckmann.

Personal website: <http://www.ru.nl/personen/haak-k/>

#### **Abstract: The language connectome**

Language processing in humans is supported by communication between different regions associated with specific functioning. The underlying structural organisation can be assessed in-vivo by means of novel neuroimaging techniques to form a view on the structural connectome within the language system. Functional Connectivity provides a second alternative approach to shed light on the language system and the functional interactions within and beyond areas considered core language regions. In this talk we will provide a coarse overview of the known functional and structural connections. Further, we will introduce a data driven approach for using big data to investigate the functional hierarchies and describe how such an approach can be used to investigate conceptual descriptions of language processing. Specifically we will discuss two mathematical approaches that can be used to define data-driven models of organisation and compare these to both the Hickok and Poeppel (2007) conceptualisation of the two-stream hypothesis of language function and the Margulies and Petrides (2013) conceptualisation of a mirror-symmetric topographic organisation within core areas of the language system.

**Prof.dr. Elia Formisano**

**Maastricht Brain Imaging Center, Department of Cognitive Neuroscience,  
Maastricht University**



Elia Formisano received his MSc degree in Electronic Engineering in 1996 from the University of Naples (Italy) and his PhD from the national (Italian) program in Bioengineering in 2000. Thanks to an outgoing grant, in 1998-1999, he was a visiting research fellow at the Max Planck Institute for Brain Research in Frankfurt/Main (with Dr. Rainer Goebel). In January 2000, he was appointed Assistant Professor at Maastricht University (Faculty of Psychology and Neuroscience) where he is now Full Professor of Neural Signal Analysis. In 2008-2013, he was Head of the Department of Cognitive Neuroscience.

He is Scientific Director of the Maastricht Brain Imaging Center (MBIC) and Principal Investigator of the "Auditory Perception and Cognition" research group. His research aims at discovering the neural basis of human auditory perception and cognition by combining multimodal functional neuroimaging with methods of machine learning and computational modeling. He pioneered the use of ultra-high magnetic field (7 Tesla) functional MRI in neuroscience studies of audition. Methods development focuses on algorithms for unsupervised (e.g. independent component analysis) and supervised (e.g. multivariate classification and regression) learning. On these topics, he has published in high ranked journals, including Science, Neuron, PNAS, Current Biology and received prestigious funding, such as NWO VIDI (2005-2010) and NWO VICI (2013-2018).

Personal website: <https://www.maastrichtuniversity.nl/e.formisano>

**Abstract: The speech ready organization of the human auditory cortex**

The auditory cortex of human and non-human primates share many fundamental aspects of anatomical and functional organization. There are distinctive differences as well, most likely emerged in the human brain to accommodate the processing of speech and language, arguably the most complex and behaviourally relevant function the human auditory cortex contributes to.

In this lecture, after a brief review of the anatomical and functional organization of the human auditory pathway and cortex, I will discuss (functional neuroimaging) research examining basic auditory processes relevant for the analysis of speech. I will argue that – in the human brain - even “general purpose” mechanisms of neural sound analysis and representation have been shaped by the acoustic properties of speech and are optimized for the fine-grained analysis of speech signals.

## Dr. Nicola Palomero-Gallagher

### Institut für Neurowissenschaften und Medizin, Forschungszentrum Jülich



My research topic is on the function and dysfunction of the cerebral cortex: transmitter receptors and cytoarchitecture

My major goal is to understand the cyto- and receptorarchitectonic basis of cortical segregation and interareal interaction in the healthy and diseased brain. My focus is on the organization of the human, non-human primate and rodent cingulate cortices and language-related regions. I evaluate the cyto-, myelo-, and receptor architecture of rodent, monkey and human cortices. The focus is on receptors because they are the molecular basis for the functional specificity and circuitry organization of each cortical and subcortical unit.

I am particularly interested in the effect of depression on cingulate cortex structure and function. I am currently examining structural changes and functional alterations in the cingulate cortex, a crucial brain region in the regulation of mood and its disorders. Furthermore, language-related regions are studied to reveal their specific transmitter receptor organization compared to other neural networks.

Personal website:

<http://www.fz-juelich.de/SharedDocs/Personen/INM/INM-1/EN/Palomero.html?nn=534704>

#### **Abstract: Receptor expression in Broca's and Wernicke's regions**

Transmitter receptors are key molecules of signal processing in the nervous system. They show a considerable regional heterogeneity in their expression between cortical and subcortical regions. Previous studies of post mortem human brains have shown that the analysis of numerous receptors of different transmitter systems within each brain region provides a characteristic "multi-receptor fingerprint". A fingerprint reveals the quantitative relations between the densities of excitatory, inhibitory and modulatory receptors expressed in a brain region. Furthermore, a receptor fingerprint is not only characteristic for the structurally or functionally defined cortical area, but also for functional networks. I.e., all areas belonging to a defined functional network exhibit similar fingerprints, which are different from those of other networks. Here, the multi-receptor expression in cytoarchitectonically (Broca's region) or macroscopically defined sites in Wernicke's region will be demonstrated. Furthermore, the degree of similarity of those receptor fingerprints will be examined with hierarchical cluster and principal component analyses to reveal organizational principles of language regions at the molecular level. In addition to receptor data from Broca's region, a regional analysis of multi-receptor fingerprints in the extended Wernicke region based on a macroscopical parcellation scheme will be presented for the first time. These data can be compared with functional imaging observations. This allows an in-depth interpretation of MRI findings by considering the molecular organization subserving language functions, and a comparison with non-language related cortical regions.

## Monday July 11: The genetics of language by Simon Fisher

**Prof.dr. Simon E. Fisher**

**Max Planck Institute for Psycholinguistics**

**Donders Institute for Brain, Cognition and Behaviour, Radboud University**



Simon E. Fisher is director of the Max Planck Institute for Psycholinguistics and Professor of Language and Genetics at the Donders Institute for Brain, Cognition and Behaviour in Nijmegen, the Netherlands. Simon obtained his Natural Sciences degree at Cambridge University, UK in 1991, followed by a DPhil at the Biochemistry Department, Oxford University, UK in 1996. For postdoctoral research he worked at the Wellcome Trust Centre for Human Genetics (WTCHG) in Oxford, identifying genetic factors that contribute to developmental disorders such as dyslexia and speech/language disorders. During this time he and his colleagues discovered FOXP2, the first case of a gene implicated in speech and language. In 2002, Simon was awarded with a Royal Society University Research Fellowship and became head of his own laboratory at the WTCHG, using state-of-the-art methods to uncover how language-related genes influence the brain. From 2007-10 Simon was also the Isobel Laing Fellow in Biomedical Sciences at Oriel College, Oxford, where he taught Biochemistry and Medical Genetics. In 2010 he was appointed director of a new department devoted to "Language and Genetics" at the Max Planck Institute in Nijmegen.

Simon is author of >130 journal articles, including publications in Nature, Nature Genetics, Science, New England Journal of Medicine, Cell, Current Biology, PNAS, American Journal of Human Genetics, Nature Reviews, Annual Reviews and Current Opinion journals. According to Google Scholar, his work has received more than 15,500 citations in total, and he has an h-index of 57. Simon is frequently invited to talk at international conferences across a diverse range of fields, and has also spoken to school, student and public audiences. His research has an interdisciplinary remit, integrating data from genetics and genomics, psychology, neuroscience, developmental biology and evolutionary anthropology. Simon is an elected fellow of the Royal Society of Biology, and his awards include the Francis Crick Medal and Lecture in 2008, and the inaugural Eric Kandel Young Neuroscientists Prize in 2009.

Personal website: <http://www.mpi.nl/people/fisher-simon>

**Prof.dr. Timothy C. Bates**

**School of Philosophy, Psychology and Language Sciences , The University of Edinburgh**



Timothy Bates is professor at the School of Philosophy, Psychology and Language Sciences at The University of Edinburgh.

His work is on the genetics of human cognitive abilities and potential. As such it spans positive psychology as well as cognitive differences. He uses behaviour genetic and molecular genetic approaches to get at causality.

Recent research includes.

- Global differences in GxSES effects on IQ
- How social status amplifies IQ (WSJ article).
- The genetic and environmental structure of Optimism
- A GWAS for dyslexia & the phonological loop
- How education and learning to read (but not reading) raise IQ.

Personal website: <http://about.me/timothybates>

**Abstract: Mapping genes involved in reading and language skills**

Reading and language were among the first traits ever to have a formal familial, and then genetic interpretation. This was confirmed in behaviour genetic studies (in which, again, reading was one of the first non-psychiatric mental traits to be studied). With the advent of linkage and chromosome-based techniques, molecular regions were implicated, followed by specific genes identified by fine-mapping. In the GWAS era, reading and language have been studied with positive results. It is perhaps fair to say, however, that work in psychiatry has demonstrated that study scale must increase by orders of magnitude to take the next steps. The value of these steps will be briefly outlined.



## Dr. Clyde Francks

### Max Planck Institute for Psycholinguistics



Clyde Francks is Senior Investigator (W2 Tenured) at the Language and Genetics Department of the Max Planck Institute in Nijmegen, the Netherlands.

He investigates the genetic basis of brain asymmetry and its links to variation in human cognition. He is leader of the research programme 'Brain and behavioural asymmetries'.

About this research programme: The left and right sides of the human brain are specialized for different kinds of information processing and much of our cognition is relatively lateralized to one side or the other. Language is a striking example, which is lateralized leftwards in most people. Left-right asymmetry is an important organizing feature of the human brain, but the underlying molecular mechanisms remain almost completely unknown. In addition, language impairments, schizophrenia and autism are sometimes linked to altered brain asymmetry. In this research programme we aim to identify genes that contribute to brain asymmetries during human development and adulthood.

Personal website: <http://www.mpi.nl/people/francks-clyde>

#### **Abstract: The genetic bases of brain lateralization**

A degree of functional lateralization is characteristic of various aspects of human cognition, including aspects of language processing, which show left hemisphere dominance in most people. Left-right asymmetries of the human brain and behaviour are likely to arise from lateralized genetic-developmental programs that originate in the early embryo. In adults, a recent study of gene expression data from superior temporal and auditory cortex found subtle, quantitative lateralization of genes involved in synaptic transmission and neuronal electrophysiology. These observations are consistent with functional lateralization of this cortical region for language. Genetic polymorphisms that may have small, modifying effects on brain and behavioral asymmetries are starting to be identified through association studies, although core genetic mechanisms of asymmetrical brain development are not known. A major challenge will be to understand how neuronal circuits of the left and right hemisphere become differently fine-tuned, at the molecular level, to preferentially support particular cognitive functions. Through analyzing the inter-hemispheric genetic contrast, powerful insights may be gained into the exact properties of the left hemisphere's architecture which are particularly supportive of language-related functions.

## Dr. Sonja Vernes

### Max Planck Institute for Psycholinguistics



Sonja Vernes is an independent Max Planck Research Group Leader at the Max Planck Institute in Nijmegen, the Netherlands.

Sonja Vernes leads the Neurogenetics of Vocal Communication (NVC) Research Group that studies the genetics of vocal communication in mammals, as a way to understand the evolution and biological bases of human speech and language.

Many animals, including our primate cousins, have limited vocal repertoires. But a few mammals such as bats, whales and elephants use complex and varied vocalizations that share some characteristics with human speech such as the ability to learn vocalizations from other members of their social group. Currently almost nothing is known about the genetic basis for these sophisticated vocal behaviours in such species.

The NVC group uses cutting-edge molecular techniques to understand genes that are important for vocal communication and brain development in non-human mammals, including bats and mice. To link these genes to human speech and language, they investigate the function of these genes in human cells and look in human populations for relationships between language ability and variation or mutation of these genes. Studying these animal models, together with data from cells and human studies could provide clues about how human language evolved, and how language abilities are encoded in the human genome.

Personal website: <http://www.mpi.nl/people/vernes-sonja>

#### **Abstract: Neuromolecular approaches to language**

The capacity for speech and language is a fundamental trait of humankind, but its genetic encoding is poorly understood. I will present a range of diverse but complementary approaches to study the genetic underpinnings of speech and language including; clinical studies that investigate the molecular mechanisms underlying speech and language disorders; neuromolecular studies that demonstrate how such genes influence neuronal development and function; and work in animal models linking gene function to behaviours relevant for speech and language.

**Prof.dr. Wolfgang Enard**

**Anthropology and Human Genetics department, Faculty of Biology,  
The Ludwig Maximilians University of Munich**



Wolfgang Enard is Professor for Anthropology and Human Genetics at the Ludwig Maximilians University in Munich since 2013.

He graduated in molecular biology in Munich (1998) before joining the group of Svante Pääbo at the Max Planck Institute for Evolutionary Anthropology in Leipzig, where he did his PhD (2003) and worked as a postdoc and group leader (2003-2012). He worked on comparing gene expression patterns between humans and chimpanzees, was part of the chimpanzee sequencing consortium and studied the evolution of FOXP2, a gene involved in speech and language development. His current focus is the use of comparative functional genomics, iPS cells and mouse models to understand human brain evolution. Our goal is to understand the molecular basis of human evolution, including its implications for biomedical questions. A core expertise of our group in this context is bridging the gap between evolutionary genomics and experimentally approachable molecular mechanisms.

Personal website: <http://humangenetik.bio.lmu.de/personen/chair-enard/enard/index.html>

**Abstract: A genomic perspective on language evolution**

Language is a phenotype that has evolved since the lineage to humans split from the lineage leading to chimpanzees. Hence, the genetic basis of language evolution must be a subset of the ~20 million genetic changes that occurred since then. As humans and chimpanzees cannot be crossed to genetically disentangle this genotype-phenotype relationship, additional information needs to be added from more indirect sources. Such sources include statistical measures to identify genetic elements that have evolved under positive selection during human evolution and gene-phenotype associations in currently living humans. In addition, gene-phenotype associations within and across other species adds crucial information at least for some aspects of language. Importantly, particular hypotheses on the genetic basis of language evolution will need to be experimentally followed up to gain plausibility and the unknown suitability of available model systems and readouts is currently a major limiting factor. I will use the case of the transcription factor FOXP2 to discuss possibilities and limitations of this genomic perspective on language evolution.

## Tuesday July 12: Animal models of language by Carel ten Cate & Constance Scharff

**Prof.dr. Carel ten Cate**

**Animal Behaviour and Cognition, Institute of Biology, Leiden University**



His core research is on animal communication and cognition, in particular in relation to the learning and processing of vocal and visual signals in species ranging from birds and fish to humans. Over the years, this expanded towards comparative research to explore the similarities and differences of vocal processing in birds and that of speech and language in humans. Learned birdsong is considered the closest animal analogue to human language and several projects address how the acquisition, rule learning and other cognitive abilities of birds, as well as the mechanisms underlying production and perception of song, compare to those involved in human language and speech.

Many projects involve collaboration with linguists, psychologists and others and are at the interface of biology, cognitive science, psychology and linguistics. They aim at providing insights in the origins and mechanisms of human linguistic rule learning, language development, speech perception and the neural bases of these processes.

Personal website: [http://www.science.leidenuniv.nl/index.php/ibl/ten\\_cate/research](http://www.science.leidenuniv.nl/index.php/ibl/ten_cate/research)

### **Abstract: A comparative overview of artificial grammar learning abilities of animals**

Carel ten Cate (Leiden Univ.) & Christoph Petkov (Univ. of Newcastle upon Tyne, UK)

A core feature of the human language faculty concerns syntax, the computational system that gives structure and meaning to language. It enables both the production and the processing of hierarchically organized and recursive structures. The evolution and the development of these computational abilities are debated topics. Also, views differ on whether the processing and acquisition of linguistic structure results from a single mechanism or from more than one. Against this background, there is increasing interest in comparative research, addressing what type of processing and rule learning abilities are present in other species and to what extent they are comparable to those present in humans. This may provide a window on what might have been the precursors of human abilities and which elements of the mechanisms involved in language processing are language specific or of a more general nature.

I will provide an overview of this rapidly expanding field of research. I will first discuss the structure and level of complexity of natural vocalizations for some groups of animals. While this provides insight in the 'grammar' applied to their vocal output, animals may be able of more complex sequence processing and rule learning, but not apply this in their vocalizations. These 'hidden competences' are being examined in a systematic way by means of artificial grammar learning (AGL) experiments in animals. I will discuss the findings obtained in various animal AGL studies and what they may tell about the grammatical competences of animals.

**Prof.dr. Constance Scharff**

**Department of Biology, Chemistry, Pharmacy**

**Institute of Biology, Free University Berlin**



Constance Scharff is aiming to understand how the brain brings about behaviour and how in turn behaviour influences the brain. To do so Prof. Scharff and her research group focuses on two questions. What are the neural substrates for learned acoustic communication? Most vertebrates communicate acoustically, but in only a few, among them humans, ocean mammals, bats and three orders of songbirds, is this trait learned. For their ethological, neuroanatomical, cell biological and molecular experiments they use songbirds as model, because the brain pathways controlling acoustic behaviour are best described in birds, and because avian and mammalian brains are sufficiently similar for results to likely be relevant for mammals as well. In addition, bird brains retain the capacity for regeneration of nerve cells in adulthood. This is in contrast to the much more limited capacity of mammalian brains. It is therefore vital for both

basic and medical research to understand how neuronal replacement is controlled in birds.

Personal website: [http://www.bcp.fu-berlin.de/en/biologie/arbeitsgruppen/neurobiologie\\_verhalten/verhaltensbiologie/team/scharff/](http://www.bcp.fu-berlin.de/en/biologie/arbeitsgruppen/neurobiologie_verhalten/verhaltensbiologie/team/scharff/)

**Dr. Mirjam Knörnschild**

**Animal Behavior Lab, Free University Berlin**

**Smithsonian Tropical Research Institute, Barro Colorado Island, República de Panama**



PD Dr. Knörnschild is a Heisenberg Fellow leading an independent research group at the FU Berlin in Germany and a Research Associate of the Smithsonian Tropical Research Institute in Panama. As a behavioral ecologist, she holds extensive scientific expertise in acoustic communication, cognition, learning and social behaviour of mammals, particularly bats. Her research projects are highly interdisciplinary, incorporating genetics, neuroethology and biolinguistics. She mainly works with free-living animals and most of her field studies are conducted in the Neotropics and South Africa.

Personal website: <http://mirjam-knoernschild.org/>

**Abstract: Genes relevant for vocal learning, speech and language: insights from animal models**

Constance Scharff (Freie University Berlin), Mirjam Knörnschild (Freie University Berlin), Erich Jarvis (Duke University)

Since language is a uniquely human trait, we will begin our chapter with an attempt to disambiguate and operationally define different key aspects of language, to be able to evaluate which parallels can be drawn to animal communication. Comparative biolinguistic studies have focused on three key components of language, namely vocal learning, syntax and semantics, which concern the acquisition, structure, and meaning of a signal. In the context of relevant genes for these features of language, it is necessary to think about the different forms of vocal learning. Genes involved in learning to produce a signal and learning when to give it on the one hand may be quite different from those relevant for learning to decipher a signal, in what context it is given and what it means. We will review which animals (songbirds, parrots, hummingbirds, mice, bats, whales, elephants, seals, drosophila) have served to model particular aspects of these different learning forms and other aspects of genes and language. The chapter will then turn to the methods that have been used to identify genes relevant for traits in animals that have homologous features to human speech and language. We will conclude with a discussion of the candidate genes identified and in which molecular modules they play a role, and a general outlook what type of insights we can expect from this approach.

**Dr. Steffen Hage**

**Neurobiology of Vocal Communication**

**Werner Reichardt Centre for Integrative Neuroscience, Tübingen University**



Dr. Hage aims to understand the neuronal mechanisms underlying vocal communication. The focus of his research is to understand, how audio-vocal integration mechanisms are modulating vocal production and vocal perception as well as how cognitive and motivational processes are involved in primate vocal behaviour. He is particularly interested in whether these mechanisms can be assumed to be pre-adaptations for human speech and how they might be a suitable model to study such pre-cursors of human speech in the primate lineage. His lab uses combined psychophysical, neuroethological and neurophysiological methodologies to tackle these questions.

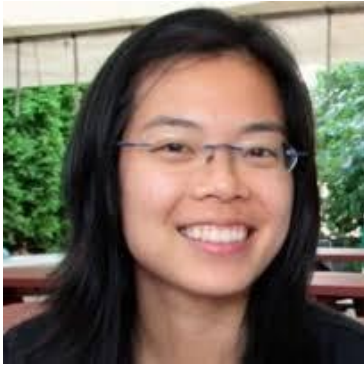
Personal page: <http://vocalcommunication.de/>

**Abstract: Primate vocalizations**

The human language faculty vastly outperforms primate vocal communication systems in scope and flexibility. While human speech is above all a learned vocal pattern, the vocal motor system of non-human primates consists mainly of stereotyped and innate calls that are almost exclusively uttered affectively. However, even if the speech and language system in humans is categorically different from the vocal motor system of non-human primates, the theory of evolution postulates pre-adaptations in the primate lineage, no matter how exiguous they might be. In this lecture, I will give an overview on vocal behaviour in nonhuman primates and its scopes and limits to serve as a model for studying specific pre-adaptations of human speech. First, different types of vocal learning such as vocal production learning, vocal usage learning and perception learning will be explained. Then, I will discuss, if and how these different types of vocal learning mechanisms are present in monkey vocal behaviour by combining evidence from the wild and from the lab. Finally, I will give an overview on the current state of the knowledge on the neuronal network, which is underlying vocal motor control in non-human primates, and how it might be suitable to investigate neuronal pre-adaptations of cognitive control of vocal behaviour in the monkey brain.

**Dr. Buddhamas (Pralle) Kriengwatana**

**School of Psychology & Neuroscience, University of St Andrews**



I am interested in cognition and learning from a developmental and comparative perspective. One aspect of my research focuses on how developmental experiences influence cognitive functions and neuroendocrine systems to subsequently shape cognition and behaviour later in life. I also aim to understand cognitive processes involved in perceiving speech and language by comparing perception of vocally-learned signals in humans and songbirds. My current work is part of a BBSRC funded project "Cognitive decline during ageing: the role of developmental and adult stress" which investigates the effects of stress during different life stages on brain and cognition.

Personal website: [https://risweb.st-andrews.ac.uk/portal/en/persons/buddhamas-pralle-kriengwatana\(3361763b-780e-41f5-90af-d2b65cf513fd\).html](https://risweb.st-andrews.ac.uk/portal/en/persons/buddhamas-pralle-kriengwatana(3361763b-780e-41f5-90af-d2b65cf513fd).html)

**Abstract: Speech perception: what do nonhuman animals have to say?**

Speech is the most common vehicle through which language is communicated and learned, hence understanding speech perception is essential for understanding language mechanisms and evolution. Although speech perception may seem effortless, it is a deceptively complex process as speech signals are susceptible to interference from background noise, distorted by neighbouring speech sounds, and modified by speaker voice. Nonetheless, human speech perception is surprisingly robust, leading some researchers to suggest that human brains and auditory systems have evolved to treat speech as different from other acoustic signals. Comparative studies of speech perception in nonhuman animals are crucial for resolving this "speech is special" debate because they can reveal whether speech perception is possible only through uniquely human mechanisms or may be achieved through domain-general auditory mechanisms shared with other animals. I will review results of pioneering work in comparative speech perception that made important contributions to theoretical perspectives on the specialization of human speech perception. Comparative work that relates to more recent developments in theories of human speech perception and similarities in vocal production mechanisms of humans and animals will also be discussed. Finally I will attempt to synthesise the insights that animal models have provided regarding the extent to which domain-general mechanisms guide speech perception and discuss how close we might be to resolving the debate on the uniqueness of human speech perception.



## Wednesday July 13: Modeling language by Willem Zuidema

Dr. Willem Zuidema

Institute for Logic, Language and Computation, University of Amsterdam



Willem Zuidema is assistant professor in cognitive science and computational linguistics at the University of Amsterdam. He leads the Cognition, Language & Computation lab, that further includes 4 PhD students and a variable number of MSc students doing research at the intersection of cognitive science, computational modelling and natural language processing. His research interests include artificial language learning, statistical syntactic and semantic parsing, recursive neural networks, and the evolution of language, speech and music.

In the past, he has worked in the Behavioural Biology group at Leiden University in the Netherlands (2007-2008), and the Language Evolution and Computation Research Unit and the Institute of Cell, Animal and Population Biology (now the Institute of Evolutionary Biology) of the University of Edinburgh (2002-2004) in Scotland, where he worked on a PhD thesis on “The Major Transitions in the Evolution of Language”. Before that, he was a research assistant at the Artificial Intelligence Lab of the Vrije Universiteit Brussel in Brussels, Belgium (2000-2002), where he worked on the project “Origins of Language and Meaning”, briefly at the Sony Computer Science Laboratory – Paris in France (2000), and in the Theoretical Biology group of the University of Utrecht, the Netherlands (1998-1999).

Personal website: <http://wzuidema.humanities.uva.nl/>

Dr. Phong Le

Institute for Logic, Language and Computation, University of Amsterdam



I'm a Postdoc interested in neural networks and deep learning. My recent work is to employ them to solve natural language processing tasks such as dependency parsing, semantic role labeling, and sentiment analysis. I'm also interested in formal semantics, especially learning semantic parsing, which is the topic of my master thesis.

Personal website: <https://sites.google.com/site/lephongxyz/>

### **Abstract: Vector-based and neural models of semantics**

How can we represent the meaning of words and sentences in a computational model? We review foundational work in distributional semantics, where word meanings are represented with (high-dimensional) numerical vectors, and recent extensions of this approach that generalize the vector representations to also apply to sentences. We contrast these approaches to alternative modelling traditions, including frame semantics (and related approaches for lexical semantics) and Montague semantics (and related approaches for compositional semantics). We show that vectorial models are surprisingly versatile, and account for a wide variety of semantic phenomena often claimed to necessitate symbolic formalisms, while offering the additional benefits of being much more compatible with both neurobiological modelling and existing machine learning frameworks.

**Prof.dr. Bart de Boer**

**Artificial Intelligence Lab, Vrije Universiteit Brussel**



Bart de Boer is research professor at the artificial intelligence laboratory of the Vrije Universiteit Brussel. He investigates evolution of speech using a combination of computer models, experiments and comparative biology.

Personal website: <https://ai.vub.ac.be/members/bart>

**Abstract: Computer Models of the evolution of speech**

Computer and mathematical modeling has been an important tool in the study of speech since its very beginning. In this talk I will present a number of results from the study of the evolution of speech that illustrate how computer and mathematical models can successfully be used - in combination with traditional empirical approaches such as experiments, comparative studies and the study of fossils. I will focus on two topics: the evolution of the vocal tract and the co-evolution of biology and culture.

**Prof.dr. Frank Keller**

**Institute for Language, Cognition and Computation, School of Informatics,  
University of Edinburgh**



Frank Keller is professor of computational cognitive science in the School of Informatics at the University of Edinburgh. His background includes an undergraduate degree from Stuttgart University, a PhD from Edinburgh, and postdoctoral and visiting positions at Saarland University and MIT. His research focuses on how people solve complex tasks such as understanding language or processing visual information. His work combines experimental techniques with computational modeling to investigate reading, sentence comprehension, translation, and language generation, both in isolation and in the context of visual information such as photographs or diagrams. Prof. Keller serves on the management committee of the European Network on Vision and Language, is a member of governing board of the European Association for Computational Linguistics, and was awarded an ERC starting grant in the area of language and vision.

Personal website: <http://homepages.inf.ed.ac.uk/keller/>

**Abstract: Cognitive models of syntax and sentence processing**

Frank Keller (University of Edinburgh) & Vera Demberg (Saarland University)

We give an overview of recent efforts to build computational models of human sentence processing. We start by introducing the key components of such models, i.e., architectures, algorithms, and linking theories. We then give an overview of the central phenomena that models of human sentence processing have to capture, including garden paths, center embedding, locality and anti-locality, local coherence, and digging in. We evaluate specific modeling proposals in the literature against these phenomena. We first look at specific parsing algorithms and their cognitive plausibility, and then discuss the main theoretical proposals, including dependency locality theory, surprisal, similarity-based interference, and psycholinguistically motivated tree-adjoining grammar.

**Dr. Stefan Frank**

**Centre for Language Studies, Faculty of Arts, Radboud University**

**Department of Experimental Psychology, University College London**



Stefan Frank is an assistant professor of psycholinguistics at the Faculty of Arts of Radboud University Nijmegen and holds an honorary position as senior research associate at the Department of Experimental Psychology of University College London.

His research interests include sentence and narrative comprehension, computational cognitive modelling, computational linguistics, neural networks, multilingualism, embodied cognition, philosophy of mind, and any combination of these. He currently investigates how probabilistic language models can account for (neuro)physiological measures of cognitive processing during language comprehension, and how structural differences between language affect comprehension processes. In previous projects, he developed a non-compositional representation of the meaning

of propositions and showed how it can be applied in models of inference during story comprehension, the retention of stories, the resolution of ambiguous pronouns, and incremental sentence comprehension. In addition, he studied the application of echo state networks to sentence processing, and investigated to what extent recurrent neural networks display syntactic and semantic systematicity in sentence processing and comprehension.

Personal website: <http://www.stefanfrank.info/>

**Abstract: Neural network models of language acquisition and processing**

Artificial neural network (or “connectionist”) models simulate processing as the interaction between a large number of simple, quantitative processing units (“neurons”) that are linked by weighted connections. Acquisition can be simulated by adapting the connection weights as a consequence of the input the model receives representing the task at hand. Although originally inspired by computation in the brain, connectionist models are not usually viewed as computational neuroscience models, that is, they simulate cognitive representations and processes instead of their biological neural underpinnings. In this lecture, we will survey the most influential connectionist models of multiple tasks involved in language acquisition and processing: word and category acquisition, and syntactic and semantic sentence comprehension and production. We focus in particular on the behavioural and neural data these models are (un)able to account for.

## Dr. Stella Frank

Institute for Logic, Language and Computation, University of Amsterdam



I am a researcher at the Institute of Logic, Language and Computation, in the Universiteit van Amsterdam, working with Khalil Sima'an. Previously, I was at the University of Edinburgh, where I did my Ph.D. with Frank Keller and Sharon Goldwater. My work there involved building Bayesian models of early language learning, ranging from phonetics to morphology and syntactic categories. More recently, I have been working on using visual grounding to align multilingual data using neural network models.

Personal website: <https://staff.fnwi.uva.nl/s.c.frank/>

## Raquel Garrido Alhama

Institute for Logic, Language and Computation, University of Amsterdam



I am a PhD Candidate in the Institute of Logic, Language and Computation, in the Universiteit van Amsterdam. My supervisor is Jelle Zuidema and my promotor is Carel Ten Cate. I work in a project where we compare the mechanisms of linguistic acquisition of songbirds and humans. My role is to develop computational models of artificial language learning to test how different factors - perceptual biases, computational constraints, memory limitations, etc. - influence learning.

Personal website: <https://staff.fnwi.uva.nl/r.garridoalhama/>

### **Abstract: Bayesian models of natural and artificial language learning**

This lecture will present an introduction to the Bayesian modelling framework, a probabilistic modelling framework that describes how one's hypotheses should be updated based on observed data and one's prior beliefs. It is a mathematically rigorous framework; equally importantly, models based on Bayesian principles have been found, in many cases, to match human behaviour.

We will focus on the problem of word segmentation. Segmentation is a task that language learners need to solve for the linguistic input they hear in daily life. This is an ability that infants seem to master from a very young age. As shown by studies on Artificial Language Learning (Saffran et al., 1996; Aslin et al., 1998), 8 month old infants can segment artificially created languages based solely on the distributional information of the input. This same experimental paradigm has been used to study how human segmentation performance varies depending on characteristics of the artificial language.

We will discuss the application of Bayesian models (Goldwater et al., 2006; Goldwater et al. 2009; Frank et al., 2010) to word segmentation in these two scenarios: firstly, to segment child-directed speech corpus data, revealing the statistical properties of the language that make it learnable by the so-called 'ideal learner'; and secondly, to understand the computations performed by participants in Artificial Language Learning tasks. We discuss what can (and what cannot) be learnt about the cognitive processes underlying segmentation using this model.

## Thursday July 14: Language and information in the world by Antal van den Bosch & Piek Vossen

**Prof.dr. Antal van den Bosch**

**Centre for Language Studies, Faculty of Arts, Radboud University**



Antal van den Bosch is professor of Language and Speech Technology at Radboud University Nijmegen.

In his research he develops machine learning and language technology. Most of my work involves the intersection of the two fields: computers that learn to understand and generate natural language. Specific interests include memory-based learning, machine translation, the relation between written and spoken language, text mining, the Dutch language,

computational humanities, and cultural heritage.

Personal website: <http://ant Alvandenbosch.ruhosting.nl/>

**Prof.dr. Piek Vossen**

**Language, Literature and Communication department, Faculty of Arts,  
VU University Amsterdam**



Prof. Vossen is full Professor of Computational Lexicology at the VU University Amsterdam, Head of the Computational Lexicology & Terminology Lab (CLTL), co-founder and co-president of the Global WordNet Association (GWA) and partner in the Centre for Digital Humanities Amsterdam.

His research interests are WordNets, Computational Lexicon, Ontologies, Computational Linguistics, Language Technology and Computer-Applications, both within a single

language and from a multilingual perspective. Vossen is interested in the relation between lexicons and ontologies, from a theoretical point of view as well as from their usage in computer-applications in which meaning and interpretation play a role. He sees the lexicon as a fundamental resource to anchor meaning and interpretation in useful computer behaviour. Computer behaviour can make use of communicative models and insights from communication science. The organization of the lexicon and the knowledge stored in it need to take that usage as a starting point. He combines linguistics and computer science to model understanding of natural language texts by computers.

Personal website: <http://vossen.info/>

### Dr. Alona Fyshe

Department of Computer Science, University of Victoria, Canada



Dr. Fyshe is an Assistant Professor in the Computer Science Department at the University of Victoria. Her interests are Computational Linguistics, Machine Learning and Neuroscience. Her work combines all three of these areas to study the way the human brain processes language.

Models of language meaning (semantics) are typically built using large bodies of text (corpora) collected from the Internet. These corpora often contain billions of words, and thus cover the majority of the ways words are used.

However, to build computer programs that truly understand language, and can understand more rare and nuanced word usage, we need algorithms that can generalize beyond common word usage. By collecting brain images of people reading, she explores how the human brain handles the complexities of language, which could inspire the next generation of semantic models.

Personal website: <http://web.uvic.ca/~afyshe/>

### Dr. Leila Wehbe

Helen Wills Neuroscience Institute, University of California, Berkeley



Dr. Wehbe is a postdoctoral researcher in the Helen Wills Neuroscience Institute at the University of California, Berkeley. She recently received my PhD from the Machine Learning Department and the Center for the Neural Basis of Cognition at Carnegie Mellon University. She was a member of the Brain Image Analysis Group led by Tom Mitchell.

Dr. Wehbe uses functional Magnetic Resonance Imaging (fMRI) and Magnetoencephalography (MEG) to investigate how the brain represents the meaning of words, sentences and stories. FMRI and MEG yield very high dimensional, noisy images and are also expensive to acquire. Part of her work is finding Machine Learning solutions to these brain image problems. Another part of her work is defined by the complexity of language and the inexistence of a comprehensive model of meaning composition. With appropriate experimental settings and computational models, she can study both problems: using existing models of language to study the brain representation of meaning, or using brain data to evaluate different meaning composition hypotheses.

Personal website: <http://www.cs.cmu.edu/~lwehbe/>

#### **Abstract: Language processing in the brain: Mapping neural activity to language meaning.**

People have long been curious about how the brain represents what it knows. What does the brain do when it recalls a concept, and what does it mean to understand a sentence? We explore the brain's representation of the meaning of words, and how the brain integrates linguistic context into sentence understanding. Taking inspiration from previous work in computational linguistics, we define word meaning in terms of numerical representations called word vectors. Combining these word vector representations with machine learning algorithms, we train computational models that map from observed neural activity to these vector representations of meaning. This approach enables us to detect brain representations of a wide variety of linguistic stimuli, even stimuli beyond those used to train the model. This freedom to detect the representation of novel stimuli opens up a whole new world of experimental design wherein we can cover highly diverse stimuli, including experiments where there is no repetition of stimuli at all. We present case studies demonstrating the use of this approach to analyze comprehension of adjective-noun phrases, and reading of entire stories. We close by looking to the future of cognitive neuroscience under these more permissive experimental conditions.

## Prof.dr. Luc Steels

### Institute for Evolutionary Biology (UPF-CSIC) Barcelona



Luc Steels studied linguistics at the University of Antwerp (Belgium) and computer science at the Massachusetts Institute of Technology (USA). His main research field is Artificial Intelligence covering a wide range of intelligent abilities, including vision, robotic behaviour, conceptual representations and language. In 1983 he became a professor of computer science at the University of Brussels (VUB) and founding director of the VUB AI lab. He founded the Sony Computer Science Laboratory in Paris in 1996 and became its first director. Currently he is ICREA research professor at the Institute for Evolutionary Biology (CSIC,UPF) in Barcelona.

Steels has participated in a dozen large-scale European projects and more than 30 PhD theses have been granted under his direction. He has produced over 200 articles and edited 15 books directly related to his research. During the past decade he has focused on theories for the origins and evolution of language using computer simulations and robotic experiments to discover and test them.

Personal website: <https://ai.vub.ac.be/members/steels>

Free download: <http://langsci-press.org/catalog/book/49>

#### **Abstract: The robot language learner**

Getting (physical) robots to speak and understand human language is an incredible challenge. It requires not only very robust speech processing and fast articulatory synthesis, very robust parsing and accurate semantically driven utterance production, but also adequate representations of the context, inference, implicit world knowledge, and the grounding of meaning and knowledge representation in sensory-motor interaction. Moreover, given the huge complexity of human language, all of these capabilities will have to be learned, preferably in interaction with humans, and because robots can be expected to be part of multi-agent systems, so that they can learn from each other, we must address issues how coherence can be reached in a population of artificial agents.

There are two approaches currently being tried to achieve this challenge. The first one is pragmatic. It uses machine learning and information gleaned from the Web to acquire enough heuristics to respond to human requests. The work of Michael Beetz and his team in Munich is characteristic of this approach, and they have already shown that interesting levels of performance can be attained.

The second approach attempts a more principled approach. It seeks detailed models of all the components of the semiotic cycle and learning mechanisms that exploit situatedness, embodiment, turn-taking and shared context. The talk will focus primarily on this approach. Specifically how it could give us open-ended language processing.

**Prof.dr. Walter Daelemans**

**CLiPS Research Center, University of Antwerp**



My research field is computational linguistics. In our team we develop computer models to investigate how people learn, produce, and understand natural language. What knowledge and which computations are necessary for this? We also apply our computational models of language understanding for practical tasks such as question answering, summarization, text analytics, authorship analysis, and so on. Because of its

importance in both human and machine language acquisition, we focus in our research on the theory, methodology and application of Machine Learning methods. In this context, we developed memory-based language processing as an approach with both theoretical and application-oriented ambitions.

Walter Daelemans is professor at the University of Antwerp (UA), teaching Computational Linguistics and Artificial Intelligence courses and co-directing the CLiPS research center. He is a fellow of EURAI and ACL and a member of the Royal Academy of Dutch Language and Literature. He has currently (co-)supervised 24 successfully finished PhDs.

Personal website: <http://www.clips.uantwerpen.be/~walter/>

**Abstract: The robot stylometrist**

Text contains a lot of information. At a first level, the text describes some reality in terms of concepts, relations between concepts, events, and facts. Extracting those is the domain of objective text analysis (text mining). At a second level, we can infer stance, emotion, sentiments, and opinions from text, both from the authors and attributed to others by the author: subjective text analysis. However, this talk will be about a third, lesser known, type of knowledge extraction from text: what we can learn about the author of a text by analysing his or her language use. We can infer to some extent demographic and psychological properties of the author, and in some cases even the identity, not by trying to understand what he or she says, but by analysing how it is said. We will call this computational stylometry. In this case our evidence is indirect; unlike in objective and subjective text analysis we do not find any direct clues about fact or opinion in the text, instead we have to rely on indirect evidence: patterns of function words, distributions of syntactic structures, punctuation patterns, and more generally anything that can help us analysing the style in which a text was written. The approach we take is a kind of reverse sociolinguistics. Where sociolinguists describe how differences in age, gender, education level, social class and related properties are correlated with specific language variation, in computational stylometry we try to predict these author properties using systematic language variation between groups as evidence. The most successful methodology for this is to apply a machine learning methodology. In this talk, I will give an overview of this approach and discuss some achievements and interesting problems with it.



**Prof.dr. Emiel Krahmer**

**Tilburg Center for Cognition and Communication (TiCC), Tilburg School of Humanities,  
Tilburg University**



How do people communicate with each other? How do they exchange information, both verbally and non-verbally, using speech, gestures and facial expressions? In his research, Emiel Krahmer combines computational models and experimental studies to gain a better understanding of human speech production, which in turn may lead to improvements in the way computers present information and communicate with human users.

Krahmer is an expert in Automatic Text Generation, a subfield of Artificial Intelligence which studies how computers can automatically generate coherent natural language text based on input data. Using insights from human speech production, he tries to improve existing text generation methods. In his recently completed NWO [Vici project](#) he studied the production of referring expressions (descriptions like “the tall man”), using both computational modeling techniques and experimental production studies. More recently, he has been involved on externally

funded projects on language and emotion, automating newsrooms, robot tutors and online discussion summarization.

Emiel Krahmer is a full professor of Language, Cognition and Computation, and scientific director of the Tilburg center for Cognition and Computation (TiCC), one of five centers of excellence at Tilburg University.

Personal website: <https://www.tilburguniversity.edu/webwijs/show/e.j.krahmer.htm>

**Abstract: The robot writer**

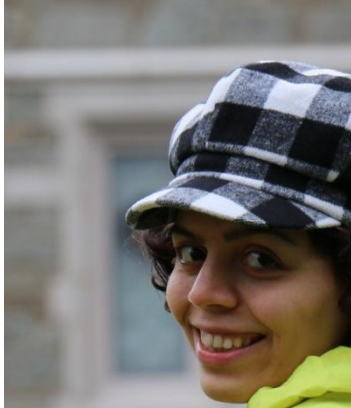
Robot writers automatically produce coherent natural language text on the basis of input data, which has various potential applications, ranging from automated journalism to the description of patterns observed in brain scans. In this introduction to robot writing, I will start with describing what robot writers are, how they are built, and why researchers are interested in them. As we will see, one way to look at robot writers is as implementations of psycholinguistic models of speech production, and we shall review the similarities and differences between such models and computational text generation models. In general, I will make a case for robot writers as a research tool for computational cognitive modelling of language production. Finally, the future of robot writing will be discussed, with a focus on creative text production, asking to what extent robot writers can be expected to write more creative text, such as jokes and stories.

## 4. PRESENTATION OF PARTICIPANTS

### **Samira Abnar**

Institute for Logic, Language and Computation, University of Amsterdam

Graduate Program in Logic



I am a PhD student at ILLC. My research is about computational models of human cognition aiming at both understanding more about the human brain, and building tools to help people in their daily tasks. Currently, I am investigating neural models to see to what extent they can be creative in generating or inferring linguistic rules. During my PhD, I want to apply deep neural networks for language and vision to study language evolution.

Title Poster: Emergence of Language in a Population of Deep Neural Nets

### **Midas Anijs**

Max Planck Institute for Psycholinguistics

IMPRS Graduate School



I am a first-year PhD student in the Neurogenetics of Vocal Communication Group of the Max Planck Institute for Psycholinguistics. I am studying genes involved in language disorders to understand their roles in the development and function of human neurons. By studying the causes of language disorders, I aim to identify common themes in how molecular and cellular functions of these genes contribute to the normal development of language. For my research, I use human neurons that are generated from stem cells.

Title Poster: Investigating the shared functions of language-related genes using human neurons

### **Pashiera Barkhuysen**

Donders Institute - Centre for Cognition, Radboud University



Pashiera Barkhuysen is a postdoc knowledge transfer at the Donders Centre for Cognition in Nijmegen. Within the Language in Interaction (LiI) Consortium she is responsible for disseminating LiI research output through socially relevant applications such as therapies, apps and web applications. She developed a series of language apps (apps.languageininteraction.nl) in close collaboration with LiI researchers that are now available for free on the App Store, Google Play store, and on the web. These apps disseminate

and/or apply research results, while some of them also collect data for the aim of improving the effectivity of the app or for research purposes.

Her PhD research focused on pragmatic aspects of spoken, semi-natural interactions, where she explored the role of the visual modality (e.g. facial expressions) and the auditory modality for expressing prosody in different conversational contexts. Her background in cognitive psychology (psycholinguistics) and her ICT work experience in various job roles for hospitals and private companies helps her in designing implementations on intersections of language and psychology in clinical and technological settings.

Pashiera will coordinate the demonstration session of computer programs on the section day of Language and information in the world on July 14. During this session she will also demonstrate the six apps developed by Language in Interaction.

### **Julia Berezutskaya**

University Medical Center Utrecht

Utrecht University Graduate School of Life Sciences



I am a PhD student at the University Medical Center in Utrecht and I work with Nick Ramsey and Peter Desain. I hold two Master's degrees: in Cognitive Neuroscience and Linguistics. Towards my PhD I investigate cortical representations of language by applying data-driven techniques to ECoG and fMRI data. Apart from work, I am quiet passionate about horse riding and acting. I also like learning new languages and occasionally play some piano.

Title Poster: Low-level Encoding of Continuous Speech Perception in ECoG High Frequency Band

**Luis Miguel Berscia**

Max Planck Institute for Psycholinguistics  
IMPRS Graduate School



Luis Miguel Rojas-Berscia is a Peruvian linguist. He is currently working on Shawi, an Amazonian language spoken in the Upper Amazon. His work combines linguistic fieldwork, variationist linguistics, and descriptive linguistics.

Title Poster: The Babel Problem: Variation in Shawi Grammar

**Hans Rutger Bosker**

Max Planck Institute for Psycholinguistics



I'm working as a Postdoc at the Max Planck Institute for Psycholinguistics. My background is in phonetics and psycholinguistics. I study the production and perception of speech rate, with a particular interest in neural entrainment to speech. Recent work focuses on how the speech rate of a context sentence influences the perception of subsequent speech (rate normalization). I mainly use behavioral methods and MEG.

Title Poster: Our own speech rate influences speech perception

**Dick van den Broek**

Max Planck Institute for Psycholinguistics



I have a background in physics. During my master project on optimal control theory I came into contact with topics in machine learning and neural networks. Following this interest I came to work as a research assistant at the MPI. Here I worked on models of spiking neural networks for language processing and came to appreciate the intricacies of language studies. I will continue my work in a PhD position starting next September.

Title Poster: Spiking Neural Networks for Semantic Processing

**Merel Burgering**

School for Social and Behavioral Sciences, Tilburg University  
Donders Graduate School for Cognitive Neuroscience

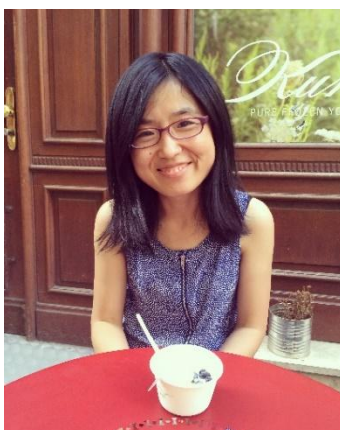


My name is Merel Burgering. I started my PhD project on perception of multidimensional speech sounds in humans and songbirds in February 2015. I'm currently working most of the time at Behavioural Biology department in Leiden. Soon, I will start an fMRI study on speech perception in Maastricht. Besides science in general and especially (neuro)biology and psychology, I'm contributing to science communication by blogging for Kennislinks' Faces of Science.

Title Poster: Perception of vowels and sex of speaker: a comparative study on auditory categorization

**Bohan Dai**

Max Planck Institute for Psycholinguistics  
IMPRS Graduate School



I am a PhD student in the Max Planck Institute for Psycholinguistics. My research is concerning with understanding language in adverse conditions, which is so 'easy' for human being and so 'hard' for computers. I mainly use MEG to investigate the underlying neural mechanism: oscillations tracking the target speech and oscillations inhibiting the background sound.

Title Poster: Pure linguistic interference during comprehension of competing speech signals

**Robert Deckers**

Company owner

PhD study in collaboration with Dept. of Computer Science, Faculty of Sciences, VU Amsterdam

SIKS Research school



Robert Deckers has been working in the area of architecture, model driven development, and requirements engineering since 1991. He has researched and developed specification methods and supporting tools. Robert is author of the book "DYA|Software, architecture approach for mission critical applications“, and also shares his knowledge via courses, presentations, and coaching. His device for the architect is “be like an explorer, think like a guard and act as a guide”. In 2013 he has started his own company to devote himself to his vision: software development is about integrating and transforming human knowledge and not about realizing technology.

Title Poster: The smallest software particle

**Paolo Devanna**

Max Planck institute for Psycholinguistics

IMPRS Graduate school



I am a first year PhD student at the Max Planck institute for Psycholinguistics in Nijmegen, in the Neurogenetics of Vocal Communication group, and part of the IMPRS graduate school. I have developed an extensive background in biotechnology and molecular biology and I'm applying it to understand how genes and genetic mutations affect the biological substrates that underlie language.

As part of a multidisciplinary research endeavor I use new approaches to look at non-coding DNA with regulatory functions that direct when, where and how much of the protein has to be produced.

By looking at this previously neglected part of the genome I expect to identify new genes associated with language disorders, which

will foster our knowledge of the genetic basis of language and inform us about novel molecular pathways and mechanisms that underlie human ability to speak.

Title Poster: Digging deeper in next generation sequencing data: identification of functional non-coding variants that contribute to neurological disorders (an SLI case study)

### **Linda Drijvers**

Centre for Language Studies, Faculty of Arts, Radboud University  
IMPRS Graduate School



Linda Drijvers is a PhD Candidate in the Multimodal Language & Cognition Lab at Radboud University, as well as the Neuronal Oscillations Lab at the Donders Centre for Cognitive Neuroimaging. In her PhD, she researches how functional brain networks support gestural enhancement of degraded speech. Using magnetoencephalography (MEG) and electroencephalography (EEG), she investigate whether oscillatory synchronization within and between brain regions predicts the degree of integration and comprehension of speech coupled with co-speech gestures in adverse listening conditions. She studies these enhancement effects, oscillatory dynamics, functional connectivity patterns and ERP/ERF's in both native as non-native listeners, to understand whether both groups have a similar benefit effects of these visual cues. Additionally, she investigates whether there is a general brain mechanism that can account for these enhancement effects.

Title Poster: Drijvers, L., Ozyurek, A., Jensen, O. Gestural enhancement of degraded speech comprehension engages the language network, motor and visual cortex as reflected by a decrease in the alpha and beta band.

### **Nicole Eichert**

Graduate Training Centre of Neuroscience Tübingen  
Max Planck Institute for Psycholinguistics



I'm a master student at the Graduate Training Centre of Neuroscience in Tübingen and due to my strong interest for language studies I decided to perform my final project at the Max Planck Institute for Psycholinguistics in Nijmegen. In the department for Neurobiology of Language I study language-driven anticipatory eye movements in virtual reality to investigate the interplay between linguistic and visual information processing in a more naturalistic environment. I will continue my studies as graduate student in a Doctoral Programme in Neuroscience at the University of Oxford. In the future I want to understand more deeply, what the neurobiological infrastructure for the uniquely human capacity of language is.

Title poster: Language-driven anticipatory eye movements in virtual reality

**Frank Eisner**

Donders Institute - Centre for Cognition, Radboud University



Frank is a postdoc at the Donders Centre for Cognition. His research focuses on the functional and neural organisation of speech perception, in particular in how the system is shaped by learning. Recent projects investigate how speech perception interacts with memory, reading, and speech production.

Title Poster: Specialised memory systems for learning spoken words

**Fabian Heim**

Institute of Biology, Leiden University  
Faculty of Science Graduate School



I completed both my Bachelor's and Master's on genetic links to behaviour in Tübingen and Hohenheim in Germany. I started my PhD within LII in September 2014 and am part of a joint project between Leiden University, the MPI for Psycholinguistics in Nijmegen and the Freie Universität Berlin. Within this project I am finally able to connect my personal interest for birds with my scientific interest on the molecular processes behind complex behaviours such as language. Due to the people and institutes involved I am able to apply a wide range of methods that will help to shed light onto how FoxPs influence molecular mechanisms of auditory processes in songbirds. Ultimately, I hope that my research on vocal learning zebra finches will enable us to gain insights into how language perception works on the molecular level.

Title Poster: The Neglected Side of FoxPs - How does FoxP1 affect auditory perception?

**Dieuwke Hupkes**

Institute for Logic, Language and Computation, University of Amsterdam  
Graduate Program in Logic



My name is Dieuwke, I am working as a PhD student at the Institute for Logic, Language and Computation, under supervision of Willem Zuidema. I have a bachelor's degree in Physics and Astrophysics and a Master's degree in Logic (with a focus on computational linguistics). During my Master's I spent a semester in Edinburgh, where I studied machine learning techniques and (cultural) language evolution. In my PhD project my focus is on discovering more about how language could be implemented in the brain, through developing a recurrent artificial neural network that can do semantic parsing.

Title Poster: Can Sequential Neural Networks Solve Hierarchical Tasks?- Processing Arithmetics as a language using sequential and tree based networks (joint work with Sara Veldhoen).



**Sara Iacozza**

Max Planck Institute for Psycholinguistics  
IMPRS Graduate school



I am a PhD student at the Max Planck Institute for Psycholinguistics, in the Psychology of Language Department. I am genuinely interested in how language unfolds in social contexts. In fact, lexical choices vary from person to person, and social characteristics of the speakers have been shown to alter the way we comprehend what is said. In my research project, I aim at understanding how encoding and storage of newly learned lexical items, as well as predictive mechanisms, are modulated as a function of the speakers' identity.

Title poster: Processing the language of In- versus Out-group members

**Lisette Jager**

Centre for Linguistics, Leiden University  
Landelijke Onderzoeksschool Taalwetenschappen



My name is Lisette Jager and I am currently working as a PhD student at the Leiden University Centre for Linguistics. The central question of my research project is whether or not brain potentials can reflect individuals' potential to learn a second language. Under the supervision of Prof. Niels Schiller and Prof. James McQueen, I aim to answer this question by examining neural measurements of L1/L2 interactions and by comparing these measurements with L2 production results over time.

Title Poster: The first steps towards an analysis of how brain potentials can reflect second language acquisition potentials.

**Nikki Janssen**

Donders Institute - Centre for Cognition, Radboud University  
DGCN Graduate school



Nikki Janssen is PhD student at Donders Center for Cognition. She holds a Bachelor degree in Medicine as well as Psychology and completed her Master in Health-care Psychology at the Radboud University in Nijmegen.

Within the Language in Interaction Consortium, Nikki will investigate the functional contribution of the ventral and dorsal pathways to speaking by assessing whether connectivity measures predict language performance for both healthy speakers and patients with primary progressive aphasia (PPA). Neuroimaging techniques will be used in order to measure linguistic and behavioural performance relative to brain function, structure and connectivity.

In doing so, the project aims to illuminate the contributions of ventral and dorsal pathways to speaking, which is not only of fundamental but also practical importance, as it may further validate a clinical test for PPA in terms of underlying brain atrophy.

Title poster: Logopenic variant of primary progressive aphasia – Case report

**Dilay Karadoller**

Max Planck Institute for Psycholinguistics  
IMPRS Graduate school



I completed my undergraduate studies in Department of Psychology at Bogazici University, Turkey (2013), where I discovered my interest in research mainly on cognitive sciences. After graduation I did my masters on Psychological Sciences in Bogazici University (2016). Throughout my undergraduate and graduate years I worked in two projects to investigate differences in autobiographical memory properties of blind and sighted individuals. I wanted to extend my studies on testing deaf individuals who use different modality during my PhD studies at Radboud University and IMPRS, Max Planck Institute for Psychological Sciences. My research mainly focuses on

understanding the differences in spatial memory and spatial attention between deaf individuals who learn sign language right after birth and hearing individuals, as well as deaf individuals who learn to sign later in life.

Title Poster: Effect of Language Modality on Development of Spatial Cognition and Memory

**Arnold Kochari**

Institute for Logic, Language and Computation, University of Amsterdam  
Graduate Program in Logic, ILLC



I am a PhD candidate within the LI consortium based at the University of Amsterdam. My PhD project is about processing vague adjectives like "big", "tall" and "expensive" which do not have any clearly defined meaning and yet are not an obstacle to successful communication, but quite the opposite. In my research, I am currently trying to merge theories and methods from cognitive psychology and semantics.

Title poster: Perceiving using analog magnitude representations, and communicating using vague adjectives

**Jana Krutwig**

Donders Institute - Centre for Cognition, Radboud University  
IMPRS Graduate School



As part of the Donders Centre for Cognition, I have been working on investigating the interaction between the production and perception systems during second language learning. So far, I have been mostly concerned with behavioural feedback loops underlying the development of novel speech categories, as well as neural changes reflected in the EEG signal measured throughout the time course of an English speech category training in Dutch natives. In the near future, I will focus on using the obtained knowledge to develop and test a neurofeedback system training similar novel speech categories. For this, I have been supervised by James McQueen, Peter Desain and Makiko Sadakata and am based at the Brain-Computer-Interface group of the

Cognitive Artificial Intelligence department here in Nijmegen.

Title Poster: Perception and production interactions in non-native speech category learning

**Alessandro Lopopolo**

Centre for Language Studies, Faculty of Arts, Radboud University  
SIKS research school



I am a PhD candidate at the Center for Language Studies of the Radboud University and at the IMPRS. My project aims to combine computational linguistics features extraction and neural decoding techniques. The coupling of computational linguistic features and brain activity will allow optimal probing of the spatial and temporal localization of how the linguistic properties of the stimuli are encoded in the human brain. Moreover, I am currently working on mapping different types of stochastic information processed by the brain during natural language comprehension.

Title Poster: Mapping the Lexical, syntactical and phonological information of naturalistic language stimuli in the brain using Markovian models.

**Andre Marquand**

Donders Institute - Centre for Cognitive Neuroimaging, Radboud University



Andre Marquand is a neuroscientist interested in the development of novel statistical techniques to further the understanding of human brain function. He has a particular focus on machine learning techniques that aim to learn to detect patterns of statistical regularity in empirical data. These methods aim to learn to detect patterns of statistical regularity in empirical data and hold significant promise for decoding cognitive states and predicting clinically relevant variables in health and disease.

Title Poster: Are you normal? Probabilistic normative models for neuroimaging

**Valeria Mongelli**

Max Planck Institute for Psycholinguistics  
IMPRS Graduate School



I am a 1st-year PhD student at Max Planck Institute for Psycholinguistics, in the Neurobiology of Language group. After a Bachelor in Philosophy, a Master in Linguistics and a Master in Cognitive Neuroscience, I decided to spend my PhD investigating the causal relations between language and consciousness. My work is jointly supervised by Peter Hagoort (Max Planck Institute for Psycholinguistics; Donders Institute for Brain, Cognition and Behaviour) and Simon Van Gaal (University of Amsterdam; Donders Institute). I am currently running the first of a series of EEG and fMRI visual masking studies that aim to explore the conscious and unconscious processing of sentence-level, semantic operations. These studies will hopefully shed a

light on whether the neural encoding of semantic roles necessarily requires consciousness.

Title Poster: Can we combine meanings without knowing it? Exploring relations between semantics and consciousness

**David Neville**

Donders Institute - Centre for Cognitive Neuroimaging, Radboud University



David Alberto Neville is postdoc researcher at the Centre for Cognitive Neuroimaging of the Donders Institute. His research focuses on understanding how mnemonic and linguistic processes interact during the accumulation of semantic conceptual information (knowledge), with particular emphasis on the underlying neurocomputational mechanisms.

Title Poster: Geometries of conceptual spaces

**Izabela Przezdziak**

Donders Institute - Centre for Cognitive Neuroimaging, Radboud University  
Donders Graduate School for Cognitive Neuroscience



Izabela Przezdziak is a PhD student at the Donders Center for Cognitive Neuroimaging. She holds a Bachelor`s degree in Psychology and a Master`s degree in Brain Imaging and Cognitive Neuroscience.

Her research within the Language in Interaction Consortium focuses on the language and memory networks interaction. Her main interest is the use of functional magnetic resonance imaging (fMRI) toward understanding the dynamics between these two networks and investigation into the interaction between different memory processes involved in language acquisition. As information processing in the brain is very often topographically organised, such organisation and fine-grained functional segmentations across these two domains will be

analysed using novel connectivity methods.

Title Poster: Mapping the cortico-hippocampal connectivity gradient in single subjects using resting-state fMRI.

**Iris van de Pol**

The Institute for Logic Language and Computation, University of Amsterdam  
Graduate Program in Logic



Iris van de Pol is a PhD candidate at the Institute for Logic Language and Computation at the University of Amsterdam, and she is a member of the Computational Cognitive Science group at the Donders Institute for Brain, Cognition and Behaviour in Nijmegen. She works on logic-based computational models of communication, using epistemic logic, game theory, and parameterized complexity analysis. Specifically, she focusses on pragmatic and non-linguistic communication, and the role of theory of mind. She is also interested in philosophy of cognitive science, in particular in the different levels of investigation used in cognitive science and related

methodological and philosophical issues.

Title Poster: Computational models of Pragmatic Communication

**Marpessa Rietbergen**

Donders Institute - Centre for Cognition, Radboud University  
IMPRS Graduate school



I am Marpessa Rietbergen, PhD Candidate at the Donders Institute and Centers for Cognition and Cognitive Neuroimaging at Radboud University, and the Max Planck Institute for Psycholinguistics. I work with Ardi Roelofs and Roshan Cools on a project that focuses on cognitive control during language planning and production. The current methods we are using are fMRI and DTI techniques to investigate the mechanisms of subcortical structures and their involvement in flexible top-down cognitive control during the planning and production of speech.

Title Poster: Cognitive Control over vocal and manual output: Examining the influence of response modality on updating, inhibiting and shifting

**Joe Rodd**

Max Planck Institute for Psycholinguistics  
IMPRS Graduate School



Joe Rodd is a PhD student at the Max Planck Institute for Psycholinguistics and at the Centre for Language Studies, Radboud University.

His project within the Language in Interaction consortium is about the production of accelerated and decelerated speech, and began in February 2016. His research uses computer simulation to derive predictions about the kind of errors that should arise in accelerated and decelerated speech according to various plausible theories of the lexical access and phonological encoding, with the aim of unravelling the psychological mechanisms involved in controlling speech rate. The predictions of the simulations will be compared to productions elicited under conditions

where speech rate is controlled, focusing on dependent variables such as phonetic measures of reduction and co-articulation, speech onset times and rates of phonological and semantic errors.

Title Poster: How to slow down and speed up: controlling speech rate

**Daniel Sharoh**

Donders Institute - Centre for Cognitive Neuroimaging, Radboud University  
Donders Graduate School for Cognitive Neuroscience



Daniel is a PhD student in the Neurobiology of Language group at the Donders Centre for Cognitive Neuroimaging. He works on laminar fMRI and directed connectivity in the language domain. The purpose of his research is to generate new knowledge pertaining to the functional organization of cortical areas involved in language processing.

Title Poster: Investigation of Depth-Dependent BOLD During Language Processing

**Irina Simanova**

Donders Institute - Centre for Cognition, Radboud University



Irina Simanova is Postdoc at the Donders Centre for Cognition. Her research concerns the functional relationship between language and other cognitive systems in the brain, in particular, sensory perception. Language is intervened with sensory perception in many ways. Fast integration of linguistic input and multi-modal sensory information is crucial for social communication. On the other hand, categorical structure provided by language could shape sensory perception. Simanova's current research within the our consortium addresses these different sides of the interaction between multi-modal perception and language.

Title Poster: Decoding of concepts within and across semantic categories.

**Lot Snijders Blok**

Human Genetics Department, Radboud UMC  
Donders Graduate School for Cognitive Neuroscience



Lot Snijders Blok is a PhD candidate in a collaborative project between the Human Genetics department of the Radboudumc and the Max Planck Institute in Nijmegen. She holds a Master degree in Medicine and worked the last years in Clinical Genetics. Her research will focus on the genetics of speech and language disorders. In her project she will combine speech/language- and neurocognitive phenotyping with various molecular laboratory technologies, to shed new light on the neurobiological background of speech and language.

Title Poster: Genomics of speech and language disorders: the next generation



### **Shuang Song**

Max Planck Institute for Psycholinguistics



My name is Shuang Song and I am now a visiting student at the Language and Genetics department, Max Planck Institute for Psycholinguistics. I am a 2nd year PhD student from School of Brain and Cognitive Science, Beijing Normal University, China. When I was working for my master degree, I did some research about the cognitive bases of reading development and reading disability. I am now very interested in the biological bases in dyslexia and reading development, as well as the integration of gene, brain, and behaviour.

Title Poster: The influences of early language development on school-age Chinese literacy ability.

### **Rene Terporten**

Max Planck Institute for Psycholinguistics

IMPRS Graduate School



I am a fresh PhD student in the neurobiology of language department of the Max Planck Institute for Psycholinguistics. After completion of my Bachelor in Psychology and my Master in Cognitive Neuroscience, I decided to investigate the neural network dynamics during language processing. For that I focus on changes in neuronal oscillations that are induced by context constraints, as measured by e.g. MEG. With my research I hope to not only clarify the role of oscillations during language processing, but I also aim to highlight how relevant areas in a language network exchange information over time.

Title Poster: The Influence of Context Constraints on a Language Network

### **Stephanie Theves**

Donders Institute - Centre for Cognitive Neuroimaging, Radboud University  
Donders Graduate School for Cognitive Neuroscience



Stephanie Theves is a PhD student at the Donders Centre for Cognitive Neuroimaging based in Nijmegen. She holds a Bachelor degree in Psychology and a Master degree in Interdisciplinary Neuroscience from the University of Frankfurt.

Her research within the Language and Interaction Consortium focuses on the neural basis of conceptual semantic memory. In her project she uses high-field functional MRI and multivariate data analyses to map the emergence of conceptual knowledge representations over the course of learning in the hippocampal-prefrontal-thalamic circuit. This project will help to understand how conceptual meaning is assigned to novel information, entailing implications for research on semantics and semantic memory.

Title Poster: Tracking the emergence of hierarchical concept representations

### **Lara Todorova**

Donders Institute - Centre for Cognition, Radboud University  
Donders Graduate School for Cognitive Neuroscience



Lara Todorova is a PhD student at Donders Center for Cognition. She received her Bachelor in Theoretical and Applied Linguistics at Russian State University for the Humanities, and completed her Research Master in Cognitive Science at the University of Trento.

During her Internship at the Donders Center for Cognitive Neuroimaging, she worked on a visual mental imagery project within Prediction and Attention lab headed by Floris de Lange. They studied the nature and the dynamics of visual mental imagery using multivariate pattern analysis with MEG. Within the Language in Interaction Consortium, Lara will investigate how language can influence perception of facegender using fMRI. This project will provide new insides about how language modifies predictions in the

brain and how sensory information is filtered and interpreted based on those cross-modal predictions.

Title Poster: Effects of linguistic priming on face gender perception

**Chara Tsoukala**

Center for Language Studies, Faculty of Arts, Radboud University  
Landelijke Onderzoeksschool Taalwetenschappen



Chara Tsoukala is a PhD Candidate at the Center for Language Studies of Radboud University Nijmegen. She holds a Bachelor's degree in Computer Science and a Master's degree in "Human-Machine Communication" from the University of Groningen. For her MSc thesis she moved to Edinburgh to work with the Statistical Machine Translation group on Interactive Translation Prediction. Through translation she got interested in multilingualism, and in her current project she is developing a computational cognitive model to investigate sentence production and code-switching behaviour in multilinguals.

Title Poster: Uncovering the mechanisms of language switching using computational modeling.

**Marvin Uhlmann**

Max Planck Institute for Psycholinguistics  
IMPRS Graduate School



Marvin Uhlmann is a PhD student in the Department Neurobiology of Language at the Max Planck Institute for Psycholinguistics. He completed his Bachelor in Physics at ETH Zürich and received a Master's degree in Cognitive Neuroscience at the Donders Institute in Nijmegen.

The PhD project in the Language in Interaction consortium focusses on developing neurobiologically realistic computational models of language processing using recurrent networks of spiking neurons. The goal is to develop a neural network model based on biologically realistic neuron models and network architectures that has processing memory and is able to incrementally interpret vector representations of words in terms of thematic roles.

Title Poster: Dealing with the problem of two: temporal binding in sentence understanding with neural networks

**Shruti Ullas**

Cognitive Neuroscience, Maastricht University  
Faculty of Psychology and Neuroscience Graduate School



Shruti is a PhD student at Maastricht University, where she studies auditory and speech perception. Her current project focuses on how phoneme category boundaries are susceptible to adjustment when listeners utilize various cues being produced by a speaker, such as lexical or lip-reading information. She also aims to use high-field 7T fMRI to investigate the neural basis of these two forms of phoneme boundary recalibration in order to determine the possible similarities and differences.

Title Poster: Lexical and lip-reading information as sources of phoneme boundary recalibration

**Tobias Winner**

Donders Institute - Centre for Cognition, Radboud University  
Donders Graduate School for Cognitive Neuroscience



Tobias Winner is a PhD student at the Centre for Cognition of the Donders Institute for Brain, Cognition and Behaviour. His research within the Language in Interaction Consortium focuses on the neurocomputational mechanisms of communicative pointing. In this project, behavioral and neuroimaging experiments are combined with computational modeling to investigate how communicative intentions interface with the motor system during the planning and control of pointing movements.

Title Poster: Recipient Design and Perspective Taking in Communicative Pointing

## 5. PRACTICAL INFORMATION

### Addresses and contact information

Language in Interaction Office

<https://www.languageininteraction.nl/>

Programme coordinator Sander Berends: [s.berends@donders.ru.nl](mailto:s.berends@donders.ru.nl),

tel. +31-24-3619838 (office)

Secretary Carolin Lorenz: [c.lorenz@donders.ru.nl](mailto:c.lorenz@donders.ru.nl)

tel. +31-24-3666272 (office)

*Venue Summer school:*

Hampshire Hotel Holthurnsche Hof

Zevenheuvelenweg 48a - 6571 CK - Berg en Dal, the Netherlands

Tel. +31 (0)24 684 17 44

Email: [info.holthurn@hampshire-hotels.com](mailto:info.holthurn@hampshire-hotels.com)

<https://www.hampshire-hotels.com/en/hampshire-hotel-holthurnsche-hof>

*Addresses Social Events:*

Golfcourse Rijk van Nijmegen

Postweg 17, 6561 KJ Groesbeek

Tel. 024 397 6644

<https://www.golfenophetrijk.nl/nijmegen.html>

Lasergaming Nijmegen

Ziekerstraat 3, Nijmegen

<http://www.laserquestnijmegen.nl/>

Muziem

Keizer Karelplein 32H, 6511 NH Nijmegen (in Stadschouwburg Nijmegen)

Tel. 024 322 1681

<http://muzieum.nl/>

Restaurant de Stadstuyn

Graafseweg 32-34, 6512 CC Nijmegen

Tel: 024 323 8312

<http://destadstuyn.nl/>

### Declaration of expenses

We cover the following expenses of speakers and section editors:

- 2<sup>nd</sup> class return train fare or economy flight from your home city to Nijmegen (direct way)
- An allowance of €0,19/km if you come by car (free parking available).
- Accommodation and food/drinks at Holthurnsche Hof for up to 3 days.
- Taxi transport between Nijmegen central station and Holthurnsche Hof

Please keep original tickets and any related boarding passes for later reimbursement. You have received a declaration form for the reimbursement of your travel costs. After you return home you can send me a scan of the completed and signed form together with the scanned tickets and receipts.

For questions on the reimbursement of costs you can contact Carolin Lorenz ([c.lorenz@donders.ru.nl](mailto:c.lorenz@donders.ru.nl)).

## Directions to social events during Summer school

### Social event Wednesday July 6th

On July 06th, you will receive a lunch bag (provided by the Holthurnsche Hof) at 12.00h. For the afternoon, you can take part in either a Golf Clinic or in Laser gaming. Each event has room for a maximum of 25 people. If you have a preference for one of the two events, you should inform Sander Berends about it in advance (from Monday July 04 onwards). The day will end with a barbeque at the golf course for ALL participants (thus from both groups).

#### Group 1: Golf Clinic

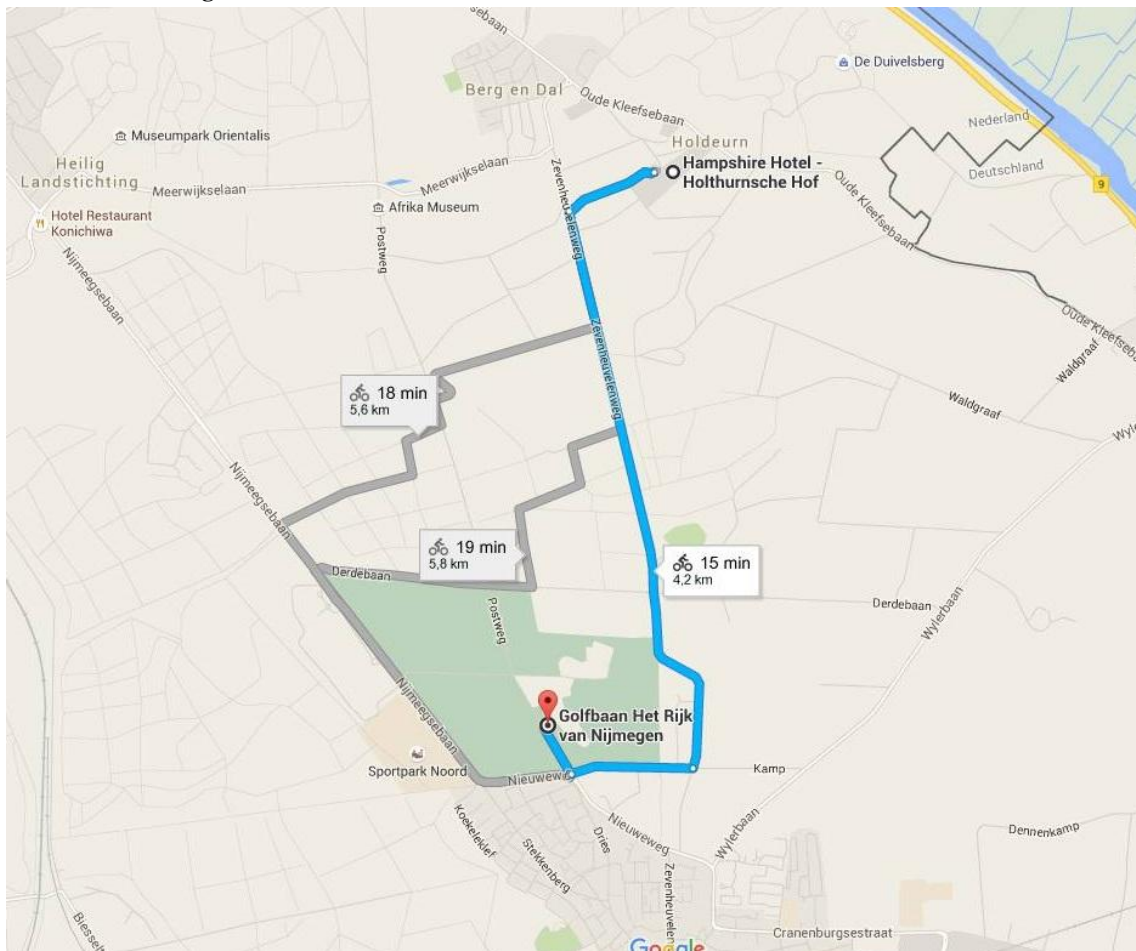
Starting time 13:30 h

Contact-person: Andre Marquand

Golfcourse Rijk van Nijmegen  
Postweg 17, 6561 KJ, Groesbeek  
Tel.024 397 6644

<https://www.golfenophetrijk.nl/nijmegen.html>

Directions from Hotel Holthurnsche Hof to golf course (4.2 km; 15 min by bike): follow the Zevenheuvelenweg.



## Social event Wednesday July 6th

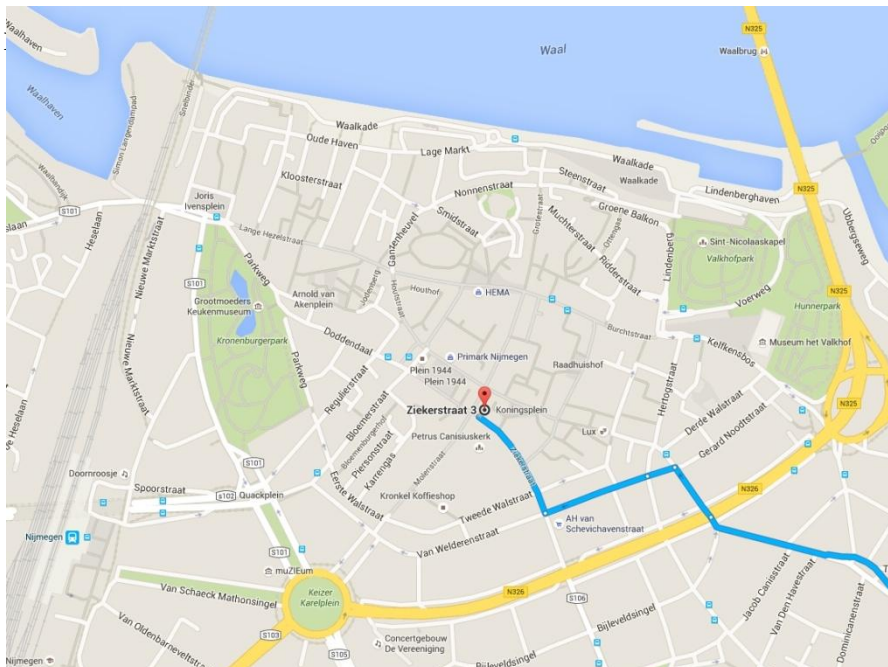
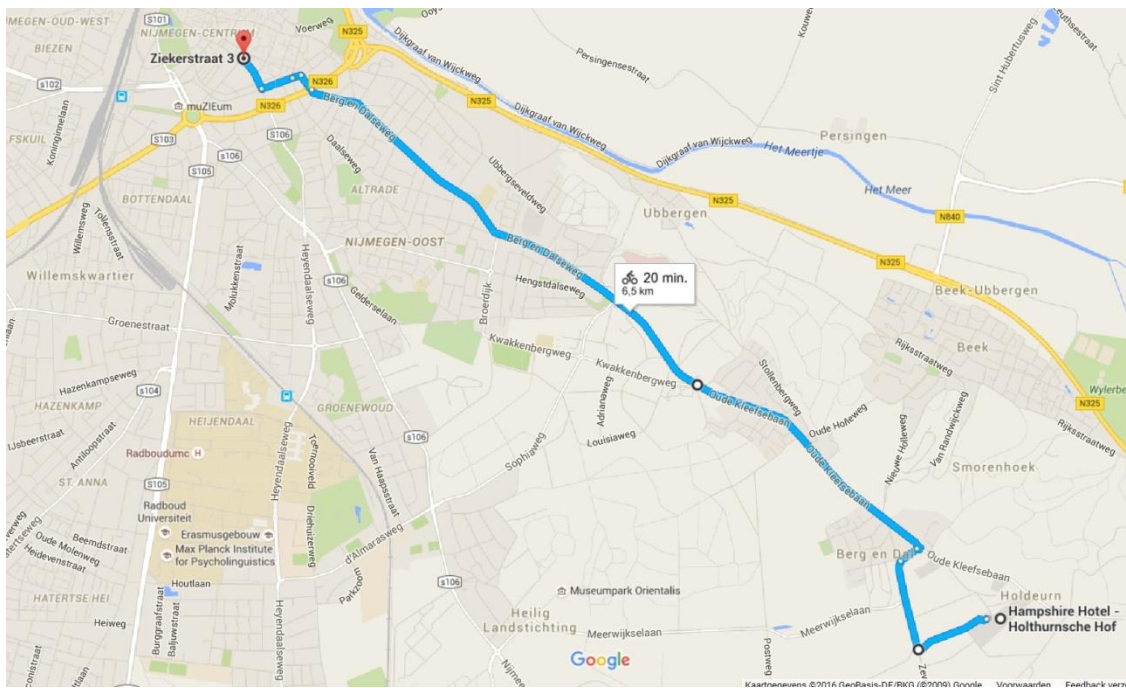
### Group 2: Laser Game

Starting time 14:00 h

Contact-person: Sander Berends

LaserQuest Nijmegen  
Ziekerstraat 3, Nijmegen  
<http://www.laserquestnijmegen.nl/>

Directions from Hotel Holthurnsche Hof to LaserQuest (6.5 km; 20 min by bike): cycle straight ahead following the Berg en Dalseweg.



## Social event Wednesday July 6th

### Barbeque at Golf course

Group 1 (golf clinic) and 2 (laser game) combined

Starting time 18:00 h

Contact-persons:

Participants already at golf course: Andre Marquand

Participants from Laser gaming: Sander Berends

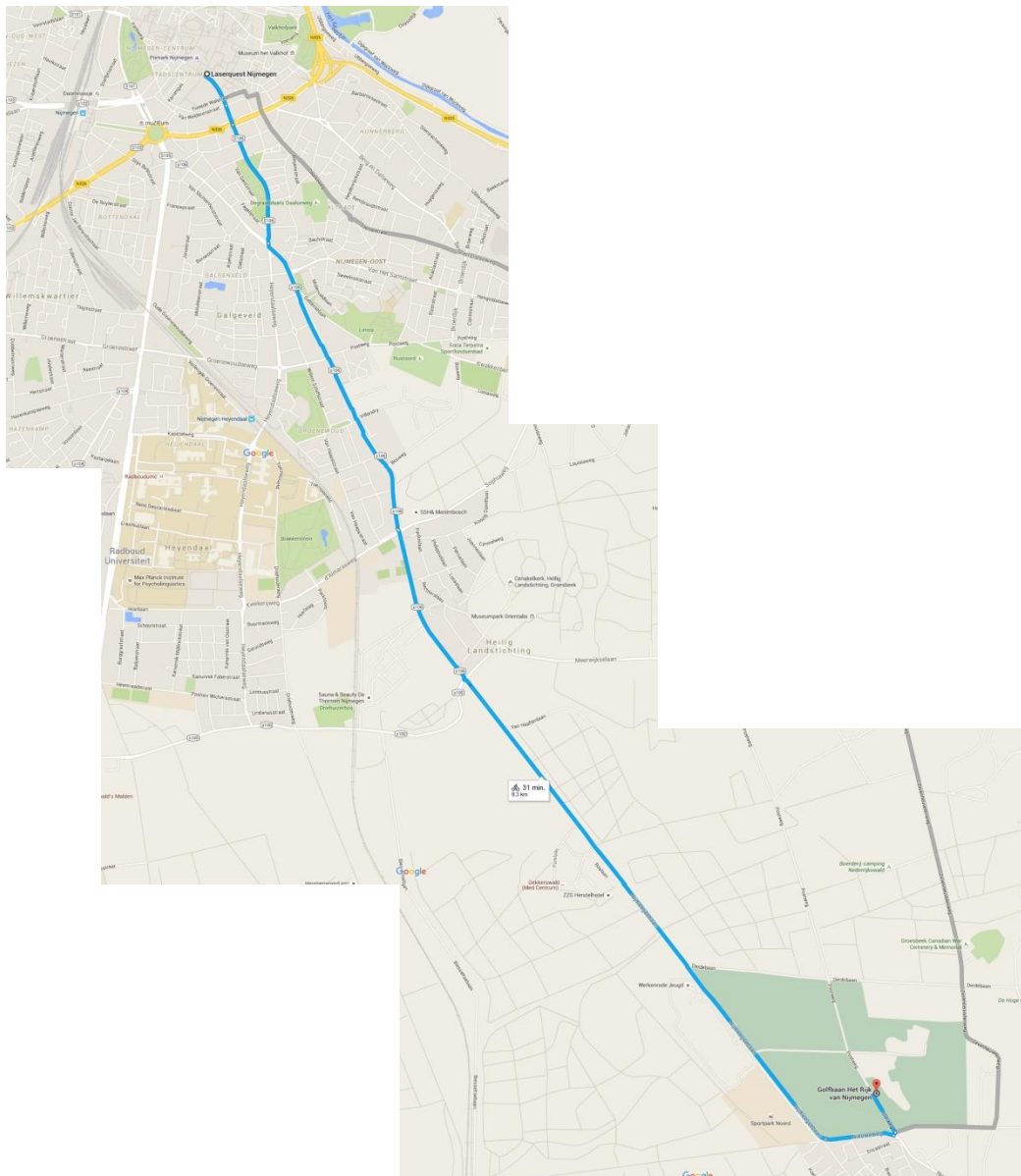
Golfcourse Rijk van Nijmegen

Postweg 17, 6561 KJ, Groesbeek

Tel.024 397 6644

<https://www.golfenophetrijk.nl/nijmegen.html>

Directions from Laser gaming to Golf course (8.3 km; 31 min by bike): cycle straight ahead following the Nijmeegse baan and the Groesbeekseweg.





## Social event Sunday July 10th

On July 10th, you will receive a lunch bag (provided by the Holthurnsche Hof) at 12:00h. In the afternoon, a visit to the MuZIEum has been arranged for you in combination with a city tour around Nijmegen. The day will end with a diner at restaurant "De Stadstuyn".

Starting time 13:15 h

Contact-persons:

Frank Eisner

Pashiera Barkhuysen

MuZIEum

Keizer Karelplein 32H, 6511 NH, Nijmegen (in Stadschouwburg Nijmegen)

Tel. +31 (0)24 322 1681

<http://www.muzieum.nl/>

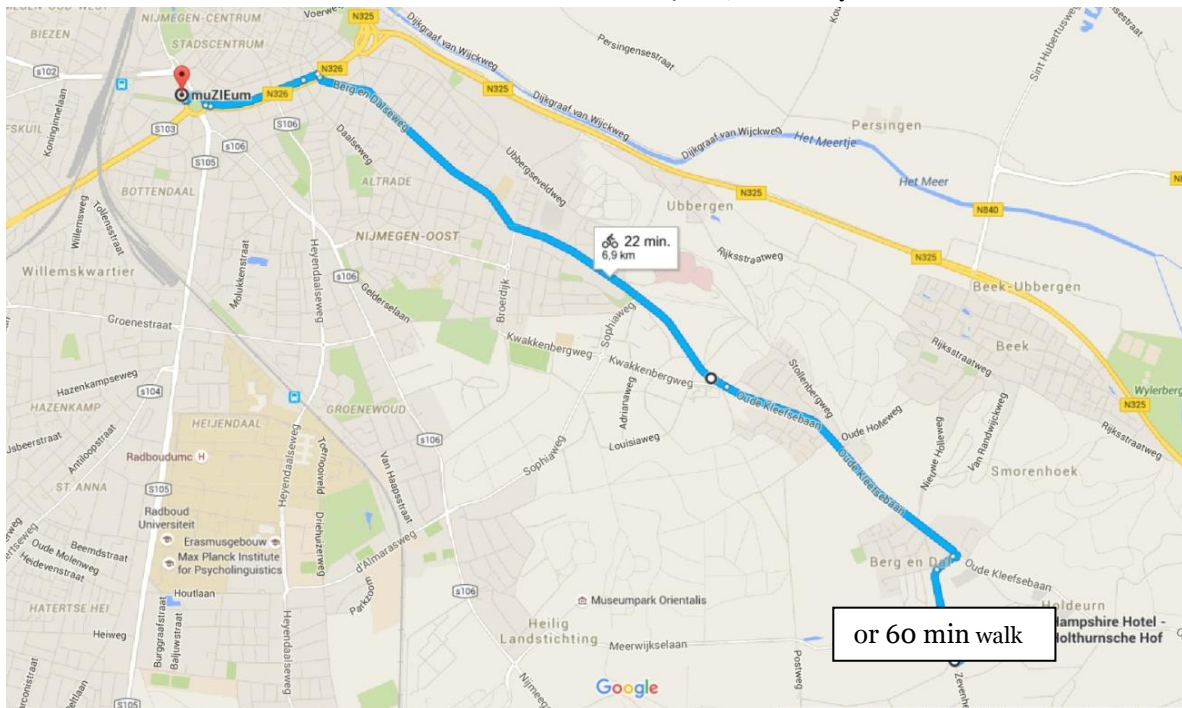
Restaurant De Stadstuyn

Graafseweg 32-34, 6512 CC, Nijmegen

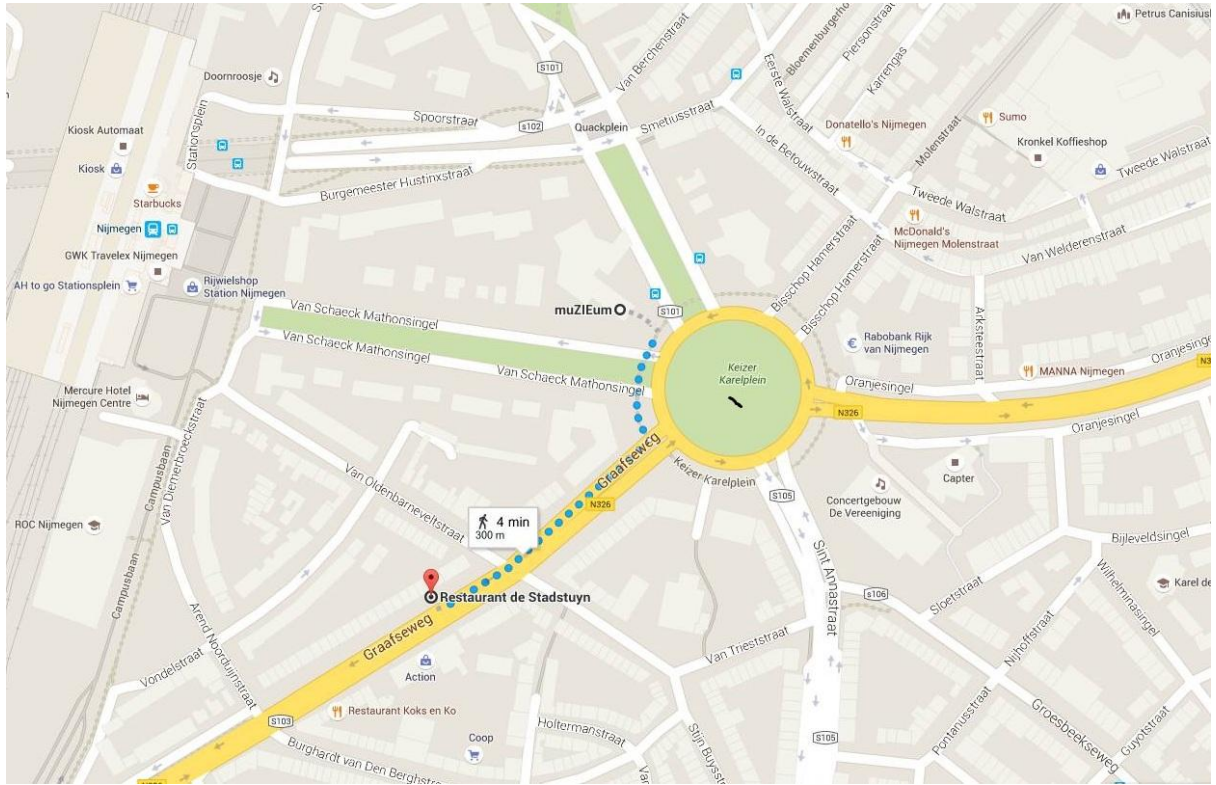
Tel: +31 (0)24 323 8312

<http://www.destadstuyn.nl/>

Directions from Hotel Holthurnsche Hof to MuZIEum (6.9 km; 22 min by bike)



Directions from muZIEum to restaurant De Stadstuyt (300 ; 4 min walk)





**LANGUAGE**  
in **INTERACTION**



**NWO**  
Netherlands Organisation for Scientific Research