MAX PLANCK INSTITUTE
FOR PSYCHOLINGUISTICS

RESEARCH REPORT 2015|2016

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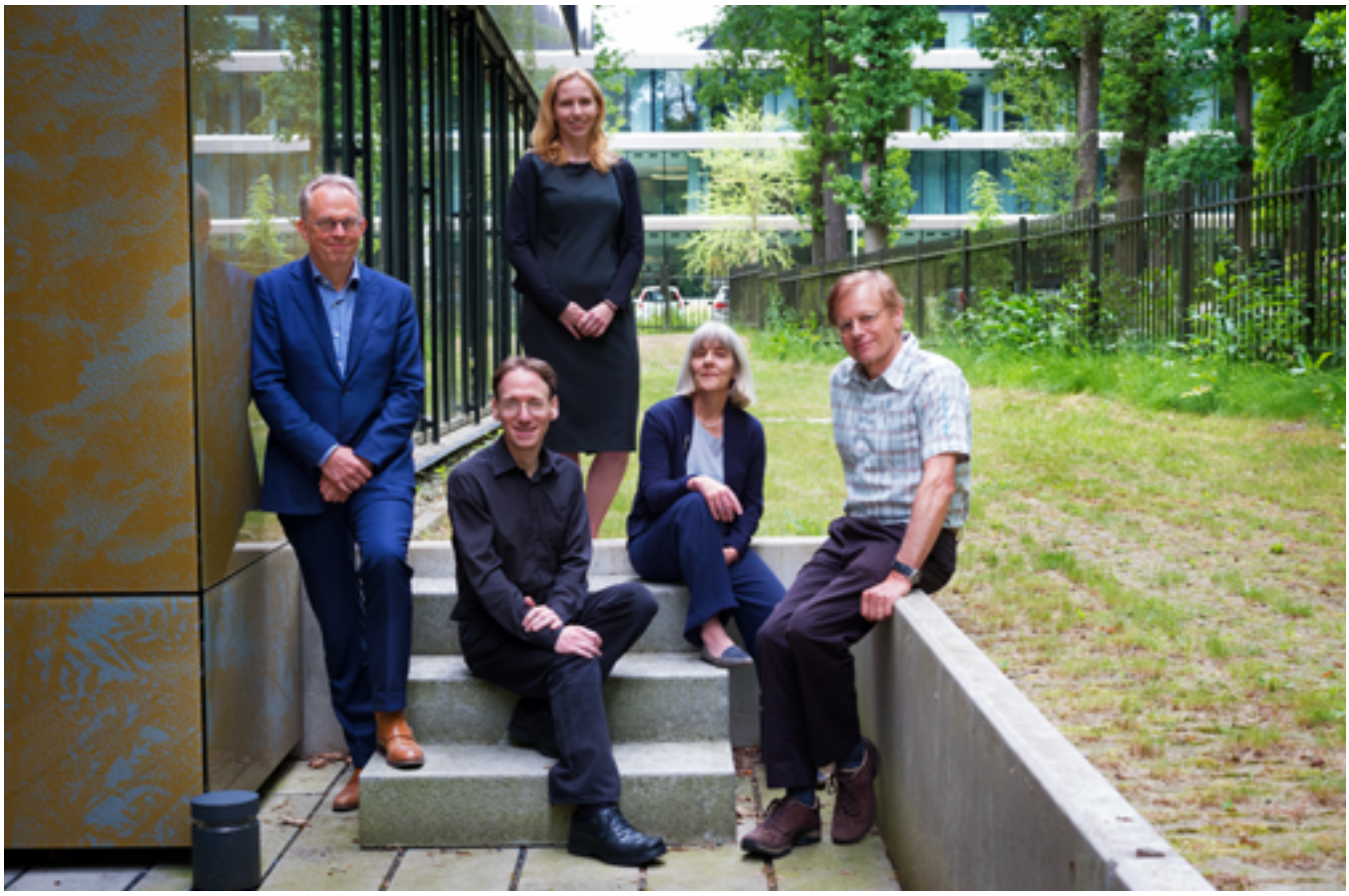


The current board of directors (left to right): Peter Hagoort, Simon E. Fisher, Caroline Rowland, Antje S. Meyer, Stephen C. Levinson.

PREFACE

The Max Planck Institute for Psycholinguistics is at the forefront of research into the foundations of language. Scientists at the Institute investigate how children and adults acquire their language(s), how speaking and listening happen in real time, how the brain processes language, how the human genome contributes to building a language-ready brain, and how language is related to cognition and culture, and shaped by evolution.
Our approach to the science of language and communication is unique because we address these fundamental issues at multiple levels, from molecules and cells to circuits and brains, all the way through to behaviour of individuals and populations. This report illustrates the value of such an integrated strategy, describing samples of the life of the Institute for the years 2015 and 2016. For interested readers who want to learn more about the research, details can be found on the news archives, departmental pages and blogs of our website (www.mpi.nl), as well as in the many primary publications, review articles, chapters, books and PhD dissertations that we have produced during this time, examples of which are noted in the pages of this report.

Two significant developments are worth highlighting. On June 10th 2015 Princess Laurentien of the Netherlands opened the new wing of our Institute by planting the 'Tree of Language' (see picture on the next page). The new wing houses the Language and Genetics Department including state-of-the-art labs for molecular biology and tissue culture, as well as facilities for the other Departments including a state of the art Virtual Reality lab. Following on from this opening event, we held an open house for the general public which attracted more than 600 visitors. They were able to enjoy a special film about the Institute (see www.mpi.nl; "A celebration of language") and lab demonstrations, and they could do their own tests and experiments. A 10 year old girl commented: "This was the best day of my life."

A second exciting development was the start of the Language Development Department in September 2016, with Caroline Rowland as the recently appointed director. The arrival of Caroline Rowland signifies a boost for the Institute's research program on one of the central questions in our field: how do infants acquire the intricate and highly complex system of natural language? In the new wing a child and family friendly environment is being created for testing language skills in children using the latest methods.

An important feature of the Institute is our ability to bring together scholars and researchers from distinct disciplines and generate an environment in which cross-departmental collaborations are fostered. We have a very lively community of junior scientists and are particularly proud of our International Max Planck Research School (IMPRS) for Language Sciences, a joint initiative with the Donders Institute for Brain, Cognition and Behaviour and the Centre for Language Studies, both at the Radboud University. This graduate school has delivered 25 students with completed PhDs in years 2015 and 2016. Its organization and monitoring system has been further optimized. The current funding of the IMPRS by the Max Planck Society runs until 2021.

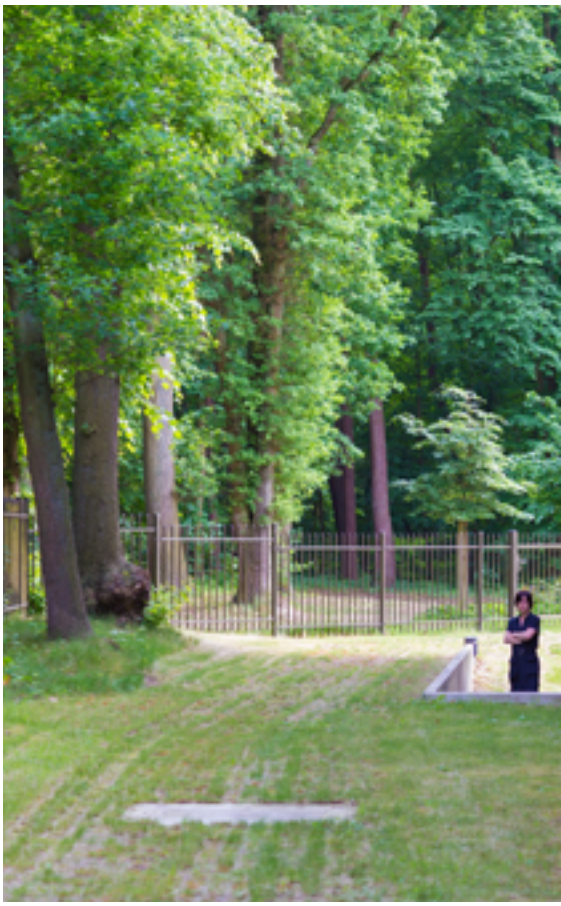
Our Institute benefits greatly from being embedded in a wide network of collaborations, having many joint research efforts with different groups at Radboud University. MPI scientists are also key players in projects and initiatives of diverse scales with expert teams in other parts of the Netherlands, Europe, and elsewhere in the world. The success of such initiatives reflects our continued ability to attract significant funding awards in addition to our longstanding support from the Max Planck Society. An apt illustration is the Institute's leading role in establishing the Language in Interaction Consortium which unites a large number of top scientists from eight research institutions to study universality and variability of language at multiple levels. In 2016 the Language in Interaction program had its mid-term evaluation. At the end of 2016 a letter from the Dutch Minister of Science and Education was received mentioning that the outcome was very positive and hence the full 10 year budget of 27.6 million Euros will be made available. Staff and directors of our Institute play a leading role in this endeavour (see www.languageininteraction.nl for more information).

This is an exciting time for the language sciences, as substantive changes in technology and development of theoretical frameworks has led to novel opportunities for scientific advance, accompanied by interesting new challenges. We hope that the pages that follow will give you an impression of what we have achieved in 2015 and 2016.

Peter Hagoort
Managing Director

OPENING **NEW WING**
MPI IN 2015

On June 10th Princess Laurentien opened the new wing of the MPI for Psycholinguistics, which marked the start of an exciting new era of interdisciplinary research into the foundations of language.
The new wing houses a virtual reality suite, experiment rooms (including infant testing labs and EEG facilities) and state-of-the-art molecular biology laboratories, allowing us to trace connections between genes, brain circuits and language.

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Stephen C. Levinson
Antje S. Meyer
Caroline Rowland

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Willem J.M. Levelt

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Asli Özyürek *(head)*

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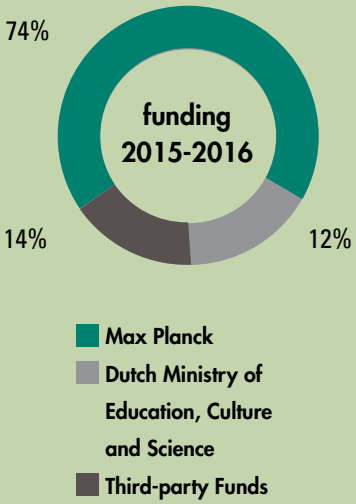
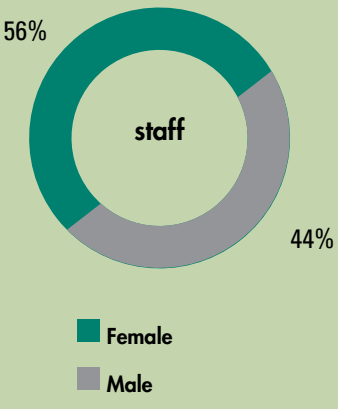
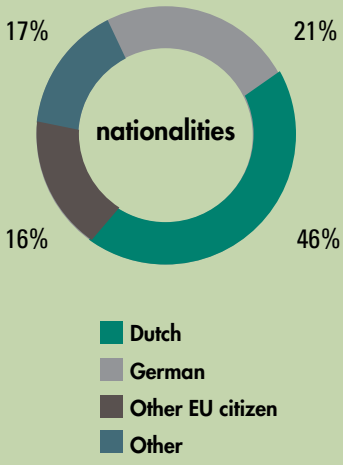






HONOURS AND AWARDS

2015

Anne Cutler was elected Fellow of the Royal Society (FRS).

Mark Dingemanse, Francisco Torreira & Nick Enfield were awarded the IgNobel Prize ("Research that makes people laugh, then think") for the discovery that a word like "Huh?" is found in roughly the same form and function in spoken languages across the globe.

Mirjam Ernestus was elected to the Royal Netherlands Academy of Arts & Sciences (KNAW).

Clyde Francks was awarded with a major grant to join the European Commission's Flagship Human Brain Project, leading a transnational team of researchers in the Netherlands, France and Spain, on a set of interrelated studies called 'MULTI-LATERAL: Multi-level Integrative Analysis of Brain Lateralization for Language'.

Willem Levelt was made the Sarton Chair of History of Science at Ghent University, and awarded the Sarton Medal.

Asifa Majid won the Ammodo Award for Humanities from the Royal Netherlands Academy of Arts and Sciences (KNAW).

Asli Özyürek received a VICI award from the Netherlands Organization for Scientific Research (NWO) for her project 'Giving cognition a hand: Linking spatial cognition to linguistic expression in native and late learners of sign language and bimodal bilinguals'.

Jan-Mathijs Schoffelen (MPI/DCCN) received a VIDI award from the Netherlands Organization for Scientific Research (NWO) for his project on the orchestration of activity in the brain.

Annemarie Verkerk was awarded the Otto Hahn Medal from the Max-Planck-Gesellschaft.

Sonja Vernes was appointed as leader of an independent Max Planck Research Group on Neurogenetics of Vocal Communication, hosted at the MPI for Psycholinguistics from January 2016.

Kirsten Weber received a Junior Fellowship at the Hanse Wissenschaftskolleg (Institute for Advanced Studies), Delmenhorst, Germany.

Roel Willems (MPI/DCCN) received a VIDI award from the Netherlands Organization for Scientific Research (NWO) to investigate why we enjoy reading stories and how this differs between individuals.

2016

Marisa Casillas received a VENI award from the Netherlands Organization for Scientific Research (NWO) to investigate child rearing and language development in two indigenous communities.

Anne Cutler was elected Fellow of the Cognitive Science Society.

Simon Fisher was appointed Chair of the Scientific Advisory Board of the Netherlands Institute of Neuroscience by the KNAW.

Stephen Levinson received an honorary doctorate from the University of Uppsala, Sweden, and was selected to deliver the Golledge Lecture at the University of Santa Barbara, USA.

Elizabeth Manrique received a Rubicon award from the Netherlands Organization for Scientific Research (NWO) to study the role of the visual modality in achieving mutual understanding in responsive utterances, at University College London, UK.

Asli Özyürek was appointed to a Joint Professorship with the Donders Centre for Cognition, (Social Science Faculty) in addition to her affiliation with CLS (Humanities Faculty), both at Radboud University, Nijmegen.

Sean Roberts received an Early Career Fellowship from the Leverhulme Trust, to study causal effects in cultural systems at the University of Bristol, UK.

Joost Rommers received a VENI award from the Netherlands Organization for Scientific Research (NWO) for his project: 'When predictions don't come true: The costs and benefits of prediction for language comprehension'.

Kazuki Sekine (CLS) was awarded with a Marie Skłodowska-Curie Individual Fellowship to investigate the neural basis of multimodal integration in children.

Amanda Tilot was awarded with a Marie Skłodowska-Curie Individual Fellowship to study the genetics of grapheme-colour synaesthesia.

Julia Uddén was awarded a Pro Futura Scientia 5-year Grant by the Swedish Foundation for Humanities and Social Sciences, to conduct research at Stockholm University into how the adolescent brain develops to support pragmatics.

Tessa Verhoef received a VENI award from the Netherlands Organization for Scientific Research (NWO) for her project 'Where do meaning and structure in languages come from?'

Sonja Vernes was awarded a Human Frontiers Scientific Program Grant to study bats as the first mammalian model for vocal learning.

Connie de Vos received a VENI award from the Netherlands Organization for Scientific Research (NWO) for her project 'The face in sign language interaction'.

PHD COMPLETIONS

2015

Salomi Asaridou *An ear for pitch. On the effects of experience and aptitude in processing pitch in language and music.*

Binyam Gebre *Machine learning for gesture recognition from videos.*

Alessandro Gialluisi *Investigating the genetic basis of reading and language skills.*

Rósa Gisladottir *Conversation electrified. The electrophysiology of spoken speech act recognition.*

Jeremy Hammond *Switch reference in Whitesands. Theoretical issues and experimental evidence.*

Florian Hintz *Predicting language in different contexts: The nature and limits of mechanisms in anticipatory language processing.*

Edwin van Leeuwen *Social learning dynamics in chimpanzees. Reflections on animal culture.*

Lilla Magyari *Timing turns in conversation. A temporal preparation account.*

David Peeters *A social and neurobiological approach to pointing in speech and gesture.*

Giovanni Rossi *The request system in Italian interaction.*

Elexa St. John-Saaltink *When the past influences the present: Modulations of the sensory response by prior knowledge and task set.*

Alastair Smith *Modelling multimodal language processing.*

Beyza Sumer *Acquisition of spatial language by signing and speaking children: A comparison of Turkish Sign Language (TID) and Turkish.*

Maartje van de Velde *Incrementality and flexibility in sentence production.*

2016

Martin Becker *On the identification of FOXP2 gene enhancers and their role in brain development.*

Amaia Carrión Castillo *Deciphering common and rare genetic effects on reading ability.*

Rebecca Defina *Events in language and thought: The case of serial verb constructions in Avatime.*

Jolien Francken *Viewing the world through language-tinted glasses.*

Suzanne Jongman *Sustained attention in language production.*

Huib Kouwenhoven *Situational communication in non-native variation.*

Malte Viebahn *Acoustic reduction in spoken-word processing: Distributional, syntactic, morphosyntactic, and orthographic effects.*

Ewelina Wnuk *Semantic specificity of perception verbs in Manique.*

ACRONYMS

EEG: electroencephalography

ERP: event-related potential

fMRI: functional magnetic resonance imaging

MEG: magnetoencephalography

TMS: transcranial magnetic stimulation

VR: virtual reality

DEPARTMENT **LANGUAGE AND COGNITION**

Goals of the Department

The Language and Cognition Department examines the relation between language, culture and general cognition. A distinctive character of the work involves using linguistic diversity to throw light on these relations, but the Department also makes use of insights from human development, experimental psychology, and brain imaging. Leading questions are: Can we measure how diverse languages actually are? How did the diversity arise? What makes the diversity possible, for example from a learning perspective? Over the review period, and supported by two ERC projects, a major research focus was on the interactional underpinnings of language. Clear universals were found in such areas as turn-taking in conversation, the organization of interactive repair, and the sequencing of speech acts. The hypothesis is that a universal foundation for communicative interaction supports the acquisition and use of culturally divergent languages. Progress was also made in other areas, including the processing of verb-initial languages, sign-language research, iconicity and multimodality.

Turn-taking

The most fundamental use of language is in social interaction, where speakers rapidly alternate between mostly short bursts of speech (circa 2 seconds long). The modal response time in conversation is circa 200 milliseconds, which is remarkably rapid when the latencies involved in language production (circa 600 ms for a single word, 1500 ms for a simple clause) are taken into account. This implies that in listening to an incoming turn, the addressee must begin preparing a response as soon as the speech act (pragmatic content) of the incoming turn can be predicted (Figure 1). This was confirmed by finding an EEG signal for an early switch into production mode. Using other measures, including the preparation of breathing for speaking, and the use of prosody, a model was proposed where speakers prepare responses as soon as possible but only trigger them when the syntax and prosody of the incoming turn signals that it is coming to an end. These final cues to turn completion can be studied in different ways, e.g. in a triad of speakers, the unaddressed participant shifts his or her gaze to the next speaker before the current speaker ends. Eye-movement was also used to study this predictive understanding in children, where it develops remarkably early, but producing timely responses is a different story: children do not reach adult norms even in middle childhood. Pre-linguistic infants on the other hand seem to show some kind of instinctive rapid vocal response, also found in some other primate species. The study of language use in its most basic interactive niche thus promises to throw fundamental light on the nature of the capacity for language in the human species.

Language diversity and language acquisition

Theories about the mechanisms that drive language acquisition are based in part on what we assume children's linguistic input is. Decades of careful work on (primarily) Western children's linguistic environments has directed much attention toward the role of behaviours such as toy play, book reading, and infant-directed speech. However, in many parts of the world, language acquisition proceeds normally without these features. Studying children's language acquisition in non-Western contexts offers a useful corrective to the study of "input" behaviours as we understand them from a Western point of view, raising questions about how children adapt to the learning environment in which they are raised. In 2015 and 2016 Casillas and colleagues began data collection and analysis for a comparative study of communicative development in two communities: (a) a rural Tzeltal Mayan village in Mexico and (b) a cluster of villages on Rossel Island in Papua New Guinea (Figure 2). The aim is to capitalize on this difference to try and understand how early language experience changes the way children engage with their linguistic environments during the process of acquiring a language. In both fieldsites, over 50 children (or in case of infants, their mothers) wore vests and cameras that

Director Stephen C. Levinson

Department members Julija Baranova, Mathias Barthel, Joe Blythe, Sara Bögels, Kangsuk Byun, Luis Miguel Berscia, Marisa Casillas, Ludy Cilessen, Jeremy Collins, Rebecca Defina, Mark Dingemanse, Tyko Dirksmeyer, Nick Enfield, Simeon Floyd, Rósa Gisladottir, Gabriela Garrido, Harald Hammarström, Clair Hill, Elma Hilbrink, Paul Hömke, Elliott Hoey, Judith Holler, Gertie Hoymann, Kobin Kendrick, Tomas Lehecka, Edwin van Leeuwen, Lilla Magyari, Asifa Majid, Elizabeth Manrique, Tayo Neumann, Elisabeth Norcliffe, Sean Roberts, Giovanni Rossi, Lila San Roque, Sebastian Sauppe, Gunter Senft, Francisco Torreira, Sylvia Tufvesson, Connie de Vos, Ewelina Wnuk, Merel van Zuylen

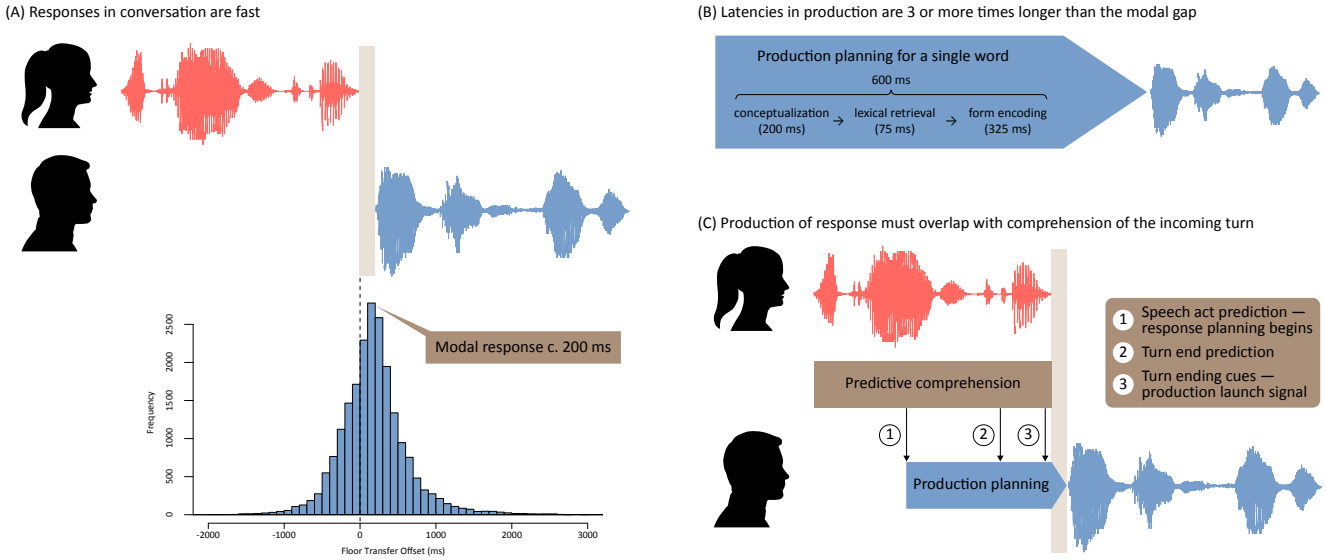
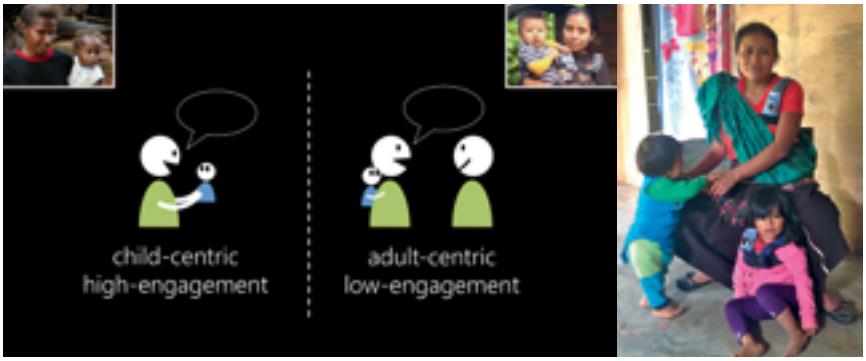


Figure 1. (A) Switching of speakers is rapid, with a typical gap or offset of 200 ms. Inset is a histogram of response times with 200 ms mode (0 is the end of the prior turn, with overlaps to the left, gaps to the right). (B) Response latencies for the production of single words, as measured in primed picture-naming tasks, require ~ 600 ms. (C) The slow production mechanism may be compensated for by predicting the continuation and termination of the incoming turn, and launching production early.

recorded their interactions over one full day. In addition a range of cross-age experiments were conducted in a portable lab. While these two communities are similar in many ways (small-scale language community, subsistence farming, multi-generation households, few books and toys), they differ greatly in the way adults talk to young children; Rossel children encounter a high-engagement, child-centred environment, while Tzeltal children experience a low-engagement, adult-centred interactional ecology (Figure 2).



(A) (B)

Figure 2. (A) Schematic of the different quality of child rearing on Rossel Island (left) and in a Tzeltal-speaking Mayan community (right). (B) Tzeltal mother wearing recorder and camera to record interactions with infant (left), while toddler (right) wears her own recording vest.

The day-long recordings confirm that there are indeed large differences between the two fieldsites in the access infants have to the social activities around them. Ongoing work seeks to establish whether these different ecologies induce different developmental trajectories.

Iconicity

A basic assumption in linguistics is the principle of arbitrariness: the notion that the form of a word bears an arbitrary relation to its meaning. Research by Dingemanse and colleagues contributes to an upheaval in the field by providing evidence that iconicity — where form and meaning are linked by means of perceptual analogies — is more prevalent than long assumed. Much of this work focuses on ideophones, iconic words found in many of the world's languages, and offers a powerful demonstration of the importance of linguistic diversity for cognitive science.

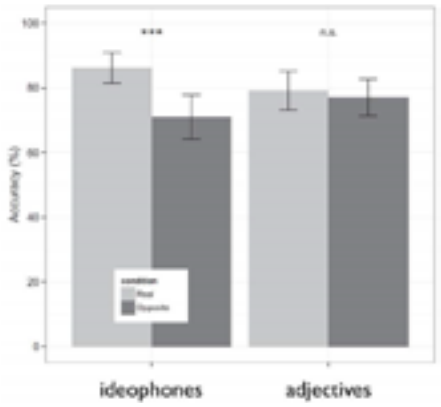


Figure 3. Japanese ideophones, but not adjectives, are easier to learn with their real than with an opposite meaning. For example, the ideophone gorogoro was easier to learn with the correct meaning 'rolling' than with the antonymic 'sliding'.

One study takes ideophones from 5 languages around the world and finds that 80 participants can guess their meaning above chance in a binary choice task. The study shows that both phonemes and prosody can serve as iconic cues, revealing an important confound not controlled for in most earlier studies. A set of learning studies shows that Japanese ideophones are easiest to learn when paired with their real meaning, and significantly harder when paired with an opposite meaning (Figure 3). This difference in ease of learning does not occur for a set of matched arbitrary Japanese adjectives under the same manipulation, suggesting a privileged link between form and meaning in ideophones. Work on iconicity is done in close collaboration with colleagues across Departments. Underlying mechanisms are explored in neuroimaging work with Gwilym Lockwood (Neurobiology of Language). Individual differences in sound-symbolic sensitivity turn out to be linked to ERP signatures that point to processes of crossmodal integration. Population-wide variation in crossmodal processing is further explored in work on dyslexia with Linda Drijvers (Center for Language Studies), and in large-scale studies of synaesthesia and crossmodal associations with Amanda Tilot (Language and Genetics) and Tessa van Leeuwen (Donders Institute). This work suggests that sensitivity to iconicity is disrupted in dyslexia and enhanced in synaesthesia. With Gerardo Ortega and Asli Ozyürek, Dingemanse coordinates an Iconicity Focus Group that unites work on iconicity at the MPI and the Radboud University's Center for Language Studies. As a result of this concerted research effort, the assumption of arbitrariness is giving way to a more textured view of vocabulary structure, in which competing motivations shape and constrain the distribution of arbitrariness and iconicity.

Blinks are a communicative signal in multimodal interaction

In face-to-face human communication, recurring intervals of mutual gaze are vital as they allow listeners to provide speakers with visual feedback during conversation (e.g., smiling; nodding). Does blinking – a facial behaviour that may appear to be a pure physiological necessity at first sight – also serve a communicative function? To address this question, Hömke and colleagues built a corpus of Dutch conversations, identified short and long listener blinks during extended turns, and measured their occurrence relative to the end of turn constructional units (TCUs), the location where feedback typically occurs. Listener blinks were indeed timed to the end of TCUs. Also, long blinks were more likely than short blinks to occur during mutual gaze, with nods or continuers, and their occurrence was restricted to communicative contexts in which signalling understanding was particularly relevant, suggesting a special signalling capacity of long blinks. Are speakers really sensitive to listeners' blinking behaviour as a social signal? And is there a causal influence of listener blink behaviour on speakers' linguistic behaviour in face-to-face communication? A novel virtual reality-based experimental paradigm was developed enabling us to selectively manipulate blinking in a virtual listener, crucially distinguishing between short and long blinks (Figure 4). It was found that high-empathy speakers unconsciously took into account subtle differences in listener blink duration (in the ballpark of milliseconds), producing substantially shorter answers in the context of long listener blinks. The findings demonstrate that, in addition to physiological, perceptual and possible cognitive functions, listener blinks can serve as a social "move on" signal in face-to-face

communication – playing a critical role in shaping how we speak.
The different functions of listener blinking are, of course, not mutually exclusive. The cognitive and perceptual functions very likely underlie and precede the communicative signalling function, phylogenetically as well as ontogenetically. In the same way in which squinting (as if trying to see more clearly) seems to signal a lack of understanding, closing the eyes by blinking may signal "no need to 'see' anymore" because sufficient understanding has been reached. Taken together, these findings potentially shed new light on the visual origins of mental-state signalling, a crucial ingredient for achieving mutual understanding and intersubjectivity in communication.

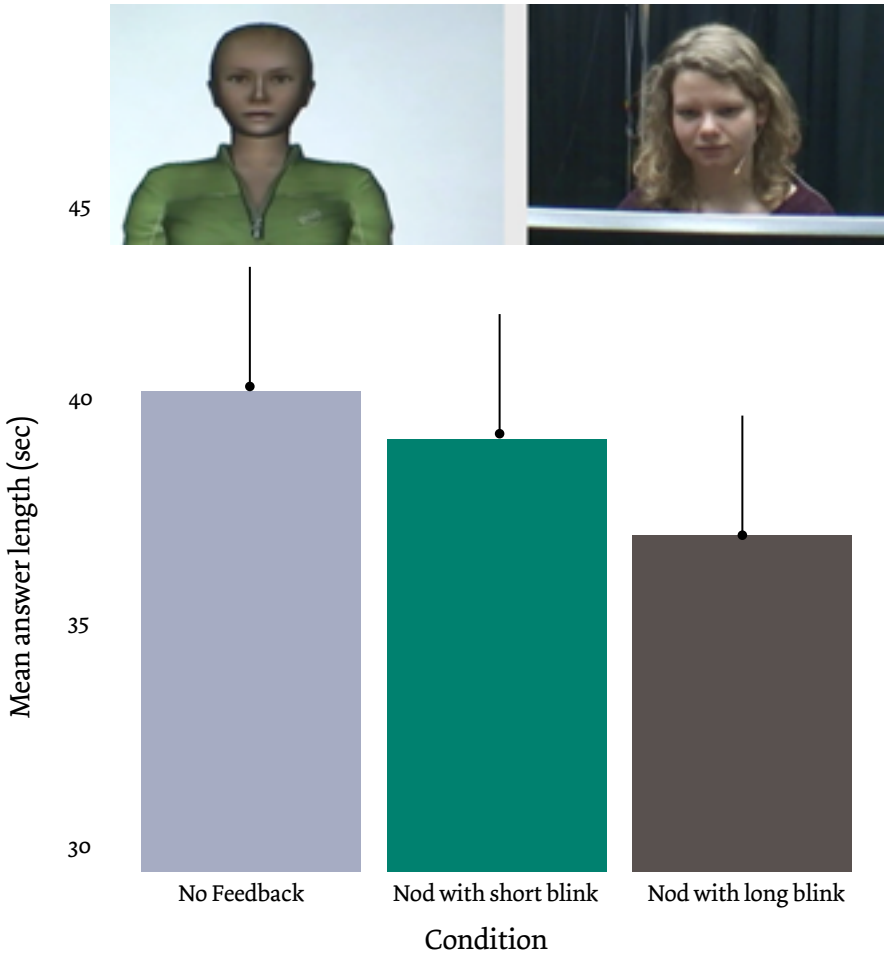


Figure 4. Virtual listener (left) interacting with human speaker (right) in the experimental set-up. The human responses were longer when not punctuated by the virtual listener's nods, but became briefer with blinks, especially when long, suggesting blinks signal 'message understood'.

Selected publications

Levinson, S. C. (2016). Turn-taking in human communication, origins, and implications for language processing. *Trends in Cognitive Sciences*, 20(1), 6-14.

Bögels, S., Magyari, L., & Levinson, S. C. (2015). Neural signatures of response planning occur midway through an incoming question in conversation. *Scientific Reports*, 5, 12881.

Everett, C., Blasi, D. E., & Roberts, S. G. (2015). Climate, vocal folds, and tonal languages: Connecting the physiological and geographic dots. *Proceedings of the National Academy of Sciences of the United States of America*, 112, 1322-1327.

Dingemanse, M., Blasi, D. E., Lupyan, G., Christiansen, M. H., & Monaghan, P. (2015). Arbitrariness, Iconicity and Systematicity in Language. *Trends in Cognitive Sciences*, 19 (10), 603-615.

Casillas, M., & Frank, M. C. (2017). The development of children's ability to track and predict turn structure in conversation. *Journal of Memory and Language*, 92, 234-253.

DEPARTMENT **LANGUAGE AND GENETICS**

Goals of the Department

Human children have an unparalleled capacity to acquire sophisticated speech and language skills. Despite the huge complexity of this task, most children learn their native languages almost effortlessly and do not need formal teaching to achieve a rich linguistic repertoire. The Language and Genetics Department was established in 2010 with the goal of shedding new light on this enigma. The Department adopts the latest innovations in molecular methods to discover how your genome helps you speak.
The Department's work identifies genes that are important for development of speech, language, reading and social communication, and uses those genes as windows into the key neural pathways. Success depends on interdisciplinary research at multiple levels, from determining molecular interactions and functional roles in neural cell-biology to effects on brain structure and activity. The Department goes further to ask how genes may help to explain both the evolution and variability of human language.

Left-right asymmetries in human neural development

Many cognitive processes, including important aspects of language, are partially lateralised towards either the left or right sides of the human brain, but the underlying mechanisms remain mysterious. The group led by Francks investigates the biological basis of these lateralisations using a range of contemporary genomic methods. Handedness is probably the best known human asymmetry which arises from nervous system laterality, with the large majority of humans being right-handed. Interestingly, a likely precursor of handedness is observed early on in human development: eight weeks after fertilisation, embryos already tend to move their right arms more than their left. However, in eight-week-old embryos, signals are not yet sent from the cerebral hemispheres to the arms. Rather, the arms are only connected by nerves to the spinal cord. In a research project supported by the Netherlands Organization for Scientific Research (NWO), de Kovel and Francks

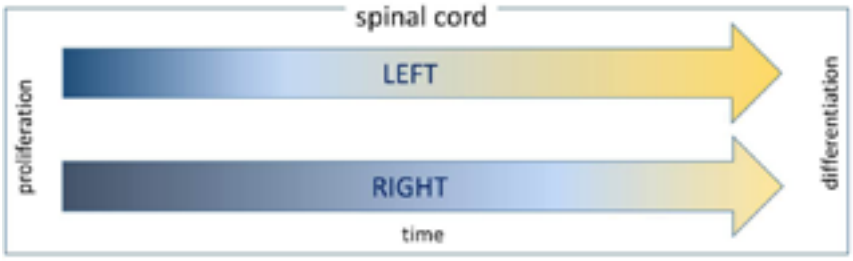


Figure 1. Schematic figure to indicate left-right differences in rates of maturation in the embryonic spinal cord, from 4-8 weeks after fertilisation. Both sides change from an earlier profile of gene activity that reflects cells multiplying by division (a process called proliferation), to a later stage in which cells have started to turn into mature neurons (a process called differentiation). The left and right sides are not in synchrony with each other: the left is slightly ahead.

Director Simon E. Fisher
Department members Midas Anijs, Martin Becker, Sara Busquets Estruch, Jasper Bok, Amaia Carrión Castillo, Xiaowei Sylvia Chen, Dan Dediu, Pelagia Derizioti, Paolo Devanna, Else Eising, Clyde Francks, Margot Gerritse, Alessandro Gialluisi, Sarah Graham, Tulio Guadalupe, Jurgen Heijsen, Fabian Heim, Carly Jaques, Rick Janssen, Guy Karlebach, Tulya Kavaklioglu, Xiangzhen Kong, Carolien de Kovel, Katerina Kucera, Scott Moisik, Moritz Negwer, Pedro Rodenas-Cuadrado, Beate St Pourcain, Chin Yang Shapland, Lot Snijders Blok, Elliot Sollis, Jon-Ruben van Rhijn, Pauline Roost, Amanda Tilot, Ellen Verhoef, Sonja Vernes, Arianna Vino, Kai Wanke

measured gene expression levels in the left and right spinal cords of 18 post-mortem human embryos aged 4-8 weeks after fertilisation.
They found that the left side of the spinal cord matures slightly faster than the right (Figure 1). This is the earliest left-right difference of development in the human nervous system to have been discovered so far. Sets of key genes that control growth and maturity reached a more advanced profile of activity on the left side than the right. These left-right differences in embryos may trigger some of the later asymmetries which appear in the brain, such as the eventual dominance of the left hemisphere for language in most adults. People with the psychiatric disorder schizophrenia have an elevated rate of left-handedness, and sometimes show altered brain asymmetry. De Kovel and her colleagues observed that genes with the largest left-right differences in the embryos also tended to be involved in the genetic risk of developing schizophrenia, as assessed from genome-wide screens in very large cohort studies. Disruptions of the lateralised developmental programme may therefore play a role in the genetic susceptibility to schizophrenia.

Deciphering the genetic epidemiology of human communication

In 2015, St Pourcain arrived at the MPI from the University of Bristol (UK), bringing a new research program to the Language and Genetics Department. Through studies that combine thousands of participants from consortia across several countries, her group applies modern techniques of molecular epidemiology to study the genetic architecture of social and communication skills throughout the life course. Leading an international team of collaborators, St Pourcain identified links between genetic risks for psychiatric disorder and normal variation in how well people socially engage and communicate with others. In other words, the researchers discovered evidence at the molecular level for an underlying continuum between normal and abnormal behaviour (Figure 2). Genetic overlaps with normal variation were identified for psychiatric disorders that start during early childhood, like autism, as well as for those with a typical onset during young adulthood, such as schizophrenia. People with autism have serious difficulties in understanding social cues in human interaction, and are often rigid, concrete thinkers with obsessive interests. In contrast, schizophrenia is characterized by hallucinations, delusions, and seriously disturbed thought processes, although many affected individuals also have difficulties communicating adequately. St Pourcain and colleagues showed that genes influencing social communication problems during childhood overlap with genes conferring risk for autism, but that this relationship wanes during later development.
In contrast, genes influencing risk for schizophrenia were most strongly interrelated with genes affecting social competence during later adolescence, in line with the natural history of the disorder.
The findings suggest that the risk of developing highly contrasting psychiatric conditions such as autism and schizophrenia may involve distinct sets of genes. These gene sets might both affect social communication skills, but exert their maximum influence during different periods of development. St Pourcain's work shows that an apparent symptom overlap between disorders can be disentangled through a developmentally sensitive analysis design, and indicates the importance of well-characterized cohorts with longitudinal data for understanding the biological basis of traits like human communication. The group now aims to identify and characterise different gene sets that affect social-communication problems during the course of development, and link them to different stages of the development of the social brain.

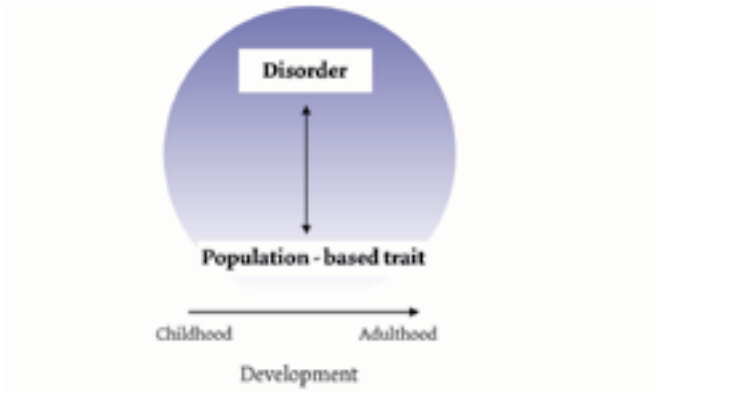


Figure 2. Hypothetical continuum linking population-based traits and disorder

Implicating rare mutations in developmental disorders affecting speech and language

The majority of inter-individual variation in language-related skills involves complex genetic underpinnings, with interactions of many genomic variants each having a small effect. However, sometimes a child carries a rare mutation of one gene which is sufficient by itself to disrupt development of her/his communicative abilities. By discovering such mutations and studying functions of the mutated genes, we gain unique insights into the crucial biological pathways. The value of this approach is illustrated by prior work of Fisher and colleagues on *FOXP2*, the first gene implicated in a developmental speech and language disorder. *FOXP2* mutations are unusual since they have disproportionate effects on speech and language skills compared to other aspects of cognition and behaviour. Advances in DNA sequencing increase the potential to identify rare variants in new genes which disrupt language-related abilities, moving the scope beyond *FOXP2*. Curiously, the novel genes implicated so far appear to have broader developmental effects, highlighted by two recent examples from the Department:

First, *FOXP1* is a regulatory gene that is extremely similar to *FOXP2*. The protein products of these genes can directly bind to each other, to regulate shared pathways in the brain (see below). Sollis and colleagues described cases of children carrying different rare mutations in *FOXP1*, some of which closely match mutations previously found in *FOXP2* in cases of speech/language disorder. The team found that although children with *FOXP1* mutations displayed speech and language deficits, these symptoms occurred against a background of global delay, poor muscle tone, and autistic features.

Second, the *BCL11A* gene became of interest when a deletion was reported in a child with speech sound disorder. In a research project with the Wellcome Sanger Institute (Cambridge, UK), Estruch and collaborators studied multiple mutations of *BCL11A*, found in affected children in a de novo state (i.e. newly-arising, absent from parents) from a large-scale sequencing screen (the Deciphering Developmental Disorders study). Across nine patients with different types of *BCL11A* mutations (Figure 3), a clinical picture emerged encompassing global developmental delay with language deficits, and a core set of facial features. The team used cellular and animal models to show that the mutations disrupt the intracellular localisation of the protein encoded by *BCL11A* and interfere with its ability to form functional protein complexes. Given the scarcity of mutations in genes like *FOXP1* and *BCL11A*, along with the observation that they have wider impacts on cognition and development than *FOXP2*, the hunt continues for additional more selective causes of speech and language problems. For example, Eising analyses whole genome sequences of children with a primary diagnosis of speech apraxia, from the USA and Australia. In a complementary project, Snijders Blok works with the Human Genetics Department of Radboud University Medical Center to integrate next-generation clinical sequencing with in-depth cognitive profiling, to identify and cluster new patients with developmental speech and language issues.

Modelling the impact of mutations using cellular systems

The advent of next-generation DNA sequencing is accelerating our discovery of rare gene variants that may represent causative mutations in speech and language disorders. Computer-based prediction methods can provide some insight into the potential consequences of these variants, but experimental techniques in cellular systems are important to confirm whether they are truly causal and to enable a deeper understanding of their biological significance. The work of the Department on genes like *FOXP2* and *FOXP1* provides an apt demonstration of the benefits of cell-based models. Screening of *FOXP2* in individuals with speech and language disorder has identified several rare genetic variants, but their causative role is sometimes uncertain. Estruch and colleagues performed detailed experiments in live cells and found direct evidence that certain mutations damage the function

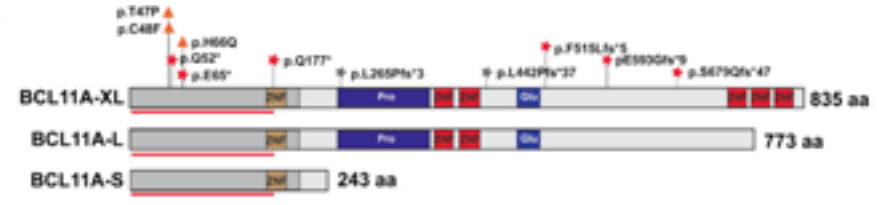


Figure 3. Schematic of BCL11A mutations identified in cases of intellectual disability with speech and language deficits. Triangles, missense variants that alter amino acids in the encoded protein; red stars, protein truncating variants; grey stars, mutations previously seen in cases of autism spectrum disorder. Reproduced from Dias, Estruch, et al., Am J Hum Genet, 2016.

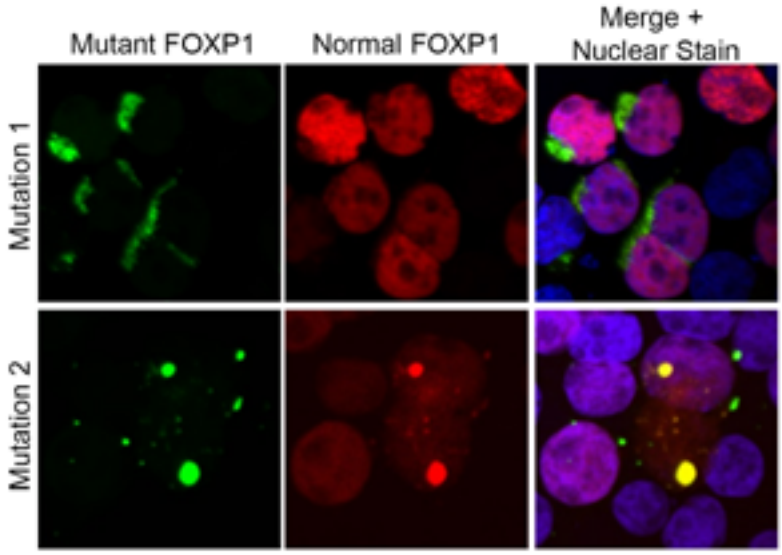


Figure 4. A subset of mutations in the FOXP1 gene can interfere with the function of the normal protein product. The FOXP1 protein is normally found in the nucleus of the cell, shown in blue. Some mutations (e.g. Mutation 1, top panel) produce an abnormal protein (green) that is located outside the nucleus and does not bind to the normal FOXP1 protein (red), which remains inside the nucleus. Another sub-group of mutations (e.g. Mutation 2, bottom panel) produce an abnormal protein that retains the ability to bind to the normal FOXP1 protein, translocating it out of the nucleus.

of the encoded protein, causing it to mislocalise in the cell, disrupting interactions with other proteins, and disturbing the regulation of target genes. Remarkably, a number of variants that had been claimed as causal in prior sequencing studies in fact had no effect on function and are likely to be incidental to the disorder.

These kinds of experiments can also identify subtypes of mutations based on their effects. Sollis and colleagues described several patients with mutations disrupting one copy of *FOXP1*. To model this situation, cells were generated to contain both the normal encoded protein and a mutant protein. A sub-group of mutations not only disrupted the localisation of the mutant protein, but were also able to bind to the normal protein and relocate it in the wrong part of the cell (Figure 4).

In a separate study, Estruch discovered that the protein product of *FOXP2* may be subject to an extra layer of regulation in the cell, through modification with additional molecules, known as small ubiquitin-like modifiers (SUMOs). A mutation in *FOXP2* that causes speech and language deficits led to a marked reduction in the addition of these SUMO modifiers, which may be relevant for the manifestation of the disorder.

Selected publications

De Kovel, C. G. F., Lisgo, S., Karlebach, G., Ju, J., Cheng, G., Fisher, S. E., & Francks, C. (2017). Left-right asymmetry of maturation rates in human embryonic neural development. *Biological Psychiatry*. Advance online publication.

Dias, C., Estruch, S. B., Graham, S. A., McRae, J., Sawiak, S. J., Hurst, J. A., Joss, S. K., Holder, S. E., Morton, J. E., Turner, C., Thevenon, J., Mellul, K., Sánchez-Andrade, G., Ibarra-Soria, X., Deriziotis, P., Santos, R. F., Lee, S.-C., Faivre, L., Kleefstra, T., Liu, P., Hurles, M. E., DDD Study, Fisher, S. E., & Logan, D. W. (2016). BCL11A haploinsufficiency causes an intellectual disability syndrome and dysregulates transcription. *The American Journal of Human Genetics*, 99(2), 253-274.

Graham, S. A., & Fisher, S. E. (2015). Understanding language from a genomic perspective. *Annual Review of Genetics*, 49, 131-160.

Hibar, D. P., et al. (2015). Common genetic variants influence human subcortical brain structures. *Nature*, 520, 224-229.

St Pourcain, B., Robinson, E. B., Anttila, V., Sullivan, B. B., Maller, J., Golding, J., Skuse, D., Ring, S., Evans, D. M., Zammit, S., Fisher, S. E., Neale, B. M., Anney, R., Ripke, S., Hollegaard, M. V., Werge, T., iPSYCH-SSI-Broad Autism Group, Ronald, A., Grove, J., Hougaard, D. M., Børglum, A. D., Mortensen, P. B., Daly, M., & Davey Smith, G. (2017). ASD and schizophrenia show distinct developmental profiles in common genetic overlap with population-based social-communication difficulties. *Molecular Psychiatry*. Advance online publication.

DEPARTMENT
LANGUAGE DEVELOPMENT

Goals of the Department

Language is a uniquely human, complex communication system learnt apparently effortlessly in the first few years of a child's life. The new Department's goal is to discover how children achieve this. Researchers build, develop and test process models and theories that address the central question of first language acquisition: How do children's learning mechanisms exploit information in different environments to build mature linguistic knowledge? This work is supplemented by a department-wide Innovations team, whose research will focus on building big data research tools for the automated collection, coding and analysis of child language data.

Figure 1. Elicitation methods. The child is encouraged to talk to the "talking dog" and ask them questions.

Director Caroline Rowland

Department members Marisa Casillas, Patricia Manko, Nienke Rulkens-Dijkstra, Ingeborg Roete

Figure 2. Using an eyetracker to track children's comprehension of sentences.

Figure 3. Book reading is one of the best ways to build a child's vocabulary.

DEPARTMENT **NEUROBIOLOGY OF LANGUAGE**

Goals of the Department

The focus of the Neurobiology of Language Department is on the study of language production, language comprehension, and language acquisition from a cognitive neuroscience perspective. This includes the use of neuroimaging, behavioural and virtual reality techniques to investigate the language system and its neural underpinnings. Research facilities at the MPI include a high-density EEG lab, a virtual reality lab, and several behavioural testing labs. With part of the Department located at the Donders Institute for Brain, Cognition and Behaviour, Centre for Cognitive Neuroimaging, we also have access to a whole-head 275 channel MEG system, MRI-scanners at 1.5, 3 and 7 Tesla, a TMS lab, and several EEG labs. Figure 1 summarizes our overarching view on the neurobiology of language.

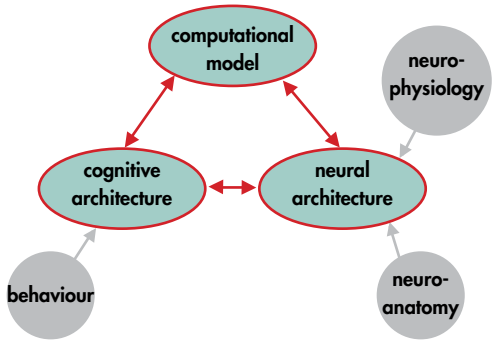


Figure 1. Overarching view on the neurobiology of language.

Pharmacolinguistics

Listeners interpret utterances by integrating information from multiple sources, including word-level semantics and world knowledge. When the semantics of an expression is inconsistent with their knowledge about the world, the listener may have to search through the conceptual space for alternative possible-world scenarios that can render the expression more acceptable. Such cognitive exploration requires considerable computational resources, and the extent to which a listener is willing to do so might be influenced by motivational factors. Oxytocin is a hormone and neuropeptide that is known to influence social motivation by reducing social anxiety and enhancing affiliative tendencies. Since this effect may alter motivational factors, such as willingness to agree with an interlocutor in a communicative scenario, we explored the impact of oxytocin on the integration of world knowledge and sentence meanings. The study used a between-participant double-blind randomized placebo-controlled design. Forty-five healthy male participants received intranasal doses

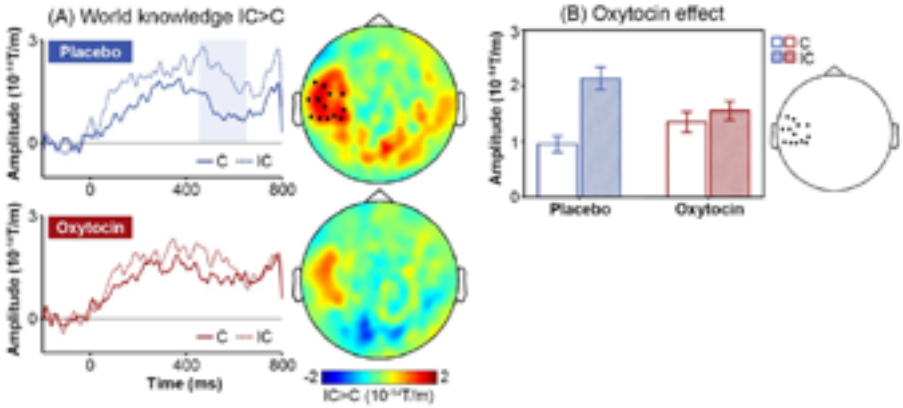


Figure 2. Listeners' brain responses to sentences Coherent (indicated with a C) with world knowledge (e.g. "Dutch trains are yellow and very crowded") were compared to their responses to sentences Incoherent (IC) with world knowledge (e.g. "Dutch trains are white and very crowded"). The N400m effect (IC>C), which usually indexes the brain's response to semantic violations, is greater under placebo than oxytocin.
(A) MEG data; timecourse of MEG signals on the left, distribution of activity over the scalp on the right. Sensors showing significant N400m effect are indicated as black stars.
(B) Bar graph shows average activity over sensors that show significant N400m effect (indicated at right) under placebo, displayed for C and IC sentences under placebo and oxytocin.

Director Peter Hagoort

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of oxytocin or placebo before listening to sentences that were either congruent or incongruent with facts of the world. The impact of the real-world validity of the statements was evaluated using magnetoencephalography (MEG) to detect the N400m, which is an index of semantic integration (Figure 2). Compared with congruent sentences, world-knowledge incongruent sentences elicited a stronger N400m effect in the placebo group. Oxytocin administration significantly attenuated the N400m effect at both sensor and cortical source levels throughout the experiment. These findings suggest that oxytocin drives listeners to resolve challenges of semantic integration, possibly by promoting the cognitive exploration of alternative possible-world scenarios.

Mother of all unification studies (MOUS)

When making sense of written or spoken language, we must combine individual words into larger units of meaning. MOUS is a large-scale project that aims to elucidate the neural basis of sentence processing using multiple techniques. The MOUS team recorded MEG and fMRI from 204 participants while they were reading sentences and unstructured lists of words. Genetic data and brain structural data were also acquired. In one analysis they investigated the bidirectional interregional interactions in the brain network for language of 102 participants reading sentences using MEG. Using Granger causality analysis, the inferior frontal cortex and anterior temporal regions were found to receive widespread input, and middle temporal regions to send widespread output. This fits well with the notion that these regions play a central role in language processing. Characterization of the functional topology of this network, using data-driven matrix factorization, which allowed for partitioning into a set of subnetworks, revealed different directed connections within distinct oscillatory frequency bands (Figure 3). Connections originating from temporal regions peaked at alpha frequency, whereas connections originating from frontal and parietal regions peaked at beta frequency. These findings indicate that processing different types of linguistic information may depend on the contributions of distinct brain rhythms.

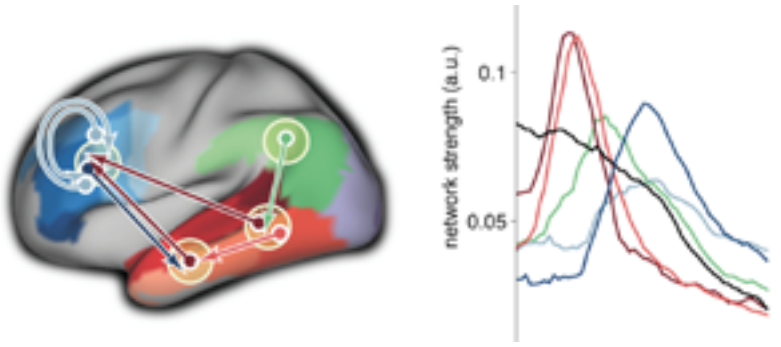

Figure 3. Interaction from and to temporal cortex are subserved by brain rhythms in different frequency bands. (A) Left hemisphere of the brain. Shaded regions are those with significant roles in sentence reading. Arrows indicate directions of interregional influence. (B) Plots indicating the frequencies at which interregional interactions occur. Coloured lines reflect colours of arrows in panel (A), black line is 1/f noise. It can be seen that different interregional influences have peaks at different frequencies. Feedforward connections are centred in the alpha band (around 12Hz) and feedback connections are centred in the beta band (around 25Hz).

How brain rhythms shape speech comprehension

Speech segmentation requires flexible mechanisms if it is to remain robust in the face of variable speech rates and accents. Recent hypotheses suggest that low-frequency neural oscillations provide a speech-rate invariant mechanism that contributes to speech parsing. How this mechanism functionally operates remains unclear. One current hypothesis suggests that neural oscillations track the dynamics of speech to generate temporal predictions that optimize the processing of ongoing speech input. During listening, this suggests that past speech-rate information should constrain the ongoing neural oscillatory activity, which would, ultimately, affect comprehension. In an MEG experiment, native Dutch speakers listened to sentences with varying speech rates. The beginning of the sentence (carrier window) was presented at either a fast or a slow speech rate, while the last three words (target window) were heard at an intermediate rate. Participants were asked to report their perception of the last word of the sentence, which was ambiguous with respect to its vowel duration (/ɑ/–/aː/ contrast).

Results show that the perception of the target word was influenced by the preceding speech rate - listeners who heard faster speech during the carrier window tended to classify the vowel as long, while those who heard slower speech during the carrier window tended to classify the vowel as short (Figure 4). During the carrier window, neural oscillations in auditory cortices followed the current speech rate. During the target window, sustained oscillatory response to the preceding speech rate was observed in right medial and superior temporal areas, and correlated with behaviour: participants whose perception was influenced by the speech rate showed stronger sustained oscillatory activity. The results suggest that neural entrainment lasts after rhythmic stimulation and encodes temporal predictions for speech comprehension. To further test the causal role of neural oscillations in speech processing, a follow-up study using brain stimulation is currently underway.

The role of prediction in a rich virtual environment

Predictive language processing is often studied by measuring eye movements as participants look at two-dimensional line drawings on a small computer monitor while they listen to spoken sentences. The use of such 'visual world paradigms' has shown that information encountered by a listener at a spoken verb can give rise to anticipatory eye movements to a target object. This is taken to indicate that people predict upcoming words. However, the ecological validity of such findings remains questionable, because the large majority of previous studies used visually-impoverished stimuli that are mere abstractions of real-world objects. Do these results hold in an immersive,

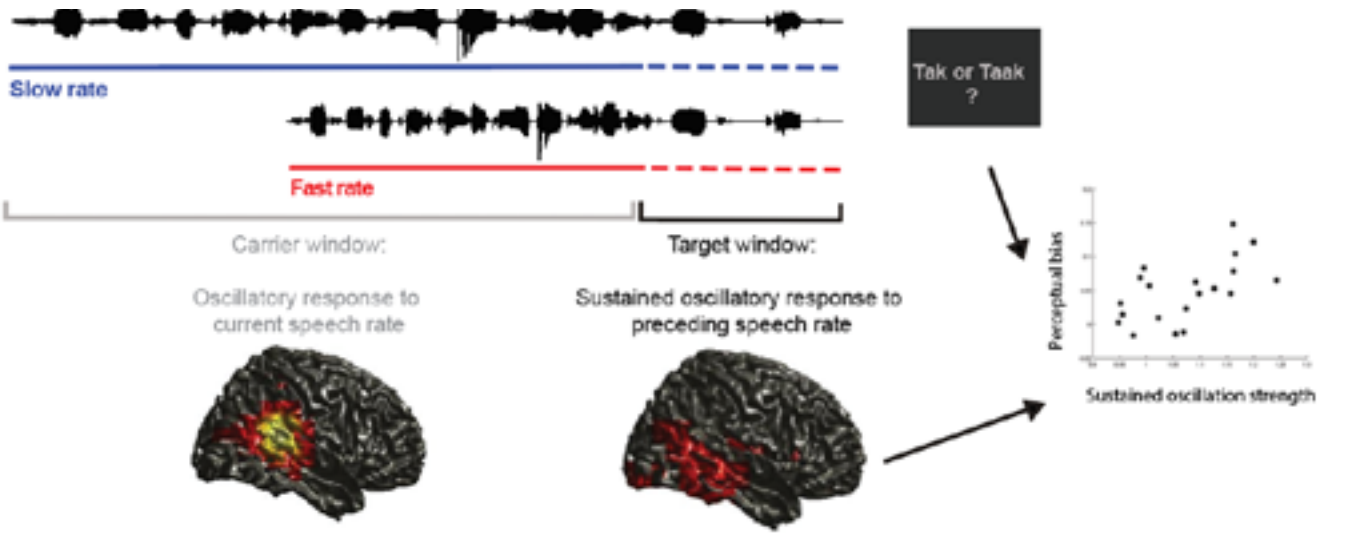

Figure 4. Listeners heard sentences that began with either fast or slow segments. The final segment of the sentence was presented at an intermediate rate, and participants were asked to report their perception of a word that could be interpreted as having a long or short vowel. The scatter-plot shows the relationship between the strength of oscillations in temporal cortex entrained by the initial speech-rate, and the subsequent perception of spoken words.

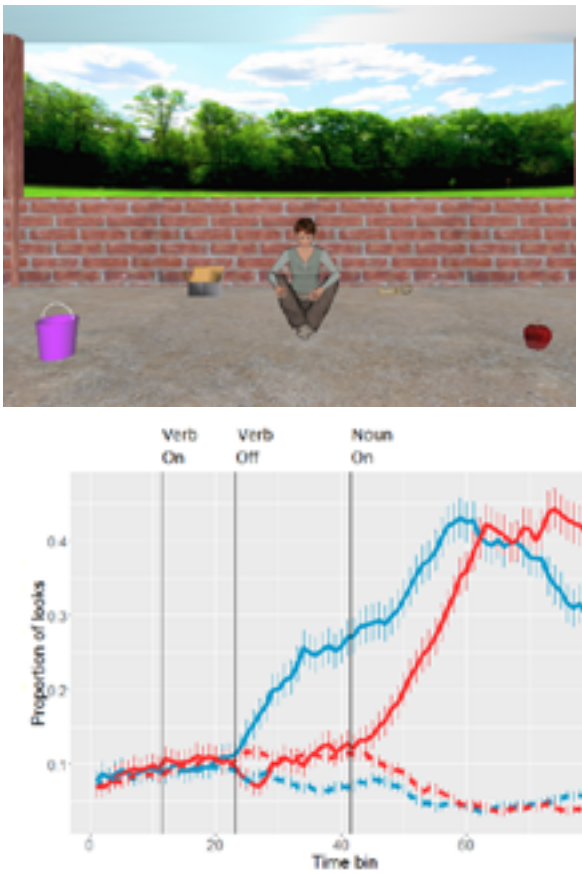

Figure 5. When presented with the three-dimensional scene in (A) and hearing the restrictive sentence "The woman eats an apple", participants' gaze fixates significantly more on the apple than anywhere else as soon as they hear verb 'eat'. No such anticipatory eye gaze is observed if the unrestrictive verb 'move' is heard, in "the woman moves an apple". Panel (B) shows the proportion of gaze fixations to the apple over time when listening to restrictive vs unrestrictive sentences. It can be seen that in restrictive contexts, gaze fixes on the target (such as the apple) earlier than in unrestrictive contexts. This suggests that we use linguistic information to actively search the world and to predict what is coming next.

three-dimensional, virtual-reality environment? Despite significant changes in the stimulus material and a different mode of stimulus presentation, language-mediated anticipatory eye movements are nonetheless observed (Figure 5). These findings thus indicate prediction of upcoming words in language comprehension in a more naturalistic setting, where natural depth cues are preserved. Moreover, the results confirm the feasibility of using eye-tracking in rich and multimodal 3D virtual environments. Ongoing studies will reveal how robust prediction is, when faced with increasing complexity of the visual environment.

Selected publications

Van Bergen, G., & Flecken, M. (2017). Putting things in new places: Linguistic experience modulates the predictive power of placement verb semantics. *Journal of Memory and Language*, 92, 26-42.

Lam, N. H. L., Schoffelen, J.-M., Udden, J., Hulten, A., & Hagoort, P. (2016). Neural activity during sentence processing as reflected in theta, alpha, beta and gamma oscillations. *NeuroImage*, 142 (15), 43-54.

Weber, K., Christiansen, M., Petersson, K. M., Indefrey, P., & Hagoort, P. (2016). fMRI syntactic and lexical repetition effects reveal the initial stages of learning a new language. *The Journal of Neuroscience*, 36, 6872-6880.

Willems, R. M., Frank, S. L., Nijhoff, A. D., Hagoort, P., & Van den Bosch, A. (2016). Prediction during natural language comprehension. *Cerebral Cortex*, 26 (6), 2506-2516.

Bastiaansen, M. C. M., & Hagoort, P. (2015). Frequency-based segregation of syntactic and semantic unification during online sentence level language comprehension. *Journal of Cognitive Neuroscience*, 27 (11), 2095-2107.

DEPARTMENT **PSYCHOLOGY OF LANGUAGE**

Goals of the Department

The research in the Psychology of Language Department is directed at developing functional models of speaking and listening. One cluster of research questions concerns the representation of linguistic knowledge in the mind. For instance, are there clear distinctions between knowledge of words and the grammar of a language or between linguistic and non-linguistic knowledge? How much individual variation is there in the way language is represented? A second cluster concerns the way linguistic knowledge is accessed in speaking and listening. For instance, which linguistic and domain-general cognitive control processes are involved? How does their impact vary across individuals and tasks? How do speakers coordinate listening and speech planning in conversations? A third cluster concerns the ways speakers adapt to and learn from each other. For instance, how do people adapt to an interlocutor's speech rate? How do properties of their social networks influence their linguistic skills?

Language can be used in many different ways, for example, when chatting with a neighbour, delivering a lecture, listening to a fairy tale, or participating in a picture-naming task in a psycholinguistics lab. The aim of the Department, as illustrated in the projects below, is to understand how people perform all of these tasks.

The representation of linguistic knowledge in the mind

No linguistic task can be accomplished without knowledge of words. Consequently, much work in the Department has been directed at understanding how lexical knowledge is represented in the mind. One line of research, led by Shao, has concerned the representation of noun phrases, such as "brown shoe." Analyses of the effects of whole-form and constituent frequencies on speech onset latencies and memory performance suggest that complex phrases are represented both in terms of their constituents and as units.

These findings have important implications for theories about the size and structure of the mental lexicon and the way phrases are built and understood.
A second line of research is the development of vocabulary tests for young adults. Having reliable and valid instruments to assess lexical knowledge is crucial for studying how individual differences in lexical knowledge affect how people produce utterances and understand others. This work is conducted in close cooperation with colleagues in the NWO-financed consortium Language in Interaction and the research group of Marc Brysbaert (Ghent U.).

The role of low-level visual processes in language comprehension

How clear is the distinction between linguistic and non-linguistic knowledge in the mind? Philosophers and psychologists have long argued that symbolic conceptual representations must be grounded in the sensory-motor systems. Recent research indeed suggests the recruitment of sensory systems during language comprehension. However, this does not mean that the activation of sensory-motor representations is a necessary component of language comprehension. Using a detection paradigm implemented with continuous flash suppression (Figure 1), Ostarek and Huettig found that otherwise invisible images become visible when participants hear the picture name (e.g. "bottle") just before the image appears. This suggests that spoken words activate processes involved in the earliest stages of visual perception, facilitating perception of the object. They then investigated in which tasks low-level visual processes support spoken word processing. Using a visual noise technique, they found that interfering with low-level visual processes only slowed down responses when participants had to judge the concreteness of spoken words, but not when they had to indicate their grammatical class.

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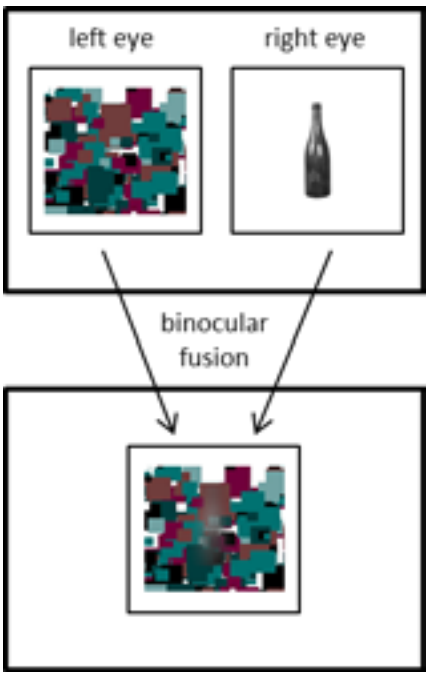


Figure 1. Binocular Fusion: Different images are projected to the left and right eye. The brain combines them into a single fused percept (bottom picture).

This suggests that the involvement of basic visual processes in language comprehension is not automatic but depends on task demands.

Accessing linguistic knowledge during speaking and listening

Just having linguistic knowledge alone isn't sufficient for communication. Speakers and listeners also need to be able to access the right word at the right time. It has often been proposed that interlocutors in conversation plan their utterances while listening to their partners. Such linguistic dual-tasking would contribute importantly to the perceived fluency of conversation. However, consistent with earlier work, several studies in the Department have shown that understanding and remembering spoken words is substantially hindered by concurrent word planning tasks. This is because attention needs to be distributed across the two tasks and because there is mutual interference between words activated for speaking and for listening. Current work led by Jongman is directed at understanding speakers' strategies in allocating their processing resources in dialogue. One clear outcome of these studies is that speakers often simply avoid the need for linguistic dual-tasking by postponing their utterance planning until close to the end of the interlocutor's turn.

Another project, led by Hoedemaker, investigates how interlocutors influence each other's lexical access processes. It has been proposed that interlocutors predict their partner's utterances by simulating their word production processes. On this view, hearing another person name a picture should have the same effect on a speaker's future speech planning processes as naming the picture him/herself. This prediction was confirmed in a recent study: Hearing a partner produce several words of a given category (e.g., several animal names) had the same detrimental effect on a speaker's speed of naming yet another member of the same category as producing several category members him/herself.

Using linguistic knowledge to predict upcoming input

It is now well established that we can use our linguistic knowledge to anticipate or predict upcoming input, and that this ability is a key characteristic of spoken language comprehension. Several mechanisms of predictive language processing have been proposed. The possible influence of mediating factors such as working memory and processing speed, however, has hardly been explored. Huettig and Janse sought

Figure 2. The same Dutch ambiguous target sound (in between short /ɑ/, as in "tak" and long /a:/, as in "taak") is presented following two different contexts: a slow sentence and a fast sentence. Hearing the ambiguous target word preceded by a fast context makes the target vowel sound longer (e.g., more /a:/-like).

to find evidence for such influences using an individual differences approach. Participants received spoken instructions (e.g., "Kijk naar de afgebeelde piano" - look at the displayed piano) while viewing four objects. Articles (Dutch "het" or "de") were gender-marked such that the article agreed in gender only with the target. Participants could thus use gender information from the article to predict the upcoming target object. The participants anticipated the target objects well in advance of the critical noun. Multiple regression analyses showed that enhanced working memory abilities and faster general processing speed supported anticipatory spoken language processing. These findings suggest that models of predictive language processing must take mediating factors such as working memory and processing speed into account.

Our own voice affects perception

How malleable is our linguistic knowledge and access to it? Often in conversations, we speak with people with different knowledge, experience, and linguistic backgrounds from ourselves, but nonetheless our own speech and that of our interlocutor(s) follow each other easily and in rapid succession. As listeners we quickly adapt to our interlocutors' accents and ways of expressing themselves. However, a substantial part of the speech we hear is produced by ourselves, a sort of 'listening constant'. A project led by Bosker aims to uncover how characteristics of our own voice interact with our perception of others'.

It is well known that the acoustic context in which we listen to words can influence our perception. For instance, presenting a manipulated vowel in between Dutch short/ ɑ /and long /a:/ after a fast sentence context can make the ambiguous vowel be perceived as the long vowel /a:/ (Figure 2). In one experiment, participants were instructed to produce sentences at fast and slow speech rates. After each self-produced sentence, auditory targets with vowels ambiguous between/ ɑ/ and /a:/ were presented, and participants indicated which word (e.g. "tak" (branch) or "taak" (task)) they heard. Participants perceived the ambiguous vowels as more /a:/-like when they had been talking at a fast, rather than slow, speech rate only moments earlier. Since in dialogue our own voice typically forms the context in which we listen to speech produced by others, this suggests that our own speech might alter our perception of our interlocutors' speech.

Further work investigated whether these local effects of contextual speech rate generalize to more global contexts. One group of participants heard sen-

tences at neutral and fast speech rates, whereas another group heard the same sentences at neutral and slow speech rates. Ambiguous / ɑ/–aˑ/ vowels were embedded in the neutral sentences. The second group reported more /a:/ responses than the first group, indicating that the slow speech in the second group made the neutral sentences sound *faster*. However, another experiment revealed that producing slow speech oneself does not produce a similar change in vowel perception. This indicates that speech perception is only influenced by local (i.e., immediately preceding) self-produced speech but not by one's global speech rate.

Social networks

Through the entire lifespan, people learn language from their linguistic environment. The social networks project, led by Lev-Arí, uses individual differences studies, experiments, and computational simulations to investigate how individual differences in social network properties influence language use and learning. Specifically, the project examines how social network properties are related to the distributional properties of the input, and how these properties affect language skills. For example, larger social networks provide more variable phonological input (Figure 3). Experiencing more variable input leads to more robust speech perception, as reflected in better perception of speech in noise. Social network size also predicts other skills ranging from comprehension of evaluative language to lexical prediction. For instance, as lexical choice varies with age, the heterogeneity of a person's social network in terms of the speakers' ages is related to their success at predicting the word forms (e.g., "bicycle" vs. "bike") young or older persons are likely to use.

Other work in this project studies how social network properties, in particular network size, influence the malleability of people's representations. In general, the more input sources people have, the less weight they give to each of them. Consequently, people with smaller social networks are more susceptible to variation in novel linguistic input compared to people with larger networks.

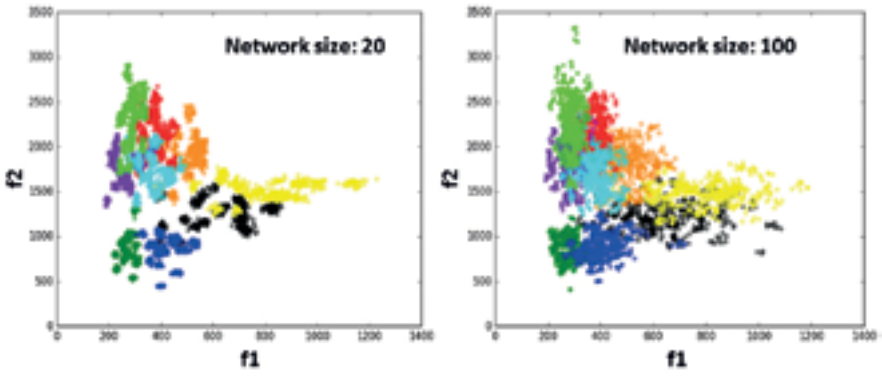


Figure 3. Results of computational simulations showing the phonological input that a typical agent with a social network of 20 and a typical agent with a social network of 100 receives. f1 and f2 refer to the formants of a vowel.The number of data points is equal in both plots. Colours represent vowel categories. A vowel's formant frequencies are more variable, i.e., the input distribution has a higher standard deviation, for agents with larger social networks.

Selected publications

Bosker, H. R., (2017). How our own speech rate influences our perception of others. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. Advance online publication.

Hoedemaker, R. S., Ernst, J., Meyer, A. S., & Belke, E. (2017). Language production in a shared task: Cumulative semantic interference from self- and other-produced context words. *Acta Psychologica, 172*, 55-63.

Huettig, F., & Janse, E. (2016). Individual differences in working memory and processing speed predict anticipatory spoken language processing in the visual world. *Language, Cognition and Neuroscience*, 31(1), 80-93.

Lev-Ari, S. (2016). How the size of our social network influences our semantic skills. *Cognitive Science*, 40, 2050-2064.

Ostarek, M., & Huettig, F. (2017). A task-dependent causal role for low-level visual processes in spoken word comprehension. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. Advance online publication.

RESEARCH GROUP
NEUROGENETICS OF VOCAL COMMUNICATION

Group head Sonja C. Vernes
Group members Midas Anijs, Martin Becker, Ine Alvarez von Tussenbroek, Laura Baas, Paolo Devanna, Nienke Hoeksema, Ella Lattenkamp, Janine Mengede, Jon Ruben van Rhijn, Pedro Rodenas-Cuadrado, Kai Wanke

Goals of the Group

The Neurogenetics of Vocal Communication Group aims to understand the biological encoding and evolution of speech, language and vocal communication. The Group uses a range of diverse approaches to answer this question including; clinical genetic studies to identify genes underlying human language and language-related disorders, molecular and cellular studies to understand the influence of genes and proteins on neural development and circuit function, and animal models to study vocal communication. A major focus of the Group is establishing bat species as novel model systems enabling an understanding of the neurogenetic mechanisms underlying vocal learning behaviour – a shared feature of bat and human vocal communication.

Understanding the genetics of language-related disorders

Determining the genetic factors causing speech and language disorders can lead to improved diagnosis and treatment of disorders and reveal fundamental molecular properties underlying normal speech and language. Next-generation sequencing technologies now make it possible to screen large cohorts of affected individuals to identify the underlying genetic causes. Whilst many focus on protein-coding regions, the Group is exploring non-coding DNA to determine how variation in this part of the genome contributes to language-relevant disorders. Non-coding regions of the genome play a crucial role in regulating how much, when and where proteins are expressed. For this reason, the Group studies the DNA of children with neurodevelopmental disorders (e.g. language impairment), to identify non-coding DNA variants disrupting the control of protein expression.

Recently, the Group identified a non-coding DNA variant in children with language impairment and showed that this variant was more common in affected children. Using cell models and human brain tissue they found that it resulted in higher expression of a protein known as ARHGEF39. Having too much protein at important points in development could affect how neuronal circuits develop and function, potentially leading to changes in skills like language. This represented the first time that functional consequences were demonstrated for a common gene variant associated with typical forms of language impairment, suggesting new molecular pathways that might underlie this complex disorder.

What vocal learning bats can tell us about human speech and language

Although language is unique to humans, vocal learning is a language-relevant trait that has been identified in a handful of other mammals such as elephants, whales, seals and bats. Bats represent an ideal, if currently understudied, model to explore the biological underpinnings and evolution of vocal learning. Bats famously use vocalisations to navigate their environment via echolocation. Perhaps less well known, but just as fascinating is their use of vocalisations to facilitate complex social interactions. In some bat species, these social interactions rely on learning new calls, which can be thought of as comparable to how humans learn new vocalisations to communicate via speech. A major goal of the Group is to use a comparative approach to study this trait in bats and understand how it is biologically encoded. To make this possible, the Group is working to establish two vocal learning species of bats as model systems via comprehensive investigations of the neurological and molecular mechanisms underlying bat vocal learning. This work aims to significantly advance our knowledge about the origins of mammalian vocal communication and may ultimately give insight into the biological encoding and evolution of human speech.

Selected publications

Devanna, P., Chen, S., Ho, J., Gajewski, D., Smith, S. D., Gialluisi A., Francks, C., Fisher, S. E., Newbury, D. F. & Vernes, S. C. (2017). Next-gen sequencing identifies non-coding variation disrupting miRNA binding sites in neurological disorders. *Molecular Psychiatry*. Advance online publication.

Vernes, S. C. (2017). What bats have to say about speech and language. *Psychonomic Bulletin & Review* 24(1), 111-117.

Rodenas-Cuadrado, P., Chen, S., Wiegrebe, L., Firzlaff, U., Vernes, S. C. (2015). A novel approach identifies the first transcriptome networks in bats; a new genetic model for vocal communication. *BMC Genomics*. 16:836.

EXTERNAL GROUP
CLSM SPEECH COMPREHENSION

Goals of the Group

The Group's ultimate goal is to build a model of speech comprehension that accounts for how listeners process their native or non-native language in naturalistic listening conditions. The Group therefore investigates how listeners understand informal speech, which often includes reduced pronunciation variants, like *yeshay for yesterday*. Moreover, the Group investigates why listeners differ in how easily they process speech in everyday noisy and distracting conditions.

Group head Mirjam Ernestus
Group members Ellen Aalders, Martijn Bentum, Louis ten Bosch, Sophie Brand, Robert Chamalaun, Sascha Coridun, Xaver Koch, Esther Janse, Lisa Morano, Kimberley Mulder, Thordis Neger, Mark Noordenbos, Annika Nijveld, Juliane Schmidt, Malte Viebahn

Reduced words in the native and the non-native language

As research into the differences between speech registers helps us to investigate how listeners process these registers, Ernestus and colleagues conducted several corpus studies on speech register differences. They found substantial differences in acoustic reduction between spontaneous and read aloud speech, and between formal and informal speech. Furthermore, speech registers differ in the predictability of words given the preceding words. Ernestus and colleagues also further investigated the processes underlying the comprehension of reduced words. On the basis of several speech comprehension experiments, they conclude that native listeners rely on the syntactic probabilities of words, on their knowledge of the frequencies of occurrences of the different pronunciation variants of a word, and on the subtle characteristics of the speech signal. Non-native listeners rely on the same types of information, but are less successful. This is, among other reasons, 1) because their knowledge of the frequencies of occurrence of the pronunciation variants is less adequate; 2) because they have difficulties interpreting subtle acoustic cues, even those occurring in their native languages; and 3) they are hindered by the phonotactic constraints of their native languages. Furthermore, Ernestus and colleagues found evidence that, in native and non-native listeners, lexical activation spreads less quickly through the semantic network for reduced than for full words. Ten Bosch, Ernestus and Boves continued developing a new computational model of speech comprehension, called Diana. They especially adapted the component that makes it possible to classify words as pseudowords. The model successfully simulates participants' behaviour in both lexical decision experiments and word recognition experiments in Dutch and English.

Differences among listeners

When we listen to speech, we do not just listen to what is being said, but also how it is being said in order to interpret the speaker's emotional state. Janse and colleagues found that older age and hearing loss (independently) changed the way in which listeners make use of information in the speech signal (such as intensity and pitch) to evaluate the speaker's affective state. Another study investigated individual differences in lexically-guided perceptual learning, in which listeners retune their sound categories when presented with words containing an odd pronunciation of a particular sound (e.g., "paradise", in which word-final /s/ is ambiguous). Listeners' attentional abilities were found to be associated with the degree to which they show this type of perceptual learning. As such, these findings are informative with respect to how listeners may differ in how analytically they listen or rather focus on meaning. Janse and colleagues also continued their research on how changes in hearing status affect speech production by studying changes in articulation in novice users of cochlear implants. This research contributes to our knowledge on updating of speech motor routines upon changes in auditory feedback.

Selected publications

Drijvers, L., Mulder, K., & Ernestus, M. (2016). Alpha and gamma band oscillations index differential processing of acoustically reduced and full forms. *Brain and Language* 153-154, 27-37.

Koch, X., & Janse, E. (2016). Speech rate effects on the processing of conversational speech across the adult life span. *Journal of the Acoustical Society of America*, 139, 1618-1636.

Viebahn, M., Ernestus, M., & McQueen, J. (2015). Syntactic predictability in the recognition of carefully and casually produced speech. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 41 (6), 1684-1702.

EXTERNAL GROUP
MULTIMODAL LANGUAGE AND COGNITION

Group head Asli Özyürek
Group members Zeynep Azar, Linda Drijvers, Vicky Fisher, Dilay Karadoller, Francie Mahnhardt, Kimberley Mulder, Gerardo Ortega, Kazuki Sekine, Anita Slonimska, Beyza Sümer, James Trujillo, Ercenur Unal

Goals of the Group

This Group investigates the role our communicative bodily actions plays in language structure, processing, development, as well as in language evolution and emergence. The focus is on two domains of human communicative behaviour: (1) eye gaze and hand gestures that hearing people use while speaking or without speech (e.g., pantomimes), and (2) sign languages used by deaf people (e.g., homesigns, emerging or established sign languages). Cross-linguistic and cultural comparisons as well as a variety of methodologies (corpus, developmental and experimental studies, as well as neuroimaging) are used to understand how humans use multiple modalities in communication as a window into language and cognition, and the relations between them.

Language modality guides visual attention

As part of an NWO- funded 5 year VICI project, the Group began to investigate how iconic form meaning resemblances in the case of spatial language (e.g., pen left of paper) in sign languages influence signer's memory and attention for events as compared to speakers who use arbitrary and categorical labels to express spatial relations. In an eye-tracking experiment, PhD student Mahnhardt, along with members of the project, investigated for the first time whether these linguistic encoding differences guide signers versus speakers visual attention to spatial events (of left-right configurations) differently during viewing of static events for language production. It was found that speakers, when asked to talk about a target left or right of two objects next to each other (e.g., pen left to paper or pen right to paper), are more likely to fixate on the competitor left or right picture than signers. This study provides the first evidence that sign languages' iconic versus speakers' categorical linguistic structures guide signers/speakers visual attention to events differently for language production.

Gestures enhance degraded speech comprehension

With PhD student Drijvers, as part of the Language in Interaction Consortium, the Group started a project to investigate how gestures enhance comprehension of speech in noise by listeners and how the brain's spatiotemporal dynamics enables this process - using behavioural experiments as well as MEG and EEG. The behavioural results show that listeners use information from gestures more than lips to disambiguate the degraded speech. Secondly, it was found that gestural enhancement is enabled by suppression of alpha and beta oscillations in motor and visual areas as well as in the frontal and temporal language network. Furthermore, gamma power increased in left-temporal areas and the medial temporal lobe, suggesting that the semantic information from the gesture can facilitate a matching process of degraded input with lexical memory traces.

Patterns of gesture use in language emergence

Finally, Ortega as part of his VENI project investigated how speakers, when instructed to use only their gestures, communicate about actions versus objects, as a window into language emergence. The study was conducted with hearing participants both in the Netherlands and Mexico. They yielded very systematic patterns regarding how gestural representations differentiate between actions and objects in the absence of language on the one hand and the type of object depicted (manipulable and non manipulable) on the other. Furthermore, these strategies were found to be similar to those used in emerging sign languages revealing a possibly universal pattern in humans' ability to use representations in the manual modality to communicate in the absence of a linguistic system.

Selected publications

Drijvers, L. & Özyürek, A. (2017). Visual context enhanced. The joint contribution of iconic gestures and visible speech to degraded speech comprehension. *Journal of Speech, Language, and Hearing Research*, 60 (1), 212-222

Ortega, G., Sümer, B. & Özyürek, A. (2017). Type of iconicity matters in the vocabulary development of signing children. *Developmental Psychology*, 53 (1), 89-99

Peeters, D., Snijders, T. M., Hagoort, P., & Özyürek, A. (2017). Linking language to the visual world: Neural correlates of comprehending verbal reference to objects through pointing and visual cues. *Neuropsychologia*, 95, 21-29.

INFRASTRUCTURE
TECHNICAL GROUP

Goals of the Group

The Technical Group (TG) has two major goals: (1) to provide the IT infrastructure of workplace, labs, servers, and field equipment for the day-to-day running of the Institute, and (2) to devise experiment systems and software that enable new scientific developments within the Institute.

Group head Reiner Dirksmeyer
Group members Herbert Baumann, Dik van den Born, Jeroen Derks, Alex Dukers, Ronald Fischer, Gerd Klaas, Peter Nijland, Albert Russel, Tobias van Valkenhoef, Kees van der Veer, Ad Verbunt, Rick van Viersen, Johan Weustink, Peter Withers, Nick Wood

Computer systems

In the first half of 2015 the move of all computer and storage systems to the new server room was finished. The new server room is fully functional. The old server room was reduced in size and acts as a backup server room.
In the second half of 2016 until early 2017 the Institute's storage systems have been completely renewed. This includes server and storage hardware, HSM software and a new tape library based on LTO-7.
To enable fast access to central Max-Planck supercomputers and storage systems a second independent 1 GB/sec internet connection has been established. Backup and archive data are mirrored to these central computer centres. Some basic services like the e-mail service has been outsourced to the Max Planck Society's computer centre GWDG.

Experimental labs

The Institute has built and maintains eight reaction time labs, six eye movement labs, various portable eye-tracker setups (glasses and remote eye-tracker), one HMD based virtual reality lab, two EEG labs (Faraday-caged), one gesture lab, one baby lab and two interaction labs. Two child observation labs are planned to be set up as well.
The new virtual reality (VR) lab, based on a three-side cave system (3.3m x 2.5m), has been opened for production in September 2015. This lab gives researchers unique possibilities to conduct experiments. Participants can be placed in carefully controlled and tailored environments or circumstances and facilities are available to record EEG and eye tracking during the experiments.
Furthermore, a new experiment system is in development that allows researchers to define and run Web or App based experiments.
A new web portal for subject registration has also been developed and is active since October 2016. The portal makes it much easier to recruit participants for experiments.
The main neuroimaging facility is housed in the Donders Centre for Cognitive Neuroimaging, where 1.5, 3 and 7 Tesla fMRI, MEG and EEG labs are maintained by a dedicated Technical Group.

Field expeditions

During the period of review 25 field trips were fully equipped with devices from solar panels to portable eye-trackers.

Molecular biology labs

Housed in the extension of the Institute are state-of-the-art wet lab facilities that are in use since January 2015.
There are five dedicated laboratories for general molecular biology, tissue culture, RNA work, histology and microscopy. These labs have very specific laboratory equipment of which many are controlled by computers. Examples of equipment are Bio-Rad CFX96 real time PCR machines and a Zeiss LSM880 confocal microscope with Airyscan.

THE LANGUAGE ARCHIVE

Goals of the Group

The Language Archive (TLA) maintains one of the largest collections of spoken and signed language data, currently covering more than 200 different languages spoken around the world. Its goal is to preserve these materials for the long term and to provide access to them now and in the future. The collections stored in the archive include endangered languages data from the DOBES (Documentation of Endangered Languages) programme of the Volkswagen Foundation, first and second language acquisition corpora, and sign language corpora, as well as studies of gesture and multilingualism. TLA is also developing software for improved archiving of research data, as well as linguistic tools such as ELAN, a leading tool for the scientific annotation of multimedia recordings. The archive's infrastructure meets the highest archiving requirements (it holds the Data Seal of Approval) and serves as a model and reference for similar initiatives.

Group coordinators Paul Trilsbeek *(head)*, Stephen C. Levinson, Caroline Rowland *(directors)*

Group members Eric Auer, Peter Beinema, Daan Broeder, Sebastian Drude, Willem Elbers, Jeroen Geerts, Twan Goosen, Alexander König, Kees Jan van de Looij, Sander Maijers, André Moreira, Daniel von Rhein, Olaf Seibert, Olha Shkaravska, Guilherme Silva, Han Sloetjes, Dieter van Uytvanck

Developments and projects

In collaboration with the Meertens Institute, TLA started developing a new archiving system to replace the in-house built system in 2017. The system currently used is not up to today's standards with respect to user interface and ease of use. The new system is largely based on existing open source software in order to reduce maintenance costs. A large part of the development on the side of the MPI is being completed as part of the project "Kölner Zentrum für Analyse und Archivierung audiovisueller Daten (KA3)", funded by the German ministry for education and research.

Furthermore, TLA is making many of the openly available sound recordings in the archive discoverable via the Europeana portal of online cultural heritage within the Europeana Sounds project. Europeana enables users to explore more than 50 million artworks, artefacts, videos and sounds from across Europe.

In October 2015, selected collections from The Language Archive were inscribed on the UNESCO Memory of the World register. This prestigious register consists of documentary heritage that is of exceptional value to the world and contains, for example, the Anne Frank diaries and the original Wizard of Oz film negatives.

At the end of September 2016, the formal TLA project - funded by the Max Planck Society (MPG), the Berlin-Brandenburg Academy of Sciences and Humanities (BBAW), and the Royal Netherlands Academy of Arts and Sciences (KNAW) - came to an end. From October 1st, 2016, the core of the archive has been embedded back in the Technical Group of the MPI. Caroline Rowland, the new director of the Language Development Department, will continue aspects of the original TLA mission: She will be focusing on spoken and signed language corpora of everyday conversation.

United Nations
Educational, Scientific and
Cultural Organization

Selected data collections of the world's language diversity at the Language Archive
Inscribed on the Register in 2015
Memory of the World

Selected publications

Sloetjes, H., & Seibert, O. (2016). Measuring by marking; the multimedia annotation tool ELAN. In A. Spink, G. Riedel, L. Zhou, L. Teekens, R. Albatal, & C. Gurrin (Eds.), *Measuring Behavior 2016, 10th International Conference on Methods and Techniques in Behavioral Research* (pp. 492-495).

Trilsbeek, P., Broeder, D., Elbers, W., & Moreira, A. (2015). A sustainable archiving software solution for The Language Archive. In *Proceedings of the 4th International Conference on Language Documentation and Conservation (ICLDC).*

LIBRARY

Goals of the Group

The Library Group supports our researchers in all their information needs in providing printed or electronic content. They support the publication management and display of the Institute's publications. The Group also assists in compiling bibliometric impact measures of researcher's publications.

Members Karin Kastens *(head)*, Meggie Uijen

A hybrid library

The library's collection closely follows the Institute's research. Starting with 2013 the library became an e-only library for journal content. The Max Planck-wide licenses, together with dozens of locally licensed e-journal subscriptions specifically aimed at the Institute's research, provide access to more than 80,000 academic e-journals. While printed books are still purchased, e-books became a valuable resource primarily guaranteed via Max Planck licenses. The fast interlibrary loan support complements the provided service.

Publication support

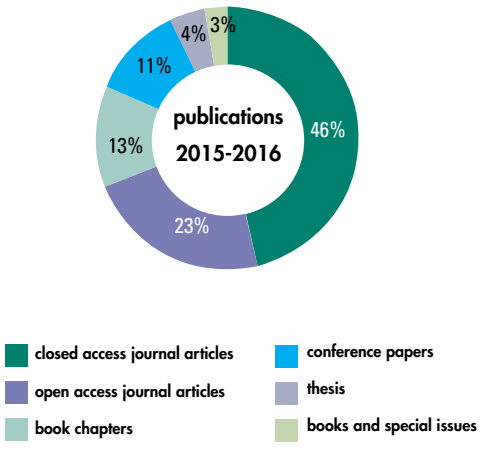
The publication output of the Institute is managed via the institutional publication repository MPG.PuRe (http://pubman.mpdl.mpg.de). The complete publication and presentation lists of MPI researchers are entered into the repository. The library's workflow allows researchers, secretaries, and librarians to enter publication and presentation data and upload full texts.

The publication and presentation data are uploaded daily onto the Institute's website and are being rendered on person, Department, and other pages with links to full texts and supplementary material. During the last two years 2300 items were added or updated. The librarians perform a quality check.

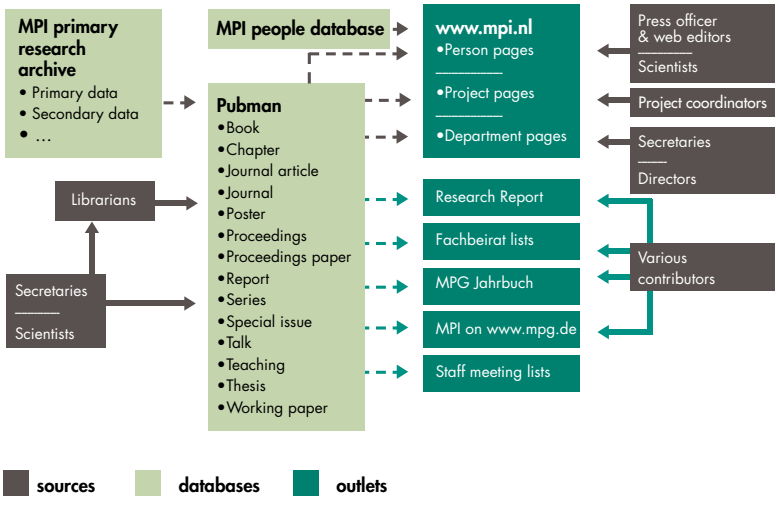
The librarians inform MPI researchers of newly added or updated publications on their homepages. The librarians work closely together with the Public Outreach Officer to enhance the visibility of new publications.

Open Access

Information about Open Access is provided by the library as well, especially information about Max Planck-wide agreements regarding Article Processing Charges. In 2015-2016 thirty percent of the Institute's journal publications were published gold Open Access.



MPI information flow



INTERNATIONAL MAX PLANCK RESEARCH SCHOOL (IMPRS) FOR LANGUAGE SCIENCES

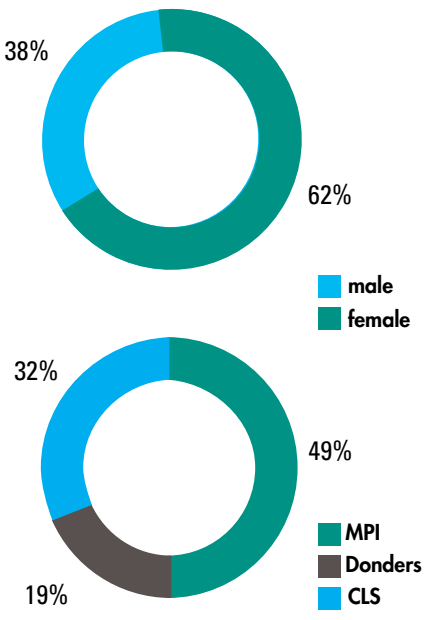
Goals of the IMPRS

The International Max Planck Research School (IMPRS) for Language Sciences is a joint initiative between the Max Planck Institute for Psycholinguistics and two partner Institutes – Donders Institute for Brain, Cognition and Behaviour & Centre for Language Studies – based at Radboud University Nijmegen. Since July 2009, the IMPRS continues to promote a well-rounded approach to education in its curriculum.

Spokesperson Stephen C. Levinson *(director)*
Coordinator Els den Os
Assistant Dirkje van der Aa (2015), Kevin J. Y. Lam (2016)

Students

By the end of 2016, the IMPRS for Language Sciences had seen 41 doctoral graduations, and the 50th defence is expected to take place in the first half of 2017. The most recent cohort is made up of the largest number of PhD students to date at 27 members representing 15 nationalities. The composition of active cohorts (2013-2016) by sex and Institute is depicted as follows:



Training programme

The IMPRS for Language Sciences provides a structured training programme through the broad course offerings at Radboud University as well as on-demand courses tailored according to current needs (e.g., Bayesian statistics, linear mixed-effects modelling, programming in R and Python). Over the course of their training, the programme ensures that students develop a strong foundation in technical skills such as neuroimaging methods, acquire clear written and spoken communication skills for different audiences, and soft-skills for their future careers.

Activities

All students benefit from a range of activities designed to provide numerous opportunities to share their research and foster intellectual growth. For example, each year, students gain special access to the keynote speaker of the Nijmegen Lectures in the form of a 'meet the speaker' lunch. Moreover, students are highly encouraged to organise large-scale events. Two such events took place in 2015 -- a public outreach event *Nijmeegse Taalmiddag* and an international IMPRS workshop on *Perspectives on the Ontogeny of Mutual Understanding*.

Research projects

The research projects span the breadth of the language sciences. A representative selection of their topics follows:

– Xiaochen Zheng (Donders | 2015 Cohort)
The neural basis of error monitoring in language context

– Dilay Karadöller (CLS | 2016 Cohort)
The effect of delayed first-language exposure on spatial cognition and memory in deaf children and adults

– Midas Anijs (MPI | 2015 Cohort)
Investigating the function of language-related genes in human stem cell-derived neural networks

– Dick van den Broek (MPI | 2016 Cohort)
The computational role of synaptic plasticity in language processing

PUBLIC OUTREACH

Coordinator Charlotte Horn

Goals for Public Outreach

Public Outreach for the Institute has three major goals: 1) to distribute knowledge deriving from the Institute's research to the general public, 2) to create interaction between the wider audience and the Institute's scientists and science, and 3) to ensure profiling and visibility for the Institute both nationally and internationally.

In March 2016, the Institute appointed a full time Science Communication and Public Outreach Officer to coordinate and enhance efforts in this area. The Officer at the Institute has a wide range of science communication tasks, such as handling media attention for publications, organising events and workshops for the general public, and advising on a general communication strategy.

Website

The Institute's website attracts about twenty thousand visitors a month, from 95 different countries, mainly the US, Germany, the Netherlands and the UK. Two thirds arrive via search engines, a quarter directly, and ten percent via other websites such as social media sites like Facebook and Twitter. There are about 500 downloads of publications from the website every month. To stimulate the Institute's visibility and profiling, the Institute has started working on a major redesign of the website.

Press and social media

In 2015-2016, MPI research has been covered by major Dutch newspapers like the *Volkskrant* and *NRC*, as well as by the *BBC*, *the Guardian*, *the Huffington Post*, *Scientific American*, *New Scientist*, the *Atlantic*, *Chicago Tribune*, the *Times of India*, *Der Spiegel*, and *Neue Zürcher Zeitung*. News items and publications are shared through the Institute's Twitter account, which has almost 1700 followers.

Events

In June 2015 the Institute held its first public open day. With over 600 visitors of all ages and backgrounds, it was a resounding success. Visitors could extract DNA; learn about endangered languages; visit the virtual reality lab; see brain signals visualised through EEG; participate in actual experiments; and listen to lectures.
This strategy of public engagement was continued in 2016, by acting as a partner in two large science communication events. At *DRONGO*, the language festival of the Netherlands and Belgium, thirteen MPI scientists demonstrated state-of-the-art experiments, including virtual reality, mobile eye tracking and Kinect, to let visitors experience how the Institute conducts its research. For *InScience*, the Dutch International Science Film Festival, the Institute contributed to development of the programme, including a strand on language, which involved talks from MPI scientists, a 'Do It Yourself' lab for children, and a 'pop up' museum about MPI research at Nijmegen library. Beyond these examples, researchers from all Departments present their work to different audiences outside the research community, from primary school pupils to speech therapists.

EVENTS AND ACTIVITIES

2015

WORKSHOP

Gender and classifiers: areal and genealogical perspectives
[The 2nd dissemination workshop]
Organised by Gunter Senft, Edith Sjoerdsma, Sebastian Fedden (U. Surrey), and Greville Corbett (U. Surrey).
Participants: Maria Polinsky (Harvard U.), Alexandra Grandison (Surrey U.), Xavier Bach (Oxford U.), Alex Cobbinah (SOAS London), Connie De Vos, Inge Zwitzerlood and Kang-Suk Byun, Francesca Di Garbo (Stockholm U.), Stephanie Farmer, Martine Bruil (UC Berkeley), Michael Franjieh (Surrey U.), One-Soon Her, Hui-Chin Tsai, Kun-Han Lin, Marc Tang and Meng-Chang Lee (National Chengchi U., Taiwan), Marcin Kilarski (U. Poznan), Matthias Passer (UvA), Olga Krasnoukhova (Radboud U.), Zachary O'Hagan and Lev Michael (UC Berkeley), Hiram Ring (Nanyang U. Singapore). *January 26-27.*

WORKSHOP

Computational models of sentence processing
Organised by Peter Hagoort.
Participants: Jenny Audring (Leiden U.), Rens Bod (U. Amsterdam), Hartmut Fitz, Stefan Frank (Radboud U.), Karl Magnus Petersson and Jelle Zuidema (U. Amsterdam). *March 18.*

SYMPOSIUM

Decoding the neurobiology of synaesthesia
[Royal Netherlands Academy of Arts and Sciences Symposium]
Organised by Katerina Kucera, Sarah A. Graham and Simon E. Fisher.
Speakers: Jamie Ward (U. Sussex), Romke Rouw (U. Amsterdam), Avishai Henik (Ben-Gurion U.), Greg Neely (Garvan Institute Sydney), Anil Seth (U. Sussex), David Brang (Northwestern U.), Beat Meier (U. Bern), Edward Hubbard (U. Wisconsin), Simon Baron Cohen (U. Cambridge), Tessa van Leeuwen (Radboud U.), Michael Banissy (U. London), and Duncan Carmichael (U. Sussex). Amsterdam, *March 18–20.*

WORKSHOP

Neurobiologically realistic models of language processing
[1st Workshop]
Organised by Karl Magnus Petersson.
Participants: Ray Jackendoff (Tufts U.), Renato Duarte (Forschungszentrum Jülich), Stefan Frank (Radboud U.), Peter Hagoort, Hartmut Fitz, Willem Zuidema (U. Amsterdam), Marvin Uhlmann and David Neville (Radboud U.). *May 2 –3.*

SYMPOSIUM

A Celebration of Language
[Symposium on the official Opening of the New Wing]
Organised by Simon E. Fisher and Peter Hagoort.
Keynote lecture: Evan E. Eichler (U. Washington).
Presenters: Asli Özyürek, Sonja Vernes, Wim Emmerik (sign poet), Henk Ester (poet), Hobbit (beatbox artist) and Choir Mnemosyne. *June 10.*

WORKSHOP

Pragmatic typology: new methods, concepts and findings in the comparative study of language in use
Organised by Mark Dingemanse and Giovanni Rossi (U. Helsinki).
Participants: Jörg Zinken (U. Mannheim), Sandy Thompson (UC Santa Barbara), Stef Spronck (U. Leuven), Simeon Floyd, Julija Baranova, Joe Blythe, Mark Dingemanse, Kobin Kendrick and N.J. Enfield , Ilana Mushin (U. Queensland). Antwerp, *July 27.*

WORKSHOP

African ideophones and their contribution to linguistics
Organised by Mark Dingemanse and Steven Rose (UCSD).
Kyoto, *August 22.*

WORKSHOP

Pointing in spoken and signed communication
Organised by David Peeters.
Participants: Sotaro Kita (U. Warwick), Thomas C. Gunter (MPI Human Cogn. Brain Sci.), and Connie de Vos. *September 14.*

WORKSHOP

Reappraising the role of linear structure in language
[Lorentz Workshop]
Organised by Karl Magnus Petersson, Rens Bod (U. Amsterdam), Stefan Frank (Radboud U.) and Morten H. Christiansen (Cornell U.).
Participants: Afra Alishahi (Tilburg U.), Christian Bentz (U. Cambridge), Rens Bod (U. Amsterdam), Grzegorz Chrupala (Tilburg U.), Alexander Clark (King's College London), Peter Culicover (Ohio State U.), Peter Dominey (BRON, France), Ramon Ferrer-I-Cancho (Polytechnical U. Catalunya), Hartmut Fitz, Stefan Frank (Radboud U.), Daniel Freudenthal (U. Liverpool), Peter Hagoort, Dieuwke Hupkes (U. Amsterdam), Elena Lieven (Manchester U.), Andrea E. Martin (Edinburgh U.), Stewart Mccauley (Ithaca U.), Nicola Molinaro (Basque Ctr Cognition, Brain and Language), Padraic Monaghan (Lancaster U.), Karl Magnus Petersson, Fenna Poletiek (Leiden U.), Jeremy Skipper (UC London), Arie Verhagen (Leiden U.),

Véronique Verhagen (Tilburg U.), Eva Wittenberg (UC San Diego), and Willem Zuidema (U. Amsterdam). Leiden, *September 14–18.*

WORKSHOP

Perspectives on the ontogeny of mutual understanding

[IMPRS workshop]

Organised by Zeynep Azar, Julija Baranova, Evelien Heyselaar, Elliot Hoey , Rick Janssen, Suzanne Jongman, Elizabeth Manrique, Lisa Morano, Annika Nijveld, Lotte Schoot, William Schuerman and Johanne Tromp.

Participants: Michael Tomasello (MPI for Evolutionary Anthropology), Mardi Kidwell (U. New Hampshire), Rebecca Saxe (MIT), Vasudevi Reddy (U. Portsmouth). *October 1-2.*

WORKSHOP

Self-monitoring and control in speech production

Organised by Antje Meyer and Zeshu Shao.

Speakers: Gary Dell (U. of Illinois at Urbana-Champaign), Robert Hartsuiker (Ghent U.) Andrea Krott (U.of Birmingham), Randi Martin (Rice U.) Sieb Nooteboom (Utrecht U.) Ardi Roelofs (Radboud U.), Niels Schiller (Leiden U.). *October 5–6.*

WORKSHOP

Nijmegen-Tilburg Multi-modality workshop

Organised by Judith Holler, Asli Özyürek, Zeynep Azar, Emiel Krahmer (Tilburg U.) Marc Swerts (Tilburg U.), and Ingrid Masson Carro (Tilburg U.). Tilburg, *October 22.*

WORKSHOP

Grambank workshop for coders

Organised by Harald Hammarström.

Participants: Hedvig Skirgard, Peter Edelstein (SOAS), Ger Reesink (U. Amsterdam), Sebastian Bank (U. Leipzig), Luise Dorenbusch (U. Leipzig). *December 4-5.*

WORKSHOP

Individual differences in language processing across the adult life span

Organised by Esther Janse, Thordis Neger and Xaver Koch.

Speakers: Ardi Roelofs (Radboud U.), Matt Goldrick (Northwestern U.), Valerie Hazan and Outi Tuomainen (U. London), Megan McAuliffe (U. Canterbury, NZ), Anna Woollams (U. Manchester), Jerker Rönnberg (U. Linkoping, Sweden), Mirjam Ernestus (Radboud U.), Patti Adank (U. London), James McQueen (Radboud U.), Florian Jaeger (U. Rochester, USA), Deniz Başkent and Terrin Tamati (Groningen UMC), Art Wingfield (U. Brandeis, USA), Antje Heinrich (MRC, Nottingham), and Falk Huettig. *December 10-11.*

EVENTS AND ACTIVITIES

2016

COURSE

Neurobiology of language and communication
[FENS-Hertie Winterschool]
Organised by Julia Fischer (U. Goettingen) and Peter Hagoort.
Participants: David Poeppel (New York U.), Nina Dronkers (UC Davis), Steffen Hage (U. Tübingen), Simon Fisher, Dan Margoliash (U. Chicago), Anne Christophe (LSCP- CNRS), Nicola Palomero-Gallagher (Forschungszentrum Jülich), and Franck Ramus (École Normale Supérieur - CNRS). Obergurgl, Austria, *January 3–9.*

WORKSHOP

Morphology in the Parallel Architecture
Organised by Peter Hagoort.
Participants: Ray Jackendoff (Tufts U.), Jenny Audring (Leiden U.), G.E. Booij (Leiden U.), Jelle Zuidema (U. Amsterdam), Stefan Frank (Radboud U.), Antal van den Bosch (Radboud U.), Julia Udden, Karl-Magnus Petersson, Pim Levelt and Arie Verhagen (Leiden U.). *March 18.*

WORKSHOP

Language Adapts to Interaction
Organised by Sean Roberts and Gregory Mills (Groningen U.).
New Orleans, *March 21.*

WORKSHOP

Understanding Pragmatics
[Postgraduates and PhD candidates]
Organised by Yoko Fujii (JWU) and Gunter Senft. Tokyo, *March 24.*

WORKSHOP

Morphology and the relation of a linguistic account to processing and cross-linguistic considerations
Organised by Peter Hagoort.
Participants: Ray Jackendoff (Tufts U.), William Marslen-Wilson (U. Cambridge), and Mirjana Bozic (U. Cambridge).
April 14.

WORKSHOP

Causality across languages (CAL)
[Training workshop]
Organised by Stephen Levinson and Jürgen Bohnemeyer (Buffalo U.).
Participants: Anja Latrouite & Rainer Osswald (U. Düsseldorf), Erika Bellingham (Buffalo U.), Randi Moore (Buffalo U.). *April 11-14.*

WORKSHOP

Causality in the Language Sciences Conference
Organised by Damian Blasi (Zurich), Jürgen Jost (MPI for Mathematics in the Sciences), Peter Stadler (Leipzig U.), Russell Gray (MPI for *the Science of Human History), Bernard Comrie (MPI for Evolutionary Anthropology), Stephen Levinson, Nihat Ay (MPI for Mathematics in the Sciences), Sean Roberts and Leonardo Lancia (MPI for Evolutionary Anthropology).* Leipzig, *April 13-15.*

WORKSHOP

Neurobiologically realistic models of language processing
[2nd Workshop]
Organised by Karl Magnus Petersson.
Participants: Renato Duarte (Forschungszentrum Jülich), Hartmut Fitz, Marvin Uhlmann and Dick van den Broek.
May 14–15.

SYMPOSIUM

Session: The role of neural oscillations in cognition
[International Neuropsychological Symposium]
Organised by Peter Hagoort and Lorraine Tyler (U. Cambridge).
Participants: Pascal Fries (Ernst Strüngmann Institute), Ole Jensen (U. Birmingham), Joachim Gross (U. Glasgow), Pieter Roelfsema (Netherlands Inst. Neuroscience), David Poeppel (MPI for Empirical Aesthetics), Wolf Singer (Ernst Strüngmann Institute), and Jan-Mathijs Schoffelen (Radboud U.). Baiona, *June 21–25.*

COURSE

Human language: From genes and brains to behaviour
[Language in Interaction Summer School]
Organised by Peter Hagoort.
Participants: James McQueen, Antje Meyer, Ray Jackendoff (Tufts U.), Asli Özyürek, Gerardo Ortega, Ardi Roelofs (Radboud U.), Sally Andrews (Sydney U.), Caroline Rowland, Evan Kidd (Australian National U.), Sarah Kucker (U. Wisconsin Oshkosh), Shanley Allen (TU Kaiserslautern), Heike Behrens (U. Basel), Michael Skeide (MPI Human Cogn. Brain Sci.), Vicky Chondrogianni (U. Edinburgh), Nina Dronkers (UC Davis), William Marslen-Wilson & Lorraine Tyler (U. Cambridge), Vitória Piai (Radboud U.), Ivan Toni (Radboud U.), Stephen Levinson, Federico Rossano (UC San Diego), Herb Clark (Stanford U.), Christian Beckmann & Koen Haak (Radboud U.), Elia Formisano (Maastricht U.), Nicola Palamero-Gallagher (Forschungszentrum Jülich), Simon Fisher, Timothy Bates (Edinburgh U.), Clyde Francks, Sonja Vernes, Wolfgang Enard (Ludwig-Maximilians University Munich), Carel ten Cate (Leiden U.),

Constance Scharff (Freie U.Berlin), Steffen Hage (Tübingen U.), Buddhamas Kriengwatana (U. Amsterdam), Mirjam Knörnschild (Freie U. Berlin), Willem Zuidema (U. Amsterdam), Bart de Boer (Vrije U. Brussel, Frank Keller (Edinburgh U.), Stefan Frank (Radboud U.), Stella Frank (U. Amsterdam), Phong Le (U. Amsterdam), Antal van den Bosch (Radboud U.), Piek Vossen (Vrije U. Amsterdam), Alona Fyshe (U. Victoria), Leila Wehbe (UC Berkeley), Luc Steels (Vrije U. Brussel), Walter Daelemans (U. Antwerp), and Emiel Krahmer (Tilburg U.). Berg en Dal, *July 4–14.*

COURSE

2nd Cold Spring Harbor Laboratory course on Genetics and Neurobiology of Language

Organised by Simon E. Fisher, and Kate E. Watkins (Oxford U.).
Speakers: Richard Aslin (U. Rochester), Matt Davis (U. Cambridge), Karen Emmorey (San Diego State U.), Evelina Fedorenko (MIT), Tecumseh Fitch (U. Vienna), Ellen Lau (U. Maryland), Mairead MacSweeney (U. College London), Angela Morgan (Murdoch Childrens Research Institute), Dianne Newbury (Oxford U.), Liina Pylkkänen (New York U.), Constance Scharff (Freie U. Berlin), Sophie Scott (U. College London), Katie Slocombe (York U.), Ofer Tchernichovski (Hunter College), Bruce Tomblin (U. Iowa), Faraneh Vargha-Khadem (Institute of Child Health), Sonja Vernes, Janet Werker (U. British Columbia).
Long Island, New York, *July 25–31.*

COURSE

Brain Imaging Genetics: Genetics for Imagers, Radboud University Summer School

Organised by Barbara Franke (Radboud UMC), and Simon E. Fisher.
Speakers: Alejandro Arias Vasquez (Radboud UMC), Sarah Medland (QIMR Berghofer Medical Research Institute), Marieke Klein (Radboud UMC), Beate St Pourcain, Dennis van der Meer (U. Oslo), Jason Stein (U. North Carolina), Eiko de Jong (Radboud UMC), Kees Albers (Radboud UMC). *August 8-12.*

WORKSHOP

5th International Workshop on Formal Approaches to Particles

Organised by Geertje van Bergen, Lotte Hogeweg (U. Amsterdam), and Henk Zeevat (U. Amsterdam).
Participants: Yael Greenberg, Moria Ronen, Galit Sassoon & Dina Orenstein (Bar Ilan U.), Adriana Osa-Gomez (U. British Colombia), Mira Grubic (U. Potsdam), Katja Jasinskaja (U. Cologne), Barbara Tomaszewicz (Inst. Deutsche Sprache und Literatur), Lisa Matthewson (U. British Colombia), Sophia Malamud (Brandeis U.), Allyson Ettinger (U. Maryland), Junwen Lee (Brown U.), Upsorn Tawilapakul (Thammasat U.), Sonja Thoma (U. British Colombia), Anne Bertrand, Johannes Heim, & Martina Wiltschko (U. British Colombia), Eva Csipak (U. Konstanz), and Sarah Zobel (U. Tübingen). *August 22–26.*

WORKSHOP

Linking social effects in language processing to social effects in language evolution.

Organised by Shiri Lev-Ari and Antje Meyer.
Presenters: Molly Babel (U. British Columbia, Canada), Sara Bögels, Christine Caldwell (U. Stirling, UK), Alin Coman (Princeton U.) Dan Dediu, Maxime Derex (Arizona State U.), Olga Feher (U. Edinburgh.), Simon Garrod (U. Glasgow), Pat Healey (Queen Mary U. London), Gary Lupyan (U. Wisconsin-Madison), Shiri Lev-Arí, Irit Meir (U. Haifa), Sean Roberts, Natalie Sebanz (Central European U., Hungary) Paul Vogt (Tilburg U.). *September 15–16.*

MINI-SYMPOSIUM

Neurogenetic Insights Into Speech and Language From Birds and Bats

Organised by Sonja Vernes.
Speakers: Jesse Goldberg (Cornell U.), Morgan Wirthlin (Carnegie Mellon U.), Xiaoching Li, (Louisiana State U.), Mirjam Knörnschild, (Freie U. Berlin & Smithsonian Tropical Research Institute), Michael Yartsev (UC Berkeley), and Sonja Vernes. Society for Neuroscience Annual Meeting, San Diego, USA. *November 12-16.*

LECTURES AND COLLOQUIA

Nijmegen Lectures

2015

FEB 25-27| SUSAN CAREY AND **ELIZABETH SPELKE,**
DEPARTMENT OF PSYCHOLOGY, HARVARD UNIVERSITY CAMBRIDGE
The Origin of Abstract Thought
The series included three lectures: 'Number', 'Geometry', and 'Logic/Abstract Relations'. Discussants in the seminars were: Harold Bekkering (Radboud U.), Andrea Bender (U. Bergen), Andrea Frick (U. Fribourg), Christian Doeller (Radboud U.), Bart Geurts (Radboud U.) and Ágnes M. Kovács (Central European U. Budapest). The lectures were organised in collaboration with Radboud U. by Nanjo Bogdanowicz, Marisa Casillas, Sarah Gerson, Ina Grevel, Asli Özyürek, Irina Simanova and Sharon Unsworth.

2016

JAN 20-22 | DAVID POEPPEL, MAX PLANCK INSTITUTE FOR EMPIRICAL AESTHETICS, FRANKFURT /NEW YORK UNIVERSITY
(Un)conventional wisdom: Three neurobiological provocations about brain and language
The series included three lectures: 'On how speech is pretty special', 'On the sufficiency of abstract structure' and 'On the insufficiency of correlational cognitive neuroscience'. Discussants in the seminars were: Elia Formisano (Maastricht U.), Barbara Tillmann (Lyon Neuroscience Research Center), Usha Goswami (U. Cambridge), Ole Jensen (U. Birmingham), Peter Hagoort and Norbert Hornstein (U. of Maryland).
The lectures were organised in collaboration with Radboud U. by Ina Grevel, Peter Hagoort, Anne Kosem and Tineke Snijders.

Donders Lectures

2015

MARCH 12 | REZA SHADMEHR, JOHNS HOPKINS U.
The cerebellum and neural control of movements
OCTOBER 1 | DOROTHY BISHOP, U. OXFORD
The enigma of cerebral lateralization
OCTOBER 29 | STEPHEN FARAONE, SUNY UPSTATE MEDICAL U.
Advances in the genetics and neurobiological mechanisms underlying neuropsychiatric disorders – The example of ADHD
DECEMBER 3 | ERICH JARVIS, DUKE U.
Learned birdsong and the neurobiology of human language

2016

MARCH 10 | DAVID BOAS, HARVARD MEDICAL SCHOOL
Optical imaging of oxygen delivery and consumption: guiding interpretation of BOLD fMRI
JULY 7 | MAHZARIN BANAJI, HARVARD U.
Implicit social cognition
SEPTEMBER 8 | CATHY PRICE, U. COLLEGE LONDON
Predicting outcome and recovery after stroke
OCTOBER 6 | JOHN O'KEEFE, U. COLLEGE LONDON
The hippocampus as a cognitive map: past, present and future
NOVEMBER 3 | DANIEL LEVITIN, McGILL U.
The organized mind: thinking straight in the age of information overload

LECTURES AND COLLOQUIA

MPI Colloquium series

2015

JANUARY 20 | SIMON KIRBY, U. EDINBURGH
The cultural origins of structure
MARCH 10 | CHRISTOPHE PALLIER, INSERM-CEA COGNITIVE NEUROIMAGING UNIT, NEUROSPIN, FRANCE
In search of syntactic structures in the brain
APRIL 29 | SONJA KOTZ, U. MANCHESTER/MPI FOR HUMAN COGNITIVE AND BRAIN SCIENCES, LEIPZIG
Prediction in multimodal emotional speech
MAY 20 | PETER GÄRDENFORS, LUND U.
A semantic theory of word classes
JUNE 15 | HOLLY BRANIGAN, U. EDINBURGH
I said it once, I'll say it twice: Structural priming effects as evidence for linguistic representation in adults and children
SEPTEMBER 15 | KATE WATKINS, U. OXFORD
Neurological abnormalities in speech fluency disorders
NOVEMBER 3 | WOLFGANG ENARD, LUDWIG-MAXIMILIANS U. MUNICH
Mouse models for human brain evolution
DECEMBER 1 | MAIREAD MACSWEENEY, U. COLLEGE LONDON
Reading a language you can't hear: The relationship between speechreading and reading in deaf children

2016

FEBRUARY 16 | GARETH GASKELL, U. YORK
Language learning: the long and the short of it
MARCH 15 | CHRISTOPHER PETKOV, NEWCASTLE U.
Structured sequence processing, language evolution and the primate brain
APRIL 26 | VINCENT JANIK, U. St. ANDREWS
Complexity and meaning in marine mammal communication
MAY 17 | JUDIT GERVAIN, LABORATOIRE PSYCHOLOGIE DE LA PERCEPTION (CNRS)
Mechanisms of speech perception at birth: NIRS studies with newborns
JUNE 23 | SIMONE PIKA, MPI ORNITHOLOGY
The evolution of cooperative communication: can gestures bridge the gap?
SEPTEMBER 6 | KATRIN AMUNTS, JÜLICH FORSCHUNGSZENTRUM
"Big brains" as tools to understand human brain organisation
OCTOBER 18 | NAPOLEON KATSOS, U. CAMBRIDGE
How children learn "some", "all" and "most" words
DECEMBER 13 | CHRISTOPHER JARROLD, U. BRISTOL
Rehearsal and the development of verbal short-term memory

Nijmegen Gesture Centre Lecture Series

2015

JANUARY 22 | KIM OUWEHAND, ERASMUS U. ROTTERDAM
Integration of action phrases with gestures versus actions in young and older adults: an ERP study
MARCH 10| REYHAN FURMAN, U. ALBERTA
Do you see what I mean? Children use iconic gestures in speech disambiguation
MARCH 17 | KARIN VAN NISPEN, TILBURG U.
Why some people with aphasia may struggle to use gesture compensatorily
JUNE 30 | JENNY PYERS, WELLESLEY COLLEGE
The emergence of spatial language and spatial categories in Nicaraguan Sign Language
SEPTEMBER 9 | LORENZA MONDADA, U.BASEL
Pointing for requesting: Choosing the right product at the shop's counter
SEPTEMBER 30 | MARKUS PERLMAN, U. WISCONSIN, MADISON
The gorilla that coughs on command (and covers her mouth): What a human-fostered ape can teach us about the evolution of language

2016

MARCH 23 | REYHAN FURMAN, U. CENTRAL LANCASHIRE
Predicting individual differences in children's iconic gesture use
JULY 12 | SPENCER KELLY, COLGATE U.
When and how iconic gestures help word learning in a foreign language?
JULY 12 | RABIA ERGIN, TUFTS U.
The roots of linguistic organization in Central Taurus Sign Language (Turkey)
DECEMBER 20 | SOTARO KITA, WARWICK U.
A model of speech-gesture production

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