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Language

The Berlin School of Mind and Brain offers a unique research and training environment for doctoral candidates to work at the interface between the sciences and the humanities.

Recent progress in the neurosciences has opened up new and exciting avenues for research, improving our understanding of how the brain works, and how complex cognitive processes such as language are processed within the brain. The application of neuroscientific methods to language research has become standard practice, involving such techniques as EEG/ERP/MEG to study its temporal dynamics, as well as fMRI studies to determine its spatial extent within the brain. However, there remains a substantial gap between the fine-grained linguistic theories of complex and diverse language phenomena on the one hand and current neuroscientific insights on the other.

The aim of the language-related studies within the School is to analyse and systematically describe the cognitive and neurobiological correlates of the linguistic subsystems. To bridge the gap between classical linguistic and psychological approaches and more recent advances in neuroscientific methods each doctoral student is assigned two supervisors, one from the mind sciences and one from brain sciences. ▶

Editorial
by ISABELL
WARTENBURGER
and KATHARINA
SPAŁEK, faculty
members of the
Berlin School
of Mind and Brain

Overall, the School's faculty comprises more than fifty distinguished researchers, who come from a variety of institutions both within Berlin (i.e., Humboldt University, Free University, Technical University, the Bernstein Center for Computational Neuroscience, and the Max Planck Institute for Human Development), as well as further afield (e.g., the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig and the nearby universities of Potsdam and Magdeburg).

The School's faculty harbors a substantial collection of research groups and facilities within the fields of both theoretical and experimental linguistics. There are active groups in the fields of reading and language comprehension, information structure, language acquisition and language production who work to characterize the cognitive prerequisites, mechanisms and processes that are specific to human language abilities. All projects are staffed with experts in neuroscience, linguistics and cognitive psychology, who work together closely, either within one of the interdisciplinary research clusters or within a plentitude of successful bilateral collaborations.

In the past, several doctoral projects within the field of language have been nurtured as a result of active collaborations between mind and brain scientists. Previous language-related projects include: the influence of emotion on language processing; the mechanisms of processing different verb classes; the acquisition of sentence structures in children; the characterization of functional and structural processing streams of language within the adult brain; the neural dynamics of processing linguistic event structures; the activation of conceptual knowledge; and the interaction of gesturing and cognition.

Overall, researchers within the Berlin School of Mind and Brain cover all major domains of language study and apply up-to-date neuroscientific methods to its study. This infrastructure for language research generates a fertile ground for training doctoral students; while the interaction with the larger cognitive and neurobiological community within the greater Berlin area offers exciting synergistic potentials for both education and research. ●

Q What is your research topic?

A What I try to do in my project is look at how we use natural language to talk about different kinds of events and the participants in these events. For example, we can talk about events that stretch out over a certain period of time – as in *‘Mary painted the door’* – or about events that only take an instant, as in a sentence like *‘Mary kicked the door’*. What I concentrate on at the moment, though, is if an event implies that one of its participants changes in the course of the event: if I tell you that *‘The doctor cured the boy’*, the verb *‘cured’* automatically makes you infer that something about the boy’s state has changed – he underwent a change of state from sick to healthy. If I say that *‘The doctor treated the boy’*, on the other hand, the verb *‘treated’* leaves quite open if the boy’s state has actually changed – it might, but it might as well have not. The nice bit about such properties of words referring to events is that such differences in meaning often have quite interesting repercussions on the syntactic level, i.e. on sentence structure. I use different methods like questionnaires, reading times

and event-related potentials to find out a bit more about how such factors may influence how we process sentences online.

Q What do you see as the challenges of interdisciplinary research?

A Most people would probably agree that it takes a common language for different disciplines to truly do interdisciplinary research. Borrowing from linguistics, there’s a nice analogy: what often evolves when two communities of adult people speaking mutually unintelligible languages come into contact (as in the colonial times, for instance) is a pidgin. A pidgin is the result of language contact, a simplified language with highly reduced vocabulary and grammar. It is used as an auxiliary language for basic communication and doesn’t have any native speakers. What it takes for a pidgin to further evolve is a generation of children growing up in such an environment: they will automatically acquire a new language with elements of both of the original languages as well as new elements and the pidgin will thus evolve into a creole, a fully-fledged native language with com-

plete vocabulary and grammar. I think many people in science speak some kind of pidgin – the big challenge for truly interdisciplinary work lies in moving on to a creole, maybe one where the new elements that may come up will be much more interesting than the bits taken over from the original languages.

Q *What do your parents think you are studying?*

A I guess they got a bit confused when – a couple of years into my linguistics undergraduate studies – I still didn't speak a single language more than I used to. Since then they do know that doing linguistics is more about language than about languages. I give them regular updates on what I'm doing and I think they find it something between puzzling and awesome (especially that somebody is paying me for doing this). In fact, my mother has started to hunt down every documentary and article about language and/or the brain within reach.

PHILIP RAUSCH

I actually try to deliberately obscure the details of my doings as far as possible, since my parents and my brother are among my all-time favourite subjects – and too much knowledge spoils your subjects. And the fact that nobody in my family knows for sure what my brother is doing in his job actually eases my mind a bit – it's a stable equilibrium.

Q *What classes from undergraduate study do you wish you had taken?*

A Maths and other things about numbers. ●



Q & A

MILENA
RABOVSKY

Q *What motivated you to apply for the Berlin School of Mind and Brain?*

A When I had to decide what to study for my undergraduate education I had a hard time choosing between philosophy, psychology, and medicine. I feel that knowledge from both the humanities and the sciences is necessary to understand how the brain gives rise to the mind. In my undergraduate studies I finally opted for psychology, but also took additional courses in philosophy (logic, theory of mind, freedom of will) and medicine (psychiatry, neurology, pathophysiology). The program of the Berlin School of Mind and Brain seemed to perfectly match my desire to gain an integrated understanding of the mind/brain system.

Q *What is your research topic?*

A I am interested in how perceptual inputs evoke meaning within the brain. I am currently using electroencephalography (EEG) to track the time course of meaning access in visual word recognition. Written words are symbolic representations

with only arbitrary relationships between their visual features and their meaning. Nevertheless, we found that the amount of semantic features associated with a written word (i.e., the richness of the semantic representation) modulates processing in left-lateralized visual brain regions within 200 ms of word presentation. This suggests surprisingly fast access to word meaning when reading. In addition, I am studying how different brain regions interact when processing word meaning, as well as the role (if any) of attention and conscious perception in assessing word meaning.



MILENA RABOVSKY

Q *What do you see as the challenges of interdisciplinary research?*

A It seems very challenging to find a common language, and based on this language, to identify possibilities to do research which are really informative for different disciplines. I find that very often interdisciplinary communication is at cross-purposes. Even though revolving around the same issues, results from one field often seem of little interest to another. The primary challenge for fruitful interdisciplinary work is to identify genuine contact points between disciplines.

Q *What classes from undergraduate study do you wish you could still remember or wish you had taken?*

A I wish I had taken classes on physics, mathematics and computer science! Implementing theories using computational models is one of the most promising ways towards real progress in the mind/brain sciences. Although I studied the right areas in terms of content at an undergraduate level, when it comes to methods, physicists, computer

scientists and mathematicians often seem much better prepared for mind/brain research. Luckily I am still young so that I can try to catch up a bit.

Q *What do you like best about studying in Berlin?*

A Berlin feels old and heavy with history, but simultaneously (and somewhat paradoxically) young and forward looking. It seems to have a place for almost everyone; and if such a place doesn't exist opportunities exist to create it. It seems impossible to ever get bored by this city. ●

Q *What motivated you to apply for the Berlin School of Mind and Brain?*

A I wanted to get a chance to stick my nose into neuroscience and philosophy. I am now at the end of my doctorate. I appreciate neuroscience and philosophy and what can be learnt from these disciplines. However, during the course of my studies I discovered that I am a behavioral researcher with all my heart. Being at the School was a very worthwhile experience. By exposing me to different ways of doing science the School helped clarify what I want to do as a career. In addition, it allowed me to be in regular contact with other students with similar interests: getting their input, having classes together, and enjoying a cup of coffee with them once in a while. Finally, having the chance to speak English regularly was an important additional motivational factor in my application.

Q *What is your research topic?*

A I want to know why people move their hands when they talk. It is a more complex matter than you might think as there are different reasons why people gesture. For example, to communicate, to regulate interaction with other people, to show or regu-

late emotions, and so on. Research from different fields shows that the relationship of gesturing and thinking might be more important than its relationship to language and communication. My research is primarily concerned with the mechanisms that underlie gesturing associated with thinking processes (such as reasoning, memory, and learning), and learning why there are such great individual differences between people in how much they gesture.

Q *What do you find most interesting about your research?*

A I really enjoy the fact that everybody knows about the phenomenon I am studying. This makes it easier for me to grab people's attention and interest when discussing my work. What I find very exciting is the yet unknown links gesturing has with wide-ranging aspects of language, mind, and body. For example, I have found that people with high reasoning ability (fluid intelligence) gesture more when explaining how they solved a visual task. Their gestures (but not their speech!) seem to "tell" us that these people imagined movement in the task to a greater extent than their peers with average fluid intelligence.

Q *What do you see as the challenges of interdisciplinary research?*

A One thing I always have to keep in mind in an interdisciplinary situation is that there are different kinds of questions underlying research in different disciplines that are often not made explicit. Having said that, this is also – as I see it – one great advantage of working in an interdisciplinary environment: That people come up with questions regarding your research that you would otherwise not think of asking.



UTA SASSENBERG

Q *What classes from undergraduate study do you wish you could still remember or wish you had taken?*

A I mostly studied cognitive psychology, and now I wish I knew more about clinical psychology and the psychology of individual differences, at least about syndromes or personality traits that come along with cognitive difficulties in a very wide sense (e.g., schizophrenia or alexithymia). Also, I wish I could remember more about my classes on memory. More than a little ironic, I think. ●

Q What motivated you to apply for the Berlin School of Mind and Brain?

A I have a master's degree in linguistics and Indo-European languages; so my background is solely in the humanities. The doctoral program of the Berlin School of Mind and Brain seemed like a good way to broaden my horizon in the direction of a more science-related approach to the questions posed in the field of linguistics. Combining my knowledge of language development and psycholinguistics with the methods and theories of science offered at classes in the School sounded exciting and desirable. And it sure is!

Q What is your research topic?

A My research is situated at the interface of linguistics and neuroscience. It examines first language acquisition by employing behavioral methods, as well as eyetracking and event-related potentials. In German, one and the same proposition can be expressed in simple transitive structures in two different ways:

by an “object initial” or “subject initial” construction. For example, *The frog kisses the tiger*: ‘Der Frosch küsst den Tiger’ (subject initial) or ‘Den Tiger küsst der Frosch’ (object initial). Given these structures, the question arises at what age children correctly discriminate between these two constructions. I study the development of the processing of case marking and argument structures in adults and children between the ages of two and six years old.



CHRISTINE SCHIPKE

Q *What do you find most interesting about your research?*

A On a theoretical level, it is interesting how mind and language (or thinking and speaking) are related. Studying language acquisition can shed light on the process of the developing mind and brain. Moreover, it can contribute to the question of how thought and language are related in cognitive development. On a practical level, I like the various activities that are involved in my research (programming; literature research; data processing; writing; and interacting with children and their parents on an almost daily basis).

Q *What do you see as the challenges of interdisciplinary research?*

A Finding a common language as the basis of communication between researchers from different disciplines is a challenging and ultimately necessary part of interdisciplinary research. In my opinion, while it is a particularly difficult task

for a scientist to understand the argumentation of a researcher from the humanities (or *visa versa*), it is also absolutely necessary in order to create the basis for real interdisciplinary research.

Q *What do you like best about studying in Berlin, Potsdam, and Leipzig?*

A Working in Berlin-Lichtenberg, studying in central Berlin, being a matriculated doctoral student in Potsdam, while being officially employed in Leipzig can be a bit of a hustle – but it brings me together with so many interesting people that I would not miss it for anything. On a leisure-related note: I certainly love Berlin for all the possibilities that it offers when it comes to cultural life and night life (my favourite time of the day). However, I was really surprised when I learned how great going out in Leipzig is. A fact that I had never expected (no offense, Leipzig!). ●

Q *What motivated you to apply for the Berlin School of Mind and Brain?*

A After having graduated in biochemistry and taken up linguistics, I was looking for a language-cognition-ish place to realize my psycholinguistic doctoral project in. It seemed the School was going to appreciate my background in two unrelated fields, and I would meet inspiring people. I also liked the idea of a structured curriculum and of continually learning from experts and other students. Of course, the real reason was my upcoming high school reunion. Ten years before, I had told my friends that I wanted to become a “brain scientist”. By becoming a member of the School, I managed to convince them and myself that this really is my job now.

Q *What is your research topic?*

A I investigate how people process transitive sentences, and which kinds of information they use to assign roles to the participants in the situations described. I focus on the use of animacy hierarchies between subjects and objects, and how these animacy hierarchies are used in processing sentences with different verbal case marking patterns. I use

self-paced reading paradigms, eye-tracking and EEG measurements. If you think this is crazy talk, the answer to the next question may help.

Q *What do your parents think you are studying?*

A My parents think that I make people read sentences about different kinds of situations. I try to find out how people understand the different sentences and what cues they use to figure out who does something to whom in the situations described.

Q *What do you see as the challenges of interdisciplinary research?*

A One challenge certainly is not expecting too much. Interdisciplinary exchange is very exciting, but it is rather unlikely that it will make you investigate or network any better. So it takes a genuine interest in other people’s work, and a lot of spare time that will not directly benefit your own success. I believe that if you accept this, and are willing to invest that much, most of the other problems (differences in terminology, different ways of thinking and interacting) can be sorted out, and it can be interesting and rewarding.

Q *What classes from undergraduate study do you wish you could still remember or wish you had taken?*

A I painfully remember most of my undergraduate studies about organic chemistry. I wish I had taken any classes that would have prepared me for what I do now – statistics, philosophy, linguistics, anything really. At least, now I know how to make soap. For example.

Q *What do you like best about studying in Berlin?*

A There are many collaborative high-level linguistics groups in Berlin and Potsdam. It is a great to meet interesting researchers and learn from them in an inspiring and supportive context. And then, Berlin is beautiful. I love the landscape, high skies and rich history, how relatively empty and run-down it is, and the fact that I can get all kinds of food. Although there are great research opportunities, the city is not academic at all, and I enjoy the privilege of working in science while living in a place that is about everything else. ●



ANNA CZYPIONKA

Q & A

SARAH
BIHLER

Q *What motivated you to apply for the Berlin School of Mind and Brain?*

A To be honest, I never wanted to live in Berlin or Leipzig. However, given the opportunities afforded by the School I simply had to apply. There were many reasons: having a monitored structure for your time as a doctoral student; opportunities for close exchanges with other doctoral students working in related fields; and of course looking beyond one's own nose and learning more in the broader fields of neuroscience (both from natural scientific and humanistic approaches!). I now work at the Max Planck Institute for Human Cognitive and Brain Sciences



SARAH BIHLER

in Leipzig with Professor Friederici. I am a proud member of the School and very happy with my research environment. Moreover, living in Leipzig and walking around in Berlin is not as bad as I thought.

Q *How would you explain what you do to a non-expert?*

A In my research, I study what happens in the brain when language is used (e.g., right now when you read this text). In particular, I am trying to determine which structures and fiber tracts in the brain work together when listening, or repeating aloud, lists of words and sentences of differing complexity. I use neuro-imaging techniques (functional Magnetic Resonance Imaging; Diffusion Tensor Imaging) to differentiate brain areas (grey matter) associated with language processing from fibre tracts connecting these areas (white matter). By doing this I hope to disentangle separable networks associated with specific functions in the processing of language.

Q *What do you find most interesting about your research?*

A The human brain is the most fascinating object on Earth. Without a functioning brain, we would be absolutely nothing. To have the chance to study it, to unlock its mysteries and thereby to understand the world a little bit better is an incredible privilege. Language is something everybody uses each day. However, behind this seemingly simple activity lies a complex and multidimensional structure. I love working analytically to uncover the systematic quality of a problem and so by investigating how the brain works when processing language I can combine my love of analytic problem solving with my desire to better understand brain function.

Q *How important is interdisciplinarity for you?*

A Working in the field of neuro-cognition of language, I am not only working with other disciplines but I am working within a discipline that is highly interdisciplinary. This is one reason why my field of research is in my nature: I love becoming acquainted with many subjects and different ways of thinking and work-

ing. By its very nature, interdisciplinarity is a precondition of my work and I am glad that the School is actively promoting and supporting this type of research.

Q *What do you like best about working in Leipzig?*

A The Max Planck Institute offers great opportunities for scientific work. I am not aware of any other place where you have such a good framework for experimental research. In combination with my scholarship and the great research opportunities the Berlin School of Mind and Brain provides, I am able to conduct my research in a concentrated fashion within an inspiring and supportive environment. ●

Q *What is your research topic?*

A I study the influence of emotional content on language processing, especially on reading. Is there, for instance, any difference in the brain while reading the word “sunshine” compared to reading “table”? Growing evidence suggests that emotional content in words can be detected early on in the processing stream, sometimes as early as 100 ms after word presentation. Reading words with emotional content triggers bodily reactions, such as tiny reactions in the facial muscles responsible for smiling or frowning, conductivity changes in the palm’s sweat glands, and changes in the diameter of the pupils of the eye. My research focus lies on the specific role of emotional dimensions, and on the boundary conditions for these emotional effects. To explore these questions I use behavioral measures, electrophysiology (EEG), and peripheral psychophysiological measures (such as skin conductance responses, facial muscle electromyogram and pupillometry).

Q *What do you find most interesting about your research?*

A Emotion research is a field that seems to catch everybody’s interest, as emotional experience is a constituent part of being human. I like how I can rather easily explain my work to people outside the research community by giving examples that are within everybody’s own experience. On the other hand, especially the subjective character of emotional experience poses a special challenge for empirical approaches. By using a variety of central and peripheral psychophysiological measures as well as behavioral and rating studies, I hope to gain a holistic picture of the processes and mechanisms involved in emotional word processing.

Q *What do you see as the challenges of interdisciplinary research?*

A In order to benefit from interdisciplinary exchange it is absolutely necessary to gain some understanding for the other field’s terminology and general way of thinking. Especially at the beginning of our course, this seemed hard and even tedious at times. By now, I see the exchange of ideas and knowledge between disciplines as a major advantage of

working within the interdisciplinary framework of the School. Personally – coming from a psychology background and now working on emotions in language processing – I am very happy to have linguists to exchange ideas with and ask for advice.

Q *What do you like best about living in Berlin?*

A I love how everyone speaks of Berlin as vibrant, creative, and ever-changing; and still, everyone is actually referring to something different, and everyone loves Berlin for different reasons! I like how it just seems to suit almost everyone.

Consequently, Berlin seems rather tolerant and easy-going. Central Berlin's government professionals belong here just as well as the drunken guy on the street at Kottbusser Tor, and this whole diversity in my eyes constitutes the city's special charm. ●



MAREIKE BAYER



CONTACT

If you would like to talk to us about research at the Berlin School of Mind and Brain and our doctoral program, please get in touch!

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Front Cover
Wilhelm von Humboldt (1767–1835), scholar of comparative linguistics, Prussian statesman, and co-founder of Berlin University. Elder brother of Alexander (1769–1859), natural scientist and explorer, whose portrait was on the cover of Newsletter 1.
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