



**DFG**

Research Unit FOR 2253

# Crossing the Borders

## Development of language, cognition, and the brain

27<sup>th</sup> – 29<sup>th</sup> of September, 2018  
Potsdam



## Welcome to the first Crossing the Borders conference!

The topic for this 3-day conference is the interplay of language, cognition, and the brain in early human development. We aim to bring together researchers from psychology, linguistics, and developmental neuroscience for an inspiring interdisciplinary approach to early childhood research. The program will include keynote talks, oral presentations and poster sessions, and a science slam.

The conference will be held in building 6 on Campus Griebnitzsee (see Section 5 for a campus map and further information). You will find the registration desk located in the foyer area. Keynotes and oral presentations will take place in building 6, room H02. Poster presentations will take place in the foyer area of building 6 (which will be signposted).

The conference dinner will be at the ZWEIHUNDERTTEINS on September 27th at 7pm. The restaurant is located directly at the Griebnitzsee (see Section 5 for further information).

If you have questions, please don't hesitate to ask someone of the organizing committee or via mail: [crossing@uni-potsdam.de](mailto:crossing@uni-potsdam.de).

Thank you for coming and enjoy the conference!

Annika Unger

Antonia Götz

Anne van der Kant

Mariella Paul

Sarah Eiteljörge

Barbara Höhle

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The Organizing Committee



# Crossing the Borders

Development of language, cognition and the brain

27<sup>th</sup> - 29<sup>th</sup> of September, 2018

TIME	THURSDAY (SEPT 27TH)	FRIDAY (SEPT 28TH)	SATURDAY (SEPT 29TH)
9:15	<b>Welcome &amp; Introduction</b>		
9:30	<b>Roberta Golinkoff</b> (University of Delaware): Carving events for language	<b>Victoria Southgate</b> (University of Copenhagen): Are infants altercentric? The Other and the Self in early social cognition.	<b>Judit Gervain</b> (Université Paris Descartes and CNRS): Repetition-based rule learning at 6 months in speech and sign: developmental changes
11:00	<i>Coffee Break</i>		
11:30	<b>Jie Ren &amp; Barbara Höhle</b> (Potsdam, Germany): Integrating Different Aspects of Early Cognitive Development using Advanced Statistical Techniques	<b>Beate Sodian &amp; Irina Jarvers</b> (Munich, Germany): Implicit and Explicit False Belief Understanding and Language in Early Childhood	<b>Anne van der Kant, Mariella Paul, Claudia Männel, Jutta Mueller, Barbara Höhle, Isabell Wartenburger, Angela D. Friederici</b> (Potsdam/Leipzig/Osnabrück, Germany): Developmental shift in non-adjacent dependency learning
12:00	<b>Peter Horn, Tom Fritzsche, Antje Ehlert &amp; Flavia Adani</b> (Potsdam, Germany): Exploring potential parallels in the development of lexical and mathematical knowledge: A longitudinal study on word learning and number concepts in 30- and 36-month-old children	<b>Sara Shoghi Javan, Shahla Raghibdoust &amp; Vida Shaghghi</b> (Tehran, Iran): An Evaluation of Syntactic Processing Ability and Theory of Mind in Autism Spectrum Disorder	<b>Melanie Schreiner &amp; Nivedita Mani</b> (Göttingen, Germany): Familiarity as source of information during infant word segmentation
12:30	<i>Lunch</i>		
13:30			<b>Sarah Eiteljörge, Maurits Adam, Birgit Elsner &amp; Nivedita Mani</b> (Göttingen, Germany): Semantic consistency of actions influences children's word learning
14:00	<b>Larissa Samuelson</b> (University of East Anglia): The role of multiple general processes in early word-object mapping and selective attention	<b>Tobias Grossmann</b> (University of Virginia): The cradle of human prosociality	<b>Samuel H. Cospes, Claudia Männel &amp; Jutta L. Mueller</b> (Osnabrück/Leipzig/Potsdam, Germany): Mapping novel words onto auditory referents in infants and adults: an ERP study
14:30			<b>Antonia Götz, Anna Krasotkina, Gudrun Schwarzer &amp; Barbara Höhle</b> (Potsdam/Gießen, Germany): Perceptual Narrowing in speech and face recognition in infants
15:00		<i>Coffee Break</i>	<b>Wrap-Up &amp; Goodbye</b>
15:30	<b>POSTER SESSION &amp; Coffee Break</b>	<b>Bahar Tunçgenç, Carolyn Koch, Inge-Marie Eigsti &amp; Stewart Mostofsky</b> (Baltimore, US): Spontaneous mimicry of interaction partners and social-communicative function in children with autism	
16:00		<b>Romy Råling, Matt Hilton, Birgit Elsner &amp; Isabell Wartenburger</b> (Potsdam, Germany): Shake, rattle and roll: Boundary cue perception in language and action	
16:30	<b>Jingtao Zhu &amp; Anna Gavarró</b> (Barcelona, Spain): Very early comprehension of word order: Evidence from Mandarin		
17:00	<b>Gregor Kachel, Manuel Bohn, &amp; Michael Tomasello</b> (Leipzig, Germany): Creating a language: the development of a gestural code system in dyads of preschool peers	<b>SCIENCE SLAM</b>	

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## 1 Invited speakers

### 1.1 Roberta Michnick Golinkoff (University of Delaware, US)

**Carving events for language**

**Thursday, Sept 27th, 9:30h**

Events are continuous. Our perception of them is not. Remembering the past and predicting the future demand that we parse events into components that will also lay the foundation for language learning. In this talk, we present a series of studies designed to examine infant attention to and interpretation of event structure. Using Mandler (2012) and Talmy (2000) as our inspiration, we find that infants are sensitive to event components like paths and manners and figures and grounds, among others. Infants also detect statistical relationships within event components that allow them to abstract predictable patterns with relatively little exposure. Finally, our work suggests that infants use both bottom up and top down processes to parse continuous events into the categories of experience. We explore several ways in which these new findings on event processing might interface with cognitive development and the acquisition of language.



### 1.2 Larissa Samuelson (University of East Anglia, UK)

**The role of multiple general processes in early word-object mapping and selective attention**

**Thursday, Sept 27th, 13:30h**

Infants are able to learn multiple novel word-object mappings from ambiguous presentations that include multiple objects and multiple words in each event. We have been examining the roles of basic cognitive processes such as attention, memory and novelty-detection in this learning via empirical studies and a computational model. Our work uses the cross-situational word learning paradigm introduced by Smith & Yu (2008). We analyse the relation between looking behaviour during training and later demonstrations of learning and compare data from studies with highly-similar versus more variable stimuli. We find that children who learn more word-object mappings show differences in looking to the learned and unlearned words from the very beginning of training, and this is influenced by the variability inherent in the stimulus set. In addition, the data suggest that looking during test may be driven more by object familiarity than word-object mappings — a finding that fits with recent work on the role of visual familiarity in predicting what



words children learn first (Clerkin, et al., 2017). Further, by capturing these findings in a model of autonomous visual exploration and early word learning, we are able show how individual differences in word learning emerge from small initial differences in looking behaviour. I will discuss this work in relation to prior studies of selective attention in word learning and related studies of referent selection and retention.

### 1.3 Victoria Southgate (University of Kopenhagen, DK)

**Are infants altercentric? The Other and the Self in early social cognition**  
**Friday, Sept 28th, 9:30h**

Much research in recent years has revealed that humans have a striking tendency to be influenced by the behaviours of other conspecifics. Our own actions can be disrupted by the presence of another person performing a different action, and our own representation of an event can be influenced by the presence of another agent holding a competing representation. In this talk, I will suggest that this 'altercentric' stance has its origins early in development, and is the default state for human infants. I will suggest that early altercentricism can explain infants' tendency towards spontaneous perspective taking, even in situations where adults do not spontaneously adopt the others' perspective. Furthermore, I will suggest that altercentricism is characterised by an absence of self-other distinction and that altercentricism gradually gives way to a more egocentric cognition as infants acquire a self-awareness and a self-other distinction. As part of my talk, I will present some recent work in which we have begun exploring the development of self-awareness, with a view to testing our hypothesis that the emergence of self-awareness, and a transition from altercentricism to egocentricism could be part of the explanation for the apparently discrepancy between infant and preschooler Theory of Mind skills.



## 1.4 Tobias Grossmann (University of Virginia, US)

### The cradle of human prosociality

Friday, Sept 28th, 13:30h

One of the most enduring puzzles in biology and psychology is why humans engage in acts of altruism towards genetically unrelated individuals. I will argue in this talk that other-oriented emotional processes play an important role in guiding altruistic behavior from early in ontogeny. In particular, the ability to show concern for others in need and distress is a vital building block for altruistic tendencies among humans. I will first present recent research supporting the view that infants genuinely care about others in need and distress. Importantly, I will also show evidence for a caring continuum, which underpins variability in infant prosocial action. Specifically, I will present results from a longitudinal study in which we demonstrate that differences in attentional and brain responses to viewing others in distress (fearful faces) at 7 months predict altruistic behavior at 14 months of age. This research sheds light on the ontogenetic roots of altruism and attests to infants' affective competency in engaging prosocially.



## 1.5 Judit Gervain (Université Paris Descartes and CNRS, France)

### Repetition-based rule learning at 6 months in speech and sign: developmental changes

Saturday, Sept 29th, 9:30h

The talk will present a series of NIRS experiments investigating how 6-month-old infants perceive and learn repetition-based regularities (e.g. ABB) implemented in speech as well as in sign language sequences. The results suggest that a change takes place between birth and 6 months, such that by 6 months, infants become able to represent difference (e.g. ABC structures), not only sameness. Also the developmental trajectory of this ability may be different for speech, a signal familiar for infants, than for signs, which infants are not familiar with.



## 2 Abstracts of talks

### 2.1 Jie Ren & Barbara Höhle

#### **Integrating Different Aspects of Early Cognitive Development using Advanced Statistical Techniques**

**Thursday, Sept 27th, 11:30h**

We developed a unique battery of eye-tracking tasks to examine the interrelations between the general cognitive abilities and early language development. Tasks in the battery are adapted from existing paradigms (Kovács & Mehler, 2009; Rose, Feldman & Jankowski, 2001), and implemented in all the six labs of the program. A large sample (so far  $N > 400$ ) of 12-, 24- and 36-month-olds were tested on their processing speed, cognitive control, recognition memory and sustained attention using eye-tracking measures. Participants also completed standardized assessments for cognitive and language development. To integrate findings across individual projects in the joint program, we incorporated data from the task battery and the standard assessments with data in every single project and analyzed the data using advanced multivariate statistical techniques. Current results suggested that the development of general cognitive abilities, as indicated by the eye-tracking tasks, significantly predicts both receptive and productive language skills.

### 2.2 Peter Horn, Tom Fritzsche, Antje Ehlert & Flavia Adani

#### **Exploring potential parallels in the development of lexical and mathematical knowledge: A longitudinal study on word learning and number concepts in 30- and 36-month-old children**

**Thursday, Sept 27th, 12:00h**

Forming associations between words and referents is a crucial ability in early lexical development. This skill (fast mapping) emerges around 18 months of age but is only an initial step as word learning continues with memory consolidation and further development of conceptual structure (Horst, 2018). Successful retention of newly learnt words is not detected until 30 months (Bion, Borovsky, & Fernald, 2013). From this age onwards relations between vocabulary and number concepts have been reported (Negen, & Sarnecka, 2012). Our study asks whether the ability to retain novel words for unfamiliar objects is related to the knowledge of number concepts in 30-month olds and six months later. We predict a positive correlation of novel word retention and vocabulary size with children's knowledge of number concepts because the mechanism of fast mapping is argued to be implicated in the acquisition of both (Barner, 2017).

Thirty German-learning 30-month-olds took part in an eye-tracking study and 25 of them could be re-tested six months later. In the retention trials they viewed pairs of

two unfamiliar objects for which they had the chance to learn the name. The dependent variable is the target looking proportion. The children also completed the Give-a-Number task (Wynn, 1990). Vocabulary was assessed using the CDI (Szagun, Stumper, & Schramm, 2009) at 30 months and PPVT (Dunn, & Dunn, 2007) at 36 months.

Results reveal a weak positive correlation between target looking in retention trials at 30 months and number knowledge, which was not present at 36 months. At the later time point we found a moderate positive correlation between vocabulary and number knowledge, which was not present earlier. Additional analyses will be discussed at the conference. These findings support the existence of a relation between lexical and mathematical development in the first three years of life and they suggest that how these abilities interact may change over time.

## 2.3 Jingtao Zhu & Anna Gavarró

### Very early comprehension of word order: Evidence from Mandarin

Thursday, Sept 27<sup>th</sup>, 16:30h

Candan et al. (2012) argued that there is cross-linguistic variation in the timing of the acquisition of the parameters determining word order: in their study, English children were able to parse canonical sentences earlier than Turkish or Mandarin Chinese children (before their second birthday) and the authors attributed the contrast to the more rigid word order of English, which would constitute more robust input for the child. Here we pursue this investigation with an eye-tracking experiment for Mandarin. We tested 24 typically-developing Mandarin infants with a mean age of 17;5 months ( $SD = 2.2$ ) both on canonical SVO (1) and non-canonical sentences involving the *ba* construction (1b,c). The results in the figure show gazing time in four windows: baseline and three consecutive exposures to the target sentence. The statistical analysis shows that in the SVO and SbaOV conditions, infants preferred looking at the scene with the first NP being the Agent. However, in the OSbaOV condition, they looked longer at the scene with the first NP as Theme during the first ( $t(23) = 3.35, p < .01, d = .65$ ) and the second presentation ( $t(23) = 2.08, p < .05, d = .57$ ). The proportion of looking time to the target video showed above chance performance (defined as 50%) during the first presentation of the sentence ( $Z = -2.77, p < .01, r = .57$ ). From these we conclude that infants exposed to Mandarin are sensitive to the target word order from age 17;5 at the latest. This contrasts with the results from Candan et al. (2012), who only found evidence for it at almost age 3. This finding holds for canonical as well as non-canonical word order, instantiated in conditions (1b, c) - a result only available, to our knowledge, for French Clitic Left dislocation, Lassotta et al. (2015).

## 2.4 Gregor Kachel, Manuel Bohn, & Michael Tomasello

### Creating a language: the development of a gestural code system in dyads of preschool peers

Thursday, Sept 27th, 17:00h

Being unable to communicate verbally - for example when traveling - adults can quickly revert to gesture and instantly create signs that allow them to communicate highly complex content. Thereby, they do not only demonstrate perspective-taking skills and a talent for iconic expression but also the insight that meaning can be created ad hoc by speakers. When does this ability emerge?

In this study, we investigated how dyads of same aged children spontaneously create and transmit novel communicative signals to solve a coordination problem. Children played a game in which one child had to communicate to the other which of 5 pictures needs to be selected. Four pictures depicted actions (e.g. eating) and one picture was blank (“nothing”). Each child was in a different room and communication was possible via an audio/video connection (akin to a Skype conversation). At some point during the game, the experimenters switched of the audio connection so that children could no longer hear one another but were still able to see each other. To continue the game, children had to spontaneously create gestures to communicate the content of the pictures to their partner. With this setup we wanted to address the following four questions: 1) Do children spontaneously create gestures to communicate? 2) Are they able to create gestures for abstract concepts (“nothing”) 3) Do they converge on the same gestures? 4) Do gestures become more abstract over time? Similar processes have been observed in more naturalistic settings, most prominently in Nicaraguan Sign Language.

Our results show that four- and six-year-old peers spontaneously create and understand gestures for actions as well as for abstract concepts. Furthermore, children converge on the same gestures and gestures become more abstract over time. Ongoing analyses on conditions in which children have to combine gestures to express more complex scenes will show whether such effects also occur in sign combinations.

## 2.5 Beate Sodian & Irina Jarvers

### Implicit and Explicit False Belief Understanding and Language in Early Childhood

Friday, Sept 28th, 11:30h

We report two studies, a conceptual replication of an anticipatory looking paradigm by Southgate et al. (2007) (Study 1) which yielded evidence for implicit false belief understanding in 18-month-olds (“car-box-task”) and an exact replication of an anticipatory looking paradigm by Grosse Wiesmann et al. (2017, Study 2) which indicated false belief

understanding in 27-month-old children (“tunnel task”). In Study 1, longitudinal data showed predictive relations between implicit false belief understanding at 18 months and explicit false belief understanding as well as intention understanding at 4 to 6 years, independently of verbal IQ and executive functions. Moreover, implicit false belief understanding at 18 months was correlated with goal-encoding at 7 months, suggesting an implicit Theory of Mind in infancy. Neither the car-box-task nor the tunnel task yielded any correlations with language measures in independent datasets, while explicit false belief tasks were strongly correlated with language. We discuss these findings with respect to current debate about implicit false belief understanding and its relations with explicit false belief understanding and language.

## **2.6 Sara Shoghi Javan, Shahla Raghibdoust & Vida Shaghghi**

### **An Evaluation of Syntactic Processing Ability and Theory of Mind in Autism Spectrum Disorder**

**Friday, Sept 28th, 12:00h**

Impairments in ‘theory of mind’ (TOM) is a core cognitive feature of autism spectrum disorder that is believed to be interrelated with language, in general, and with complement clauses, in particular. A number of researchers have asserted that children suffering from autism use language as a compensatory strategy to perform false belief tasks. Given that, since embedded propositions in complement sentences can be either true or false, semantic properties of these structures are of significance to explore the relationship between theory of mind and language. The present study was designed to investigate language development and detect the relationship between syntactic processing ability and theory of mind in autistic children in comparison to typically developing children. The participants included 5 Persian-speaking children with autism (aged 10 to 15 years) and a typically developing control group of 10 (aged 4.5 to 7 years), matched on non-verbal IQ. Test of Language Development (TOLD) was conducted, firstly to homogenize the two groups in terms of their receptive vocabulary knowledge through the subtest of picture-vocabulary, and then to compare language development in these groups. To assess theory of mind, the ‘unexpected content’ or smarties task was employed. Three tasks evaluating complements of verbs of communication, cognition and perception were performed to investigate the semantic role of verbs in the matrix clause in comprehending complement sentences. The data were analyzed by the SPSS software using Mann-Whitney U test and Spearman’s correlation. The results showed that children with autism were significantly impaired in theory of mind and language development as compared to the control group. Moreover, it was observed that autistic children did poorly on understanding all three types of complement clauses. For children with autism, correlations were found between theory of mind and language development, and theory of mind and complement sentences.

## 2.7 Bahar Tunçgença, Carolyn Kocha, Inge-Marie Eigstic & Stewart Mostofsky

### Spontaneous mimicry of interaction partners and social-communicative function in children with autism

Friday, Sept 28th, 15:30h

#### Introduction:

Mimicry of non-verbal gestures has an important communicative function in children (Agnetta, & Rochat, 2004; Grusec & Abramovitch, 1982; Meltzoff, 2007) and adults (Duffy & Chartrand, 2015; Stel, Dijk, & Baaren, 2016), facilitating social interactions and pro-sociality. Children with autism spectrum disorders (ASD) - a neurodevelopmental disorder marked by social interaction deficits - mimic others' emotional expressions less than typically-developing children (TDC) (Oberman, Winkielman, & Ramachandran, 2009). To investigate mimicry deficits in the absence of emotion-reading demands, we examined how children with ASD and TDC spontaneously mimic others' generic body movements and conversational gestures.

**Hypothesis 1:** Children with ASD will mimic conversational gestures, but not necessarily generic body movements, less frequently than TDC.

**Hypothesis 2:** Mimicry frequency of conversational gestures will correlate negatively with increased autism symptom severity, measured by parent ratings of social functioning (Social Responsiveness Scale-2; SRS-2).

#### Methods:

Preliminary data includes eleven 8-12-year-olds (6 ASD, 5 TDC), matched on verbal and overall IQ. In a novel design, children played a "memory game", in which they watched a video of a narrator tell a story in 5 parts (2 baseline, 3 test). Throughout the test blocks, the narrator performed certain generic body movements (yawning, drinking water, rubbing face, scratching arm) and conversational gestures (co-speech gestures and posture changes) (Fig.1). Following each block, children told the story back to the narrator. Mimicry was assessed during both "listen" and "re-tell" blocks.

**Results & Conclusion:** Both groups re-told similar amount of content, indicating equivalent comprehension of the story. In line with Hypothesis 1, there was a trend towards significance showing less mimicry of conversational gestures by children with ASD as compared with TDC (MASD=0.83, MTD=4.20,  $p=.08$ ), but not of generic body movements (Fig.2). As predicted in Hypothesis 2, increased autism symptom severity was associated with less mimicry of conversational gestures (SRS-2 Total:  $r=-.71$ ,  $p=.03$ , SRS-2 Social Communication/Interaction Sub-scale:  $r=-.84$ ,  $p=.005$ ). Data collection is ongoing. Investigating subtle differences in mimicking others can elucidate non-verbal factors influencing social interactions and autism-related social-communicative issues in development.

## **2.8 Romy Råling, Matt Hilton, Birgit Elsner & Isabell Wartenburger**

**Shake, rattle and roll: Boundary cue perception in language and action**  
**Friday, Sept 28th, 16:00h**

Both speech and action processing involve the segmentation of information delivered in a continuous stream. This segmentation relies on the detection of boundary cues that separate one sub-unit from the next. Boundary cues presented in the speech stream are lengthening and pitch-rise at pre-boundary phonemes and an inclusion of a pause. Similar cues also signal boundaries between actions, namely acceleration of the pre-boundary movement as well as a pause. We examined the Closure Positive Shift (CPS), an ERP component that is related to prosodic boundary processing in language and music, in order to explore whether domain-general segmentation processes might underlie speech and action processing. We present ERP data from adults that support domain-general segmentation aspects in both domains. We also present preliminary ERP data of 12-month old infants which sheds further light on the developmental profile of domain-general processes during segmentation of speech and actions.

## **2.9 Anne van der Kant, Mariella Paul, Claudia Männel, Jutta L. Mueller, Barbara Höhle, Isabell Wartenburger & Angela D. Friederici**

**Developmental shift in non-adjacent dependency learning**  
**Saturday, Sept 29th, 11:30h**

Sentences like “The sister is singing” require listeners to track grammatical relations between non-adjacent elements, here “is” and “-ing”. Recent event-related potential (ERP) studies revealed that 4-month-olds can learn these dependencies through mere exposure, while adults only learn under active task conditions (Friederici, Mueller, & Oberecker, 2011; Mueller, Oberecker, & Friederici, 2009). Moreover, adults’ ERP responses can be modulated by inhibiting the prefrontal cortex (PFC, Friederici et al., 2013). We therefore propose a developmental shift from infants’ effortless learning of non-adjacent dependencies (NADs) to adults’ effortful learning, potentially caused by PFC development.

We aim to specify at what age this developmental shift occurs by testing German-learning 12-, 24-, and 36-month-olds. We first familiarized children to Italian sentences containing NADs (e.g. “La sorella sta cantando”; The sister is singing) and then tested them with both correct and incorrect examples (containing a NAD violation, e.g. “\*La sorella sta cantare”; \*The sister is sing). Differences between neural responses to correct and incorrect sentences reveal learning of the underlying rule. Using both ERPs and

near-infrared spectroscopy (NIRS) in parallel experiments allows us to study the learning mechanisms as well as the brain areas involved in NAD learning.

NIRS and EEG data revealed that 12- and 24-month-olds still learned NADs from mere exposure in the linguistic domain, while 36-month-olds, similarly to adults, did not learn under passive listening. In the non-linguistic domain, no NAD learning was observed. Furthermore, NAD learning was supported by left hemisphere pre-frontal brain regions in 24-month-olds. NAD learning thus shows a developmental shift between the age of 24 and 36 months. These data are in line with a recent neurocognitive model suggesting the age of three years as a turning point between sensory-based associative and frontally-based control processes (Skeide & Friederici, 2016).

## 2.10 Melanie S. Schreiner & Nivedita Mani

### **Familiarity as source of information during infant word segmentation**

**Saturday, Sept 29th, 12:00h**

Previous research has identified different sources of information that impact infants' segmentation abilities. Starting in the mother's womb, language learning benefits from the familiar voice of the mother (DeCasper & Spence, 1986). Similarly, familiarity with a word-form has been suggested to impact segmentation of similar sounding words (Altvater-Mackensen & Mani, 2013). Against this background, the current studies further explore the effects of familiarity - with the maternal voice and words - on infants' word segmentation abilities.

Study 1 compares 7.5-month-olds segmentation abilities from maternal and unfamiliar voices (N=52). In a word segmentation task, infants were first familiarized with passages containing novel pseudowords recorded by their own mother or an unfamiliar speaker. In the test phase, infants were exposed to isolated tokens of the two familiarized words and two other novel control words. The results suggests that only infants on-task in the maternal speech condition demonstrated successful segmentation, listening significantly longer to novel control words than familiarized words,  $t(51)=-2.52$ ,  $p=0.015$ ,  $d=-0.35$ .

Extending the findings by Altvater-Mackensen and Mani (2013), study 2 investigates whether 7-month-olds (N=28) benefit from words that are already familiar from their naturally occurring input outside of the laboratory in segmenting new similar sounding words. Here, infants were familiarized with passages containing related words that resembled words already familiar to the infant, e.g. Beck, and unrelated words infants had never heard before, e.g. Nipp. In a test phase, infants listened significantly longer to isolated tokens of the unrelated words relative to the related words,  $t(27)=-2.56$ ,  $p=0.016$ ,  $d=-0.34$ , suggesting that they were better able to segment the related words from the speech stream.

Together, these results demonstrate that familiarity with the voice of the mother but

also familiarity with words may impact infants' word segmentation abilities, and hence, identifies familiarity as an important source of information in early language acquisition.

## **2.11 Sarah Eiteljörge, Maurits Adam, Birgit Elsner & Nivedita Mani**

### **Semantic consistency of actions influences children's word learning**

**Saturday, Sept 29th, 13:30h**

Communication with young children not only includes speech input in the linguistic modality but also actions from the gestural modality, like the use of two fingers hopping to mimic the hopping of the rabbit. This multimodal input has been shown to support language learning (Gogate, Bahrick, & Watson, 2000, Werker, Cohen, Lloyd, Casasola, & Stager, 1998) as long as the input is compatible with the child's cognitive capacities (e.g., Gogate, Walker-Andrews, & Bahrick, 2001). However, the overlap across modalities is not merely temporal but can also vary along dimensions of semantic consistency, e.g., caregivers typically produce a hopping action when talking about rabbits and a snapping action for crocodiles. Here, we examined the influence of semantic consistency of actions on early word learning.

Children (18 months, 30 months, 36 - 48 months) and adults were presented with two novel objects and heard their novel labels while different actions were performed on these objects, such that the pairing of actions and objects was either consistent (Consistent group) or varied across trials (Inconsistent group). At test, participants saw both objects and heard one of the labels to examine whether participants fixated the correct target object upon hearing its label.

Growth curve models revealed that only 42-month-olds and adults learned words with the children benefiting from consistent action presentations. This suggests that the presentation of multimodal input had an effect on word learning in early childhood which diminishes across development. In terms of a dynamic system account of word learning (e.g., Gogate et al., 2001), our study shows how multimodal learning settings interact with the child's perceptual abilities, and can therefore shape the learning experience.

## **2.12 Samuel H. Cosper, Claudia Männel, & Jutta L. Mueller**

### **Mapping novel words onto auditory referents in infants and adults: an ERP study**

**Saturday, Sept 29th, 14:00h**

Although words are used to label multimodal objects and events, there is a strong research focus on the visual modality. Much is known about learning word meaning with visual referents; yet, how do we learn words for things we hear, but cannot see? We address

this gap by an event-related potential (ERP) experiment by presenting adults and 10- to 12-month-old infants environmental sounds and spoken pseudowords sequentially in an associative-learning paradigm. In the learning phase, participants were presented the sounds and words either in a consistent manner, where associative learning can occur, or in an inconsistent manner. The consistent object-word pairs were presented in a subsequent testing phase either in matching or non-matching conditions. The absence of significant ERP effects in the testing phase shows that adults (N=32) are ineffective in learning the meaning of the new labels in both active button-pressing and passive listening task designs. Preliminary analysis of infants' ERP data (N=29) shows a trend towards a negativity for non-matching versus matching words in the testing phase. This suggests that infants might be able to map the novel labels onto auditory referents; thus indicating infants are able to acquire novel word meaning irrespective of the modality of the referent. As adults were unable to learn in active and passive tasks, ongoing research is investigating under which conditions adults can map novel words to auditory referents, specifically, what is the impact of modality and timing of the referent to be mapped.

### **2.13 Antonia Götz, Anna Krasotkina, Gudrun Schwarzer & Barbara Höhle**

#### **Perceptual Narrowing in speech and face recognition in infants**

**Saturday, Sept 29th, 14:30h**

The development of face and speech processing during the first year of life is characterized by perceptual narrowing (PN) - the rapid attunement of discriminatory abilities to stimuli that infants often encounter in their everyday lives, along with declining discrimination abilities for stimuli rarely encountered in the environment. The parallel PN during infants' development of face and speech processing (Werker & Tees, 1984) has led to the hypothesis that PN may be driven by domain-general processes. Therefore, our goal was to investigate the PN processes for face and speech stimuli within the same infants at 6 and 9 months of age. This approach allowed us to test whether PN appears in the same time frame for speech and face perception in the same infants, which would support the hypothesis of domain-general processes driving PN in both modalities.

We tested Caucasian, monolingual German-learning infants on their ability to discriminate among non-native Cantonese tones, as well among same-race German faces and other-race Chinese faces. We tested the infants using an infant-controlled habituation-dishabituation paradigm, with infants' preferences for looking at novel stimuli versus the habituated stimuli (dishabituation scores) acting as indicators of discrimination ability. As expected, 9-month-olds were able to discriminate between same-race faces, but not between other-race faces or non-native tones. Most interestingly, we found that infants' dishabituation scores for the non-native tones and other-race faces showed significant

positive correlations, while the dishabituation scores for non-native speech tones and same-race faces did not. These results therefore support the hypothesis that shared domain-general mechanisms may drive PN in both domains.

Furthermore, we explored the neurophysiological correlates of PN in both domains. This does not only complements behavioral experiments but also contributes to the discussion whether neural discrimination of speech and faces can maintain in the absence of behavioral discrimination.

### 3 Abstracts of Science Slam

#### 3.1 Fatemeh Karimian, Yalda Kazemi & Arash Najimi

##### Statistical learning in late-talkers compared with normally-developing language peers

**Introduction:** Statistical/implicit learning (SL) (Shafto et al., 2012) is defined as “the ability to process patterns of environmental stimuli such as spoken language, music, or one’s motor action, that unfold in time” (Daltrozzo & Conway, 2014). It is argued that children with (specific)language impairment (SLI) have deficits with procedural memory system which underpin SL of language grammar (Obeid et al., 2016; Ullman & Lovelett, 2018). We hypothesize that if some late talkers (LTs) outgrow as SLI, they might be identified using SL tasks at onset. The first aim of the current study is to set up a child language study laboratory to start studying the field of SL in Iran. The second aim is to find the SL outcomes of LTs compared to normally- developing language (NDL) peers.

**Method:** The SL in the form of visual statistical learning (VSL) tasks will be operated for 32 pairs of LTs and NDL children (24-30 months old), measured by children’s head preferences and eye movements. The language measures will be also determined. The correlation between VSL scores and language measures will be calculated. Both groups of LTs and NDL children will be compared in terms of all visual and language tasks.

**Discussion:** Some LTs might show problems in SL tasks and may continue language problems in the future, developing as SLI.

#### 3.2 Joana Rosselló

##### Alex, the boy without grammar

Alex is a 10-year-old autistic boy with an open-ended trilingual lexicon made up of perfectly pronounced nouns along with a total absence of grammar both in production and comprehension. Despite his open-ended lexicon, he indeed behaves like nonverbal autistic children. His case challenges received views in linguistics, psychology and cognitive science regarding language in both development and evolution; and in particular regarding issues such as symbolism, imitation, non- verbal vs. verbal communication, learnability, critical periods, etc.

Alex learned his first words through reading. Having been taught the names of individual graphemes, he began to produce spoken words with the help of written words presented to him as captions of images that he was interested in. This happened when he was two and a half year old.

Alex’s case strongly suggests that grammar is unlearnable through exposure to images

alone. Grammar must be acquired by talking. Grammar depends on hearing, which requires fast processing of sequential and transient stimuli where the grammatical stimuli are precisely the shortest ones. Sign, as seen in sign languages, despite involving vision, does not contradict this: Signing is literally speaking with the hands and listening with the eyes. Grammar and full-fledged language would only develop with spoken (signed) communication.

Apart from a review of his developmental stages since early childhood, results on standard tests (PPVT, ADO-s, COMFOR) will be presented along with some further results on tailored tests which must shed light on the relationship between functional (grammatical) categories and recursive merge. In this regard it is telling that Alex presents with no arithmetic abilities and no skill for building blocks construction games. Recursion, in this hypothetical scenario, would then appear as the result of combining lexical and grammatical meaning.

### 3.3 Gerlind Große

#### Shared thinking in peer groups

Humans are different from other animals in a variety of ways: they talk, they cooperate, they help others without expecting reward. It has been hypothesized that all these differences have their basis in a single but complex phenomenon: shared intentionality (Tomasello & Carpenter, 2007). **Shared intentionality** (SI) encompasses both especially powerful skills to recognize and understand others' intentions, but also a unique motivation to share psychological states with others. While there is a rich body of research on intention understanding, very little is known about the development of the second prerequisite: the motivation (and skills) to share psychological states with others.

Sharing psychological states, as for example during episodes of joint attention, is crucial for other important developments in infancy and childhood, like early communication, empathy, theory of mind, and attachment. More complex forms of sharing psychological states - like sharing complex information (via communication) or sharing perspectives or thoughts - develop later in childhood. **Sustained shared thinking** (SST), for example, is a sophisticated form of SI and describes the sustained exchange of thoughts, hypotheses or explanations to solve a problem, clarify a concept or evaluate an activity (Sylva, Melhuish, Sammons, Siraj-Blatchford, Taggart, 2004). In early child care settings, SST has proved to be highly important for later academic achievement (Hamre et al., 2013). However, it is unclear so far, which skills, scaffolding and/or environmental circumstances are necessary for its development.

I propose that developing the motivation and skills to share psychological states in early childhood is of great importance both for a healthy psychological development and for positive academic outcomes.

**With the current research project**, I start to investigate how different types of adult-child and peer interaction foster shared intentionality development, specifically, shared thinking. SST in peers and its interrelation with other domains like language, emotion and cognition. It is also not clear, whether and from what age on, SST among peers might profit children's conceptual development. To address these questions, I adopt a dynamic systems approach (State Space Grids Analysis), using observation to discover specific patterns of turn-taking and the use of linguistic elements such as questions or epistemic markers. Furthermore, I analyze which individual characteristics (e.g., language and socio-emotional competence), and situational factors (like e.g., group size, activity type, group composition, topic) contribute to more sophisticated episodes of sustained shared thinking among peers.

### 3.4 Konstantina Margiotoudi

#### **How old are "Boubas" and "Kikis"? Sound Symbolism from an evolutionary perspective**

Have you ever wondered why you would call a round figure "bouba" and an angular one "kiki"? Good news! You are not the only one! These nonarbitrary associations between human speech and visual features of the referent consist a universal phenomenon across human languages (Blasi, Wichmann, Hammarström, Stadler, & Christiansen, 2016). The universal presence of vocal iconicity in humans known also as sound symbolism (Köhler, 1929) could be interpreted as a human-specific trait related to language acquisition and evolution (Imai & Kita, 2014). In the present talk, I will discuss this view by presenting evidence for absence of sound-shape correspondences in our closest phylogenetic relatives, the great apes.

### 3.5 Matt Hilton

#### **An odd state of mind? The effect of shyness on cognitive development**

"Shyness is nice and shyness can stop you from doing all the things in life you'd like to" (The Smiths, 1988). Although it is a trait that we all have personal experience of, progress in understanding the causes and effects of shyness has been slow, despite the fact that there is a clear evidence that shyness exerts a strong effect on learning and communication. We also know that shyness is a stable trait that exerts an effect on cognition throughout childhood and into adulthood. Drawing together evidence from ecology, psychology, pedagogy and beyond, it becomes clear that a better understanding of shyness can inform not only our theories of development, but also offer much-needed guidance to caregivers, practitioners and teachers in supporting shy children. So in this slam I will explore why shyness is such a difficult trait to conceptualize, explain what we

know so far about the role of shyness in human development, and argue that we must work harder to take shyness into account in our work.

## 4 Abstracts of posters

### 4.1 Maurits Adam, Sarah Eiteljoerge, Nivedita Mani & Birgit Elsner

#### (1) Cross-Domain Influences of Speech and Action Understanding

During communication between infants and caregivers, verbal and non-verbal components both play an important role. When a caregiver demonstrates a new action to an infant, the action is not only seen, but is also usually accompanied by speech. The infant can thus make use of both sources of information to learn about the new action. Previous work suggests that verbal information presented while the action is demonstrated can affect how the action is processed. Nonverbal processing such as goal anticipation can thus be facilitated or hindered by the accompanying verbal information. This planned series of studies aims to further build on our understanding of how these two information sources work together, examining how verbal information affects infants' visual goal anticipation. In a series of eye-tracking studies, 14- and 24-month old children are shown various actions being carried out on two objects. Across different conditions, the time at which speech is presented (before or during the action), the content of the verbal information (labelling the object vs labelling the action vs labelling nothing) and also task difficulty (objects always in the same location vs in different locations) are varied. We expect that early action anticipation ability to be modulated by these factors, with this modulation demonstrated as differences in latency to anticipate goal locations. These planned studies will thus offer a new insight into the complex interaction between verbal and nonverbal abilities during early development.

### 4.2 Nadja Althaus, Aditi Lahiri, & Kim Plunkett

#### (2) The representation of phonological features in the developing mental lexicon: Eye-tracking evidence from 18- and 24-month-olds

No repetition of a word, even by the same speaker, is identical in terms of its acoustic properties, implying that word recognition involves a flexible mental representation of word sounds. Despite suggestions that infants may not represent fully specified phonological forms (e.g., Jusczyk, 1993), more recent work has demonstrated that 18-month-olds' representations of familiar words are detailed (Bailey & Plunkett, 2002). Lahiri & Reetz's (2010) *Featurally Underspecified Lexicon (FUL)*, a model of adult word recognition, assumes underspecified representations, making specific predictions for mispronunciation sensitivity. According to FUL the place of articulation is underspecified for coronal sounds such as [n] or [d] but specified for noncoronals such as [m] and [b]. "Duck" being pronounced as "\*buck" (a non-specified feature is missing from the input) should be

less detrimental to recognition than “boat” pronounced as “doat” (a specified feature is missing). We tested this prediction with 18- and 24-month-old infants, using a mispronunciation task in an eye tracking paradigm. We presented 18- and 24-month-olds with a sequence of 48 trials each containing a spoken word followed by a pair of images. Spoken words were either correct or incorrect pronunciations of words with a coronal onset ([n], [d] or [t], e.g. “duck”), or a noncoronal onset ([m], [b], or [p]; e.g., “bear”). The two images, displayed for 2 seconds, consisted of a name-known object presented alongside an unknown object (e.g. an axolotl). We hypothesized that mispronunciations would illicit more looks towards the unknown target (White & Morgan, 2008). Eye movements were recorded with an EyeLink1000 eye tracker. We used growth curve analysis to model the time taken to disengage from the first fixation. This showed that participants were clearly sensitive to the mispronunciations, but less so for words with coronal onsets compared to noncoronal onsets. This is consistent with the FUL predictions and shows that asymmetries are in place early in language development.

### 4.3 Elma Blom & Evelyn Bosma

#### **(3) Input quality in a minority-majority language context: book reading at home is more important for Frisian than for Dutch**

This study focuses on a bilingual learning context in which one language is the minority language and the other the majority language. Previous research has shown that in such a context, quantity of input at home is more important for the development of the minority language than for the development of the majority language (Dijkstra, Kuiken, Jorna, & Klinkenberg, 2016). In the current study, we examined whether the same holds true for quality of input at home. In a group of 5- and 6-year-old Frisian-Dutch bilingual children ( $n = 120$ ), we investigated to what extent vocabulary and morphology knowledge were predicted by reading activities, watching TV and storytelling activities in both languages. After controlling for age, IQ and intensity of exposure at home, the results showed that reading in Frisian predicted both Frisian vocabulary and morphology, while reading in Dutch only predicted Dutch vocabulary. This shows that reading at home is most important for the development of the minority language. This especially holds true for the acquisition of Frisian morphology, a domain that is known to be vulnerable in language acquisition (Ytsma, 1995). Watching TV did not have an effect on children’s language acquisition, neither in Frisian nor in Dutch, and oral storytelling could not be included in the model because of multicollinearity with intensity of exposure.

#### 4.4 Chiara Boila, Tom Fritzsche, & Barbara Höhle

##### (4) The relation of cognitive control to the processing of German passive sentences by monolingual and bilingual children

Monolingual children at the age of four years still have problems in interpreting complex syntactic structures (Aschermann et al., 2004; Knoeferle et al., 2008; Trueswell et al., 1999). Recent studies have linked these difficulties to the children's yet developing cognitive control abilities (Höhle et al., 2016; Huang et al., 2013; Mazuka et al., 2009; Minaiet al., 2012). The current study investigates the relation between general cognition and sentence processing, specifically the processing of passive sentences, a structure that is challenging for children (Borer & Wexler, 1987; Ehrenhofer et al., 2017, 2018; Fox & Grodzinsky, 1998). In addition to inter- and intra-individual variation, we focus on the effect of bilingualism as a potential modifying factor of cognitive control abilities (Bialystok, 1999).

A group of four-year-old monolingual (N=11) and bilingual (N=10) children performed an auditory sentence-picture matching task in a preferential looking eye-tracking study. For each group twenty more children will be tested. Different types of active and passive sentences are presented, with the cue to active or passive voice (auxiliaries *hat* or *wurde*) occurring either after or before the sentence subject. We predict that an early cue to voice prevents an initial interpretation of the first noun as agent and reduces the cognitive control demand on sentence processing resulting in better performance. Cognitive control abilities are measured using two reaction time tasks: the Flanker task (Eriksen & Eriksen, 1974) and the Task-switching Paradigm (Jersild, 1927). If there is indeed a cognitive advantage in bilinguals, then bilingual children are expected to show less difficulties than monolinguals in understanding non-canonical sentences. This is the first study that compares the influence of cognitive control on sentence comprehension in mono- and bilingual children. Data collection is ongoing and results will be ready by the time of the conference.

#### 4.5 Katerina Chládková

##### (5) Modeling the developmental stages of vowel acquisition

In their first year of life humans form categories for most speech sounds of their native language. It is well established that the acquisition of vowels precedes that of consonants (e.g. Kuhl, 2004), yet, relatively little is known about the developmental trajectories of individual contrasts within the class of vowels alone. Such lack of knowledge is surprising considering that across languages vowels are systematically distinguished by their spectral quality (height, backness) and length features. A large number of studies examined vowel acquisition but they usually focused on one contrast type (for exceptions see Sato

et al., 2010, Thiede et al., in prep.); combining findings from across experiments does not provide a clear picture either due to varying methodologies. We present a computational model of first-language vowel acquisition. The model is an artificial neural network (based on Boersma et al., 2013) where the first, input, layer represents sound’s acoustic properties, the second layer represents the actual signal that reaches the learner’s inner ear, and the third is the output layer. With this network we simulate a virtual learner acquiring a toy ten-vowel language where vowels are contrasted by height, backness, and length features. Learning starts in the prenatal period, as soon as the inner ear and temporal cortex are functional (gestational week 28-30, Graven & Browne, 2008). After enough input, the network reaches an equilibrium, meaning that the virtual infant has successfully acquired the vowels. Interestingly, inspection of the network’s activity patterns throughout learning shows that the age of acquisition differs across the different contrast types and is largely determined by two factors, namely, the acoustic saliency and the statistical reliability of the signal at the learner’s ear. The parameter settings and results of the simulations are discussed. Finally, we present model-based predictions for experiments with human infants that are currently underway.

## 4.6 Ailis Cournane & Dunja Veselinovic

### (6) The syntactic foundation of child epistemic talk: cross-linguistic evidence

This paper leverages grammatical arguments against prevailing Theory of Mind (ToM) accounts of child epistemic talk (Astington, 1993; Papafragou, 1998), focusing on modal verbs (e.g., can, have to) and adverbs (e.g., maybe, probably) in English and Bosnian/Croatian/Serbian (BCS). The ToM view holds that children produce modals with epistemic meanings (e.g., inferences) later than modals with root meanings (e.g., abilities, obligations) because epistemic uses await conceptual development. We show that epistemic talk milestones align best with syntactic category production (e.g., adverb vs. verb) and syntactic milestones (e.g., sentential embedding), not general ToM milestones (de Villiers, 2007). We stress that epistemic talk allows us to make claims about language development, but production of forms does not indicate adultlike concepts, nor does lack of production indicate lack of concepts (consider Hirsh-Pasek & Golinkoff, 1996; Onishi & Baillargeon, 2005).

**Argument 1:** The epistemic gap holds only for polysemous modal verbs (e.g.,  $\text{must}_{\text{obligation}}$  or  $\text{must}_{\text{epistemic}}$ ) (Cournane, 2015; Veselinovic & Cournane, 2018; Van Dooren et al., 2017). Early studies largely confounded modality with modal verbs, but these represent an incomplete grammatical sample that is confounded with grammatical complexity for epistemic uses (Brennan, 1993; Cinque, 1999; Hacquard, 2006; Veselinovic, 2017). Among polysemous modal verbs in English and BCS children, the epistemic gap consistently varies in duration by 1 year (longer in BCS) (Veselinovic & Cournane, 2018),

problematic on a ToM account but straight forwardly predicted by greater syntactic complexity in BCS, which requires late-acquired biclausal structures to represent epistemics verbs (Veselinović, 2017).

**Argument 2:** Children use epistemic talk in the form of adverbs during the time the ToM view assumes they are epistemically mum: English *maybe*, *probably* (Cournane, 2015; O'Neill & Atance, 2000), BCS *možda*, *sigurno* (Veselinovic & Cournane, 2018); also French *peut-etre* (Bassano, 1996), Polish *chyba* (Smoczynska, 1993). Crucially, modality is a semantically-defined category (Kratzer, 1977; Portner, 2009), not a syntactic one, so to measure child epistemic talk we must look at the full range of forms each language uses to express epistemic meanings. Lexical epistemic forms like adverbs are available to much younger children than functional verbs.

#### 4.7 Sebastian Dörrenberg, Lisa Wenzel, Marina Proft, Hannes Rakoczy & Ulf Liszkowski

##### (7) Systematic replication and task variation of an interactive false belief task

The last decade produced astonishing findings that even young infants are capable of false belief (FB) representation, the litmus test for crediting a Theory of Mind. However, a variety of recent replication studies question their reliability. In particular, a recent replication attempt of the Sefo-task (an interactive FB task by Southgate et al., 2010) was unsuccessful in finding FB representation in 24-month-olds (Dörrenberg et al. 2018). Also another Sefo replication study failed with older children (Grosse Wiesmann et al. 2017). Surprisingly, the Sefo-task suffers from weak pragmatic soundness. For instance: Why does the experimenter leave the room? Why does she not retrieve the toy herself? To clarify why these studies failed to reproduce the original findings, (i) we conducted close direct replications with the original age group (17-month-olds), (ii) we developed pragmatic modifications by introducing a substrate that created a fun game with the objects and that gave the experimenter a reason to leave the room, and (iii) we validated the Sefo-task by testing 3-year-olds in a direct replication and additionally in a standard FB task. Results were negative across tasks and age groups. Our findings question the suitability of the Sefo-task to measure FB understanding in young children.

#### **4.8 Kerstin Ganglmayer, Tobias Schuwerk, Beate Sodian & Markus Paulus**

##### **(8) Do children, adolescents and adults with autism-spectrum-condition visually anticipate other's actions as goal-directed after frequent observation?**

Theories suggest that individuals with autism spectrum condition (ASC) have difficulties in anticipating others goal-directed actions. This might be caused by an impairment of using prior information. Yet, it is not clear whether individuals with ASC can process the actual goal of an action or just rely on movement trajectories when anticipating actions. To this end, the current study investigated whether children, adolescents and adults with ASC anticipate another's action based on the action goal and not just on the movement trajectory after frequent observation of the action. Children ( $n = 59$ ), adolescents ( $n = 38$ ) and adults ( $n = 46$ ) with and without ASC were presented with an animated agent that repeatedly takes different paths to reach the same of two targets. Participants eye-gazes were assessed to analyze anticipations. Results show that the ASC group exhibited fewer goal-directed anticipations than the control group over the three age groups ( $p = .013$ ). Especially in the first trials individuals with ASC did not anticipate goal-directed, but increased their goal-anticipations in later trials. These findings indicate that individuals with ASC are able to anticipate the actual goal of an action and not just movement patterns. However, they are impaired in their ability to use prior information, as they needed more repetitions to encode the goal. Our findings thus inform theories on social cognitive problems within ASC.

#### **4.9 Stella Grosso, Beate Sodian, Irina Jarvers, Tobias Schuwerk, Susanne Kristen-Antonow & Nivedita Mani**

##### **(9) Implicit Understanding of Epistemic Language in 27-month-old children: an Eye-tracking task**

The third year of life is a transitional period from implicit to explicit Theory of Mind. While there is evidence for production of epistemic terms at 3 years (Harris, 2016), no systematic studies addressed to date the comprehension of 'know' and 'think' at this early age. We developed an eye-tracking task based on a paradigm by Moore et al. (1989) to investigate these differentiation in a sample of  $N = 79$  (47 female) 27-month-old children. During a familiarization, children were acquainted with a hiding game where an experimenter hid a sticker in one of two boxes and two monkeys helped to retrieve the object. After four practice trials, children watched animations in which two monkeys sequentially indicated the sticker location, each followed by a voiceover saying "The monkey knows/thinks that the sticker is in there". At the end of each trial children

were prompted by the question "Where is the sticker?".

Looking patterns were recorded at monkeys and boxes in two seconds intervals following stimulus onset (the critical mental term) across eight trials. Children's proportional looking time to target (the monkey that knows) compared to distractor was calculated across trials.

In the first test phase 49.4% of the children looked more at the agent who 'knew', increasing to 62% in the second test phase. Lower performance was visible in the last test phase where 36.7% of children preferred the target location. This could be due to the length of trials that impacted attention and short working memory resources of children. Despite that, results from the second phase, where all necessary information was already available to solve the task, indicate a predictive preference for the agent with higher knowledge. This suggests that a beginning sensitivity for implicit understanding of degrees of certainty in epistemic language can be assessed already in 27-month-old children.

#### **4.10 Larissa Kaltefleiter, Tobias Schuwerk & Beate Sodian**

##### **(10) Developmental trajectories in an implicit and an explicit false belief task in dependence of a mental state language training**

Children younger than 4 years typically fail to attribute a false belief to another agent in explicit ToM tasks, whereas even younger children pass preverbal, implicit false belief tasks. While explicit ToM is closely related to language (e.g., Milligan, Astington, & Dack, 2007), to date, no correlations have been found between implicit false belief understanding and language (Grosse Wiesmann et al., 2014). However, a recent training study by San Juan & Astington (2017) found an effect of a brief mental state language training on implicit, rather than explicit false belief understanding. In the present study, we therefore investigated possible effects of a ToM-training in two conditions (a mental state language training, and a complement syntax training without mental state verbs) on an implicit as well as an explicit false belief task. An anticipatory looking false belief task adapted from Grosse Wiesmann et al. (2014) was used as an implicit measure of children's false belief understanding. In the task, 27-month-olds' anticipatory looking behavior was recorded while they watched an agent searching for a mouse. The agent either held a true or a false belief about the mouse's current location. As an explicit measure, a representational change false belief task using a peep-through-picture-book (Moerbeek, 1994) that contained a deceptive element was administered (Hughes & Ensor, 2007). After having read the book, 33-month-olds were asked two force choice test questions covering their own and another person's prior belief and two reality control questions. Children completed both tasks again with 36 months. As Lohmann & Tomasello (2003) found positive influences of a ToM-training involving mental verbs on ToM-abilities, we

expect beneficial influences on emerging ToM-skills for the children participating in our mental state training, in addition to a general developmental performance improvement. Because differences in mental state language at 30 months predict ToM-abilities at 4 years (Brooks & Meltzoff, 2014), we also expect positive correlations between performance in the false belief tasks and mental state language measures.

#### **4.11 Anne van der Kant, Mariella Paul, Claudia Männel, Angela Friederici, Barbara Höhle & Isabell Wartenburger**

##### **(11) fNIRS reveals a sensitive period for non-adjacent dependency learning in the linguistic domain**

Infants acquire the grammatical rules of their native language with remarkable ease. The ability to implicitly extract and generalize abstract rules between non-adjacent elements (non-adjacent dependencies or NADs) is present very early in life, but limited in adulthood (Friederici, Mueller, & Oberecker, 2011). The limited ability of adults to implicitly learn NADs was attributed to an age-related increase in cognitive control through involvement of the prefrontal cortex (PFC, Friederici, et al., 2013). This increase in cognitive control might restrict associative learning processes, which have been assumed to guide implicit grammar learning under passive listening, to infancy. We aim to uncover when this sensitive period for associative NAD learning closes and whether the underlying learning mechanisms are specific to language or domain-general.

We tested the implicit learning abilities of 2-year-old (N=30) and 3-year-old (N=34) German-speaking children in a grammar learning paradigm using both linguistic materials (short Italian sentences) and non-linguistic materials (tone sequences) containing NADs. Using functional Near-Infrared Spectroscopy (fNIRS), we assessed the detection of NAD violations after a short familiarization period (5 min / 100 sentences) in an alternating-non-alternating paradigm (Gervain, et al., 2008). Moreover, we used fNIRS to assess which brain regions are involved in implicit NAD learning and whether and how activation patterns change with age.

Oxyhemoglobin (HbO) changes showed significant differences between NAD violation blocks and blocks without NAD violations in inferior frontal channels in 2-year-old children in the linguistic domain, indicating that these children learned the linguistic NADs. No evidence of NAD learning was found in the non-linguistic domain or in 3-year-olds. These results suggest that the ability for implicit learning of non-adjacent dependencies decreases during the third year of life and that left hemisphere inferior frontal regions sub-serve implicit learning of these dependencies in 2-year-olds. Furthermore, non-adjacent dependency learning in infancy appears to be domain-specific.

#### **4.12 Anastasia Liashenko, Tamara Khagabanova & Marie Arsalidou**

##### **(12) Parametric measures of mental-attentional capacity: Data from Russian children**

Cognitive competence is a fundamental predictor of academic achievement and professional success. Standard measures of cognitive competence (e.g., intelligence tests) have been criticized for relying heavily on formalized schooling (i.e., content learned through school) making these tests inappropriate for children from different cultures or socio-economic backgrounds. Core cognitive measures with minimal language and background requirements lend themselves for evaluating cognitive competence in school-aged children. In this study we are using parametric measures of mental attentional capacity developed within the theory of constructive operators (Pascual-Leone, 1970), which have been characterized to be culture fair and suitable to assess core cognitive abilities in children regardless of their language, culture and social background (Arsalidou & Im-Bolter, 2017). Our goal is to examine whether Russian children perform according to theoretical expectation (Pascual-Leone, 1970) and similarly to past empirical test obtained in countries in such as Canada, South America, Europe and Australia (Arsalidou & Im-Bolter, 2017).

We tested 240 children (121 females) from Moscow schools that attended grades 1-4 ages 7-11 years. Children completed a paper-and-pen Figural Intersection Task (FIT) and computerized tasks - Colour Matching Task (CMT) and Number Matching Task (NMT). Preliminary analysis shows significant correlation between age and mental-attentional capacity score. ( $r(240) = .203, p = .002$ ), which is consistent with the theoretical model and confirms that the task is culture fair. Theoretical expected scores of mental attentional capacity for 7-8, 9-10 years are 3 and 4 units. Results on the FIT in Russian children shows that mean scores for  $8.6 \pm 0.37$  years and  $9.6 \pm 0.41$  years correspond to 3.12 and 3.96 respectively. Overall, performances of Russian children follow predicted scores on mental-attentional capacity, supporting the culture-fairness of these measures. Theoretical and practical implications of these findings will be discussed.

#### **4.13 Konstantina Margiotoudi, Matthias Allritz, Manuel Bohn & Friedemann Pulvermüller**

##### **(13) Testing human and non-human primates on sound-shape correspondences**

The term sound symbolism describes the phenomenon of nonarbitrary links between sounds and meaning (Lockwood & Dingemanse, 2015). A classic example of sound symbolism is that of sound-shape correspondences described by Köhler (1929). People, judge

the non-word “maluma” to be a good match with a round shape whereas the non-word “takete” to an angular one. The relevant role of sound symbolism in the evolution of language has been highlighted in the literature (Imai & Kita, 2014; Perniss & Vigliocco, 2014; Ramachandran & Hubbard, 2001). Iconic signals are proposed to be a stepping stone in the evolution and acquisition of language, because they allow the achievement of displacement and referentiality (Perniss & Vigliocco, 2014). Despite the theoretical interest on sound symbolism in language evolution, there have been no studies testing sound-shape correspondences in our closest relatives, namely great apes.

In the present project, we ran a two-alternative forced choice (2AFC) audiovisual task, similar to the classic “maluma”-“takete” paradigm (Köhler, 1929). 24 healthy human subjects and eight apes were tested. During the task the subjects listened to a pseudoword preceding the presentation of two shapes, one angular and one round. The subjects had to choose one of the two shapes. Both pseudowords and shapes were rated before as “sharp” or “round” via an online questionnaire.

Based on our results, humans preferred to associate curved shapes to “round” sounded pseudowords and angular shapes to “sharp” sounding pseudowords. On the contrary, none of the great apes showed this sound-shape correspondence. The present results are discussed in the context of language evolution and acquisition. Neuroanatomical differences between the two species in perisylvian networks of language, in crossmodal connections (Rilling, 2014) and in verbal working memory mechanisms enabled by human-specific connections (Schomers, Garagnani, & Pulvermüller, 2017) could perhaps explain the absence of a sound symbolic effect in great apes.

#### **4.14 Claudia Männel, Hellmuth Obrig, Arno Villringer, Merav Ahissar & Gesa Schaadt**

##### **(14) Seizing the benefit of auditory predictive coding in infancy: Perceptual anchoring in 2-month-olds**

Predictive coding mechanisms drive learning and are evident during early development. Prediction errors, indicated by mismatch responses in the event-related brain potential (ERP), have been reported for newborns and even fetuses. The immediate benefit of predictive coding for the processing of upcoming events, however, has not yet been tested at this young age. Here, we aim to test the effect of context-based predictions from fixed reference stimuli (i.e., perceptual anchoring) in 2-month-olds. Adult listeners show a behavioral advantage in tone comparisons, when the frequency of a “reference” or “anchor” tone is kept constant. Thus, adults form an internal reference from repeated input, serving as perceptual anchor against which new sounds can be classified rather than comparing sounds online without reference. In our ERP study, we presented infants with tone pairs across anchor and no-anchor conditions. The experimental design allowed for the

evaluation of identical second tones that were either preceded by constant anchor or random (no-anchor) first tones. Preliminary ERP data in response to the second tones reveal a modulation of infants' obligatory ERP components, with more positive-going fronto-central responses at around 200 ms in the anchor than the no-anchor condition. This effect resembles the adult P2 that is associated with processes of selective attention and modulated by training, such that training-enhanced P2 amplitudes correlated with faster auditory discrimination. Thus, our study indicates for the first time that infants at two months do not only apply predictive coding mechanisms, but show processing benefits from repeated information in their learning environment.

#### **4.15 Naomi Nota & Evelyn Bosma**

##### **(15) The effect of bilingualism on reading. Gradual cognate effects in Frisian-Dutch bilingual children, an eye-tracking study.**

Bilingual adults are faster at reading cognates than non-cognates in both their first (L1) (Duyck et al., 2007) and second language (L2) (Van Assche et al., 2009). This cognate effect has been shown to be gradual in the L1: recognition was facilitated when words had higher degrees of cross-linguistic similarity (Van Assche et al., 2009). Many studies on bilingual language processing have used this effect to indicate a co-activation of lexical representations in two languages. Recent research has shown that the gradual cognate facilitation effect can also be found in bilingual children's receptive vocabulary (Bosma et al., 2016). However, it is still unknown to what extent it can be found in bilingual children's reading. The aim of the present study is to investigate whether cognate facilitation can also be observed in bilingual children's reading, and whether this effect is gradual. Frisian-Dutch bilinguals will perform a cognate reading task in both of their languages while their eye-movements are recorded. Cognates with varying degrees of form-overlap between their Frisian and Dutch counterparts will be presented (form-identical cognates: boek-boek 'book', form-similar cognates: beam-boom 'tree') and compared to non-cognates (beppe-oma 'grandmother'). Reading times are hypothesized to be influenced by cognate facilitation. This facilitation is expected to be a function of cross-linguistic similarity between cognate pairs.

#### **4.16 Cathal O'Madagain, Gregor Kachel & Brent Strickland**

##### **(16) Pointing May Originate in Touch**

Informative pointing lies at the foundation of language acquisition and seems to be a uniquely human capacity. Why children begin pointing when they do, and why this allows us to coordinate attention, however, has remained largely mysterious.

Here we present three studies that may provide answers to these questions, which indicate that pointing originates in exploratory touch. In the first, we elicit pointing gestures from children and adults, and show that pointing gestures are produced less like 'arrows' as most theories of pointing assume, but rather more like attempts to 'touch' the object of reference - the finger-tip aligning with the line of sight on the object of reference in the pointer's field of view. The second shows that although adults interpret pointing gestures as 'arrows', young children have trouble interpreting pointing gestures as arrows, and are more likely to interpret them as touch gestures, referring to the object closest to a speaker's finger-tip. The third study shows that children and adults, when attempting to point to an object at odd angles, orient their hands in such a way that they would were they trying to touch that object.

These results go towards answering the two questions raised above. First, they tell us why pointing gestures emerge with the morphology they do - because this is the morphology of a hand when it is shaped in an attempt to touch something. Second, the 'touch' story of pointing may shed light on how children and adults manage to coordinate attention through pointing, because we have independent reasons to think that vision and touch exploration are involuntarily coordinated in children and adults.

#### 4.17 Christiane Patzwald & Birgit Elsner

##### **(17) Do as I say - or as I do?! How 18-and 24-month-olds weigh words and actions to infer intentions in situations of match or mismatch**

Research illustrated infants' ability to appreciate the behavioral and verbal cues' relevance for inferring another's action intention. However, how infants weigh these cues depending on their internal relation remains an important open question. Across two experiments it was investigated how 18-and 24-month-olds' (N= 88 per age group) action selection was influenced by varying the internal relation of a verbal and behavioral cue. Using a between-subjects design, infants received six trials with different stimulus objects. In the congruent and incongruent conditions, a verb either matched or contradicted a goal-directed action demonstration, respectively; in the failed attempt condition, a verb was combined with a non goal-directed action demonstration; in the pseudo word condition, a pseudo verb was combined with a goal-directed action demonstration. In the incongruent and failed attempt conditions, 24-month-olds used the verbal cue more readily than 18-month-olds, however age groups showed different development across trials. In the congruent and pseudo word conditions, both age groups preferentially followed the verbal cue; yet, infants' action selection did not differ between these two conditions, indicating that the verbal cue's effect in the congruent condition was rather unspecific. Higher latencies to infants' first action in the incongruent and failed attempt conditions indicated that infants were faced with a higher cognitive demand than in the congruent

and pseudo word conditions. Results are discussed in light of infants' flexibility in using social cues, depending on the cue's internal relation, and on age-related differences.

#### **4.18 Gesa Schaadt, Angela D. Friederici, Hellmuth Obrig & Claudia Männel**

##### **(18) Association of speech perception and production in 2-month-olds: Relating event-related brain potentials to vocal reactivity**

Perceptual and expressive phonological abilities are key features for successful language development and a functional connection between speech perception and production has been postulated. Accordingly, it has been shown that babbling – a form of vocalization – shapes speech processing in 10-month-olds. Precursors of babbling (e.g., vocalization) already develop around the second month of life, but the association of speech perception and production (i.e., vocalization) has not been investigated during this early developmental period.

In the present event-related brain potential study, we investigated speech perception and production in 2-month-olds. For perception, the Mismatch Response (MMR) was measured in a multi-feature paradigm with four deviant categories (i.e., consonant, vowel, pitch, vowel length). For production, we used the subscale vocal reactivity (i.e., infants' amount of vocalization exhibited in daily activities) of the parental Infant Behavior Questionnaire.

Our data reveal positive MMRs for all deviant categories, typically observed in 2-month-olds. Importantly, we found a negative correlation between the MMR to vowel changes and vocal reactivity, but no such correlation for the other deviant categories. Thus, a more negative MMR to vowel changes was associated with infants' higher amount of vocalization, indicating that speech perception and production mutually interact already at an early age. Furthermore, the transition from a positive to a negative MMR polarity, with negative MMRs indicating more mature responses, might be influenced by infants' expressive abilities. The observation of an effect for vowel changes may pertain to the earlier development of vowel, compared to consonant perception and production.

#### **4.19 Esther Schott & Krista Byers-Heinlein**

##### **(19) Does cross-language similarity affect how bilinguals represent words?**

Bilingual infants learn words at the same rate as their monolingual counterparts. Yet their word learning environment is more complex: some words are similar across languages (called cognates, e.g., English/French: banana/banane), while others are different (English/French: apple/pomme). Cognates allow us to test whether properties of the words learned, such as cross-language similarity, affects how bilinguals represent words.

The study proposed here will test whether bilingual toddlers encode cognates with less phonological detail than non-cognates. For example, banana/banane may be represented as b\_n\_n\_, where only the shared sounds are encoded in more detail. This is supported by studies of Spanish-Catalan toddler' word recognition (Ramon-Casas et al., 2009, 2010), however, Spanish and Catalan are highly similar and contain many cognates. For bilinguals exposed to highly similar languages, cognates might be represented differently. We will test recognition of correctly pronounced and mispronounced cognate and non-cognate words in English-French bilingual toddlers. Toddlers will see two objects on a screen, and one object will be named (i.e., the target). In half of the trials, the named object will be a cognate (e.g., a banana), in the other half, it will be a non-cognate. For each word type, half of the trials will use the correct pronunciation ("Look, a banana!"), and the other half will use a mispronunciation ("Look, a ganana!"). Regardless of cognate status, toddlers should look less toward the target during mispronounced compared to correctly pronounced trials. Comparing cognates and non-cognates, I predict that toddlers' looking at the target will be more affected by mispronunciations for non-cognate than for cognate words. This would suggest that the cross-language similarity of cognate words is associated with toddlers encoding less phonological detail. The results of this study will inform us on the strategies that bilingual children use to cope with the variability inherent in their language input.

## 4.20 Saskia Tobias, Markus Paulus & Angela Friederici

### (20) The development of the understanding of hierarchical structures in language and action

The processing of hierarchical structures plays a crucial role in both, language and action understanding. So far, however, it is unclear whether the understanding of such hierarchical structures is domain specific or subject to domain-general processes. While there is some evidence about children's early understanding of hierarchical structures in the language domain (Fengler, Meyer & Friederici, 2016), much less is known about this development in the action domain. To investigate whether the processing of hierarchical structures has a similar developmental trajectory in the two domains, we are currently running a correlational study with 3 1/2- 5 1/2 year old children. Furthermore, the relations of ToM, working memory and inhibitory control to the developing understanding of hierarchical structures in the two domains are assessed. Data collection is ongoing and first results will be presented at the conference.

## 4.21 Susann Ullrich, D. Buttellmann, B. Harders & R. Rummer

### (21) Kiki vs. Bouba - A stable sound-symbolic effect in young children?

Sound Symbolism refers to the fit between the sound of a word and its meaning. The most widely used paradigm to investigate sound-symbolic perception is the kiki-bouba task: When subjects are asked to match non-words such as “kiki” and “bouba” onto spiky and curved shapes, around 90 % of adults match “kiki” to the spiky and “bouba” to the curved shape. Behavioral studies with children aged 2 to 7 (Maurer, Pathman, & Mondloch, 2006; Tzeng, Nygaard, & Namy, 2017) and eye-tracking studies with infants (Asano et al., 2015; Ozturk, Krehm, & Vouloumanos, 2013) show that the kiki-bouba effect is present already at a prelinguistic age, and suggest that sound symbolism scaffolds language learning from birth on.

Exploring the utilization and automaticity of this phenomenon, we conducted an object-choice task with 3-years-olds. We hid toys underneath spiky and curved containers for the children to find. As cues, the children heard kiki/bouba-like non-words with the toy being hidden under the shape matching the sound of the respective non-word.

In the implicit version, the experimenter simply uttered the non-words to the child before it got to choose a container. None of 21 children showed a significant matching of sound to shape. Overall, the children showed even a significant inversed kiki-bouba effect with a matching rate of only 44 %. In the explicit version, the experimenter told the children that the toy was hidden in the non-word like container. As a group, children chose at chance-level. However, some individuals (5/24) showed a significant kiki-bouba effect, and others a significant reversed effect (2/24). Being doubtful about the existence of the kiki-bouba effect in young children, we also tried to replicate the original Maurer et al. study (Maurer, Pathman, & Mondloch, 2006). We found a small but significant kiki-bouba effect.

In summary, different task settings yielded different results and diverse individual behavior patterns. Hence, these results question the stability of sound symbolism in early childhood.

## 4.22 Dunja Veselinovic & Ailis Cournane

### (22) Pragmatic inferences lead children to overgenerate epistemic interpretations of modal verbs

We report experimental work testing whether Bosnian/Croatian/Serbian (BCS) children use morphosyntactic cues to interpret the modal verb *morati* ‘must’ as root (e.g., obligation) vs. epistemic (e.g., inferential). *Morati*, like *must*, poses a learning challenge: one form maps to multiple abstract meanings (Clark, 1987; van Dooren et al., 2017; Papafragou, 1998). We show that despite differences in input-frequency and structural cues

compared to English *must*, children behave similarly with BCS *morati*, overgenerating epistemic interpretations by age 5. We argue world knowledge underlies this behavior - obligations normatively imply realization of the obligatory action, allowing adults to match root-biased X *must* V to (epistemic) pictures implying X's normative behavior. Older preschool-aged children adhere more strongly to this inference than adults (Kalish, 2008).

Prior English studies show older preschoolers (and some adults) prefer epistemic interpretations of *must* for root-biased structures (Cournane, 2015; Cournane & Pérez-Leroux, submitted). Cournane & Pérez-Leroux (submitted) ascribe this to availability of epistemic interpretations (X *must habitually* V), and *must* being primarily epistemic in the input (van Dooren et al., 2017; Tagliamonte, & D'Arcy, 2007). In BCS, syntax categorically disambiguates BICLAUSAL (epistemic) and MONOCLAUSAL (root) structures (Veselinović, 2017). Furthermore, *morati* is primarily root in the input (Veselinović & Cournane, accepted). BCS allows us to test three modal learning hypotheses:

- i) Syntax-driven: adultlike structure-to-meaning mapping;
- ii) Input-driven: overgeneration of deontic interpretations;
- iii) Pragmatics-driven: overgeneration of epistemic interpretations.

Participants (56 children (3;0-6;11) and 9 adults from Sarajevo) completed a picture-choice task (Cournane, 2015; Cournane & Pérez-Leroux, submitted). Four training items preceded 10 (5 BICLAUSAL, 5 MONOCLAUSAL) randomized test items. Each trial, participants heard one test sentence, and chose between two pictures (EPISTEMIC, DEONTIC).

Adults behaved predictably with BICLAUSAL, choosing EPISTEMIC M=4.78(/5) times, but not MONOCLAUSAL, choosing the unexpected (=ungrammatical[3]) EPISTEMIC M=1.67(/5) times. Older children were more adult-like than younger with BICLAUSAL, but significantly less adult-like with MONOCLAUSAL; 6-year-olds chose nontarget EPISTEMIC M=3.5(/5) times.

Our results support a pragmatic account which, unlike input-frequency or cue-based structural accounts, captures both our BCS and the extant English results.

## 4.23 Ivonne Weyers & Jutta L. Mueller

### (23) The perceptual basis of non-adjacent dependency learning

The ongoing project investigates the neurocognitive development of basic language learning mechanisms by utilizing electroencephalography to assess auditory artificial language learning in infants and adults. It aims to specify the relation between auditory grammar learning and its underlying perceptual code. Processing dependencies between distant speech elements is central to human language (e.g. he sings). Behavioral studies report evidence of learning such so-called non-adjacent dependencies starting from the second

year of life (e.g. Santelmann & Jusczyk, 1998). Recent electrophysiological evidence, however, suggests that infants detect grammatical relations between non-adjacent syllables already during their first half year of life (Friederici, Mueller, & Oberecker, 2011) and that this ability is related to basic auditory development (Mueller, Friederici, & Mannel, 2012). Yet, not much is known about the nature of the underlying learning mechanism. The present project tackles the question which speech elements carry the perceptual code for grammatical learning. As consonants have been shown to be the segment speakers rely on when identifying words in a continuous speech stream (e.g. Bonatti, Peña, Nespor, & Mehler, 2005; Nazzi, 2005), it has been suggested that consonants and vowels assume different roles in linguistic processing altogether (Toro, Shukla, Nespor, & Endress, 2008). It is thus possible that speakers, and particularly infants acquiring their mother tongue, rely on vowels when abstracting structural regularities from auditory linguistic input. Both adults and 8-10 months-old infants will be tested in an artificial grammar learning experiment. A non-adjacent dependency rule of the type ABC will be coded over different segments, namely syllables, consonants or vowels. During stimulus presentation, participants' electrophysiological brain response will be recorded via EEG. The outcome of the project will be a more precise characterization of the neural and perceptual basis of auditory linguistic rule learning and its developmental changes and contribute to a better understanding of language learning across the life span.

## 5 Practical information

### Campus Map

#### CROSSING THE BORDERS Conference University of Potsdam - Campus Griebnitzsee



Building 6 | Room H02  
Campus Griebnitzsee  
August-Bebel-Straße 89  
14482 Potsdam

“S Griebnitzsee Bhf” and “Bahnhof Griebnitzsee”  
Train RB21, S-Bahn S7, Bus 616, Bus 694, Bus 696

### Locations

Keynotes and paper/oral presentations will take place in building 6, room H02. Poster presentations will take place in the foyer area of building 6 (which will be signposted). You will find the registration desk also located in the foyer area.

### Conference dinner

In addition to the formal conference programme, we have organised a conference dinner for an enjoyable social evening with everyone in the restaurant ZWEIHUNDERTEINS right next door (Rudolf-Breitscheid-Straße 201, 14482 Potsdam). The dinner will be held on Thursday, September 27<sup>th</sup> at 7 pm and is not included in the catering fee.

### Internet Access

If you have a European university affiliation, please use eduroam.  
For other guests, vouchers are available at the registration desk:

1. Connect to the WiFi "UP-Conference"
2. Open a browser
3. You are prompted to enter the voucher code

## 6 Notes

