Helmholtz Retreat 2016

Proceedings of the 8th Helmholtz Retreat

Jun 29th - July 1st
Venue: Hotel Jan van Scorel,
Schoorl, The Netherlands

Helmholtz Committee

Office management

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Orginizers Retreat

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Dr. Sjoerd Stuit,	Utrecht University
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Prof. Dr. Chris Dijkerman,	Utrecht University
Paul Zerr (Helmholtz PhD council),	Utrecht University

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Welcome

Prof. Dr. Chris Dijkerman

This year, the Helmholtz retreat will be held for the eighth time. Indeed, it has become a well-established tradition. Although location and participating groups have changed over the years, the format of the retreat has essentially stayed the same. It involves a mixture of scientific presentations in various sessions on different topics by PhD students, combined with lectures by (inter)national guest speakers and sufficient time for informal chats about research or any other topic, a walk on the beach etc. This persistence with respect to the format is not surprising as it is highly stimulating and well-regarded by attendees.

Since our last Helmholtz retreat in June 2014 a few significant events have taken place within the research school. Colleagues from Linguistic department in Utrecht have joined and the Helmholtz School has (re)gained accreditation as a national research school from the KNAW. At the same time Helmholtz activities continue the way they have done for many years. For example, the Helmholtz lecture series each year contains renowned international speakers and Helmholtz PhD days are organised every 6 months. No doubt the highlight of the Helmholtz activities calendar remains the Helmholtz retreat.

The program of this year's retreat comprises presentations from established Helmholtz groups (e.g. Erasmus University, the Free University and Utrecht University) as well as from groups (health and social psychology, linguistics) that have joined more recently. I would like to thank Sjoerd Stuit and Anouk Keizer for all the effort that have put into organizing the retreat and I look forward to yet another highly stimulating retreat.

Chris Dijkerman

Chairman of the board of the Helmholtz Research School

Program

*Locations: All **sessions** will in the Tuinzaal. During the **breaks**, coffee will be available in at the bar or, if the weather permits, in the garden. **Breakfast**, **lunch** and **diner** will be in the restaurant 'KanunniK'. The **BBQ** will be at the terrace and the garden.*

Wednesday June 29

9.30 - 10.00	Arrival PhD students
10.00 - 13.00	PhD only session Workshop on presenting Discussion HH herald
12.00 - 13.00	Arrival other guests
13.00 - 14.15	Lunch
14.15 - 14.30	Opening by Leon Kenemans
14.30 - 15.30	Session 1: Body perception & action I
15.30 - 15.45	Break
15.45 - 16.45	Session 2: Body perception & action II
16.45 - 17:45	Break (with snacks!)
17.45 - 19.00	Keynote Johan Wagemans
19.00 - 21.00	Diner

Thursday June 30

7.30 - 9.00	Breakfast
9.15 - 10.35	Session 3: Eye movements
10.35 - 10.50	Break
10.50 - 12.10	Session 4: Affective processes
12.10 - 12.30	Break
12.30 - 14.00	Lunch
14.00 - 15.20	Session 5: Language and development
15.20 - 16:30	Time for some fresh air!
16.30 - 17.30	Business meeting
17.30 - 17.45	Break (with snacks!)
17.45 - 19.00	Keynote Karin Roelofs
19.00 - 21.00	BBQ diner

Friday July 1

7.30 - 9.00	Breakfast
9.15 - 10.35	Session 6: Social and self regulation
10.35 - 12.00	Posters and demo's (and coffee)
12.00 - 13.15	Lunch
13.15 - 14.50	Session 7: Visual attention
14.35 - 14.45	Closing

Keynote Johan Wagemans

Wednesday June 29
17.45 - 19.00,
Keynote Prof. Dr. Johan Wagemans
Laboratory of Experimental Psychology,
University of Leuven, Leuven, Belgium

On vision and art, gaps and bridges, the pains and joys of collaborations with artists, and more

More and more vision scientists are interested in studying visual perception of art. Often this comes down to running standard psychophysical paradigms on richer stimuli. Sometimes one goes as far as asking about preference and/or appreciation, in an attempt to relate visual processing of art stimuli to aesthetic responses. Very rarely one includes real art, real artists, and real aesthetic experiences into the actual research. There are very good reasons for this: One loses the firm ground of the well-controlled lab experiment and moves into the slippery terrain of complex personal relationships and subjective feelings.

In this lecture, I will present an overview of our work on the edges between visual science of art, empirical aesthetics, and psychology of art. By doing this, I will illustrate some gaps between these different worlds, and how to bridge them. In some of the example studies, the focus is on vision, in others on art, and in a few the two are in balance. I will also add my personal reflections on what I have learned from my collaborations with artists, and what it takes to make it work. I will end with some sketches of current and future projects.

About Johan:
Johan's main interest is in perceptual organization (e.g., grouping, figure-ground, texture, depth, shape, objects). Specifically, he wants to contribute to understanding why things look as they do. To do so, he combines phenomenological, psychophysical, computational, neural, ecological approaches.

Keynote Karin Roelofs

Thursday June 30
17.45 - 19.00
Keynote Prof. dr. Karin Roelofs
Donders Institute for Brain Cognition and Behavior & Behavioural Science Institute, Radboud University, Nijmegen, The Netherlands

Neuro-endocrine control mechanisms in social motivational action

Functioning in social contexts requires adequate control over social motivational actions. I will present a series of studies suggesting that down-regulation of amygdala activity by the anterior PFC is involved when people need to override their automatic approach-avoidance action tendencies. I will show that the functioning of this neural circuitry is sensitive to individual differences in emotional states (anxiety and aggression) and associated steroid hormones (cortisol and testosterone, respectively).

In addition, I will discuss recent direct manipulations of this neural circuitry by steroid hormone administration and brain stimulation (TMS). Our results suggest that the ability to control automatic approach-avoidance actions by this circuitry is central in explaining human emotional responses and may constitute an important factor in explaining anxious and aggressive symptomatology.

About Karin:
Karin's main interest is in the psychological and neuroendocrine mechanisms underlying social-motivational behavior in healthy individuals and the various forms of psychopathology where social-motivational behavior is disregulated. She aims to increase insight in affective disorders and promises to advance early detection of symptoms and their treatment. She studies hormone-brain interactions in stress-related disorders (social phobia and PTSD), psychopathy and somatoform disorders (conversion and somatisation), using various neuroscience techniques: fMRI, EEG, and TMS.

Session Details

Wednesday June 29

14.30 - 15.30 Session 1: Body perception & action I

Moderator: Astrid Kappers

14.30 - 14.50 Manasa Kandula
The relative contributions of visual and tactile stimuli to the multisensory response in the peripersonal space

14.50 - 15.10 Peter Holland
A neuroanatomically grounded optimal control model of the compensatory eye movement system

15.10 - 15.30 Irene Kuling
Sensory matching errors

15.45 - 16.45 Session 2: Body perception & action II

Moderator: Jeroen Smeets

15.45 - 16.05 Myrthe Plaisier
Timing of size and weight in the size-weight illusion

16:05 - 16:25 Kayla Stone
Measuring body representation in the lower limbs

16:25 - 16:45 Thomas Hulst
No effects of cerebellar and M1 transcranial direct current stimulation during reach adaptation in cerebellar patients

Thursday June 30

9.15 - 10.35 Session 3: Eye movements
Moderator: Stefan van der Stigchel

9.15 - 9.35 Jasper Fabius
Spatiotopic updating facilitates postsaccadic perception

9.35 - 9.55 Paul Zerr
Remapping high-capacity, pre-attentive visual-spatial working memory

9.55 - 10.15 Martijn Schut
Using visually guided corrective saccades to investigate transsaccadic memory

10.15 - 10.35 Jessica Heeman
Express saccades

10.50 - 12.10 Session 4: Affective processes
Moderator: Joke Baas

10.50 - 11.10 Tabitha Iseger
The DLPFC-sgACC network: Getting at the heart of it

11.10 - 11.30 Surya Gayet
Visual input signaling threat gains preferential access to awareness

11.30 - 11.50 Febe Eck-van der Flier
to be announced

11.50 - 12.10 Iris Schut
Anticipating reward and probability

14.00 - 15.20 Session 5: Language and development
Moderator: Johan Bolhuis

14.00 - 14.20 Hannah De Mulder
Figuring out what they feel: The role of narrative fiction in understanding others' mental states

14.20 - 14.40 Rianne van Rooijen
Beneficial effects of the mother's voice on novel word learning in infants

14.40 - 15.00 Caroline Junge
Speaker familiarity aids both novel word encoding and mapping: ERP evidence

15.00 - 15.20 Sita ter Haar
Causal mechanisms in birdsong learning as a model for human speech acquisition (VENI proposal)

Friday July 1

9.15 - 10.35 Session 6: Social and self regulation

Moderator: Henk Aarts

9.15 - 9.35 Anouk vd Weiden
Measuring automatic associations in longitudinal designs - Does the lexical decision task stand the test of time?

9.35 - 9.55 Samantha Antush
The Influence of Rewarding Actions on Intentional Binding

9.55 - 10.15 Jasper de Groot
Learning to Understand Human Olfactory Communication

10.15 - 10.35 Isabel Meier
Naltrexone increases negatively-valenced mimicry in response to happy facial expressions

13.15 - 14.50 Session 7: Visual attention

Moderator: Bas Rokers

13.15 - 13.35 Barrie Klein
Spatial attention modulates representations of visual space in humans

13.35 - 13.55 Wietske Zuiderbaan
Change blindness: the role of low-level and high-level image representations

13.55 - 14.15 Maartje de Jong
Intracranial recordings of occipital cortex responses to illusory visual events

14.15 - 14.35 Jim Maarseveen
Spatial selectivity of the duration after-effect

Posters & Demos

Bas Rokers, University of Wisconsin-Madison, USA
Poster: The neural basis of stereo motion scotomas

Jutta de Jong, Universiteit Utrecht, Psychologische Functieleer, Utrecht
Poster: Hand position modulates visually-driven fMRI responses in premotor areas
Demo: Virtual reality body swap illusion

Paul Zerr, Universiteit Utrecht, Psychologische Functieleer, Utrecht
Poster: Error correction in random vector double step saccades: with and without global saccade adaptation

Christina de la Malla, Vrije Universiteit, Human Movement Sciences, Amsterdam
Poster: Another reason for following an object with one's eyes if one intends to intercept it

Marijn Struiksma, Universiteit Utrecht, Utrecht Institute of Linguistics OTS, Utrecht
Poster: fEMG tijdens het lezen van narratieven
Demo: fEMG and narratives

Eli Brenner, Vrije Universiteit, Human Movement Sciences, Amsterdam
Poster: About measuring reaction times

Katinka van der Kooij, Vrije Universiteit, Human Movement Sciences, Amsterdam
Poster: to be announced
Demo: Oculus and Kinect

Myrthe Plaisier, Vrije Universiteit, Human Movement Sciences, Amsterdam
Demo: Size Weight Illusion

Miranda Smit, Universiteit Utrecht, Psychologische Functieleer, Utrecht
Poster: A clinical case: Bilateral ownership problems after right parietal lesion
Demo: Rubber Hand Illusion

Irene Kuling, Vrije Universiteit, Human Movement Sciences, Amsterdam
Demo: An inconsistency between different ways of matching seen and felt positions

Speaker Abstracts

Manassa Kandula, Universiteit Utrecht, Psychologische Functieleer, Utrecht

The relative contributions of visual and tactile stimuli to the multisensory response in the peripersonal space

The space closely surrounding the body, or the peripersonal space, is represented by a network of multisensory areas in the frontal parietal cortices of the brain, that respond to visual, auditory and tactile stimuli. These neurons are found to be body-part centred, thereby responding to visual/auditory stimuli around the body-part even as it moves. The visual/auditory receptive fields of these neurons are also found to extend several centimetres in space, surrounding the body part. Although these neurons are multisensory in nature, it is unclear as to whether they are summative in nature, or selectively respond to one of the three modality stimuli when presented with both. In the following human behavioural study, we use a visual-tactile redundant target effect paradigm, to investigate the relative contributions of either modality to the combined multisensory outcome. As stimuli, we use approaching visual dots, that the aforementioned multisensory areas are especially sensitive to, and short duration vibro-tactile stimuli. In order to ascertain that the multisensory outcome is indeed a result of peripersonal space modulation, we present these visual stimuli at several depths from the subject. The preliminary results of this study will be presented.

Peter Holland, Erasmus MC, Erasmus Universiteit, Rotterdam

A neuroanatomically grounded optimal control model of the compensatory eye movement system

Compensatory eye movement is a general term for several reflexes whose goal is to maintain a stable image on the retina during movements of the head, by moving the eyes in the opposite direction. In other words, these reflexes serve to reduce retinal slip (movement of the visual image across the retina). In afoveate animals like mice, the vestibulo-ocular reflex (VOR) uses vestibular input to compensate retinal slip and the optokinetic reflex (OKR) is driven by the retinal slip itself. We have proposed that a state-predicting feedback control (SPFC) framework could apply the elegance of optimal control models to the compensatory eye movement system. Here, we present a working version of the SPFC. We challenge our model by comparing the output to the eye movements of mice (n=34). The model reproduces behavior across a range of frequencies (0.1-3.2 Hz) and amplitudes (0.5-8°) for primary reflexes (OKR and VOR) as well as for two conditions where the reflexes function simultaneously (a matrix of 144 conditions). We also reproduced the response of the system to complex stimuli such as sums of sines. Moreover, we challenge the anatomical basis for the model: removal of output from specific parts of the model are compared with the known effects of neural lesions. In our model, the OKR system learns to compensate for inaccuracies of the VOR. This explains the non-linear summation of the VOR and OKR systems across different stimulus conditions. Since adaptation then changes the OKR compensation, this also explains how flocullar lesions abolish VOR adaptation but not VOR performance.

Irene Kuling, Vrije Universiteit, Human Movement Sciences, Amsterdam

Sensory matching error

People make systematic errors when matching the location of an unseen index finger with the location of the index finger of the other hand, or with the location of a visual target. These errors are subject-dependent and consistent over time. Their origin is unknown. To see whether these errors reflect mismatches between the proprioceptive and visual senses (sensory biases), we designed sets of tasks that involved the same matching configurations, but different actions to reach this configuration. For example, we compared matching errors when moving with the unseen index finger to a visual target, with matching errors when moving a visual target to the unseen index finger.
We found that the matching errors are not invertible. Furthermore, moving both index fingers sequentially to the same visual target results in a different mismatch between the hands than directly matching the two index fingers. From these results we conclude that sensory matching errors are not simply the summation of sensory biases.

Mythe Plaiser, Vrije Universiteit Amsterdam, Human Movement Sciences, Amsterdam

Timing of size and weight in the size-weight illusion

The size-weight illusion is the effect that small objects feel heavier than larger ones of the same mass. It has often been suggested that this illusion is caused by a mismatch between the expected and actual weight of objects. If this were indeed the case, we predict that the size of an object needs to be available prior to lifting the object. This allows an expectation about the weight to be made before haptic information about the weight is acquired.
We investigated this in an experiment in which size could only be perceived through vision. In each trial, we made vision available for a 200 ms interval starting at various times from lift onset ranging from 200 ms prior to lift onset until when the maximum lifting height was reached. Surprisingly, the size-weight illusion persisted even when size information became available as long as 300 ms after lift off. After 300 ms, however, the illusion did decrease. This shows that the relative timing of visual size and haptic weight information is crucial, but that size information does not need to be available prior to the onset of the lifting action.

Kayla Stone, Department of Experimental Psychology, Utrecht University, Utrecht

Measuring body representation in the lower limbs

Body representations arise from the integration of multimodal bodily input. Consequently, these representations can be measured in various ways. Several methods of investigation have been used to assess the underlying representation of the hands. For instance, in a task where participants are asked to localise unseen parts of the hand, large distortions in hand length and width are observed. Similar distortions are found when participants are asked to judge tactile distances on the hand, suggesting that these measures of body representation are intimately linked. Yet, when participants are asked to make explicit, visually-based judgements about the shape of the hand, performance is fairly veridical. But are all body parts represented in a similar manner? For example, the lower limbs are functionally and structurally different from the hands, and therefore it is possible their body representation might be reflective of these differences. Curiously, little is known about the underlying representation of the lower limbs. Thus, what does the internal body representation of the legs look like? In the current study, lower limb representation was measured in three tasks. In the first task,

participants were asked to make implicit judgements about the width and length of one's own unseen leg, a mannequin leg, and a non-corporeal object positioned horizontally under a large monitor. In the second task, participants estimated the distance between two tactile stimuli applied to the upper and lower parts of the leg. In the third task, participants made explicit judgements about the width of their legs by indicating whether individually presented images of a leg were wider or more slender than their own. Results demonstrate that the lower limbs are represented differently based on the body representation measurement employed. The results are discussed in terms of the multimodal nature of body representation.

Thomas Hulst, Erasmus Universiteit, Neuroscience, Rotterdam

No effects of cerebellar and M1 transcranial direct current stimulation during reach adaptation in cerebellar patients

People with cerebellar disease suffer from a number of specific motor impairments which are generally well-described, but for which the therapeutic options are limited. Several studies have identified transcranial direct current stimulation (tDCS) as a potential tool in the rehabilitation of cerebellar disease. While a growing number of studies have investigated the effects of cerebellar tDCS in healthy subjects, investigations of non-invasive brain stimulation in cerebellar patients are still rare. Here, we tested whether tDCS could alleviate motor impairments of subjects with cerebellar degeneration. Two groups took part in this study: twenty individuals with cerebellar degeneration (mean age 53.7 years ± SD 10.8 years) and twenty age-matched controls (mean age 54.6 years ± SD 11.2 years). A standard reaching task with forcefield-perturbations was used to compare motor adaptation between groups and to measure the effect of stimulation of the cerebellum or primary motor cortex (M1). The cerebellum was stimulated with a current density of 0.08 mA/cm2, with the anodal electrode placed 3 cm lateral of the inion. The primary motor cortex was stimulated using the same current density, with the anodal electrode placed at the position where the first dorsal interosseous muscle responded to a TMS pulse. All subjects were tested during each stimulation type (cerebellum, M1 and sham) with a break of one week between each of the three experimental sessions. As expected, individuals with cerebellar degeneration had a significantly reduced ability to adapt to perturbations of the motor system compared to healthy age-matched controls. Importantly, motor adaptation was not affected by anodal stimulation of the cerebellum and M1 in cerebellar subjects as well as control subjects. Voxel-based morphometry of T1 weighted MPRAGE scans revealed strong degeneration of the anterior lobe and superior parts of the posterior cerebellum in the cerebellar group, which may explain the motor impairments of cerebellar subjects. The specific task and stimulation parameters used in this study may constitute the lack of tDCS effects in both groups. For tDCS to become a valuable tool in the neurorehabilitation of cerebellar disease, stimulation effects should be more consistent and predictable across subjects and tasks.

Jasper Fabius, Universiteit Utrecht, Psychologische Functieleer, Utrecht

Spatiotopic updating facilitates postsaccadic perception

Introspectively, we have a continuous stream of visual perception. Yet, as the neural representation of visual information is initially coded in retinotopic coordinates, eye movements (saccades) pose a major problem for visual stability. If no visual information were maintained across saccades, retinotopic representations would have to be rebuilt after each saccade. It is currently strongly debated what kind of information (if any at all) is accumulated across saccades, and when this information becomes available after a saccade. Here, we use a motion illusion to examine the

accumulation of visual information across saccades. In this illusion, an annulus with a random texture slowly rotates, and is then replaced with a second texture (motion transient). With increasing rotation durations, observers consistently perceive the transient as large rotational jumps in the direction opposite to rotation direction (backward jumps). We first show that accumulated motion information is updated spatiotopically across saccades. Then, we show that this accumulated information is readily available after a saccade, immediately biasing postsaccadic perception. The current findings suggest that presaccadic information is used to facilitate postsaccadic perception. These results are in support of a forward model of transsaccadic perception, aiming at anticipating the consequences of eye movements on retinal input and operating within the narrow perisaccadic time window.

Paul Zerr, Universiteit Utrecht, Psychologische Functieleer, Utrecht

Remapping high-capacity, pre-attentive visual-spatial working memory.

If we could only process visual information while it was available we would be at a fatal disadvantage as dynamic agents in a dynamic world. A short-term memory buffer allows us to process visual input after it has disappeared or we have looked away. Stable visual working memory has a very limited capacity, however, and requires slow, costly top-down attention and selection. There exists a pre-attentive, high-capacity memory buffer that has a centuries spanning history as long as the list of terms that describe it, e.g. visual persistence, visual analog, iconic memory, fragile memory, sensory memory. It recently saw a revival of interest through the development of the retro-cue paradigm: a way of probing visual working memory without destroying this memory through the memory probe itself, similar to the partial report paradigm by Sperling (1960). It enables us to probe visual working memory capacity including unstable memory traces, which drastically increases measured capacities even seconds after stimulus offset. The present study investigates whether these unstable memory traces can survive eye movements and the spatial remapping process this entails. We ask the question whether items need to be placed in stable working memory before they can be remapped. To date remapping is thought to be limited to 3-4 items (the 'magic number' for visual working memory). We challenge this strongly held belief by demonstrating high-capacity remapping of spatial information. Further, we explore the time course of visual working memory through its different stages by employing a dichoptic retro-cue viewing and masking paradigm. This holds implications for and insights into the hierarchical processing of visual information in the brain.

Martijn Schut, Universiteit Utrecht, Psychologische Functieleer, Utrecht

Using visually guided corrective saccades to investigate transsaccadic memory

Despite variance in saccade execution visual system is able to establish continuity between saccades through corrective saccades. To successfully execute a visually guided corrective saccade, and establish continuity, a representation of the saccade target must be available to the visual system. In our current study, participants were tasked with remembering several shapes and performed saccades to a colored disc, which moved during the saccade, therefore eliciting corrective saccades. First, we found that corrective saccades were executed slower with increasing working memory load. In addition, results show that shape information is less accurately reported when observers had to execute a corrective saccade. Therefore, we have found evidence that visual continuity is dependent on visual working memory and visual information relevant to visual continuity may be prioritized by the visual system when competing for memory storage.

Jessica Heeman, Universiteit Utrecht, Psychologische Functieleer, Utrecht

Express saccades

Under specific conditions visually-guided saccades can have a latency that is shorter than normal. These saccades are called express saccades (average latency 80 to 130 ms). In a first study we explore eye movement behavior during anticipatory (<80ms), express (80 - 130 ms) and regular saccades (>130 ms). During the experiment participants made saccades to a target at a known location. In some trials the target was accompanied by a distractor at an unpredictable location. The implemented gap-paradigm and a warning signal ensured a high percentage of low latency saccades. We were successful in triggering a high percentage of express Saccade. Results showed that a Global Effect was present for express saccades. This indicates that the oculomotor vector is moderated very early on by visual input and counteracts the idea that express saccades are merely the execution of a preprogrammed oculomotor program. Also, the saccade latency distribution showed a clear bimodality which has often been observed in monkey studies but has rarely been observed in humans. We have hereby started exploring the properties of express saccades and our investigation into what (if at all) separates express saccades from regular saccades and anticipatory saccades.

Tabitha Iseger, Onderzoeksinstituut Brain Clinics, Nijmegen

The DLPFC-sgACC network: Getting at the heart of it

Major depressive disorder (MDD) is a chronic disease with a remitting and relapsing course. Antidepressant medication is the most common treatment MDD, however, the precise working mechanism underlying this disorder remains unclear. Recent neuromodulation treatments demonstrate that direct stimulation of the dorsolateral prefrontal cortex (DLPFC), dorsomedial prefrontal cortex (DMPFC), and subgenual anterior cingulate (sgACC) and vagal nerve stimulation (VNS) relate to clinical improvement, suggesting connectivity alterations in this neurovisceral network to mediate antidepressant response. The international Study to Predict Optimized Treatment in Depression (iSPOT-D) is a multicentre study that collected EEG data for 1008 MDD patients randomized to 3 different antidepressant medications. In order to investigate treatment responses, as defined by a decline of >50% on the Hamilton Rating Score for Depression (HRSD17), we investigated whether connectivity in alpha and theta frequencies of the DLPFC-DMPFC-sgACC network differed pre and/or post treatment between: (i) patients and controls, and (ii) responders and non-responders.

A difference in connectivity was found between men and women, pre and post treatment, in alpha and theta connectivity. For theta, MDD patients were distinguishable from controls on baseline. For male responders only, a significant time effect was found. With respect to medication-type effects, no apparent effects were found. Exact results are confidential but will be presented. The gender differences emphasize the need for a priori stratifying by gender for future imaging studies in major depression. In addition, an introduction will be given on our future research, focussing on connectivity with the vagal nerve and thereby the effect of depression, neurostimulation and medication on the heart.

Surya Gayet, Universiteit Utrecht, Psychologische Functieleer, Utrecht

Visual input signaling threat gains preferential access to awareness

Visual input that signals threat is inherently relevant for survival. Accordingly, it has been demonstrated that threatening visual input elicits faster behavioral responses than non-threatening visual input. Considering that awareness is a prerequisite for performing demanding tasks and guiding novel behavior, we hypothesized that threatening visual input would gain faster access to awareness than non-threatening visual input. In the present study, we associated one of two basic visual stimuli, that were devoid of intrinsic relevance (colored annuli), with aversive stimulation (i.e., electric shocks) following a classical fear conditioning procedure. In the subsequent test phase no more electric shocks were delivered, and a breaking continuous flash suppression task was used to measure how fast these stimuli would access awareness. The results reveal that stimuli that were previously paired with an electric shock break through suppression faster than comparable stimuli that were not paired with an electric shock.

Iris Schutte, Universiteit Utrecht, Psychologische Functieleer, Utrecht

Anticipating reward and probability

The way humans behave is greatly affected by the principle expected utility, the combination of subjective value (SV) of the outcome of an act (is it rewarding?) and subjective probability (SP) of that outcome. The present study examined electro-cortical representations of the anticipation of SV and SP during a cued Go/NoGo experiment. During this task cue letters signaled upcoming target letters to which participants had to respond. The probability of target letter appearance after the cue letter and the amount of money that could be won for correct and fast responses were orthogonally manipulated across four task blocks. During the talk I will specifically focus on the representation of probability in the cortex and how it interacts with reward value. I will show that reward and high probability equally affect a fronto-central event-related potential component.

Hannah Mulder, Universiteit Utrecht, Utrecht Instituut for Linguistics OTS, Department of Langauge and Communication, Utrecht

Figuring out what they feel: The role of narrative fiction in understanding others' mental states

"On the morning the last Lisbon daughter took her turn at suicide—it was Mary this time, and sleeping pills, like Therese—the two paramedics arrived at the house knowing exactly where the knife drawer was, and the gas oven, and the beam in the basement from which it was possible to tie a rope." (Eugenides 1993, The Virgin Suicides)

The quote above is the first sentence of Eugenides' novel The Virgin Suicides and we are immediately sucked in: who is Mary, who is Therese and why did they commit suicide? This example illustrates a hallmark of narrative fiction: it is about autonomous intentional agents and their (inter)actions and in order to make sense of it, we must engage in advanced social-cognitive processing. In this way, exposure to narrative fiction provides us with social-cognitive training and thus can potentially be used as a tool to hone our abilities in this domain. Indeed, various studies have found beneficial effects of exposure to narrative fiction on mental state comprehension in adults (e.g. Kidd & Castano, 2013), but the extent to which these findings generalise to children has received less attention. Given that

children are still developing their social abilities, it is relevant to determine whether exposure to narrative fiction may indeed provide additional input regarding how to interpret other people's mental states.

The current study employs a confirmatory Bayesian approach to assess the relationship between mentalising and exposure to narrative fiction in 8- to 16-year-old children. Mentalising was assessed using both subjective and objective measures. Exposure to narrative fiction was assessed both in terms of the general frequency with which children consume narrative fiction (as encountered in books, films and TV-series) and the particular types of fiction that they are exposed to. With respect to this latter category, a distinction was made between exposure to eudaimonic (or truth-seeking), vs. hedonic (pleasure-seeking) narrative fiction. We predicted that exposure to narrative fiction, and particularly the eudaimonic variety, would be positively related to mentalising. Results of this study partly bore out these predictions. Although the general frequency of narrative fiction exposure was not related to mentalising for most of the measures, exposure to eudaimonic narrative fiction was generally positively related to mentalising and more strongly so than exposure to hedonic narrative fiction. Exposing children to eudaimonic narrative fiction may thus be an effective means of enhancing their understanding of others' mental states.

Rianne van Rooijen, Universiteit Utrecht, Psychologische Functieleer, Utrecht

Beneficial effects of the mother's voice on novel word learning in infants

Infants seem to learn their native language quite easily and without much effort. However, learning a language is not as easy as it seems, and it comprises several important components. For instance, an infant has to identify individual words out of continuous streams of sounds. Moreover, (s)he has to generate the right word-object associations. Although all infants learn their native language, there is a large individual variation in language development. It is therefore interesting to determine which factors facilitate novel word learning. In the present study we focus on one of these possible facilitating factors, the mother's voice. Newborns already show a preference for their mother's voice over the voice of a stranger (DeCasper & Fifer, 1980). Moreover, children's comprehension of familiar words is better when they hear them from their mother compared to a stranger (Parise & Csibra, 2012). Our question is whether this effect extends to the learning of novel words.

In this eye-tracking study, we tested whether 24-month-olds learnt new word-object associations more easily from their mother compared to a stranger (the experimenter). Infants were taught two new word-object associations, in a live setting (procedure similar to Ma et al., 2011). Their word learning was assessed with a preferential looking paradigm. Results showed that infants require less exposure to the word-object mappings to acquire word learning when taught by their own mother. Infants who were taught by a stranger did learn the new word-object associations as well, yet only later during the experiment. This indicates that the mother's voice boosts learning of new words.

At the individual level, we tried to explain some of the variation in word learning abilities by looking at correlations with productive vocabulary size. We found that individual variation in word learning abilities positively correlates with current productive vocabulary size. Infants with a bigger productive vocabulary size were better at forming the new word-object associations.

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Speaker familiarity aids both novel word encoding and mapping: ERP evidence

Background: For language acquisition, the maternal voice plays a special role. It is the only voice that neonates have most experience with and prefer over any other voice. When infants hear maternal speech, they process this voice faster and increase activation in brain areas related to language and attention. Maternal speech plays a role in word processing as well: recent research suggests that in challenging situations, infants only recognize words uttered by their caretaker (compared to an unfamiliar person; word-forms: Barker & Newman, 2004; known words: Parise & Csibra, 2012). But does the advantage of maternal speech also extends to early word learning? The current study uses ERPs to study the effect of maternal speech on both the process (word and object encoding) and the result (word-object mapping) of novel word learning.

Design: We tested 44 monolingual 11-month-olds (range 303-361 days; 23 girls). Half of them listened to their own mother's voice (familiar voice condition); other half listened to the same stimuli (e.g., for them, unfamiliar voice condition). Auditory words were pre-recorded tokens of definite articles plus pseudo-words. A training phase comprised two novel object- novel word pairs, each presented eight times. The test phase showed the same objects and words again, but compared to training, only half of the pairings were congruent, and others were incongruent (e.g, switched word-object pairings). We recorded ERPs time-locked to target word onset throughout the experiment (-200 – 800ms).

Results:
For word encoding, we examined the N200-500, which is an infant ERP component sensitive to word-form repetition (Junge 2012). In both voice conditions, there is a decrease of positivity with repetition (i.e., increase of N200-500). This decrease is largest in the familiar voice condition, and mainly driven by the first block of words in the maternal voice condition, which shows the largest positivity. Considering that the N200-500 is associated with word familiarity, a larger initial positivity thus possibly reflects that infants treat words as more unfamiliar when uttered by their mother than by an unfamiliar speaker.
To measure the effect of maternal voice on word-object pairings, we examined ERPs to congruent vs. incongruent pairings. Only infants from the familiar voice condition showed a typical congruity effect (i.e., N400) over left electrodes, whereas infants in the unfamiliar voice condition fail to show any significant N400 at any hemisphere.
Together, results show that maternal voice boosts both word encoding and word-to-object mapping.

Sita ter Haar

Causal mechanisms in birdsong learning as a model for human speech acquisition (VENI proposal)

Human language acquisition is a crucial aspect of infant cognitive development. Unfortunately about 5-7% of the children are affected by language development problems, for example SLI (Specific Language Impairment). The cause of such problems is often not very well understood. It is expected that a combination of genetic and environmental factors usually underlie speech and language development problems. Disentangling genetics and environment in human infants is extremely challenging, if possible at all. Therefore, I propose to use an animal model to study development in a controlled setting. Most animal systems are not appropriate as models for speech development as their vocalizations are mostly innate. Songbirds however do learn their vocalizations by means of a combination of innate biases and experience (similar to humans) and are therefore a better model. By using songbirds as a model I aim to disentangle the causal effects of experience-dependent and -independent factors on vocal learning. Correlative data also suggests that sleep and lateralization may be associated with song learning in songbirds and speech acquisition in human infants, but again the causal relationship is unknown. Furthermore, lateralized neural activity is associated with both experience-dependent and -independent processes but again the causal relation is unknown. Finally, the left and right half of the brain are also differentially activated during sleep, suggesting all these factors probably interact, but the mechanism is unknown. I aim to investigate these issues using a combination of neural and behavioural measurements. I will use sleep deprivation to investigate the causal effect of sleep on learning. Furthermore, I will use optogenetics in order to study causal effects of lateralization by manipulating neural activity in either the left or the right hemisphere specifically during song exposure during development. Once the causal effects on song learning are known I aim to translate these findings back to humans by means of noninvasive neural and behavioural measurements to study if similar response patterns can be found in human infants and if they could be used as early markers for developmental problems.

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Measuring automatic associations in longitudinal designs - Does the lexical decision task stand the test of time?

When we strive for long-term goals (e.g., healthy eating, saving money, reducing energy consumption, or maintaining a romantic relationship), we often get in conflict with our short-term goals (e.g., tempting snacks, must-haves, getting warm, or being attracted to someone else). Although we may initially be able to resist short-term temptations, this often backfires in the long run. That is, previous research suggests that our willpower is limited and that the resistance of one temptation leads to the depletion of willpower, causing us to let ourselves go when confronted with another temptation. In line with this notion, recent research suggests that instead of investing more effort in controlling their behavior, people benefit more from effortless control strategies, such as the formation of good habits. For this purpose, we aim to investigate how automatic associations between context and behavior (habits) develop over time, and how we can accelerate this process. However, this raises the question whether measures of automatic behavior (such as the commonly used lexical decision task) are suitable for longitudinal research designs. Typically, in a lexical decision task, behavior-words are more accessible (and thus recognized faster) after being briefly primed with associated context-words. Yet, the repeated presentation of target stimuli may enhance their accessibility to the extent that the accessibility can no longer be enhanced by context-primes. As a first test of the stability of priming effects in the lexical decision task over time, we had participants perform a lexical decision task for five days in a row in which they were presented with four word-pair repetitions per day (resulting in

a total of 20 word-pair repetitions). To establish associations between context and behavior words, participants formed implementation intentions that specifically specified both context and behavior (e.g., if I am having lunch, I will eat an apple). We also included word-pairs that are strongly (guitar and music) or weakly (air and music) associated. Results showed that there was a reliable association between the context and behavior as specified in the implementation intentions, although the association strength was weak. However, association strength did not vary over time, suggesting that priming effects can still be detected after repeated presentation.

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The Influence of Rewarding Actions on Intentional Binding

Operant actions and their subsequent effects are shifted together in temporal perception. This intentional binding effect is assumed to serve the human perception of causality and is consistently used as an implicit measurement of sense of agency. Using monetary rewards, we investigated the influence of varying the nature of the action on intentional binding. It was hypothesized that executing a more rewarding versus a less rewarding action results in stronger binding. In a counterbalanced within-subjects design, participants learned that a key press was more often related to a reward than an alternative key press while both had the same neutral tone as a result. Confirming the hypothesis, executing an action that was learned to be more rewarding as compared to less rewarding increased tone binding on a subsequent Libet clock task significantly. That is, the results offer important new insights into the underlying working mechanisms of intentional binding and the development of agentic experiences. In detail, intentional binding seems to not solely be influenced by the valence of the action-outcome but also by the nature of the preceding action. Findings are in line with forward models of motor prediction and give rise to a range of empirical questions regarding the importance of action nature and action-outcome valence in the context of temporal binding.

Jasper H. B. de Groot, Utrecht University

Learning to Understand Human Olfactory Communication

Humans use multiple senses to navigate the social world. Among these, our sense of smell is arguably the most underestimated one. One intriguing function of the sense of smell is its social communicative function. Research has shown that human odors can convey information about a range of states (e.g., emotions, sickness) and traits (e.g., individuality, gender). Yet, what underlies the communicability of these states and traits via smell? I aim to fill this explanatory gap by furnishing a framework that highlights the dynamic and flexible aspects of human olfactory communication. As an alternative to a "hardwired" pheromone-perspective, I posit that human olfactory communication depends on a more flexible combination of nature and nurture. From birth, we are endowed with an olfactory system that can rapidly learn to associate smells with certain outcomes (e.g., good, bad, tasty, scary); yet, whether we actually develop these associations depends on the situations we find ourselves in, and whether establishing an odor-information link is relevant to us (e.g., based on our goals, internal state, or on the context at hand). Such a model should not only help to integrate past research on human olfactory communication, but it also opens new avenues for future research on this fascinating, yet to date poorly understood field.

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Naltrexone increases negatively-valenced mimicry in response to happy facial expressions

Positive social cues, like happy facial expressions, activate the brain's reward system and indicate interest in social affiliation. Facial mimicry of emotions, which is the predominantly automatic and unconscious imitation of another person's facial expression, has been shown to promote social affiliation. It has been demonstrated repeatedly that the opioid system is vital to social affiliation in rodents, but there is less evidence in humans. We investigated whether a 50mg administration of naltrexone, an opioid antagonist with highest affinity for the mu-opioid system, modulates emotional mimicry. A passive viewing task with dynamic facial expressions was used in a randomized placebo controlled between-subjects design. Mimicry was measured with electromyography (EMG) on three facial muscles, the corrugator supercilii and the depressor jaw muscle, associated with negatively-valenced emotions, and the zygomaticus major, which is activated during smiling. The results demonstrate an increase of negatively-valenced mimicry (corrugator and depressor) in response to happy facial expressions after naltrexone compared to placebo, consistent with lowered interest in social interaction or affiliation. Our findings provide evidence for a role of the opioid system in modulating automatic behavioral responses to cues of reward and social interaction, and translate to rodent models of the mu-opioid system and social affiliation.

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Spatial attention modulates representations of visual space in humans

Spatial attention allows us to select relevant visual information based on its location in the visual field, improving perception of the attended information and altering the neural response to the information. We will discuss how spatial attention modulates the cortical representation of visual space, using a combination of ultra-high field fMRI (7 Tesla), computational modeling and psychophysics. We show that attention biases the spatial selectivity of neural populations towards the attended location in the visual field, expanding the cortical representation of attended information. This modulation of the cortical representation increases up the visual hierarchy. We model the effects of spatial attention as an interaction between an attention component (attention field) and stimulus-driven properties of visual field maps (population receptive fields). This approach reveals that the size of the attention field is relatively constant across the visual hierarchy and that attention is implemented similarly across the visual hierarchy. Additional psychophysical studies reveal that the same attention field model captures some of the effects of spatial attention on human perception as well. Taken together, these results demonstrate that attention acts similarly across the visual hierarchy, which suggests that the attention field originates from a single source. Despite the similarity of attention fields across the hierarchy, there are still important differences between areas in the effects of attention, because receptive field properties vary between visual field maps.

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Change blindness: the role of low-level and high-level image representations

Our internal representation of an image is not as detailed as we intuitively experience. This is exemplified by the fact that subjects fail to detect large changes in a visual scene, i.e. change-blindness. Current theories propose that the internal representation captures the gist (interpretation of the image) and that changes in gist are detected faster. On the other hand, we know that early

visual cortex represents contrast energy. Here we investigate the role of the low-level feature contrast and the higher-level feature gist on our internal representation.
Methods
We measured reaction times (RTs) in a flicker-task using the change-blindness paradigm (Rensink,1997). We alternated two images (108 image-sets) and the subjects (n=60) indicated when and where they saw the change. The images were taken from the Berkeley Segmentation Dataset and Benchmark database (Martin et al,2001). This dataset contains manual segmentations where subjects identified the most important aspects of the image. We use these segmentations as a measure of gist. For every image-set, we computed both the change in local RMS-contrast and the change in gist. From these changes we defined 4 conditions: image-sets that are 'low' and 'high' in their differences for contrast and gist, respectively. We controlled for size, eccentricity, local contrast and luminance of the changed area.
Results RTs were faster when image-sets were high in gist change (median increase RT = 2.2sec), or high in contrast change (median increase RT = 1.75sec). Furthermore, RTs were fastest when image-sets were both high in gist change and high in contrast change (median increase RT = 5.0sec).
Discussion Our results suggest that the internal representation of the image, as measured with a change-detection paradigm, is not only influenced by high-level image interpretation (gist), but also by low-level image statistics such as contrast.

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Intracranial recordings of occipital cortex responses to illusory visual events

Ambiguous visual stimuli elicit different perceptual interpretations over time, creating the illusion that a constant stimulus is changing. We investigate whether such spontaneous changes in visual perception involve occipital brain regions specialized for processing visual information, despite the absence of concomitant changes in stimulation. Spontaneous perceptual changes during binocular rivalry or ambiguous structure-from-motion were compared with stimulus-induced perceptual changes that occurred in response to an actual stimulus change. Intracranial recordings from human occipital cortex revealed that spontaneous and stimulus-induced perceptual changes were both associated with an early transient increase in high-frequency power that was more spatially confined than a later transient decrease in low-frequency power. We suggest that the observed high- and low-frequency modulations relate to initiation and maintenance of a percept, respectively. Our results are compatible with the idea that spontaneous changes in perception originate from competitive interactions within visual neural networks

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Spatial selectivity of the duration after-effect

Adapting to the duration of a visual stimulus causes the perceived duration of a subsequently presented stimulus with a slightly different duration to be skewed away from the adapted duration. This pattern of repulsion following adaptation is similar to that observed for other visual properties, such as orientation, and is considered as evidence for duration-selective channels (Heron, et al. 2012). Here, we investigated the spatial selectivity of these duration channels by varying the distance between adaptation and test stimulus. Observers were presented with a 100 repetitions of a Gaussian blob (σ = 0.75°) located 8° above a central fixation cross, lasting either 160 or 640 ms. Following adaptation, participants completed a duration comparison task with each trial starting with four top-ups followed by the presentation of an auditory reference (320 ms) and a visual test stimulus. The

duration of the visual test stimulus was varied using a staircase procedure to obtain the point of subjective equality. To investigate the spatial extent of the adaptation effect, the distance between adaptation and test stimuli was varied between 0° and 15°. Our results show a clear duration adaptation effect: the test stimulus was perceived to have a longer duration following adaptation to a shorter duration, and a shorter duration following adaptation to a longer duration. Importantly, this adaptation effect occurred at all measured distances, and there was no evidence for a decrease in the strength of adaptation at larger distances. We conclude that duration adaptation is position-invariant, transferring to locations separated by more than 10° from the location of the adaptation stimulus. Given the spatial extent of the adaptation effect, it seems unlikely that the proposed duration channels are represented in lower level retinotopically organized visual areas, instead suggesting a later locus.