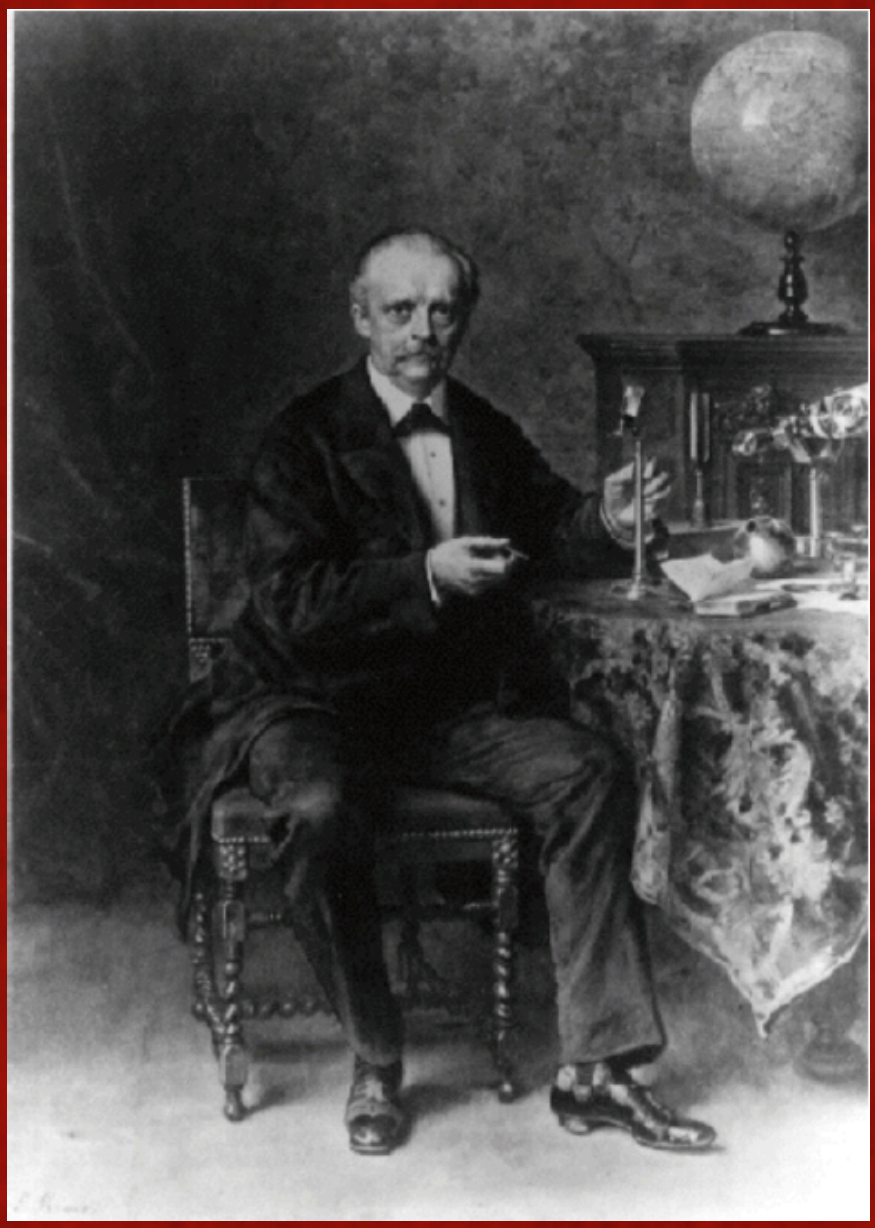
Helmholtz Instituut

PROCEEDINGS OF THE 7TH HELMHOLTZ RETREAT



4-6 June 2014
Venue: Hotel Jan van Scorel
Schoorl, The Netherlands

HELMHOLTZ COMMITTEE

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Organizers Retreat

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Miranda Smit	Utrecht University
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TABLE OF CONTENTS

WELCOME

Professor Leon Kenemans
Utrecht University
Helmholtz Institute Scientific Director

Past Helmholtz director Frans Verstraten said it all: There is no applied science without basic research. Basic, curiosity driven research ultimately dictates the applications that are conceivable at all. On the other hand we should not forget that application is fun. Developing a working application may be gratifying when it supplements the niggling and bickering with peer reviewers about ever thorny issues of interpretation and marginal significance. If it works, it works, and quality of life for both tax payer and scientist is enhanced.

As to another development since the previous Helmholtz retreat, June 2012, "one Zeitgeist will be replaced by another appreciation of national research schools versus that of university graduate schools is gently swinging back in favor of the former. This holds to the extent that at least some university graduate schools stimulate the accreditation of national research schools and especially the interdisciplinary endeavors aimed at cross-fertilization between research in different faculties and different universities.

This may lead to slight reorientations with respect to the originally dominant research perspective. The perspective usually associated with Helmholtz is "perception". However, a typical Helmholtz notion is that our perceptual capacity essentially serves adaptive action regulation. This in turn requires that perception is modulated by, or interacts with, mechanisms of attention, emotion, memory (experience!), and social cognition.

The 7th Helmholtz retreat therefore addresses the interfaces of perception, attention, memory and learning, emotion, and social cognition. These topics and their interfaces are typically most fruitfully approached with the multidisciplinary cognitive-neuroscience toolkit. This also includes developmental aspects and disturbances, clinical settings with especially brain-damage patients, and pharmacological and endocrinological mechanisms.

Together with our longstanding affiliates from Amsterdam and Rotterdam we welcome our colleagues from Developmental, Social, and Clinical Psychology, and Psycholinguistics, and of course especially our keynote speakers, Andrea Serino (Lausanne) and Ole Jensen (Nijmegen). Let's proceed to a conference that emphasizes basic but interdisciplinary research, with a balanced eye on possibilities for application.

PROGRAM

The sessions, keynote lectures and the PhD workshop will be held in the *Tuinzaal*
Breakfast, lunch and dinner will be served in *Restaurant Kannunik*
Coffee and drinks will be served at the outdoor bar *Il Palazzo**

Wednesday 4 June

09.30 – 10.00	Arrival of PhD students
10.00 – 13.00	PhD only session
12.00 – 13.00	Arrival of other participants
13.00 – 14.30	Lunch
14.30 – 14.45	Opening by Professor Leon Kenemans
14.45 – 16.05	Session 1: Social Neuroscience
16.05 – 16.45	Coffee Break
16.45 – 18.00	Keynote lecture by Dr. Andrea Serino
18.00 – 20.00	Dinner

Thursday 5 June

07.30 – 08.45	Breakfast
09.00 – 10.30	Session 2: Learning and Memory
10.30 – 10.45	Coffee Break
10.45 – 12.15	Session 3: Perception and Action
12.30 – 14.00	Lunch
14.00 – 15.30	Session 4: Plasticity and Development
15.30 – 16.00	Coffee Break
16.00 – 17.15	Keynote lecture by Professor Ole Jensen
17.15 – 18.00	Time for some fresh air!
18.00 – 19.00	Posters for sessions 1-4 with Drinks
19.00 – 21.00	Barbeque

Friday 6 June

07.30 – 08.45	Breakfast
09.00 – 10.45	Session 5: Perception and Cognition
10.45 – 11.15	Coffee Break
11.15 – 12.45	Session 6: Emotion and Attention
12.45 – 14.00	Posters for session 5-6 with Lunch
14.00 – 15.00	Pitch award and Closing

* If the weather doesn't permit, they will be served at the *Restaurant Kannunik*

SESSION INFORMATION

Wednesday 4 June

14.45 – 16.15 SESSION 1: SOCIAL NEUROSCIENCE

Henk Aarts and Jack van Honk

14.45 – 15.05 Jasper de Groot (UU)
Emotion and the Sense of Smell

15.05 – 15.25 Robert Renes (UU)
An exploratory fMRI study into inferences of self-agency

15.25 – 15.45 Estrella Montoya (UU)
Escape or Freeze: The Neural Effects of Cortisol while under Attack

15.45 – 16.05 Peter Bos (UU)
Effects of oxytocin and cortisol on neural empathic responses

Thursday 5 June

09.00 – 10.30 SESSION 2: LEARNING AND MEMORY

Albert Postma and Johan Bolhuis

09.00 – 09.15 Erik Oudman (UU)
Route learning in Korsakoff's amnesia

09.15 – 09.30 Matthijs Biesbroek (UMCU)
Distinct anatomical correlates of discriminability and criterion setting in verbal recognition memory revealed by lesion-symptom mapping.

09.30 – 09.45 Gabriel Beckers (UU)
Traveling slow-waves in the nuclear avian brain

09.45 – 10.00 Alyanne de Haan (UU)
The effect of visual enlargement of one hand on tactile distance perception on both hands.

10.00 – 10.30 Elevator Pitches

1. Surya Gayet (UU)
Perception during binocular rivalry is biased by the content of visual working memory

2. Neeltje Kant (UU)
Prospective memory

3. Linda Schoo (UU)
Self-awareness and memory

4. Michiel Classen (UU)
Disentangling spatial and temporal processes in navigation ability

5. Nathan van der Stoep (UU)
Principles of audiovisual integration in 3-D space.

10.45 – 12.15 SESSION 3: PERCEPTION AND ACTION

Chris Dijkerman and Jeroen Smeets

10.45 – 11.00 Haike van Stralen (UU)
Affective touch modulates the rubber hand illusion

11.00 – 11.15 Anouk Brouwer (VU)
The effects of the Müller-Lyer illusion on double-step saccades

11.15 – 11.30 Marieke van der Graaff (VU)
Vector and position coding in goal directed movements

11.30 – 11.45 Irene Kuling (VU)
Torques do not influence Proprioceptive Localization

11.45 – 12.00 Femke van Beek (VU)
Haptic discrimination of distance

12.00 – 12.15 **Elevator Pitches**

1. Manasa Kandula (UU)
Distance Perception influenced by action capabilities

2. Miranda Smit (UU)
Direct current stimulation in rehabilitation of hemispatial neglect

3. Rudmer Menger (UU)
Hotspots in the workspace: Investigating the Relation between Non-target Object Location and Avoidance Responses

14.00 – 15.35 SESSION 4: PLASTICITY AND DEVELOPMENT

Chantal Kemner and Jos van der Geest

14.00 – 14.15 Nicolette Munsters (UU)
I see you: the influence of visual perception on social development

14.15 – 14.30 Roy Hessels (UU)
What's in a face? Gaze to emotional expressions in infancy

14.30 – 14.45 Eric Avila (EUR)
Anodal cerebellar transcranial direct current stimulation effects on saccade adaptation

14.45 – 15.00 Peter Holland (EUR)
Electrophysiological and Behavioural effects of Cerebellar Direct Current Stimulation

15.00 – 15.30 Elevator Pitches

1. Rudolf Burggraaf (EUR/UU)
Categorizing visual search strategy by counting scanpath crossings

2. Thomas Hulst (EUR)
Aging shows a pattern of cerebellar degeneration analogous to patients suffering from cerebellar degenerative disease

3. Claire Verhage (EUR)
Cerebellar involvement in categorisation: a bipolar tDCS study

Friday 6 June

09.00 – 10.45 SESSION 5: PERCEPTION AND COGNITION

Serge Dumoulin and Susan te Pas

09.00 – 09.15 Vivian Holten (UU)
Does differential processing of optic-flow cause the anisotropy in postural sway?

09.15 – 09.30 Martijn Barendregt (UU)
The cortical representation of binocular stimuli across human visual areas

09.30 – 09.45 Ben Harvey (UU)
Topographic processing of numerosity in the human parietal cortex

09.45 – 10.00 Alessio Fracasso (UU)
Laminar imaging at 7T: profiles of population receptive field (pRF) size from human primary visual cortex

10.00– 10.15 Jan Brascamp (UU)
What causes the perception of ambiguous visual stimuli to switch?

10.15– 10.30 Maria Matziridi (VU)
Moving your head reduces perisaccadic compression

10.30– 10.45 Elevator Pitches

1. Barrie Klein (UU)
Coordinated attraction of spatial response selectivity by spatial attention throughout visual cortex

2. Manje Brinkhuis (UU)
Attentional and perceptual priming in vision: are both phenomena related?

3. Jim Maarseveen (UU)
Time Dilation in an Explicit and Implicit Timing Task

11.15 – 12.30 SESSION 6: EMOTION AND ATTENTION

Leon Kenemans and Marcel van der Hout

11.15 – 11.30 Sophie van Uijlen (UU)
Active Approach Does not Add to the Effects of in Vivo Exposure

11.30 – 11.45 Arne Leer (UU)
Countering the return of fear after extinction

11.45 – 12.00 Iris Schutte (UU)
Disappointing rewards: Startle reflex modulation by monetary gain

12.00 – 12.15 Ivo Heitland (UU)
Differences and overlap of inhibition and novelty related brain activity – a source localization EEG study

12.15 – 12.30 David Terburg (UU)
Acute effects of Sceletium tortuosum (Zembrin®), a dual 5-HT reuptake and PDE4 inhibitor, in the human amygdala and its connection to the hypothalamus

12.30 – 12.45 Elevator Pitches

1. Suzanne van Veen (UU)
Does the vividness of an aversive autobiographical memory taxes the working memory in a dose-dependent way?

2. Kevin van Schie (UU)
Do eye movements reduce accessibility of emotional memory material?

3. Puck Duits (UU)
An Updated Meta-Analysis of Classical Fear Conditioning in the Anxiety Disorder

KEYNOTE SPEAKERS

Dr. Andrea Serino
Ecole Polytechnique
Fédérale de Lausanne

Research Interests

Andrea Serino is Senior Scientist at the Center for Neuroprothetics at the EPFL since 2012 and Assistant Professor at the Department of Psychology, University of Bologna, since 2006.
His main research question is how the brain generates the experience of "being here and now" by integrating multisensory information related to the body and to the space immediately surrounding the body, i.e. Peripersonal Space. To answer this question he has been used different techniques, namely Psychophysics, Neuropsychology, TMS, tDCS, fMRI and Neural network models.

Prof. Ole Jensen
Donders Institute
Nijmegen

Research Interests

Ole Jensen received his MSc degree in electrical engineering in 1993 from the Technical University of Denmark. He then pursued his PhD at Brandeis University in the United states under the supervision of professor John E. Lisman. In 1998 he obtained his PhD degree in neuroscience specializing in computational modeling of oscillatory networks. The modeling approach was used to account for electrophysiological and behavioral findings on memory in rats and humans. As a postdoctoral fellow he applied magnetoencephalography (MEG) to address questions on brain dynamics and human cognition at the Brain Research Unit, Low Temperature Laboratory. Helsinki University of Technology. He primarily worked with Dr. Claudia Tesche and professor Riitta Hari. In 2002 he was employed as head of the MEG laboratory at the Donders Institute for Brain, Cognition and Behavior and promoted to principal investigator in 2003. In 2013 he was appointed professor at the Faculty of Science, Radboud University Nijmegen. His current work focuses on linking oscillatory brain activity to cognition: how does oscillatory brain activity shape the functional architecture of the working brain in the context of memory and attention.

KEYNOTE ABSTRACTS

Thursday 5 June
16.45 – 18.00

Dr. Andrea Serino

Peripersonal space defines the boundaries of the Self

The experience of our embodied Self is not limited to the physical constraints of our body, but it extends into the space where the body interacts with the environment, i.e. peripersonal space (PPS). I will show how premotor and posterior-parietal brain regions represent PPS by integrating multisensory-motor signals related to the physical body and to the space immediately around it. I will show how the boundaries of PPS adapt as a function of experience, such as tool-use or self-other interactions. Finally, I will present new data suggesting a close relationship between the extent of PPS representation and Self-consciousness.

Friday 6 June
16.00 – 17.15

Prof. Ole Jensen

On the functional role of human alpha oscillations: routing and prioritizing information processing

Networks in the brain must rely on powerful mechanism for limiting and prioritizing the input flow in order to prevent information overload. In the rat hippocampus, it is well established that neurons representing different spatial representations fire at different phases of the theta cycle. This mechanism limits the information presented by producing sweeps of spatial representations organized according to excitability. Similarly, we hypothesize that alpha oscillations provide a mechanism for ordering visual input according to 'relevance'. Gamma oscillations phase-locked to the alpha oscillations serve to keep competing representations apart in time. As a result sweeps representing a short 'to-do-list' organized as a temporal phase code is produced in every alpha cycle. Empirical support for such a mechanism using MEG in combination with other techniques will be discussed.

ABSTRACTS

Jasper de Groot (UU)

Emotion and the Sense of Smell

The sense of smell is one of the oldest sensory systems. Only two (three) synapses separate the olfactory nerve from the amygdala (hippocampus). As a consequence, odorants can trigger profound emotional memories. Although odors may elicit idiosyncratic responses, there may be regularities in the environment rendering it more likely that particular odor compounds are associated with particular contexts. For instance, once a person becomes fearful, adrenalin activates the apocrine sweat glands in the armpit region, producing odoriferous volatiles. We hypothesized that participants exposed to fear odor would show a partial affective, behavioral, and perceptual reproduction of fear. Three double-blind within-subjects experiments revealed a consistent pattern. Participants that were exposed to fear sweat (vs. control sweat) showed a fearful facial expression (facial EMG) and signs of sensory vigilance (sniffing behavior, eye scanning, perceptual sensitivity) (Study 1); this particular reproduction of fear was maintained regardless of co-presented (conflicting or confirming) audiovisual information (Study 2) and was observed only for females—generally having a better sense of smell and greater sensitivity to emotions (Study 3). What follows is a discussion of the underlying (neural, psychological) mechanisms of the apparent capability to chemically transfer fear from one individual to another.

Robert Renes (UU)

An exploratory fMRI study into inferences of self-agency

Building on the recent findings that the experience of self-agency over actions and corresponding outcomes can also rely on cognitive inferential processes, rather than motor prediction processes,this study aims to investigate the brain areas involved in agency inference processing in a setting where action and outcome are independent. Twenty-three right handed subjects were scanned using functional MRI while performing an agency-inference task, in which action-outcomes matched or mismatched goals. The experience of self-agency was associated with increased activation in the inferior parietal lobule as well as bilateral (medial) superior frontal cortex and medial prefrontal cortex. These findings provide new and exciting insights in the processing of inferential self-agency, providing a first look at the neural correlates of self-agency processing independent of motor-prediction processes.

Estrella Montoya (UU)

Escape or Freeze: The Neural Effects of Cortisol while under Attack

Evolution has provided for a highly flexible neural threat system that, depending on threat imminence, switches between passive freezing and active escape behaviors. Cortisol, the so-called 'stress-hormone', is thought to play an important role in both, but the exact mechanisms are not understood. Using pharmacological functional magnetic resonance imaging we investigated how cortisol modulates the brain's fear and salience systems during anticipation of a virtual-predator attack. Depending on whether the predator was escapable cortisol induced diametrically opposite effects. Cortisol not only reduced freeze-related midbrain activity during inescapable threat, but during active escape anticipation cortisol boosted the frontal salience network, which is known to be involved in autonomic control, visceral perception and motivated action. These findings provide for the first evidence on how
cortisol tunes human threat mechanisms from passive fear to active escape, which not only underscores cortisol's function in system normalization, but also shows that cortisol can drive active survival mechanisms

Peter Bos (UU)

Effects of oxytocin and cortisol on neural empathic responses

I will present two studies in which we investigated the effect of hormonal administration on neural empathic responses in males. In the first study we investigated the effect of cortisol administration on neural responses to crying infants. The data show that cortisol markedly increased hippocampal activation towards crying infants, and this effect varied significantly with parental neglect, even in our non-clinical subject-sample. Thus, without exposure to severe trauma or neglect, reduced self-experienced quality of parental care in the normal range already substantially increased hippocampal responsivity to cortisol. Such altered hippocampal sensitivity to cortisol might be a cross-species marker for risk of developing later life psychopathology. In the second study we investigated the effects of oxytocin, a key hormone in mammalian social bonding, on empathy for pain, the core aspect of affective empathy. Using functional neuroimaging we show robust activation in the neural circuitry of pain (insula and sensorimotor regions) when subjects observe pain in others. Crucially, however, this empathy-related activation in the neural circuitry of pain is reduced after intranasal OXT, implying strong decreases empathy for pain. The neurobiological mechanism by which OXT decreases neural proxies of empathy for pain defensibly involves the opioid system.

Erik Oudman (UU)

Route learning in Korsakoff's amnesia

Korsakoff's amnesia is characterized by declarative amnesia, but relatively spared implicit memory. The aim of the present study was to assess to what extent patients suffering from
Korsakoff's amnesia can acquire spatial information while performing real-life spatial navigation in a novel environment. Moreover, we examined whether residual spatial acquisition in Korsakoff's amnesia was based on automatic or effortful coding processes by manipulating the instructions before navigation. Patients showed hampered performance on a majority of tasks compared to healthy subjects, yet their performance was superior to chance level on a route time and distance estimation tasks, a map drawing task and a route walking task. Acquisition in Korsakoff's amnesia was automatic rather than effortful, since no significant differences were obtained between the intentional ("try to remember the route") and incidental (mock) instruction-condition on any task, whereas for the healthy controls the intention to learn was beneficial for the map drawing task and the route walking task. The present results suggest residual acquisition of spatial information while performing spatial navigation in Korsakoff's amnesia on multiple levels that is likely to be based on automatic coding processes.

Matthijs Biesbroek (UMCU)

Distinct anatomical correlates of discriminability and criterion setting in verbal recognition memory revealed by lesion-symptom mapping.

Background: Recognition memory depends on discriminability (reflecting explicit and implicit memory processes) and criterion setting (i.e. the application of a threshold resulting in a yes/no response, reflecting cognitive control). Discriminability and criterion setting are assumed to draw on distinct anatomical structures, but definite evidence for this assumption is lacking.
Aim: To determine the anatomical correlates of discriminability and criterion setting in verbal recognition memory.
Methods: We applied voxel-based and region of interest-based lesion-symptom mapping in 83 patients with first-ever ischemic stroke. Infarcts were manually segmented on follow-up CT or MRI images. Recognition memory was measured with the Rey Auditory Verbal Learning Test. Neuropsychological examination was performed within one month after ischemic stroke (mean 7.6 days; range 1-30). Signal-detection theory was used to calculate measures for discriminability and criterion setting.
Results: Voxel-based lesion-symptom mapping showed that discriminability draws on left medial temporal and temporal-occipital structures, on both thalami and on the right hippocampus, whereas criterion setting draws on the right inferior frontal gyrus. Lesions in the right inferior frontal gyrus were associated with liberal response bias. These findings were reproduced in the region of interest-based analysis.
Conclusion: Discriminability and criterion setting in verbal recognition memory indeed depend on distinct anatomical structures.

Gabriel Beckers (UU)

Traveling slow-waves in the nuclear avian brain

Most studied animals' sleep, yet the function of the brain activity that characterizes sleep remains an unresolved question. In mammals, sleep brain rhythms play a role in processing information acquired during prior wakefulness. Most attention has focused on the slow-oscillations, which have been recently shown to propagate through the laminar neocortex as two-dimensional traveling waves. This phenomenon is thought to be critically important for integrating spatially distributed information. Using high-density intra-cerebral recordings of slow-oscillations in zebra finches, we demonstrate that action and field potential activity also propagate in a traveling fashion in the avian brain. This is remarkable because the cytoarchitecture of the avian forebrain, which diverged from that of the mammalian brain ~300 million years ago, is organized in a fundamentally different manner. However, unlike mammalian 2D propagation, avian waves travel as local, expanding plumes of activity in three dimensions. Our findings show that the traveling aspect of the slow-oscillation is a fundamental property of both mammalian and avian brains, and is not dependent upon mammalian cortical cytoarchitecture and associated computational properties. Our results may also have implications for understanding why during the course of evolution birds 'replaced' the laminar dorsal cortex present in their reptile ancestors with nuclear neuronal cytoarchitecture. 3D propagation may confer greater computational freedom and contribute to the complex cognitive abilities of birds.

Alyanne de Haan (UU)

The effect of visual enlargement of one hand on tactile distance perception on both hands.

Tactile spatial perception cannot be achieved without the body being part of the percept. However, your body is not static, it changes considerably during your lifetime. The representation of your body therefore needs change accordingly, presumably by using visual and proprioceptive feedback. Previous studies have shown that manipulating the perceived size of a body part influences tactile distance estimations on that body part. It seems that the perceived size influenced an implicit body representation used for tactile estimations. In this study, we investigated whether changes in tactile distance estimations following manipulations of perceived body part size are restricted to the manipulated body part. We manipulated the visually perceived size of the left hand using the MIRAGE setup, and tested tactile estimations on the skin of the left and right hand. Distance estimations on the left hand increased after illusionary stretching of the hand, but so did distance estimations on the unseen, unmanipulated right hand. It seems therefore that the internal representations of the hands are linked, and manipulation of the representation of one part of the body influences more than just that part of the body representation.

Vivian Holten (UU)

Does differential processing of optic-flow cause the anisotropy in postural sway?

Previous research has shown contracting optic-flow to generate more postural sway than expanding flow. The origin of this anisotropy remains unknown. We have demonstrated previously that the biomechanical properties of the lower leg cannot cause this anisotropy. A logical candidate for the anisotropy would be the visual system. Here, we investigate whether differential processing of expanding and contracting optic-flow might explain the anisotropy apparent in postural sway. To measure the relative perceptual strength of either stimulus, we used continuous flash suppression as method. More specific, we measured the duration until either expanding or contracting optic-flow breaks the continuous flash suppression. Observers viewed the stimuli through a mirror stereoscope mounted on a chin rest. During the experiment, a dynamic mask was presented to one eye, while the other eye was presented with either an expanding or a contracting radial optic-flow pattern. Observers pressed a key as soon as dots of the flow pattern were perceived within 6-second trials. The results show that expanding optic-flow breaks suppression faster than contracting optic-flow. These results are opposite from expected based on the previous postural sway results. However the results may reflect the larger prevalence of cells tuned to expansion in, for instance, area MST.

Martijn Barendregt (UU)

The cortical representation of binocular stimuli across human visual areas

Two forward facing eyes result in two different retinal images that are mapped onto a single retinotopic representation in visual cortex. Here we provide evidence that the transformation from V1 to V2 involves a transformation of a retinotopic to a cyclopean representation of the visual scene. Using high-field fMRI (7T), we measured BOLD responses in early visual cortex to a stimulus containing binocular disparity. In two control experiments, we also measured BOLD responses to (1) the same stimulus, but with temporal interleaving of left and right eye images, and (2) the same stimulus but without the horizontal offset. The experimental stimulus results in the percept of a single object located in depth, whereas the control stimuli produce the percept of (1) two alternating objects or (2) one object located in the fixation plane. Next, we identified whether the cortical representation reflects that of a single object image or two retinal images. We found that the V1 cortical representation corresponds to the location of the stimulus on each retina. In later visual areas (V2 and onward) however, the cortical representation is not related to the retinal location of the stimulus, but follows a cyclopean representation of the visual scene.

Ben Harvey (UU)

Topographic processing of numerosity in the human parietal cortex

Numerosity, the set size of a group of visually-presented items, is processed by association cortex, but certain aspects mirror properties of primary senses (Dehaene, 1997; Burr and Ross, 2008). Sensory cortices contain topographic maps reflecting the structure of sensory organs such as the retina, cochlea or skin. Is the cortical representation and processing of numerosity organized topographically, even though no sensory organ has a numerical structure? Using high-field fMRI (7T) and custom-built model-based analysis that captures numerosity tuning (Dumoulin and Wandell, 2008), we describe neural populations tuned to small numerosities in human posterior parietal cortex. These neural populations are organized topographically, forming a numerosity map where preferred numerosity increases from medial to lateral cortex. This numerosity map is robust to changes in low-level stimulus features, although numerosity-tuning properties do vary with stimulus features. Furthermore, the cortical surface area devoted to specific numerosities (cortical magnification factor) decreases with increasing numerosity, and the tuning width increases with preferred numerosity. These organizational properties mirror key features of sensory and motor topographic maps. This extends topographic principles to representation of higher-order cognitive processing in association cortex, supports the analogy between numerosity and primary senses, and demonstrates that topographic structures can emerge within the brain.

Alessio Fracasso (UU)

Laminar imaging at 7T: profiles of population receptive field (pRF) size from human primary visual cortex

Visual input from the eyes arrives predominantly in granular layers of primary visual cortex (V1), characterized by the highly myelinated stria of Gennari (Gennari 1782). Subsequently, it rapidly spreads across lamina and through horizontal connections before reaching extra-striate cortex. In line with this laminar hierarchy, neurophysiology measurements show that neurons in granular layers have small visual receptive fields (RF's), which increase in supra- and infra-granular layers (Hubel & Wiesel, 1968). This finding has been replicated across different species and modalities suggesting a general organization principle of primary sensory cortex (Chapin, 1986). Here, we provide human in vivo evidence of population RF (pRF) size and surrounds across lamina. Our results show that pRF size increased as a function of eccentricity. Across lamina, pRF sizes and surrounds are smaller in granular compared to supra- and infra-granular layers. pRF size/ surround ratio is approximately constant across lamina.
In line with neurophysiology, we reveal a laminar hierarchy in pRF size and surrounds, being smaller in granular layers and gradually increasing towards infra and supra granular layers. These results extend the systematic pRF size variation across the visual field map hierarchy to laminar hierarchy within a visual field map.

Jan Brascamp (UU)

What causes the perception of ambiguous visual stimuli to switch?

Ambiguous images are well-known for their remarkable feature of making the viewer's perception alternate between interpretations over time, but researchers disagree about what causes these switches. Several fMRI studies have reported elevated activity of a right-lateralized fronto-parietal network accompanying perceptual switches, suggesting that these areas initiate the switches. Other work, however, suggests that perceptual switches arise without a fronto-parietal trigger, and that the observed fronto-parietal activity reflects changes in attention and task difficulty that result from the perceptual switch. We combined fMRI with binocular rivalry stimuli, a kind of ambiguous stimuli that involve independent visual stimulation of the two eyes, causing perception to switch between the two eyes' inputs. A novelty in our approach is the development of conditions where switches between the two eyes demonstrably occur, yet without the observer noticing. This allowed us to compare three conditions. In one condition, similar to traditional designs, perceptual switches were noticeable and task-relevant, yielding robust switch-related fronto-parietal activity. This activity was reduced, however, when switches were made noticeable yet task-irrelevant, and became altogether undetectable when switches were both unnoticeable and task-irrelevant. This indicates that fronto-parietal involvement is limited to the switches' behavioral consequences, and that switches occur without fronto-parietal prompting.

Maria Matziridi (VU)

Moving your head reduces perisaccadic compression

Stimuli presented briefly during or near the time of a saccade tend to appear to have been closer to where the gaze ended than they really were. The resulting compression of perceived positions has been found to increase with the amplitude of the gaze shift. In most studies on perissacadic compression the head is fixed, so gaze changes are achieved by rotating the eyes in the head. What if moving the head causes part of the change in gaze? Does decreasing the eye-in-head rotation by moving the head decrease the compression of perceived positions? To find out, we asked participants to shift their gaze between two positions, either without moving their head or with the head contributing to the change in gaze. We flashed targets around the time of the saccades and participants had to localize them. There was less compression when the head contributed to the change in gaze. We conclude that moving one’s head can reduce the systematic mislocalization of flashes presented near the time of rapid gaze shifts.

Nicolette Munsters (UU)

I see you: the influence of visual perception on social development

During the first four years of life children undergo a rapid change in social behavior. This development is influenced by the social information children take in, which again is influenced by perception of detailed and global information. For instance, during face processing detailed information (e.g. wrinkles and edges of the eyes) and global information (e.g. position and shape of the eyes) play specific roles in emotion and identity recognition. Children with Autism Spectrum Disorder (ASD) show deficits in social communication and social interaction. An often-noted deficit is an abnormality in social gaze (i.e. eye contact, gaze following and joint attention). Previous research suggests that the preference for detailed above global visual information might be one of the underlying mechanisms of ASD. Yet, the specific influence of detailed and global visual information on social gaze is still unclear. We present a perceptual model of social gaze. This model suggests that global information is important for processing social gaze. In addition, we present a method to test the model in adults and children.

Roy Hessels (UU)

What's in a face? Gaze to emotional expressions in infancy

Several studies (using EEG or behavioral indices) have indicated that seven months old infants process emotional expressions differently, but this is not reflected in their gaze patterns. The question is whether these inconsistencies are due to different developmental trajectories of neural and face scanning mechanisms, or due to the insensitivity of the eye-tracking measures used to investigate face-scanning behavior. We presented children of ten months with fearful and neutral faces, and investigated whether differences in gaze were present. Using the 'classical' analyses of looking time often reported in previous research, we found no differences in looking time between emotional expressions. However, using measures of looking order in scanning of faces, we did find differences between emotional expressions. We showed that infants made more transitions between the eyes, and that saccades in the eye-region were 1.5 times larger in amplitude when viewing neutral faces compared to fearful faces. This could point to a pre-cursor of a more global avoidant looking-style often described in adult scanning of threat-related faces, and suggests that scanning behavior of emotional faces is in fact under development in the first year after birth.

Eric Avila (EUR)

Anodal cerebellar transcranial direct current stimulation effects on saccade adaptation

In order to maintain accurate eye movements, motor commands must be adjusted after each eye movement is completed. Saccade adaptation consists on exposing the oculomotor system to repetitive saccadic errors to induce a gradual change in gain of the eye movement over time. Cerebellar integrity is necessary to achieve saccade adaptation. Transcranial direct current stimulation (tDCS) is a form of non-invasive stimulation where a weak current is applied through electrodes over the scalp and is known to induce changes in neuronal excitability in a polarity-specific manner, hence effecting motor behavior and cognitive functions. We studied the effects of tDCS on gain-up and gain-down saccadic adaptation. Twenty healthy subjects performed either an inward (n = 10) or outward (n = 10) classic double-step paradigm while receiving anodal or sham tDCS over the right cerebellum. For inward adaptation (gain-down) the group that received tDCS stimulation had a larger gain reduction compared to sham condition. For outward adaptation (gain-increase) no significant differences were found on gain. Our results demonstrate a clear effect of cerebellar tDCS on backward saccade adaptation and contribute to the knowledge that these two types of learning may utilize different neural mechanisms to achieve adaptation.

Peter Holland (EUR)

Electrophysiological and Behavioural effects of Cerebellar Direct Current Stimulation

Scientific interest in transcranial direct current stimulation (tDCS) has undergone a remarkable resurgence over the last decade and a half. The number of tDCS related publications has risen rapidly, and it's use is being considered in the treatment of a plethora of conditions. Unfortunately, our understanding of the basic principles of the mechanisms of tDCS has not kept pace. Direct electrophysiological recordings, such as can be done in animal models, are a first step in uncovering mechanisms of tDCS action, both at the level of the single neuron and the wider impact on neural networks. We performed cerebellar tDCS in awake mice and demonstrate a polarity dependent modulation of the rate of adaptation of the vestibulo-ocular reflex. Subsequently we investigated the cellular basis of this modulation using mutant mice and demonstrate the absence of this augmentation in mice lacking a specific form of cerebellar plasticity. In a second set of experiments recordings of cerebellar neuronal activity following stimulation were made using extracellular microelectrodes. We demonstrate modulations in both single units and multi-unit signals with a time course comparable to that of the behavioural effects.

Haike van Stralen (UU)

Affective touch modulates the rubber hand illusion

Pleasant touch is mediated by a distinct neural pathway that consists of un-myelinated tactile affarents (CT-fibers) that respond to stroking with a slow velocity on the hairy skin. These fibers project to the posterior insula, an area that has also been implicated in the rubber hand illusion. We hypothesized that there would be an additional effect of pleasant touch on the rubber hand illusion compared to touch that is regarded as less pleasant. We conducted two experiments with the rubber hand illusion. In the first experiment, we tested the effects of stroking velocity and stroking material; on the rubber hand illusion. We found an increased illusion for slow velocity, soft material stroking. In the second experiment, we tested whether these effects were specific for areas that contain CT fibers or whether this was a general effect of stroking speed. In line with our hypothesis, on both experiments we observed a larger proprioceptive drift (Pd) after pleasant touch as compared to regular stroking. This effect was stronger on the hairy skin compared to the glabrous skin, suggesting that CT-fibers were involved in conveying the stroking. Other outcome measures (temperature drop and the subjective illusion) showed effects of pleasant touch in the first experiment but not in the second, suggesting that these measures are less influenced by pleasant touch.

Anouk Brouwer (VU)

The effects of the Müller-Lyer illusion on double-step saccades

Visual contextual information can affect our motor behaviour. For example, the Müller-Lyer illusion influences the amplitude of saccades along this illusion (FP1 ‡ T-ML, see Figure). However, de Grave, Smeets, and Brenner (2006) showed that saccades perpendicular to the illusion (FP2 ‡ T-ML) are not affected. What would happen if we make a saccade to the remembered position of T-ML after an intervening saccade from FP1 to FP2 (double-step)? By using a double-step saccade task, we tested the role of visual contextual information in visuomotor updating. Visuomotor updating implies that the spatial dimensions of the second saccade are computed based on the initial retinal coordinates of the target and the metrics of the intervening first saccade. Our results show systematic errors in the endpoint of the second saccade, in the direction of the illusion. Surprisingly, a follow-up experiment showed that the second saccade was not affected by the illusion when T-ML and FP2 were presented simultaneously (as in de Grave et al., 2006). These results imply that the presence of FP2 together with T-ML acts as a vertical reference that suppresses the effect of the illusion. Our experiments demonstrate that the effects of the Müller-Lyer illusion on our actions depend critically on the details of the task.

Marieke van der Graaff (VU)

Vector and position coding in goal directed movements

Two different ways to code a goal-directed movement have been proposed in the literature: vector and position coding. In a study by Hudson and Landy (2012) participants made movements towards targets on a table while they saw the targets and the feedback on a computer screen in front of them, so they had to learn a new visuo-motor mapping. Participants learned this mapping by series of movements, either repeatedly towards a certain target position from different directions (position condition) or by repeating a certain movement vector from different positions (vector condition). They found that the shapes of the endpoint distributions of movements with the same target and start position were different for the two conditions, and concluded that a new mapping could be specifically learned by either vector or position coding. Do we see specific learning of one of the types of coding also if participants do not have to learn a new mapping? To find this out, we repeated the study of Hudson and Landy (2012), but our participants made movements towards the locations at which they saw the targets and received feedback about the hand position at the target location. We compared the position and vector conditions with a third condition with the same movements, but in which neither a position nor a vector was repeated (random condition). For each condition there were 6 positions and 6 movement vectors, which were each repeated 12 times.

Irene Kuling (VU)

Torques do not influence Proprioceptive Localization

Because muscle forces are related with both movements and external forces, external vertical forces on the hand, like the gravitational force, could be expected to influence the perceived position of the hand. For example, it has been suggested that torque differences (due to gravity) provide important information for judging the distance moved away from the body. To test this suggestion, we examined whether vertical forces on the hand (and the torque differences due to these forces) influence proprioceptive position matching and vector reproduction. In a first experiment, the vertical forces were constant, resulting in a change in torque that was proportional to the gravitational torque. Judged distances were not different with and without such forces. In a second experiment, gradient force fields were used to dramatically change the torque differences. Again, no differences were found between the movements made with and without force fields. Thus, vertical forces do not play an important role in judging proprioceptive positions or distances.

Femke van Beek (VU)

Haptic discrimination of distance

While quite some research has focussed on the accuracy of haptic perception of distance, information on the precision of haptic perception of distance is still scarce, particularly regarding distances perceived by making arm movements. In this study, eight conditions were measured to answer four main questions, which are: what is the influence of reference distance, movement axis, perceptual mode (active or passive) and stimulus type on the precision of this kind of distance perception? A discrimination experiment was performed with twelve participants. The participants were presented with two distances, using either a haptic device or a real stimulus. Participants compared the distances by moving their hand from a start to an end position. They were then asked to judge which of the distances was the longer, from which the discrimination threshold was determined for each participant and condition. The precision was influenced by reference distance. No effect of movement axis was found. The precision was higher for active than for passive movements and it was a bit lower for real stimuli than for rendered stimuli, but it was not affected by adding cutaneous information. This knowledge could be useful in the design of haptic devices.

Sophie van Uijlen (UU)

Active Approach Does not Add to the Effects of in Vivo Exposure

In exposure therapy, anxiety patients actively approach feared stimuli to violate their expectations of danger and reduce conditioned fear. Prior research has shown that stimulus evaluation and behavior are reciprocally related. This suggests that approach behavior itself may decrease fear. This study tested whether approach behavior adds to the beneficial effects of exposure. Spider fearful women were randomly assigned to one of three groups: repeated exposure to a spider by pulling a jar containing the spider towards themselves (Exposure + approach) or by having the experimenter do this (Exposure only), or no exposure. Effects on self-reported, behavioral, and implicit spider fear were measured. Exposure decreased self-reported and behavioral spider fear, compared to no exposure. The decrease was similar for exposure with and without approach behavior. No effects were found on the implicit (affective priming) measure. Although our results did not show an added effect of approach behavior to exposure, this does not necessarily imply that approach behavior is not relevant to the understanding of the beneficial effects of exposure. The mere visual impression of approach, and/or the decision to approach, instead of the actual motor behavior, may reduce fear.

Arne Leer (UU)

Countering the return of fear after extinction

Treatment of anxiety disorders typically involves exposure to the feared stimulus. Patients learn that their feared stimulus (e.g., giving a presentation) does not lead to a catastrophic outcome (e.g., people will judge me negatively). As a result, fear diminishes. Relapse rates, however, are high. Analogue (laboratory) studies have shown that what is learned as a result of exposure hardly generalizes across contexts: outside the 'extinction context' the feared stimulus usually reminds of the catastrophic outcome again. During my talk I will show that learned fear can also be reduced by reevaluating the catastrophic outcome (e.g., maybe negative evaluation is not the end of the world) and that such changes are maintained following a context switch.

Iris Schutte (UU)

Disappointing rewards: Startle reflex modulation by monetary gain

The startle eyeblink reflex is a defensive response in reaction to, for example, a sudden, loud noise. A large body of research has shown that the startle eyeblink reflex can be modulated by motivationally relevant stimuli. It has been reliably shown that when a subject receives a startle probe in the context of an aversive emotional event (for example during viewing of aversive pictures), the startle response is increased. The opposite, relatively inhibited startle reflex responses during an appetitive context, has also been found, but much less consistently across studies.
The current study used the startle eyeblink reflex as an objective index of the appreciation of monetary rewards. 48 participants were divided into four amount-groups and subjected to a "head-or-tails game". Participants had a chance to win money (a fixed amount dependent on the amount-group they were assigned to) or not during each trial. Whether the amount was actually won was dependent on whether a virtual coin landed on "heads" or "tails".
In line with prior studies, the present study shows that startle reflex magnitudes were significantly increased when money was at stake, compared to when no money was at stake, during anticipation of the outcome of a trial. Moreover, it shows that after feedback about winning startle reflex magnitudes were significantly increased when money was at stake and the actual outcome was "lost" compared to "won". The latter was only the case for the 20 cents group.
In sum, the present study shows significant startle potentiation when a possible monetary reward was not won. The present results might indicate that participants are relatively disappointed when 20 cents are not won, when there was a chance to win, rather than that they are satisfied when 20 cents are won.

Ivo Heitland (UU)

Differences and overlap of inhibition and novelty related brain activity – a source localization EEG study

Traditionally, inhibition of ongoing behavior has been described as a proactive, top-down process. As such, event-related potentials (ERPs) elicited during a stop-signal paradigm show a central inhibition-specific peak, the so-called stop P3. In contrast, the detection of unexpected novel changes in the environment has been described as an involuntary bottom-up switch of attention. As such, unexpected novel stimuli evoke a similar though somewhat different ERP, the so-called novelty P3 (or P3a). As of yet, few studies have focused on the overlap and differences between both these processes and their associated brain activity.

In this study, a group of healthy human subjects completed both a stop-signal task and an auditory novelty oddball paradigm while a 64-channel EEG was recorded. Source localization of the EEG data revealed that the brain activity evoked by both inhibition and novelty overlapped in parts, with (amongst other areas) the ACC as a prominent common denominator. This suggests that both inhibition and novelty processing rely, at least in parts, on a similar generic, reactive bottom-up mechanism that responds to unexpected saliency.

David Terburg (UU)

Acute effects of Sceletium tortuosum (Zembrin®), a dual 5-HT reuptake and PDE4 inhibitor, in the human amygdala and its connection to the hypothalamus

The South African endemic plant Sceletium tortuosum has a long history of traditional use as a masticatory and medicine by San and Khoikhoi people. Over the last decade the plant has attracted increasing attention for its possible applications in promoting wellbeing and relieving stress in healthy individuals, and for treating clinical anxiety and depression. The pharmacological actions of a standardized extract of the plant (Zembrin®) have been reported to be dual PDE4-inhibition and 5-HT-reuptake inhibition, a combination that has been argued to offer potential therapeutic advantages. Here we tested the acute effects of Zembrin® administration in a pharmaco-fMRI study focused on anxiety-related activity in the amygdala and its connected neurocircuitry. In a double-blind placebo-controlled cross-over design 16 healthy participants were scanned during performance in a perceptual-load and an emotion-matching task. Amygdala reactivity to fearful faces under low perceptual load conditions was attenuated and follow-up connectivity analysis on the emotion-matching task showed that amygdala-hypothalamus coupling was reduced. These results demonstrate for the first time the attenuating effects of Sceletium tortuosum on the threat circuitry of the human brain, and provide supporting evidence that the dual 5-HT-reuptake inhibition and PDE4-inhibition of this extract might have anxiolytic potential by attenuating subcortical threat responsivity.