

Helmholtz *Herald*

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{Content}:

1 ECVP 2008

Interview with...

2 Meeting Helmholtz

Haptics in Utrecht

3 Utrecht: University City

Column

4 News etc.

ECVP 2008
SPECIAL EDITION



ECVP 2008 Organised by the Helmholtz Institute

This year's European Conference on Visual Perception (ECVP) is organised by the Helmholtz Institute. We are celebrating this occasion with a special issue, devoted to the conference. Prof. Dr. Frans Verstraten, who is a professor and head of the department of the Experimental Psychology group at Utrecht University, serves as the coordinator of the organising committee. He is also chairman of the board of the Helmholtz Institute. Verstraten obtained his PhD in Utrecht and was supervised by Prof. Dr. Wim van de Grind.

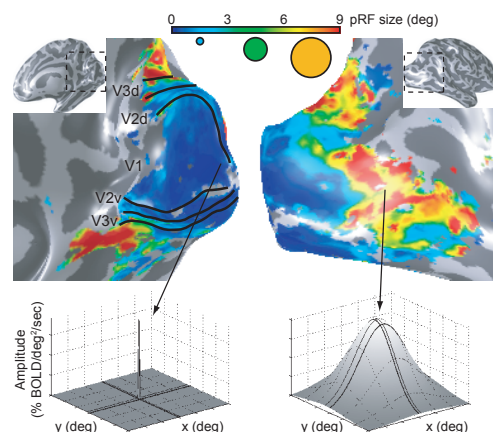
As the organiser of this year's ECV, Professor Verstraten hopes to provide a platform for the presentation of state-of-the-art science, where results are communicated faster than in scientific journals. This ideology is especially clear in the selection of symposia. The number has been cut back to only four and the topics, such as synesthesia and bistable perception, reflect a focus on the future. Whereas this ECV is the first to include a section on haptics, Professor Verstraten stresses the importance of focusing on a well-defined research area and therefore the haptics session is firmly linked to visual perception. Also, he

hopes that future meetings will attract more low-vision topics, as this area has become under-represented over the years.

Getting to know more from the fMRI signal

An important concept at the basis of many fMRI studies into vision is the visual field map. This is a map on the cortex that indicates which region of visual space each cortical location responds to. In the January 2008 edition of *Neuroimage*, Dr. Serge Dumoulin, who recently joined the Experimental Psychology group at Utrecht University, described a new fMRI method by which more can be learned from fMRI signals than the standard visual field map shows. Advancing conventional methods, Dumoulin, in collaboration with Dr. Brian Wandell, could calculate for each cortical location not only the visual field position it best responds to, but also the width of the response distribution surrounding the location, called the population receptive field (pRF). The pRF method also allows a better functional characterisation of the cortical area that represents the fovea, and neuronal properties such as population receptive field size and laterality can be measured. These properties go undetected in current fMRI approaches. The article has raised a lot of interest: the Faculty of 1000 has noted it, and Dumoulin received a Marie Curie International Reintegration Grant for the development of the method.

Dumoulin explains that the pRF method builds on conventional mapping procedures, where the single visual field position that produces the largest response in a voxel is estimated from the fMRI time course in response to stimulation using, for instance, a rotating wedge. A fundamental observation from such experiments was that the fMRI



time course to the rotating wedge in V1 and the lateral occipital cortex is quite comparable: every time the rotating wedge passes the region of the voxel's highest response, the signal goes up. However, the amplitude of the signal is lower in the lateral occipital cortex and effects are hard to measure. Dumoulin realized that this is because receptive fields in the lateral occipital cortex are much larger than in V1, so that a voxel in this region still gives a considerable response even when the wedge is not in the region of the voxel's highest response. Therefore, he created the baseline condition that was crucial to deal with this difference in local receptive field properties. When the rotating wedge is alternated with periods of stimulus absence, it can be observed that the lateral occipital response drops to a much lower baseline level when the stimulus is away. This supports the hypothesis that voxels in the lateral occipital cortex respond to a broad range of wedge positions whereas a voxel in V1 responds only to its preferred position.

To quantify these local differences, Dumoulin formalized a simple Gaussian model of the population receptive field, which is defined by the position in the visual field that the population is most sensitive to and the width of its response (the population receptive field size). By fitting the predictions from this pRF model to the time course of the fMRI signal, it could be observed that the difference in fMRI signal to the rotating wedge between voxels located in V1 and the lateral occipital cortex, could be entirely attributed to their receptive field size. Traditionally, these neural properties could only be assessed by single cell recordings in primates. Therefore computational models of, for instance, centre-surround modulation that make specific predictions about the influence of surround stimuli on the receptive field properties of a cell in the centre, can not be tested in humans. With the pRF model it becomes possible to test such hypotheses on interactions between receptive field properties using human fMRI.

Meeting Helmholtz

Physiological optics, according to Helmholtz, differs from physical optics by the fact that the latter studies optical phenomena independently of the human eye. Helmholtz, in contrast, was concerned with the entire visual path from light rays to visual experience. One of the first steps on this path is the projection of a visual image on the retina.

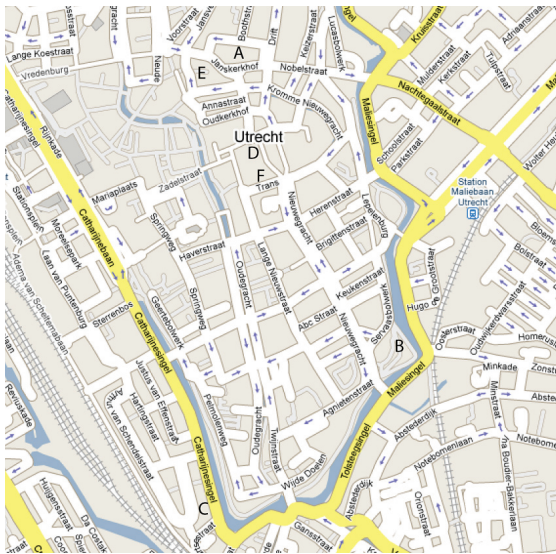
These projections of visual objects are inverted and at a much smaller scale than the real-world objects. Whereas this is common knowledge to vision scientists, few have tried to demonstrate it experimentally. Helmholtz describes an interesting method, which you can try yourself. Take a colleague into a darkened room and ask him or her to turn the eye outward (to the temporal side), so that you can see the outside of the eyeball well to the back. Now hold a light source in front of your colleague's face and you can see the tiny retinal image of that light source at the back of their eye through the sclera. If, like Helmholtz, you use a candle flame or similarly asymmetrical light source, you will even be able to tell that the image is upside down. Wondering which of your colleagues to bother with this experiment? Take note of Helmholtz' remark that the best subjects are blond, blue-eyed people, because they tend to have less pigment in the sclera.

Growing Interest in Haptics

Research into haptic perception is gaining popularity, in part due to growing interest among vision scientists in multisensory perception. The group of Professor Astrid Kappers at Utrecht University's Physics department is at the forefront of haptic perception research. Kappers, who has a background in vision research herself, welcomes the impulse from multisensory perception research. Traditionally, haptics research has focused more on topics of robotics and engineering than on human perception. Within the Helmholtz Institute a growing interest in haptics is evidenced by a recent collaboration between Kappers' group and Edward de Haan when he was at Utrecht's Psychology department, as well as by haptics projects initiated by Chris Dijkerman in Utrecht and the group of Jeroen Smeets at the Vrije Universiteit Amsterdam. An important step for haptics research worldwide was the recent initiation of the first scientific journal devoted entirely to haptics: IEEE Transactions on Haptics. Kappers, who is an associate editor of the new journal, explains that the initiative for this journal came from the fields of robotics and engineering but that the journal intends to cover perception as well. This is a welcome development for the field of haptic perception, as it was lacking a designated stage to communicate its results with fellow scientists. This was particularly problematic when researchers from

Kappers' group were faced with the editorial suggestion to 'try a more specialized journal', when no such journal existed!

At the ECVF in Utrecht in 2008, Kappers is one of the people behind the sessions devoted to the overlap between haptics and vision. She hopes this part of the program will be preserved in future years, as the interaction with vision scientists can be more relevant for her group than interaction with virtual reality developers at conventional haptics conferences. Moreover, this program section provides a stage for research in the growing field of multisensory perception.



Utrecht: University City

Utrecht University hosts the ECVF 2008, and here we take you on a walk through its history, which stretches back to long before vision research began. In the 7th century, the Irish monk Willibrord established a seminary to train future priests and young nobility. A statue of Willibrord can be found on the Janskerkhof (A). From the 12th until the 17th century the seminary expanded and started to educate administrators and lawyers as well. Utrecht became the cultural and intellectual centre of the Northern Netherlands. In 1634 the town Council established the 'Illustrious School' which became the University of Utrecht two years later. At its start the University had only 35 students and seven professors in four faculties: Theology, Law, Medicine and Philosophy. Although all official students were male, Utrecht had the honour of educating the first female student in Europe (Anna Maria van Schurman, 1607-1678). Still, she attended her lectures from Professor Voetius behind a curtain

Arnoldus van H.

Why Helmholtz did not publish on Splanchnology

Many of us perception scientist have been inspired by the writings of Hermann von Helmholtz. But have you ever wondered why Helmholtz never published on the viscera and its organs, although he graduated as a physician? I might have found the answer...

When Helmholtz was a student at the 'Königliche Friedrich-Wilhelm Institut für Medizin und Chirurgie' he wrote letters to his parents about the delights and nuisances of a 19th century student. He wrote these letters to console his parents, who were a bit worried about his health and well being. You have to realise that Hermann had a weak health and suffered from bad cases of scarlet fever as a young boy.

In a letter dating from November 1839, he writes about his roommate, describing him as 'good-natured, but not very clever', and goes on to blame him for missing his first lecture. According to Helmholtz, his roommate took him to the lecture hall, but then 'lost himself in a crowd, and never reappeared'. When Hermann finally found the lecture hall, the lecture was almost over. Even worse, he admits that he tried to copy his roommate's notes on the lecture, in which he failed since he couldn't decipher them.

What do all these nice anecdotes have to do with the question of why Helmholtz did not publish on the viscera? Well, consider this: the lecture Helmholtz missed was about Splanchnology, and was given by the great anatomist Professor F. Schlemm! Could it be that he lost interest in the subject since he missed the lecture, and – to make things worse – failed to copy the notes of his roommate? You might find this a little bit far-fetched, but doesn't a first encounter with an inspiring lecturer spark the fascination for a scientific subject? Although we might never know why Helmholtz did not get fascinated by Splanchnology, we perception scientists might consider ourselves lucky. Had he not lost interest in the viscera and its organs, he might have spent a great deal of energy writing on the subject, lacking the time to enlighten us with his many observations on the senses and the perceptions they give us. So maybe we should be grateful to his roommate...

P.S. You can find Helmholtz' letters in a biography by Leo Königsberger, which you can find on the web: <http://www.archive.org/stream/hermannvon-helmho00koenrich>

News etc.

so that other students would not see her. In order to compete with other Dutch universities such as Leiden, Groningen and Amsterdam, the university expanded. At the Sonnenborgh a botanical garden was established which nowadays houses an observatory (B). Around 1815 the Faculty of Mathematics and Physics was established, which later served as the foundation for the Utrecht School of Sciences. Harsh times arrived in the 19th century when the University had difficulties obtaining enough funding. The realization of the Academic Hospital at the Catharijnesingel (C) helped the University to survive. Around 1900 the University began to flourish again and in honour of the 250th anniversary of the University the city donated the University Building (Academiegebouw, D). This is an important building because the Union of Utrecht was signed here in 1579, marking the beginning of the Dutch state. Today, almost all university ceremonies take place in this building. At the beginning of the 20th century the University prospered. The number of students increased rapidly from 463 in 1886 to over 3400 in 1933. Numerous scientists won the Nobel Prize and the Faculty of Veterinary Medicine was founded. In the 1960's the University had expanded so much that several Faculties moved to The Uithof campus on the edge of the city. Only the Faculties of Law (E) and Humanities (F) can still be found in the city centre. In 1979, the second ECVP was organized by Maarten Bouman, a professor of sensory biophysics at Utrecht University.

Phd Defences

- May 7, 2008. S.H. Houtman (Department of Neuroscience, Erasmus MC Rotterdam) Title: 'Cytoskeleton Associated Proteins in Neurons: The Eml family and Synaptopodin.'
- May 14, 2008. C.E. Andreescu (Department of Neuroscience, Erasmus MC Rotterdam) Title: 'Unconventional Peripheral, Central and Hormonal Factors in Cerebellar Plasticity.'
- August 29, 2008 R. Volcic (Physics of Man, Universiteit Utrecht) Title: 'Multiple reference frames in haptic spatial processing.'
- September 3, 2008. M.W.A. Wijntjes (Physics of Man, Universiteit Utrecht) Title: 'Haptic perception of shapes and linedrawings.'
- September 8, 2008. B.J. van der Horst (Physics of Man, Universiteit Utrecht) Title: 'Haptic perception of curved surfaces.'
- September 24, 2008. M. Schonewille (Department of Neuroscience, Erasmus MC Rotterdam) Title: 'Cerebellar Codings for Control of Compensatory Eye Movements.'
- September 29, 2008. J. Brascamp (Functional Neurobiology, Universiteit Utrecht) 'Perception of ambiguous images within temporal context.'
- November 12, 2008. H. Anema (Experimental Psychology, Universiteit Utrecht) Title: 'Touching upon tactile processing.'
- December, 12, 2008. M. Kammers (Experimental Psychology, Universiteit Utrecht). Title: 'The body in the brain. More than the weighted sum of its parts.'

Grants & Awards

- Tanja Nijboer (Experimental Psychology, Universiteit Utrecht) received the dissertation award from the Dutch Association for Neuropsychology for her thesis entitled 'Neuropsychology of Color Vision'.
- Joke Baas (Experimental Psychology, Universiteit Utrecht) received a grant from the Hersenstichting Nederland for a project entitled 'The effect of the CBI antagonist rimonabant on the extinction of conditioned fear responses in people: a proof-of-concept study'.
- Leon Kenemans (Experimental Psychology, Universiteit Utrecht) received funding for an NWO PhD project on the neurotransmitters involved in the balance between rigid aiming and the flexible displacement of attention.
- Marjolein Kammers (Experimental Psychology, Universiteit Utrecht) received a MRC/ESRC fellowship. She will continue her work on body representations in the brain and extend her work to chronic pain patients.
- Eli Brenner (Faculteit der Bewegingswetenschappen, VU Amsterdam) received a grant of the European Union program 'Coordination for optimal decisions in dynamic environments.'
- Jeroen Smeets (Faculteit der Bewegingswetenschappen, VU Amsterdam) received an NWO grant for a PhD project, entitled 'Is dynamic touch based on an optimal combination of invariants?'

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