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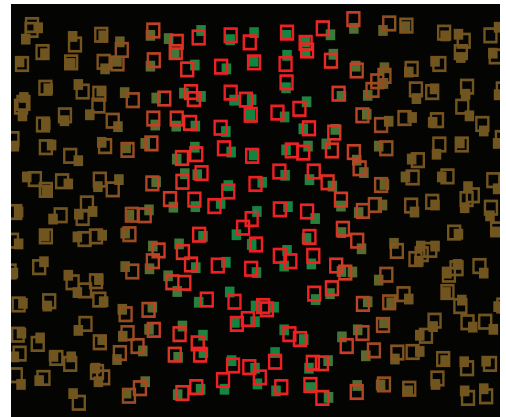
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Interview Ryota Kanai

Ryota Kanai, from the Experimental Psychology group at Utrecht University received the Dutch Psychonomic Society's dissertation award for his thesis entitled 'Dynamic inference in visual processing.' The jury praised Kanai's work for its originality and relevance, containing a great contribution to the literature including a paper in *Nature*. While being praised for his contribution to the literature, Ryota Kanai also warns about the issue of focusing on publication quantity. Many researchers publish a lot by virtue of being highly specialized and focused, but in this way they lose the aspect of general appeal, which keeps science innovative, original and interesting to the larger public. The work described in Ryota Kanai's PhD thesis is far from overly specialized. It centers on how the brain combines information from different sources to come to a coherent perceptual impression. As a PhD student and in collaboration with several colleagues at Caltech in Pasadena, he discovered several compelling illusions. Many of his stimuli provide striking and very definite information regarding motion, colour or pattern identity in the center of the visual field, which then overrides conflicting information in the more peripheral visual field. Therefore, motion and colour may be misbound, or a random pattern of crosses in the periphery may 'heal' into a rectangular grid. The theme connecting all of these illusions is that the brain tries to come up with one unified interpretation of the visual world, and in the process will 'bend' the way it processes information.

In his acceptance presentation at the NVP winter conference, Ryota Kanai demonstrated a large number of such illusions, voicing his conviction that it is better to experience than to talk about visual perception. If you subjectively see an effect with the stimuli, you know

that you will get good data. Moreover, illusions are a tool to communicate ideas to a general public. In his presentation he proposed a model that connects saccades and transient visual events. As an eclectic researcher who masters many different measurement techniques, he is intent on connecting all aspects of visual science and explaining all visual events. But formalizing the model is not one of his priorities. A theory made up of intuitions is useful as a start to make new discoveries but when formalizing a model you need to make many assumptions. For that reason formalized models run the risk of becoming somewhat trivial. One thing that has kept Ryota Kanai from doing trivial research are his many collaborations within the Helmholtz Institute and internationally. They help you to enjoy science, which keeps you productive and original and is good for testing new ideas.



Discrete colour filling-out stimulus (downsized image). When the center of this stimulus in real format is fixated, the colour in the periphery changes. The central colour spreads to the elements on the common surface without bleeding into the background. This effect demonstrates that colour filling-in is highly selective for the global organization of perceptual surfaces. It is described in chapter 11 of Kanai's thesis where the stimulus can be found in real format.

Meeting Helmholtz

Helmholtz, Hering and the Colour Controversy

Science was conducted differently in the middle part of the nineteenth century. Nevertheless, there has always been scientific controversy. Helmholtz participated in more than one, but the most prominent was regarding the mechanisms behind colour perception, a controversy he engaged in with his long-time adversary Ewald Hering. In 1802, Thomas Young postulated that colour vision was mediated by the activity of three types of photoreceptors, each sensitive to a particular region in the spectrum of visible light. In 1850, Helmholtz refined and extended this theory by pinpointing the locations in the spectrum these three types of cells are most sensitive to: short (Blue), middle (Green) and long wavelengths (Red). He did this in a series of ingenious colour-matching experiments, and showed that observers need activity in all three cone channels to perceive the normal range of colours. Thus, according to the Young-Helmholtz theory, the building blocks in our perception of colour are the relative activity of three types of retinal cells. Psychophysically, a lot of progress had been made in understanding the ways in which colour vision works, but it took until 1959 for researchers to confirm this trichromatic mechanism's existence physiologically.

However, Hering begged to differ in 1872. He was used to arguing with Helmholtz, as they had their conflicting opinions on other subjects, such as the nature of binocular rivalry. He proposed a different mechanism, named a colour-opponent process. In such a process, different receptors work antagonistically, with pairs of colours active in one channel, letting that channel convey the difference between the two colours. In this manner, Hering suggested that there are three opponent channels (Red-Green, Blue-Yellow, and White-Black) that serve as the basic building blocks of colour vision. This opponent theory had a weak point, namely that the inhibitory processing necessary for the opponent process to function had not been supported by physiological evidence. Only in the 1950s were such processes discovered.

These two theories were regarded as mutually exclusive for almost a hundred years, researchers were

taking sides and research in this topic was highly partisan, with heated and emotional debates. At that time, no-one could have guessed that these two theories could both be correct, but at different levels of the visual system. The Young-Helmholtz trichromatic notion of colour building blocks describes the receptor level processing in the retina, whereas the Hering opponent theory has turned out to describe the processing in subsequent stages of the visual system.

Sharon Gobes in 'Het Klokhuis'

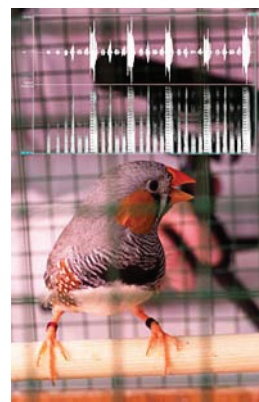


Photo: Ivar Pel

Sharon Gobes

from the Behavioural Biology group of the Helmholtz Institute presented her work on song memory in zebra finches this February at the television show 'Het Klokhuis'. We spoke to her in more depth about her PhD project at the Helmholtz Institute. The process through

which young songbirds learn their song resembles the way human infants acquire speech. Both processes involve a practice stage, called sub-song in birds and babbling in humans where song or speech is learned from a tutor. Besides birds, only sea mammals, and maybe bats, show the same behaviour. The zebra finch offers the opportunity to study the relationship between the behavioural and neurological aspects of memory. It is this connection between neurology and behaviour that has attracted Gobes to the bird model. In a recent *Current Biology* paper (2007) she showed that besides behavioural parallels between song learning and speech acquisition, there are also functional similarities between the human and avian brain. The functional dissociation between frontal and caudal temporal areas involved in speech perception in humans can also be found in the avian brain, where the caudomedial nidopallium is involved in song perception and memory.

On the behavioural level, some birds were less successful song learners than their siblings and Gobes is now investigating the neurological substrate of these behavioural differences. Moreover, new developments may allow these investigations to be expanded to the genetic level. The group of Johan

Bolhuis was invited to participate in an international genomics project involving universities in the US and Europe. This project offered the possibility of using a micro-array technique to study the relation between genes, brain activity and song memory. Asked about the role that such cooperation has played in her scientific development, Gobes answers that by interacting with other scientists working on the same project, it greatly helped her in learning new techniques, whereas the Helmholtz Institute's focus on perception makes it more difficult to find a common ground for cooperation within the institute. After her PhD, Gobes would like to pursue a subject that Daniel Margoliash presented at last year's Helmholtz Lectures: the role of sleep in memory.

Edward de Haan dean at UvA

As of February 1 2008, Edward de Haan has been appointed at the UvA in Amsterdam in the dual function of Dean of the Faculty of Social & Behavioural Sciences and Professor of Neuropsychology. Edward de Haan was the Scientific Director of the Helmholtz Institute and School between 2000 and 2005. He played a key role in expanding the focus of the institute, which back then was mainly perception, to also include strong cognitive research lines. Among other activities, he was closely involved in the initiation of the monthly Helmholtz lectures and the Helmholtz retreat in Bergen. He was also an important force in setting up the NWO Cognition Summerschool in Doorwerth. Notable results of his activities for neuroscience in Utrecht include the acquisition of a 3T MRI scanner for research at the Utrecht Medical Center, and the Neuroscience and Cognition master program. At the NVP winter conference, the Dutch Association for Psychonomics (NVP) honoured Professor de Haan for his bridging and active role in Dutch Psychonomics with the NVP 'erepenning'. With his appointment at the UvA, Professor De Haan will give up his position as professor of Neuropsychology at Utrecht University, and thereby leave the Helmholtz Institute.

Arnoldus van H.

Lost and found

The scientific breakthrough of the decade, it has already been labeled. We talk to the scientist who made the discovery. Dr. Bruno Ergasse explains: 'Freud was right after all. No serious scientist would have agreed just months ago. In fact, just a small group of historians and clinical therapists still found his ideas interesting. We have to admit though; we made this discovery by accident. We were performing experiments where we stimulate the brain using TMS. To be honest: these experiments were leading us nowhere. But boy did we get lucky! On our day of fortune, we had the settings of our machine wrong. We didn't notice anything, and just kept going with our dull experiments. Then it happened: our subject suddenly burst out into tears. At first we thought we had hurt her. Well, it turned out we had, but our hurting was not a physical one. What actually happened was that our subject was suddenly struck by, as she later explained, "a vivid and emotional childhood memory". I don't want to go into the details of the memory, it's kind of personal to her you know. However, she said this memory was of great importance to her, since it "explained a lot of psychological problems she had had later". We then went on to reconstruct what had happened during the experiments and realized the settings of the machine were quite wrong. The machine makes some sort of clicks when sending out pulses, but never in any special way. However, when listening to our pulses, they sounded like this: Dum diddle di dum diddle di dum dum, Dum diddle di dum diddle di diddle di diddle di, etcetera.' We then went on to stimulate other people's brains using the same sequence. You know what, all of them had the same experience. They all remembered some crucial event from their childhood, and all felt very happy afterwards'. If Freud only knew that a person's subconscious could be unlocked by the rhythm of the Bolero!

P.S. Veronica Maassen won my pop-quiz! Indeed, the quote from my previous writing was from the magnificent Billy and the Beaters and their song 'At this moment'. A bottle of wine is coming your way. Your new assignment is an easy one: What does Dr. Ergasse's name have to do with Freud?

News & Agenda

Helmholtz Lectures

- April 11, 2008. Eero Simoncelli (New York University, USA) Modeling the visual system.
- May 23, 2008. Steve Palmer (UC Berkeley, USA) Aesthetic science: Understanding preferences for color and spatial composition.
- June 13, 2008. John Maunsell (Harvard University, USA). How attention alters neuronal representations in monkey visual cortex.
- April 4, 2008. Professor Edward de Haan (Experimental Psychology, Utrecht University) will give a lecture titled "17 jaar lang het jaar van de Haan", to mark his transition from Utrecht to the University of Amsterdam. Time and place: 1.30 PM, Blauwe zaal, M. Ruppertgebouw, Leuvenlaan 19, Utrecht. More information: Veronica Maassen (V.Maassen@uu.nl).

PhD Defences

- December 5, 2007. Ruben Simon van der Giesen (Department of Neuroscience, Erasmus Medical Centre, Rotterdam). The role of electronic coupling in the olivocerebellar system.
- January 16, 2008. Jeroen van Boxtel (Physics of Man, Utrecht University). On the visual system's architecture underlying binocular rivalry and motion perception.

New people

- Charlotte Lindeyer. PhD student (Behavioural Biology, Utrecht University). Will work on a project on zebrafish neuropeptides and social behaviour.
- Steven Hrotic. Post doctoral fellow (Behavioural Biology, Utrecht University). Will work on a project on cultural evolution.
- Dennis Hofman and Sylco Hoppenbrouwer. PhD students (Experimental Psychology, Utrecht University). Project title: Inside the wire: steroid hormones, functional brain communication and social aggression.
- Peter Bos. PhD student (Experimental Psychology, Utrecht University). Project title: The role of oxytocin and vasopressin in human social-emotional behaviour and its neural correlates.

Retirement

- On February 2nd, 2008 Professor Jan Koenderink (Physics of Man, Utrecht University) was given his status emeritus. In spite of his official retirement, Professor Koenderink will continue his work.

Symposia & Lectures

- January 2, 2008. Professor Jan Koenderink's retirement lecture was very well attended, including many visitors from abroad. There were lectures by Whitman Richards, Wim van de Grind, Olivier Faugeras, James Todd, and of course Jan Koenderink himself.

Grants & Awards

- Dr. Ype Elgersma (Department of Neuroscience, Erasmus Medical Centre, Rotterdam) received an NWO Vici grant. Project: Mental handicap; to understand is to cure?
- Dr. Bas Meenderink (Department of Neuroscience, Erasmus Medical Centre, Rotterdam) received an NWO Veni grant. Project: Sounds in the inner ear.
- Dr. Christiaan de Cock (Department of Neuroscience, Erasmus Medical Centre, Rotterdam) received an NWO Veni grant. Project: From sensory input to brain activity.
- Dr. Lukas Kapitein (Department of Neuroscience, Erasmus Medical Centre, Rotterdam) received an NWO Veni grant. Project: From A to Better in brain cells.

Other news

- The IEEE computer society started the first scientific journal entirely devoted to haptics. 'IEEE Transactions on Haptics' will address the science, technology and applications associated with information acquisition and object manipulation through touch. Professor Astrid Kappers (Physics of Man, Utrecht University) will be associate editor of the journal.
- The Experimental Audiology group at the AMC Amsterdam investigated potential health hazards of mp3 players. Test it yourself at <http://www.mp3check.nl/>
- The organisation of the European Conference on Visual Perception (ECVP) in Utrecht (August 24 – 28) is looking for volunteers. If you are interested, email to: susantepas@ecvp2008.org

Colofon:

© Helmholtz Institute 2008
P.O. Box 80125
3508 TC Utrecht
The Netherlands
Phone: +31 30 253 4270/
4281
Fax: +31 30 253 451
Email: helmholtz@fss.uu.nl
www.phys.uu.nl/~wwwfm/

Editors:

Jan Brascamp
(j.w.brascamp@bio.uu.nl)
Tomas Knapen
(tknapen@gmail.com)
Katinka van der Kooij
(k.vanderkooij@uu.nl)

Copy editor:

Jonathan Flintham

DTP:

Tobias Borra
Ignace Hooge
Chris Paffen

Print:

Zuidam&Uithof

Suggestions, ideas & contributions:
j.w.brascamp@bio.uu.nl