

# Donders Institute Newsletter

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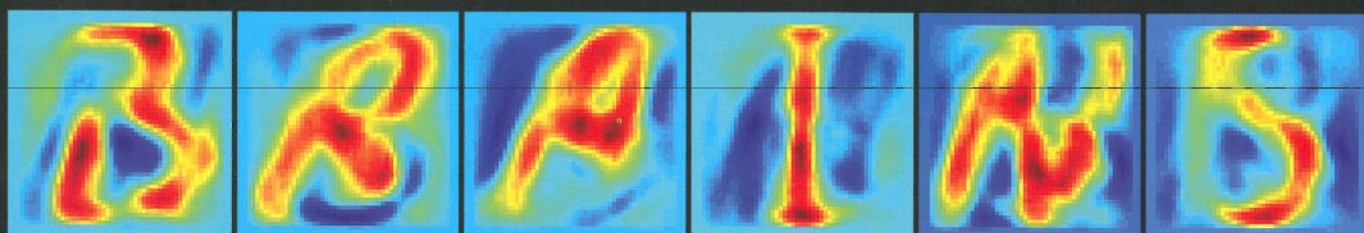
15 December 2013

The Donders Newsletter is published twice a year by the Donders Institute for Brain, Cognition and Behaviour, which consists of research groups at Radboud University Nijmegen and the Radboud University Nijmegen Medical Centre as well as the Max Planck Institute for Psycholinguistics. Its purpose is to keep you informed of developments within the Donders Institute and the field of neuroscience.

Radboud University Nijmegen



# BRAINS



**Why emotional memories last**

**Intrigued by the human mystery machine**

**The salient self: explorations of self-bias in mind and brain**

*Donders Lecture 23 January 2014, Professor Glyn Humphreys*

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**Donders Institute**  
for Brain, Cognition and Behaviour







## Why emotional memories last

**Memory researcher Benno Roozendaal's became world-famous some years ago for his model of the role of the amygdala in remembering emotional information. His model is now included in various standard reference works. Since 2012, Roozendaal has been a principal investigator at the Donders Institute, where he studies the effects of stress on memory.**

Prof. Roozendaal developed his famous functional model together with James L. McGaugh, one of the pioneers in the study of memory consolidation. The model describes the interactive effect of different stress hormones on the amygdala and how that interaction affects memories. 'If an experience is very emotional and stressful, you remember it better,' Roozendaal explains. 'That's because of stress hormones that affect the amygdala, clusters of nuclei in the brain that influence memory storage in other parts of the brain. The amygdala is a catalyst for emotional memories. But, during stressful events, it's difficult to consciously retrieve other information. We've found that the

same stress hormones are involved in these two processes.'

Prof. Roozendaal's office is full of books, printouts of articles, diagrams and research proposals, but he can find his way through this mountain of data without any problems. One of his shelves is full of sections of rat brains, which he brought with him from California. At the time, he had not yet written his articles about them. 'Of course, when you move on, you have to take all your material with you.' But what draws the eye in his room is a collection of stuffed toys and games involving rats and mice, his favourite laboratory animals. 'I'm a hobbyist – I love my work,' he laughs.

### Astronauts under stress

Roozendaal does not work only with rodents. An exciting proposal for research on stress in astronauts at the ISS space station was approved this year. Prof. Roozendaal is the only Dutch academic in a big international team that has been assembled for this study. The measurements will begin in a few years, but some technical problems need to be solved first. For example, glass test tubes are not allowed in the ISS, because of the risk if one were to break. The researchers are now working with engineers at the European Space Agency (ESA) to make special test tubes from Teflon.

The planned study, to be conducted in space and with people, is very different to Prof. Roozendaal's usual research with rats. 'Yes, it is different, and also super-interesting,' says Roozendaal, who is evidently enthused. 'Astronauts experience many different kinds of stress. They live for months under

Benno Roozendaal is Professor of Behavioural Neuroscience at the Cognitive Neuroscience Department of the Radboud University Medical Centre and he is Principal Investigator at the Donders Institute for Brain, Cognition and Behaviour. He spent fifteen years of his career in Irvine, California at the Center for the Neurobiology of Learning and Memory, before returning to the

Netherlands in 2008, where he had studied and earned his PhD. His group studies the effects of stress and stress hormones on the amygdala and other brain regions, as a mechanism that regulates memory consolidation, memory retrieval and working memory, and the possible consequences of stress and stress hormones for traumatic memories and post-traumatic stress disorder.

micro-gravity in a small space craft without privacy, they are under very high work pressure and have a short diurnal rhythm, they have to sleep in a hanging position, and on top of all that, the high radiation levels in space have negative effects. All these stresses clearly influence your cognition. There is even such a thing as 'space stupidity.' Astronauts sometimes make very stupid mistakes, which they would never make on earth. For example they may forget to put important blood samples in the refrigerator. In short, working memory is impaired in space. I am very interested in exploring this mechanism.'

### **Stress and memory in practice**

The space project is an exception for Prof. Roozendaal. His regular work keeps him much closer to everyday practice. For example, every year in the United States, 80 million prescriptions are written for glucocorticoides, anti-inflammatory drugs used in treating conditions such as rheumatism and asthma. Glucocorticoides are stress hormones, so they have a positive effect on memory, but there are also negative side effects: 15% of users develop serious memory, mood or psychiatric problems such as psychosis or depression. Roozendaal wants to contribute to developing more specific glucocorticoides with less serious side effects.

His research may also help people with stress-related psychiatric disorders. Treatment with stress hormones such as cortisol may be beneficial for people

with post-traumatic stress disorder (PTSD) and phobias. It may, for example, help them to forget traumatic memories. Prof. Roozendaal also sees opportunities in the other direction: ways to improve memory, for example in dementia patients. 'When we know precisely how the amygdala works, perhaps we will be able to turn that catalyst for storing memories on and off as we wish. In that way, we might help people with serious memory problems to preserve important memories.'

### **New solutions for new problems**

Prof. Roozendaal also wants to find solutions for new problems, with a focus on understanding the networks in the brain. 'Studying networks is more relevant than studying individual cells or regions and technical developments now enable us to do this research really well.' He puts a lot of energy into starting new joint projects, for example with Professor Tansu Celikel, who is currently establishing his Neurophysiology group, and with Francesco Battaglia, a specialist in neurophysiology and neuroinformatics of memory. 'For all of us, it's a great challenge to look beyond the boundaries of our own specialisations. That's always been a strong point at the Donders Institute. All the researchers here like to explore new paths off the beaten track. This allows you to look at your own research in a completely new light.'

*Iris Kruijen*

## **From rat to man and back to rat**

'I do my regular work with rats, but I find the venture into human research with the ISS project very interesting,' says Prof. Roozendaal. 'I am learning many new things from it, even in the preparatory phase. Right now, it's giving me a lot of fun, but ultimately I hope that this study with astronauts will give us new insight in the effects of stress on memory.' Researchers can take interesting results from the human studies and investigate them further, down to the smallest detail, in rats. The Donders Institute values the importance of such animal studies as a basis for human research. For example, these studies are giving us a much better understanding of the genetic and cellular processes that underlie cognitive functions such as memory.



A close-up portrait of a young woman with long, light brown hair, looking slightly downwards and to the right with a thoughtful expression. The background is blurred.

## *Intrigued by the human mystery machine*

**News about her paper in *NeuroImage* this summer spread quickly around the globe. A helping hand for her master plan. Sanne Schoenmakers – a PhD student in artificial intelligence at the Donders Institute – says one day she wants to be a professor herself.**

‘I want to work on research for the rest of my life. That’s my dream. I like to push the limits: my own and those of science. You can take big steps at the boundaries of what we already know – it’s awesome to work in an intellectual environment like the Donders Institute.’

Sanne Schoenmakers dares to take risks. Right now she’s analysing the data from a fascinating experiment using a 7 Tesla MRI scanner. ‘It may be that this technique hasn’t yet been developed far enough to answer my questions. The data is quite noisy and we see a lot of artefacts.’

The *NeuroImage* paper Sanne wrote with Markus Barth, Tom Heskes and her

supervisor Marcel van Gerven, raised a lot of media attention this summer. It presented an elegant Bayesian method of decoding the perception of handwritten characters derived directly from brain data. Now Sanne wants to go a bit further: can she extract the recognition of a face from 7 Tesla fMRI recordings? And, going a bit further still – will she succeed in reconstructing an imagined face from the data?

‘When you imagine something, the brain signal is rather weak. And imagining a face is not an easy thing to do... we trained the subjects with two pictures – one of Marcel: male, European, looking neutral and one of Makiko: female, Japanese and smiling. I’m not sure whether we’ll succeed,

but when we do – well – then I hope we can send the results of our work to a top journal.’

### **Technical background**

Sanne got her Master’s degree from Eindhoven University of Technology. Her subject was Human Technology Interaction. ‘At some point I realized that my interest shifted from technology to the mechanics behind human beings. This started to fascinate me more and more. So I searched for an internship in brain research and ended up at Radboud University Nijmegen. I was so excited doing my first EEG recordings! Finally I was looking directly into that mysterious machine – the human brain.’

Later she did an fMRI project on mirror neurons in Nijmegen as well. Thoroughly trained in mathematics and statistics as she is, the statistical procedures used by psychologists made her wonder. ‘The fMRI data are so

## Media attention around the globe

*Linear reconstruction of perceived images from human brain activity* (NeuroImage, 2013) received a lot of media attention around the globe. It all begun with a press release by the University's press office, which was issued via Alpha Galileo, a news wire service for science journalists. It started like this:

### COMPUTER CAN READ LETTERS DIRECTLY FROM THE BRAIN

By analyzing MRI images of the brain using an elegant mathematical model, it is possible to reconstruct thoughts more accurately than ever before. In this way, researchers from Radboud University Nijmegen have succeeded in determining which letter a test subject was looking at. There were various factors which made this item big ...

#### *The timing*

Sanne contacted the press office as soon as the paper was accepted. So there was plenty of time to prepare and look for an interesting angle to this rather technical paper.

#### *The picture*

The intriguing picture on the cover of this magazine certainly helped to spread the news.

#### *The rephrase*

As soon as journalists rephrased her findings as 'Reading brains now possible' or words with a similar popular ring to them, the news went viral. Some creative minds saw a perfect lie detector in the making.

#### *A bit of luck*

The news was released on 19 August 2013 – just when the summer holidays were coming to an end. In this 'dead' season a good story can get attention a little easier.

#### *The effects*

Sanne's paper is currently among the top three most frequently downloaded papers from *NeuroImage* and it has been cited once already. She has started to receive invitations for lectures as well. Exposure in the popular press certainly helped achieve this.

incredibly rich and the standard way of analysing them might miss out on important patterns in the data. Much more information can be extracted by using better methods.'

Improving statistical methods is the main focus of her PhD project. 'At the end patients will benefit from this kind of work as well. To be able to operate a brain computer interface with your imagination - how cool would that be?!

What does it do for her, working at the social science faculty here in Nijmegen? 'My colleagues here have a broader perspective on society and societal issues – and they write much better than most mathematicians. It's a pleasure to read their work. I hope to learn to write attractively about technical matters – using good examples and little jokes and adding to the reasoning behind the formulas.'

### Strategic planner

'I like to discover things and communicate about them. Sometimes my friends say I'm a miss know-it-all, but, really, I have an inquisitive mind – that doesn't stop after work. I even analyse the best way to eat my sandwich...'

Sanne is a single child, raised by her mother – who would certainly have gone to university herself, if she had been born in another time. 'My mom encouraged me to aim high. She knows the frustration of working all your life below your potential,' Sanne says. 'And, yes, I do have a master plan. It wasn't just for fun that I chose to be a member of a student's union; I trained my management skills by getting a place on the board. And I'm studying for my teacher's qualification now, because this will increase my chances of finding a job after finishing here. I want to work in research all my life and hope to be a professor one day – and I'll seize

all the opportunities I can to make that happen. Donders would be a nice place for a professorship, but I won't say no to Stanford...'

She smiles.

*Iris Roggema*



***Donders lecture 23 January 2014***

# **The salient self: explorations of self-bias in mind and brain**

***Professor Glyn Humphreys***

Glyn Humphreys is Watts Professor of Experimental Psychology at the University of Oxford, Principal Investigator for the CNN Lab and chairman of the Donders Institute's advisory board. He will report on his new line of research in his Donders Lecture on 23 January 2014.

'A great deal of work has demonstrated that perceptually salient stimuli – which are high in contrast relative to the background – capture attention. New experiments show that attentional salience can also be manipulated by varying the social association of a stimulus with the participant.'

'Participants have to associate a new stimulus with themselves or with other people. There is an immediate advantage in matching the stimulus to themselves. This effect occurs even when self-related stimuli are unlikely to occur; the effect is underpinned by the activation of a particular neural circuit, and it changes behavioural and neural responses in the same way as changing the perceptual saliency of a stimulus. Thus social saliency seems to affect brain processing in a similar manner to perceptual saliency. Our social associations appear to literally change the way we see the world.'

It was Prof. Harold Bekkering who invited his Oxford colleague to lecture in Nijmegen. 'Glyn is a very experienced and influential researcher. He applies almost all of the Donders methods himself. I admire his experiment designs, which are elegant and always adequate. He really knows how to make a simple design work when answering difficult questions. We aim to reach the same standard by organising project proposal meetings here at Donders, in which we discuss new experiments.'

'Glyn has done a lot of work on diagnosing and managing cognitive problems after brain injury and he stands out in the way he bridges the gap between clinical studies and basic research. I think we can really learn from him in this respect. In Birmingham, where he worked for a long time, he established the practice that all elderly and neurological patients at the university's hospital take an extensive cognitive test when they're first seen, and that this data is made available for research purposes. Patients benefit from this, as does cognitive neuroscience.'



## **Donders lecture 23 January Professor Glyn Humphreys**

**The salient self: Explorations of self-bias in mind and brain**

The Donders Lectures take place on the campus of the Radboud University: Linnaeus Building, Heyendaalseweg 137, Nijmegen and start at 4.00 pm.

More about the 2014 lecture series at [www.ru.nl/donders](http://www.ru.nl/donders)



## Meanwhile at [www.ru.nl/donders](http://www.ru.nl/donders)

*Go to our website to review the latest news and events.*

### Successful evaluation of the Donders Institute

The Donders Institute has been assessed by an external Evaluation Committee for the period 2007-2012. The Committee was chaired by Prof. Michael Gazzaniga (University of California), one of the founding fathers of cognitive neuroscience; the other committee members are also renowned neuroscientists.

Overall, the committee assessed the quality of the Donders Institute for Brain, Cognition and Behaviour as excellent. Here's a quote from the report: 'The institute has an excellent international reputation and several of the Principal Investigators are top researchers in their field. The research undertaken has had an important and substantial impact in the international field. The committee is impressed by what has been established in five years time and observed an extraordinary spirit of cooperation within the Institute. The Institute is a very stimulating environment for top researchers as well as for young talent.'

The assessment resulted in the ratings of 5 for the criteria Quality, Productivity and Vitality and Feasibility, and a 4 for Societal Relevance. The Donders Institute is very proud on this encouraging outcome and will use the numerous recommendations provided by the committee to further enhance research in the years to come. According to the opinion of Harold Bekkering, chair of the Donders Institute, 'The

report stresses the fact that we are a leading institute internationally in the field of Brain Cognition and Behaviour. We are also pleased that the committee recognizes our impact on Society – above all in the Clinic and in the field of Education, and we will continue to strive to ensure that our knowledge is translated into society.'

### James S. McDonnell grant for Floris de Lange

Floris de Lange, principal investigator at the Donders Institute, has received a \$600,000 research grant from the American James S. McDonnell Foundation. The grant is part of the JSMF Understanding Human Cognition Scholar Awards programme, which supports research on the relationships between neural systems, cognitive functions and observable behaviour. Floris was personally invited to submit a proposal after being selected by a group of international senior scholars. He plans to use the six-year grant to study the role of prior expectations in perception. He views perception as a process of probabilistic inference in which bottom-up perceptual input is continuously compared with top-down predictions based on our prior knowledge of the world. Using the James S. McDonnell grant, he will study these processes at a more fine-grained level within cortical circuits. In addition, he will investigate how the sensory regions of the brain communicate with memory and decision-related areas of the brain.

### Approval of FP7 Health grant (Aggressotype) on the biology of aggression in child psychiatric disorders

Researchers at the Donders Institute have received a FP7 Health Grant from the EU to study the biology of aggression in child psychiatric disorders. This international Aggressotype project, which will be coordinated by Barbara Franke, will involve 23 research groups from Europe and the United States. At the Donders Institute, the research groups led by Barbara Franke, Jan Buitelaar, Alejandro Arias Vasquez, Jeffrey Glennon and Karin Roelofs will be involved. The EU will spend €6 million on this large international research project, €1.775 million of which has been awarded to Donders researchers.

The aim of the Aggressotype project is to bring together researchers from different disciplines to study the causes of aggression at a variety of levels: from genes to behaviour. In addition, the researchers will develop new algorithms for predicting aggression, and they will test biofeedback to support personalised treatment and the prevention of aggression.

### First Lustrum

This autumn the Donders Institute celebrated its 5th anniversary. On this occasion around 250 Donders staff enjoyed a party on 29 November at LUX. Donders musicians conquered the stage, resulting in loud applause and a lot of admiration from their colleagues. It was a very enjoyable night!



## OUT OF OFFICE

*'Thanks for your message. I regret that I'm unable to answer your e-mail - I'm out jamming with my band.'*

The Donders Institute may be a highly ambitious international research centre, but what do staff get up to after office hours? More research, of course - clearly, it doesn't all get done during office hours - but lots of other things, too. This produces some fascinating out-of-office replies...

The Donders Institute hosts a number of musically gifted researchers. One of the Donders bands, 'Hugo and the Donders' has been in existence since 2010. In its current form this band consists of Miriam (vocals), Tom (bass) and Flora (drums), all Donders PhD students, and Hugo - who doesn't work at the institute - who plays the guitar.

A short silence follows when I ask what kind of music the band makes. 'Well, technically, we make pop/rock covers,' Tom says. 'Other people might call it background noise or caterwauling though.' 'Sometimes we also attempt to write our own songs,' Miriam adds. 'We try to practice once a week. But, since we're all busy PhD students, that always doesn't work out. Our PhD projects always come before the music. The band is supposed to be a source of relaxation after all, not a source of more stress.'

They perform occasionally, mostly at Donders events. 'Some of us played at the Donders Christmas party and also at the PhD party of our former colleague and band mate Stephen,' Flora says. That was quite an experience, as his party was held in the gardens of the Albertinum monastery in Nijmegen. Miriam: 'That meant



no electricity! So we had to improvise and find some acoustic instruments. Flora played djembé instead of her regular drums and I just had to sing extra loud, because there was no microphone. It worked out in the end though. It was really a great evening.'

'We're supposed to be smart, being PhD students and all,' Tom says. 'But on some occasions, that intelligence does not seem to be in evidence. One time, we drove all the way to Germany to buy equipment for the band. When we walked out of the store with all our new stuff, we realized that it would never fit in our tiny car together with the four of us. We eventually made it home, but we all had imprints of amps and instruments in our faces.' Miriam: 'That was a scary ride...'. The best part about being in a band? 'Making music together, jamming and messing around creatively.'

*'Hugo and the Donders' performed very successfully at the Donders lustrum party at LUX on 29 November. Curious about 'Hugo and the Donders'? Contact Miriam for questions and/or bookings.*

## Diary

- 23 January 2014, 4pm, **Donders Lecture by Glyn Humphreys** (Oxford University) Radboud University Nijmegen, Linnaeus Building, Heyendaalseweg 137, Nijmegen
- 27-29 January, **Nijmegen Lectures 2014**, Radboud University Nijmegen, Aula, Comeniuslaan 2, Nijmegen
- 6 March 2014, 4pm, **Donders Lecture by Erich Jarvis** (Duke University Medical Centre), Radboud University Nijmegen, Linnaeus Building, Heyendaalseweg 137, Nijmegen
- 10-16 March 2014, 4pm, **Brain Awareness Week**
- 14 March 2014, 3.45 pm, **Inaugural Lecture Ole Jensen**, Radboud University Nijmegen, Aula, Comeniuslaan 2, Nijmegen
- 27 March 2014, 4 pm, **Donders Lecture by Elizabeth Phelps** (New York University) Radboud University Nijmegen, Linnaeus Building, Heyendaalseweg 137, Nijmegen

## PhD defences

- 23 September 2013. **Wronka, E.** Searching for the biological basis of human mental abilities. The relationship between attention and intelligence studied with P3. (Donders series 137)
- 9 October 2013. **Kalisvaart, J.P.** Visual ambiguity in perception and action. (Donders series 126)
- 14 October 2013. **Schoon, Y.** From a gait and falls clinic visit towards self-management of falls in frail elderly. (Donders series 132)
- 16 October 2013. **Severens, M.** Towards clinical BCI applications: Assistive technology and gait rehabilitation. (Donders series 135)
- 17 October 2013. **Zedlitz, A.M.E.E.** Brittle brain power. Post-stroke fatigue, explorations into assessment and treatment. (Donders series 131)
- 23 October 2013. **Kos, M.** On the waves of language - Electrophysiological reflections on semantic and syntactic processing. (Donders series 134)
- 11 November 2013. **Lüttjohann, A.K.** The role of the cortico-thalamo-cortical system in absence epilepsy. (Donders series 138)

- 14 November 2013. **Brazil, I.A.** Change doesn't come easy: Dynamics of adaptive behavior in psychopathy. (Donders series 139)
- 25 November 2013. **Jansen, D.** The role of nutrition in Alzheimer's disease - A study in transgenic mouse models for Alzheimer's disease and vascular disorders. (Donders series 133)
- 26 November 2013. **Bultena, S.S.** Bilingual processing of cognates and language switches in sentence context. (Donders series 142)
- 9 December 2013. **Zerbi, V.** Impact of nutrition on brain structure and function. A magnetic resonance imaging approach in Alzheimer mouse models. (Donders series 140)
- 7 January 2014. **Delnooz, C.C.S.** Unravelling primary focal dystonia. A treatment update and new pathophysiological insights. (Donders series 141)
- 17 January 2014. **Janssen, G.** Diagnostic assessment of psychiatric patients: A contextual perspective on executive functioning. (Donders series 143)
- 18 February 2014. **Bergmann, H.** Two is not always better than one: On the functional and neural (in)dependence of working memory and long-term memory. (Donders series 136)

## Donders Institute Newsletter

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