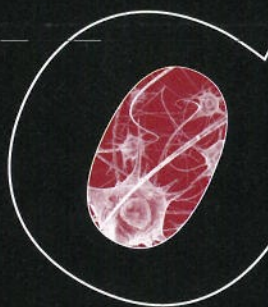


Donders Institute Newsletter

Issue 21

15 December 2012

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 cognitive neuroscience.



Scale versus focus, a Donders dilemma?

Strategic vision on the Institute's second decade

Unravelling memory: one system, not two

On the benefits of combining science and clinical practice

Optimal integration of sensory evidence

Donders Lecture 28 March 2013, Dora Angelaki

www.ru.nl/donders

Donders Institute
for Brain, Cognition and Behaviour





The Donders Institute has expanded enormously in its first ten years. The name is now well established in the world of neuroscience and the Institute can contract the best researchers in the field. The research agenda spans the full range of topics from 'molecule to man'. The risk of losing focus is not to be taken lightly. Two Donders directors comment.

Her Majesty Queen Beatrix of the Netherlands opens FCDC on 1 October 2002

Ten years ago, the Queen of the Netherlands opened the Donders Centre for Cognitive Neuroimaging, then known as the FCDC. Impressive modern fMRI machines and the promise that we would now be able to see the brain in action made a deep impression on Queen Beatrix. The general public was also keen to hear about the first results. Fellow researchers envied the FCDC staff for having their own equipment – in many other institutes fMRI studies were – and are still – done in between clinical scans, i.e. when there are no patients waiting in the queue.

Combined with the excellent reputation of the linguists at Nijmegen University and the Max Planck Institute for Psycholinguistics, as well as the renowned work on perception by people such as Prof. Charles de Weerd, the imaging facilities gave Donders a head start in the growing field of cognitive neuroscience.

Overgrown?

'The first thing you notice when you look at the Donders Institute today is the high quality of the research. The

institute attracts the best in the field – people who can raise funds for their research and expand their groups.'

On the phone from the University of Amsterdam, Edward de Haan repeats his warning that the Donders Institute may grow uncontrollably. De Haan, a professor in neuroscience and Dean of the Faculty of Social Science at the University of Amsterdam, was invited to speak at the Donders 'away day' (time for reflection) in September. The main topic was the outlook for the centre over the next decade. Specifically he warned his audience of the risk of losing focus. 'Donders has grown so quickly and in all kinds of directions. So what's the main focus? Do you intend to do everything?'

Prof. Harold Bekkering, who currently chairs the board of directors at the Institute, understands De Haan's concerns. 'His call for us to take a critical look at the coherence of our programme is justified. Our common ground is a systems approach to neuroscience within four thematic areas (see box on the right). The

research done by some PI groups do not fit into the thematic areas. We've started talks about rethinking or even stopping these research lines.' However, within the four themes people are pretty much able to follow up their own ideas, so there's not a general theoretical framework driving a specific theme."

Systems approach

Peter Hagoort, the initiator of FCDC and director of the Centre of Cognitive Neuroimaging, agrees: 'System-level neuroscience is the core of our programme. It's good to do basic neuroscience, to understand how a single neuron works or do optogenetics: to switch one single neuron on or off, but the importance for the systems level must be clear.' He warns that an overly narrow focus would put the institute at risk. 'Visible scale and diversity are both important in the world of neuroscience. Imagine we all did memory research... the funds would soon run out, because we would all be competing for the same, limited budgets. It's not a good idea to compete with your direct colleagues for the same funding.'

'We're envied for the quality of the researchers we're able to attract'

Prof. Harold Bekkering

Bekkering: 'Funds are given to people with proven excellence, not to good ideas. Even if we wanted to, we couldn't finance the institute without the top researchers we have.' Grants are typically given to projects involving groups from several institutes. This also hinders further local specialisation. 'I made several grant applications with groups from here for national calls, but they were all turned down, Harold Bekkering says. 'National and European funding agencies force you to work together with other groups – not with your colleagues next door. The NWO 'TOP' grant that I received last year was a rare exception. I really enjoy this opportunity to intensify cooperation within the institute.'

Creativity first

It's not only economics that justifies a varied research agenda. 'It's impossible to pin down good, creative researchers on a single very narrow topic. How can we know what will be important in, say, five years' time?' Hagoort asks. 'We need to maintain enough flexibility to define and pursue promising research avenues.'

Bekkering agrees that putting researchers in the strait jacket of a narrow focus is a waste of human capital, and that the course of science is unpredictable. He suggests, however, that research on the social brain will explode further and that the neurobiology of learning will become a big issue, given its high societal relevance.

Scaling down

In his speech Edward de Haan referred to the Max Planck Institute for Psycholinguistics – founded by Prof. Pim Levelt – as an example of an institute with a well-defined research agenda. 'Looking back one tends to idealize,' Hagoort reacts. 'As it happens, I know from personal experience how the Max Planck worked. Even in those days there was a lot more diversity in theoretical orientation and topics than De Haan suggests. More importantly, science has changed. New research

techniques were developed. Now we can do brain imaging and genetics; in those days, only behavioural measures were available. If you try to maintain focus at the expense of rejecting new methods and approaches to old questions, that's not good either. Which doesn't necessarily mean that Donders needs to have all of the available techniques at hand in Nijmegen.

On the whole, the selection of four themes that are central for systems-level cognitive neuroscience and seeking excellence – but also diversity – within these themes provides exactly the right degree of focus, says Hagoort. Bekkering adds: "The issue isn't so much a choice between scale and focus, but rather how to continue producing the excellent science in the institute."

Gravitation Grant

On 15 November NWO granted the Donders Institute a Gravitation Grant worth €27.6 million for the project Language in interaction. This project brings together brain researchers and social scientists to study the relationship between universal linguistic characteristics, individual variations, and how cognitive systems such as memory, action and control relate to language. This grant is a perfect example of a large-scale project with the right focus. "We will build a bridge between researchers in linguists and cognition," says Peter Hagoort. "That is our expertise."

Iris Roggema

Prof. Peter Hagoort

'We don't want to put our creative people in a straitjacket'



Donders Institute for Brain, Cognition and Behaviour

Theme 1: Language and Communication

Theme 2: Perception, Action and Control

Theme 3: Plasticity and Memory

Theme 4: Brain Networks and Neuronal Communication

Common ground: a systems-level approach

Over 400 researchers

69 research groups

Monthly Donders meetings

ensure knowledge transfer and sharing of ideas among the people working on these themes





Unravelling memory

one system, not two

According to the classic neuropsychological view, working and long-term memory are independent systems. Professor Roy Kessels set out to challenge this assumption. For his work at the Donders Institute cross-linking fundamental research with clinical applications is crucial.

Roy Kessels is Professor of Neuropsychology and a Clinical Neuropsychologist at the Donders Institute for Brain, Cognition and Behaviour and the Radboud University Nijmegen Medical Centre. He's also affiliated with the Korsakoff Clinic of the Vincent van Gogh Institute for Psychiatry in Venray. In 2009, he received a Vidi grant from the Netherlands Organisation for Scientific Research (NWO), which he used to further investigate human memory, asking questions such as: How does memory formation work? How does memory fail in different groups of patients and what does the underlying pathology of these patients say about neural theories of memory?

How can research findings be deployed within the clinic?

"My Vidi project is about the interaction or integration of two systems: working memory and long-term memory," he explains. "The first is responsible for ongoing processing, such as remembering telephone numbers or engaging in a conversation. Long-term memory is for permanent storage of information. Working memory is mediated by the prefrontal parietal region of the brain and long-term memory by the medial temporal lobe, including the hippocampus. According to the classic neuropsychological view, these two memory systems are independent. I set out to challenge this assumption. We hypothesize that working memory and long-term

memory are not in fact independent systems."

Hippocampal activation

Kessels and his colleagues conducted several experiments to test their hypothesis. They used working memory tasks, such as remembering objects for a few seconds (for example, a face and a house, or a combination of an object and a location). "We had already observed hippocampal activation in the fMRI scanner when participants were performing working memory tasks. We posed two research questions: Does it matter which type of association you need to remember? And is hippocampal activation purely related to working memory, or is it a by-product of long-term encoding?"

Two different methods were used to investigate these questions: fMRI studies in the lab with healthy participants, and studies in the clinic with patients suffering from Mild Cognitive Impairment (MCI). "People with MCI have a greater chance of developing Alzheimer's dementia," Kessels says. "Around 50 to 60 percent of the MCI patients develop dementia. The degree of impairment predicts the likelihood of getting dementia. This is why we're developing tasks and paradigms that will make it possible to diagnose impairment in patients at an early stage."

Their experiments demonstrated that working memory and long-term memory are indeed not totally independent. "If there is permanent storage or encoding, participants should be able to remember these associations later, i.e. after about half an hour. We demonstrated that the associations that were remembered later were the pairs for which we found hippocampal activation during the working memory task. This shows that the two memory systems do not completely overlap, but are not independent either. I would argue that it's a different kind of processing, depending on the task that participants are asked to perform."

Specialized clinical tests

Current clinical tests that focus on working memory use rather crude methods, Kessels continues. "They get participants to remember 'digit spans' or just a few words. But the tasks people have to perform in daily life are much more complex, such as finding your way to the supermarket. I aim to be more precise in my methods and develop more specialized clinical tests. We want to unravel all of the memory processes, not just focus on a few. In the clinic you have to examine all of the patients' deficits, not just some of them. This is why we take other cognitive domains into account. What are the deficits and can they, for instance, also be explained by psychological factors such as mood or anxiety disorder?"

Time and again, reality turns out to be even more complex than expected. "We still know very little about the brain. There is plasticity, there are individual differences, and there's scaffolding – the fact that highly educated people seem more resilient to developing dementia than those with less education. This is due to all kinds of compensation strategies. Current memory theories are often based on very homogeneous samples, usually undergraduate twenty-year-olds, but we study all kinds of people both with and without deficits. Nowadays, we have more refined methodologies and ways of looking into the brain, such as high resolution imaging. But there's still a lot of work to do."

Sounds like it could last a lifetime ...

"Yes, and I still find it fascinating! I'm passionate about basic research as well as applications in the clinic. Converging evidence is always more convincing. Besides, unfortunately, there's a lot more pressure on grants for fundamental research compared to grants for applied research."

In February 2013, Roy Kessels will publish a protocol for professionals about optimizing care of Alzheimer's patients. This protocol is a follow-up to his book "(Op)nieuw geleerd, oud gedaan" (Learned afresh, learned again), which was published in 2011, about the learning abilities of patients with Alzheimer's disease, based on results from fundamental studies on memory in dementia patients. The book, which was written for caregivers, has been very well received. He also expects a warm welcome for the protocol. "I get a lot of phone calls from professionals asking when it will be published. They seem to be quite keen to get their hands on it."

Myrna Tinbergen

"We want to unravel all of the memory processes, not just focus on a few."



Donders Lecture: Dora Angelaki

***Optimal integration of sensory evidence:
Building blocks and canonical computations***

In the Donders Lecture series outstanding researchers in the field of brain and cognition present their work and ideas to an audience of scholars with a wide variety of backgrounds – from neuroscience to physics, psychology and linguistics. It's one of the ways the Donders Institute builds connections with the global scientific community.

A top researcher in the field of multi-sensory integration will give the Donders Lecture in March 2013.

"Dora Angelaki is one of the world's leading researchers on ways in which vestibular and visual signals are integrated and transformed into either perceptual decisions or commands for movement," says professor Pieter Medendorp. "The neural mechanisms of this integration are as yet unknown, but she's been making major breakthroughs, which are helping to unravel the mystery." Medendorp will host professor Angelaki when she gives the Donders Lecture in March next year.

Dora Angelaki, who is professor and chair of the Department of Neuroscience at the Baylor College of Medicine in Houston (Texas, USA), has a joint appointment with Rice University, also in Houston. She got her undergraduate degree in electrical engineering from the National Technical University in Athens (Greece), then her Master's degree and PhD in biomedical engineering from the University of Minnesota (USA). "Angelaki is unique in combining three approaches," says Medendorp. "She and her colleagues measure the activities of single neurons and networks of neurons in the brains of macaques, combining these experiments with advanced neurocomputational models. She has very recently started a third line of research in which she tries to

link the first two approaches to brain disorders that affect balance and movement, using genetically modified mice. In the lecture she will talk about all three approaches."

Pieter Medendorp knows Prof Angelaki from the time when he was doing his own PhD research. "The work she does and the work I do with my group overlaps to a certain extent and it's also complementary. We're interested in the same basic questions about optimal integration of information in the brain. But we (Medendorp's group) don't do measurements at the level of single cells. And, although we don't directly work together, we regularly meet at conferences, exchange ideas, and we exchange researchers. What's more, she has educated many researchers over the years with whom we now cooperate. We've just start to cooperate with one of Angelaki's former postdocs, who now works in Munich."

Prof Angelaki – a regular keynote speaker at neuroscience conferences – has received many honors and awards. In January 2012 she was awarded the Pradel Research Award in Neuroscience by the National Academy of Sciences for her discoveries. "She's a truly inspiring person," says Medendorp, "and she has enough energy for ten people. I'm really looking forward to hosting her next year."

Bennie Mols

Donders Lecture, 28 March: Dora Angelaki ***(Baylor College of Medicine, Houston)***

*Location: on the campus of Radboud University Nijmegen
in the Linnaeus Building, Heyendaalseweg 137,
starting at 16:00 on Thursday 28 March 2013.*

Meanwhile at www.ru.nl/donders

Visit our website to keep up to date on our news and events.

Language in interaction

An NWO Gravity grant worth €27.6 million has been awarded for the ambitious project Language in interaction, led by Peter Hagoort: 'Human language is the most powerful communication system that evolution has produced. It is the basis of culture and social life. It comes in many forms (> 6000 languages today). At the same time it is deeply rooted in the human brain. To understand this unique capacity in its full glory we need to investigate it from the levels of genes and brains to those of social interaction and linguistic structures. The Language in Interaction consortium does exactly that.'

Donders Discussions 2012 successful

The fifth edition of the Donders Discussions was held on 25 and 26 October. Around 170 young researchers from all over Europe attended this cognition and neuroscience conference, which was organized by PhD students at the Donders Institute. We'd like to thank all speakers and participants for making this a great conference and we're already looking forward to next year.

Successful Dutch-Australian collaboration in biological psychiatry

Tamas Kozicz of the Donders Institute has published his results on how "Ghrelin regulates the hypothalamic-pituitary-adrenal axis and restricts anxiety after acute stress" in the journal

Biological Psychiatry. This publication involves collaboration with an Australian group at Monash University.

Roshan Cools joins the board of the Rathenau Institute

Principal Investigator at the Donders Institute Roshan Cools has been appointed as a member of the board of the Rathenau Institute. This institute promotes political and public discussion on science and technology. Her duties at the institute started on 1 September this year and will continue for a period of four years.

Biomag 2012: Young Investigator Award goes to Floris de Lange

The award is granted for research excellence in the field of biomagnetism. Floris de Lange, a junior principal investigator at the Donders Institute and founder of the 'Prediction & Attention' group, received the award this year. His research focuses on perceptual decision making and how it is shaped by top-down factors such as expectation and attention.

Radboud Science Award for Pieter Medendorp

Pieter Medendorp was one of three researchers who were awarded a Radboud Science Award on 20 September 2012. This award is presented annually by the university's Wetenschapsknooppunt to encourage collaboration with primary schools,

in order to stimulate pupils' curiosity about science. The work will deliver teaching materials for primary schools based on Medendorp's research on perception and movement.

ERC grants for Karin Roelofs and Alan Sanfey

Karin Roelofs and Alan Sanfey were awarded a starting grant of €1,500,000 from the European Research Council for their upcoming projects. Karin Roelofs, a professor of Experimental Psychopathology at the Behavioural Science Institute and research fellow at the Donders Institute, will use the grant to investigate the role of basic defensive (freeze-fight-flight) responses in the development of social anxiety and aggression. Alan Sanfey, a cognitive neuroscientist at the Donders Institute and the Behavioural Science Institute, is using the grant to examine the impact of trust and fairness on decisions and the importance of social norms on decision-making behaviour.

Ig Nobel Prize for crooked Eiffel Tower

Tulio Guadalupe, who is connected to the Donders Institute and the Max Planck Institute, won this year's Ig Nobel Prize for Psychology. Together with his colleagues at Erasmus University Rotterdam, he researched the influence of balance on the estimation of numbers. Ig Nobel Prizes are awarded for improbable research that makes you laugh before it makes you think.

OUT OF OFFICE

Thanks for your message. I'm currently not in the office and unable to reply, because I'm out running.

What happens in and around a highly ambitious international research centre such as the Donders Institute after office hours? Besides doing more research (clearly, this doesn't all take place during office hours), employees at the Donders Institute also take part in totally different activities, resulting in some fascinating out-of-office replies...

Arthur Willemsen, administrative director of the Donders Institute, is one of the many runners at the Institute. He's currently coordinating the participation of four Donders teams (involving a total of around forty people) in the Zevenheuvelenloop, a well-known annual 15-kilometre run in the relatively hilly area around Nijmegen that attracts over 25,000 participants. This year the run took place on 18 November.

The Donders running club has been in existence for eight years. However, last year, it competed in the corporate section of the Zevenheuvelenloop for the first time. Completely unexpectedly, the 'Donders Institute 1' team finished eighteenth, a remarkable performance, considering the fact that 781 teams participated. 'That's when we thought: wow, we're pretty good!', Arthur says, laughing. This is why the team took the run a bit more seriously this year. 'We calculated that, with our best runners, we could end up in the top ten,' says Arthur, applying the analytical focus of Donders to this activity as well.

According to Arthur, the best part of the running club is that it represents the full breadth of the Institute: DCN, DCCN and DCC are all represented, making running a Donders-wide activity. For those interested, training takes place a couple of times a week at the end of the working day and it starts at the main entrance of Kapittelweg 29. A special mailing list is used to contact the runners. Apart from the Zevenheuvelenloop, more



runs are scheduled, including the Batavierenrace, the Veluwe-loop and the Carréloop (a 3200 m. run through the 1st floor of the Radboud University Nijmegen Medical Centre). 'Each run is organized by someone else, but I focus exclusively on the Zevenheuvelenloop,' Arthur explains.

Will the 'Donders Institute 1' team make it into the top ten? Arthur seems a little nervous, but can't be held responsible for the final result: unlike last year, he didn't qualify for the first team this time. Turns out he had no reason to be nervous: the Donders top team finished eighth. Making it to the top - a good Donders habit.

Check the performance of the Donders team at <http://www.zevenheuvelenloop.nl/>

Diary

18 January 2013, 15.30 **First Donders PhD Alumni Day- LUX Nijmegen**
28-30 January 2013 **Nijmegen Lectures- Radboud University Nijmegen, Aula, Comeniuslaan 2/MPI, Wundtlaan 1, Nijmegen**
28 March 2013 **Donders Lecture by Dora Angelaki (Baylor College of Medicine, Houston)** Radboud University Nijmegen, Linnaeus Building, Heyendaalseweg 137, Nijmegen
5 April 2013, 15.45 **Inaugural Lecture Gilles van Luitelaar** Radboud University Nijmegen, Aula, Comeniuslaan 2, Nijmegen
25 April 2013 **Donders lecture by Jeff Binder (Medical College of Wisconsin)** Radboud University Nijmegen, Linnaeus Building, Heyendaalseweg 137, Nijmegen

PhD defences

26 October 2012 - Linda Sterrenburg. The stress response of forebrain and midbrain regions: neuropeptides, sex-specificity and epigenetics. Promotors: Eric Roubos, Bernard Peeters
8 November 2012 - Martine van Schouwenburg. Fronto-striatal mechanisms of attentional control. Promotors: Roshan Cools, Jan Buitelaar
19 November 2012 - Wioleta Walentowska. Facing emotional faces. The nature of automaticity of facial emotion processing studied with ERPs. Promotors: Ton Coenen, Jan Kaiser
22 November 2012 - Bart van Nuenen. Cerebral reorganization in premotor parkinsonism. Promotors: Bas Bloem, Ivan Toni, Hartwig Siebner
6 December 2012 - Esther Meeuwissen. Cortical oscillatory activity during memory formation. Promotors: Peter Hagoort, Guillén Fernández
10 December 2012 - Pascal Brenders. Cross-Language Interactions in Beginning Second Language Learners. Promotors: Janet Van Hell, Ton Dijkstra
12 December 2012 - Rob Gons. Vascular risk factors in cerebral small vessel disease: a diffusion tensor imaging study. Promotor: Bas Bloem

21 december 2012 - Philip van Eindhoven. Structural and functional MRI in the early course of depression. Promotors: Jan Buitelaar, Guillén Fernández
14 February 2013 - Ellen Wingbermühle. Cognition and emotion in adults with Noonan syndrome: A neuropsychological perspective. Promotors: Jos Egger, Roy Kessels, Willem Verhoeven
7 maart 2013 - Arjan ter Horst. Modulating motor imagery, Contextual, spatial and kinaesthetic influences. Promotor: Bert Steenbergen
21 March 2013 - Marlieke van Kesteren. Schemas in the brain: Influences of prior knowledge on learning, memory, and education. Promotors: Guillén Fernández, Dirk Ruiters
17 April 2013 - Marloes Henckens. Imaging the stressed brain. Elucidating the time- and region-specific effects of stress hormones on brain function; a translational approach. Promotors: Guillén Fernández, Marianne Joëls, David Norris
24 April 2013 - Julian Jonathan Tramper. Feedforward and feedback mechanisms in sensory motor control. Promotor: Stan Gielen

Donders Institute Newsletter

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