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# Dynamics of the Healthy Brain

## > INTERVIEW WITH MONICQUE LORIST

BCN member Monicque Lorist, from the Department of Experimental Psychology, was recently made professor. Since 1995, when she obtained her PhD at the University of Amsterdam, Monicque Lorist has investigated mental fatigue and the effects of caffeine on information processing. In addition, she has become increasingly interested in healthy ageing, taste perception, and gender differences. Besides her diverse research projects, Monicque Lorist teaches several courses in Bachelor's and Master's programmes, is chair of the Master's Programme "Cognitive Psychology and Psychophysiology", and enjoys supervising students. In addition, Monicque Lorist has been the president of The Dutch Psychonomics Society since 2012. In this interview I had the chance to find out more about Monicque Lorist and her research projects.

### ***First of all, congratulations on being made professor! Does the new title come with great changes to your work?***

No, not really. I will continue conducting research, trying to get money for different projects, teaching courses, and supervising students.

### ***I heard that you currently supervise six PhD students, which is quite a lot. Do you enjoy supervising?***

Yes, it's really great. If you are working with bright students (and I do have bright students), then it's so much fun. It also helps you to develop yourself, because your students can teach you as well. For example, I am involved in MRI research, but in fact, the PhD students are doing the experiments and all the analyses and I discuss the experimental design and the results with them. If you would put me behind the MRI scanner, then I would not know which button to press. Of course I understand how the data are analyzed and I know how the processes work, but I don't know a lot about the actual programming; I just do not have enough time for

that. But if you have students who can focus on these issues, the progress in a group is enormous.

### ***Could you tell us more about your research on healthy ageing?***

More and more, healthy ageing is becoming the major topic of my research, and I have in fact four PhD students who focus on this topic. Right now I am trying to figure out a project focusing on more applied healthy ageing research. I am working together with people from other departments within the university, and we cooperate also with companies. We are trying to figure out how we can help people who age in a working environment.

### ***How do you think society can ultimately benefit from research on healthy ageing?***

When you look at healthy ageing or ageing in general, we only know a little bit about underlying processes in the brain. We don't know what actually is changing when people grow old. What we do see is that all kinds of companies start making games to re-train the brain. But what mental functions have to be trained

is unknown. Therefore, we need to find out which specific functions deteriorate when people age. For example, when we pay attention, we enhance the processing of relevant information in the brain. At the same time attention means that you suppress irrelevant information. When you figure out that it is this suppression of irrelevant information that declines with age, training elderly people to focus on relevant information would not help, because this aspect of attention still works. So if you know more about the underlying mechanisms, you can develop more appropriate training programmes. Also, you can develop serious gaming programs in which people learn how to suppress irrelevant information and not to be distracted. The more we know about the underlying mechanisms of age-related declines in information processing, the more efficiently we can help the elderly to function adequately in, for example, the work environment.

### ***An additional topic of your research is gender differences. Do you currently have projects on that topic?***

Yes, there is one project running which is based on the idea that depression is more frequent in women than in men. A reason for this might be that in normal life stressors have a different impact on men and women. Moreover, in women these effects might be influenced by the hormonal cycle, so that women are more vulnerable to stressors in specific phases of the menstrual cycle. This project was based on a collaboration with Gert ter Horst from the Neuroimaging Center, who has a long history of studying gender



## &gt;&gt; CONTINUATION OF THE INTERVIEW WITH MONICQUE LORIST

differences in animals. We started to write a project which turned out to be too big to involve both animals and humans. So they continued the animal research, and I initiated a more “psychology-based” study in humans.

***You are also conducting research on taste perception. Could you tell us more about this?***

Yes, this is a new project which is a collaboration between food companies and researchers from the Neuroimaging Center and the University of Wageningen. It is a large project, and its topic is “Sensory and liking of food products”. In this project we are especially interested in the relationship between ageing and food consumption. It has been suggested that taste perception changes with age, but we hardly know why, and the existing results are rather confusing. Some say that taste perception in general is declining, others say that it is only the salty taste that deteriorates and that the other tastes remain intact. However, these age-related changes might affect food consumption. We are currently conducting an fMRI experiment in which we give subjects substances with different concentrations of the four basic tastes (sweet, sour, bitter, and salty) while they are in an fMRI scanner. We hope to find which brain areas become active during tasting, and we hope to find out how taste changes with age. And of course we are interested in whether the relation between age and taste perception differs for males and females. We will hopefully then have the groundwork for doing additional research which focuses on why people actually like specific food products and dislike others.

***Since completing your PhD you have conducted research on mental fatigue and the effects of caffeine on performance. What fascinates you so much about these topics?***

I am fascinated with mental fatigue and caffeine because they both change behaviour and we don't

know how. What actually changes in a person's behaviour when they think they are mentally fatigued? Are some tasks impossible to perform? All people find it relatively easy to judge whether they are fatigued or not, but it is not easy to answer the question about what is going on when they are fatigued. To make it even more complicated: When someone is feeling fatigued, do they suffer from fatigue or sleepiness? Sleepiness is the result of a lack of sleep, but mental fatigue, in contrast, is caused by doing mental effort for a period of time. Then, to make it even more complicated, do you feel fatigued because you are bored? Some people report feeling fatigued which is actually caused by boredom. So there are a lot of issues that are not solved yet.

Similarly, caffeine is the most used stimulant in the world. But what does it actually do? People often say that they can't sleep because they had coffee just before they went to bed. But now we know that it is not the quality of sleep that is affected. It is mainly the time it takes to fall asleep, which is prolonged after drinking coffee. But when it is normally five minutes and it takes seven minutes, who bothers? No one. But if you are normally awake for an hour and it becomes one and a half hours, then it matters. Also, a lot of people drink tea before they go to bed. Tea seemingly does not affect sleep, but it actually should, because two cups of tea contain as much caffeine as one cup of coffee. Still, people do not report having sleeping problems after drinking tea. So apparently, it is not only the caffeine that makes people sleep less well. Also, part of the research on caffeine was done on older adults, and they report that when they drink coffee, they can relax. This is the opposite effect of what younger people report. So what happens in elderly people? When they were young, people were not supposed to sit and do nothing. You always had to do something. Be busy. Coffee, however, was an excuse to sit down and do nothing.

That means that elderly people might associate coffee and caffeine with relaxing. Young people, on the other hand, drink coffee to stimulate themselves. Also, people who drink de-caffeinated coffee show an elevation of heart rate and all kind of effects as if they were drinking normal coffee. It seems thus that part of the effect of caffeine occurs between the ears, in the form of, for example, conditioning. We are just starting to figure out these issues more and more. But we still have a lot to discover.

***What would you identify as the common factor or the main theme that runs through all of your research projects?***

My line of research explicitly aims at enhancing our understanding of the mechanisms underlying the variability in cognitive performance within and between individuals. It is important to understand how flexible we are in less optimal circumstances. If we know this, we will understand more fully how it is possible that we are still able to deal with cognitive task demands in difficult or demanding conditions.

It is important to realise that people differ. But what is often forgotten in research is that differences can not only be observed between individuals, but that an individual also shows impressive changes in cognitive performance in different situations. We study the effects of mental fatigue, caffeine, and ageing in order to discover what these changes are. I think that with the techniques developed so far, we have a lot of tools to answer questions regarding these issues.

■ BY SABINE SCHOLZ

■ PHOTO BY SABINE SCHOLZ



> *What we do see is that all kinds of companies start making games to re-train the brain. But what mental functions have to be trained is unknown.* <



# Pleasure Research

## > AN INTERVIEW WITH TINEKE OLDEHINKEL

**“Pleasure is Nature’s test, her sign of approval. When man is happy, he is in harmony with himself and his environment.” – Oscar Wilde**

Without a doubt, pleasure plays a fundamental role in our lives. But can you imagine how life would be if we lost the ability to feel pleasure one day? You might think, “Is there really someone who can’t experience pleasure?” The answer is YES. Such people suffer from an affection known as anhedonia. Professor Tineke Oldehinkel received a grant worth € 1,5 million this year for three research projects on anhedonia.

### ***Could you give us an introduction to your three projects on anhedonia? How do you define anhedonia?***

I define anhedonia as a decreased capability to experience pleasure. This could be caused by a lack of motivation to engage in pleasurable activities, an actual inability to like things, or both. Not being able to enjoy things is a dreadful experience for those who suffer from it, because it sets you apart from the surrounding world. This is particularly true for young people, because at that age having fun is considered to be more important than ever.

My VICI projects are meant to understand better what causes and sustains anhedonia, and to explore the potential of non-invasive ‘shock’ therapies to reboot a dysregulated reward system. The first project uses data from a large existing longitudinal study, TRAILS, to investigate factors implicated in the onset and course of anhedonia in adolescents and young adults. The second project involves a cross-sectional survey to explore losses in various domains of pleasure, such as physical, interpersonal, and esthetic pleasures, and how they are related to each other. We will also distinguish between

so-called consummatory (liking) and motivational (wanting) aspects of anhedonia. In the third project we will investigate the effects of tailor-made lifestyle advice, based on observed individual temporal patterns of lifestyle factors and experienced pleasure, as a non-pharmacological means to restore pleasure. In addition, we will test whether bungee jumping, an experience known to activate the dopamine system and to elicit strong emotions, can help to reboot the reward system and so foster the recommended lifestyle changes.

### ***What are the main techniques used to study anhedonia in your projects?***

In the first two projects, most interviews will be derived from questionnaires and interviews from TRAILS, complemented with additional measures such as DNA and various physiological parameters. Participants in the third project will be asked to register their mood, experiences, and activities twice a day, for a period of three months, before and after having received lifestyle advice. We have developed a smartphone application which makes this day-to-day data collection a lot easier than it used to be. We will also collect blood samples every month to measure platelet serotonin, dopamine,

## &gt;&gt; CONTINUATION OF THE INTERVIEW WITH TINEKE OLDEHINKEL

and metanephrine. As you can imagine, the statistical analysis of these data requires a range of techniques, most of which are fairly sophisticated, but I will not bore you with that.

**Many researchers focus on the positive symptoms, such as hallucinations and delusions. What draws your attention to the negative symptoms? And why are you especially interested in anhedonia, rather than any other negative symptom?**

My background and expertise is not in the domain of psychoses, but in affective disorders. Anhedonia is one of the two core symptoms of major depression, the other core symptom is depressed mood. In the depression domain we usually do not distinguish between positive and negative symptoms. We do distinguish between positive and negative affect. Depressed mood represents high negative affect, anhedonia low positive affect.

> Humans innately contrast extreme experiences: the removal of one emotion produces the opposite response. <

**As far as I know, Prof. André Aleman (Neuroimaging Center, UMCG) is also very interested in negative symptoms. Could you tell us about some similarities and differences between your project and his project? Or what do you think are the most unique things in your project?**

André Aleman's projects concerns apathy, which is conceptually closely linked to anhedonia. So, our research lines show definite overlap and I think his results are very relevant for me and vice versa, but there are also differences. To mention a few, André examines patients with schizophrenia, my studies are based on subgroups which are selected from normal population samples. His research heavily leans on neuroimaging techniques, while I am not primarily interested in brain correlates in my projects, but in causes, precursors, and consequences. So, we are both working on the same puzzle, but focus on different pieces.

**In your first project you plan to examine the factors which prompt and maintain anhedonia in young people. Are they healthy people or patients with mental disorders or both? Is anhedonia a continuum and therefore possible to also be present in healthy controls? If yes, how do you define the normal range of anhedonia?**

As mentioned, the first project is based on TRAILS, a longitudinal study of a normal population sample of adolescents. 'Normal population' does not necessarily mean 'healthy'. Our populations includes both healthy and disordered individuals. In fact, more than half of the TRAILS sample meets the criteria for a lifetime psychiatric disorder according to the DSM-IV, and thus had a mental disorder at least once. This is not surprising if you come to think about it; the same is true for somatic disorders. But the distinction between healthy and ill is an artificial one for common mental disorders, because the severity of the symptoms

indeed form a continuum and any threshold is arbitrary. Having said this, anhedonia is often seen in patients suffering from depression or schizophrenia, but it is an independent symptom that can also occur outside the context of these disorders. However, we don't know much about this, because it has almost always been investigated in clinical populations. That is one of the main reasons why I wanted to do this research, and why I use a normal population for my VICI projects.

**In your second project, there is an intriguing question: Is anhedonia really an inability to experience pleasure or more a lack of motivation to do fun things? This is important for understanding anhedonia and also for subsequent treatment. What are your ideas or expectations?**

Based on animal and neuroimaging studies, I think the two aspects have different neuroanatomical substrates. There is increasing evidence, for instance, that dopamine is primarily linked to motivational aspects of anhedonia and not directly to the experience of pleasure. But in practice they will often go hand in hand. This is conceivable not only because brain regions do not form isolated units, but also from a logical point of view: if you don't like or anticipate to like something, there is no need to want it. If the treatment of anhedonia involves stimulation of specific brain areas or medication that acts on specific circuitries, it is obviously important to know whether these areas are actually affected in that particular patient, otherwise the intervention is unlikely to be effective. Lifestyle interventions may have a more generic effect, but actually we don't know that yet. Another reason why I wanted to do this study!

>> CONTINUATION OF THE INTERVIEW WITH TINEKE OLDEHINKEL

**Concerning the treatment of anhedonia in your third project, you mention a potentially creative solution: instructing subjects to experience an intense activity, such as bungee jumping. Could you explain more about how the intense experience may help relieve anhedonia?**

Of course! Lifestyle changes are hard to achieve or maintain for anhedonic persons, because their symptoms deprive them of the drive to pursue rewarding activities. Because they are stuck in a spiral that is hard to break out of, mild interventions may not be effective, and an intense experience may be needed to kick-start the reward system and thus initiate behaviours that can help to regain pleasure. Bungee jumping could be such an experience. Bungee jumping is an acceptable and valid human model for intense acute stress, and provides strong boosts of dopamine. Using bungee jumps may seem like a wild guess that belongs in a pub rather than in science, but I think it could actually work.



> Bungee jumping can help to reboot the reward system and so foster the recommended lifestyle changes. <

The first reason for this is that thrills like bungee jumping provoke strong emotions, and trigger a substantial fight-flight response in virtually all individuals. Most people report intense fear both during the experience as well as in anticipation of it, followed by euphoria afterwards. This affective contrast could result from the fact that humans innately contrast extreme experiences, and that the removal of one emotion (in this case fear) produces the opposite response (relaxation and pleasure). Another explanation is that conquering one's fears boosts self-confidence, and so makes people feel more vibrant. Anyhow, these positive emotions seem a fine start to implement life style changes that promote more persistent positive feelings.

The second reason for using bungee jumps is that extreme experiences can shake up and reset the way individuals respond to their environment. It is hard to predict precisely how bungee jumping will act upon the drive to engage in pleasurable activities because many systems are triggered in parallel, but that is not unlike another intervention which has proven highly effective to improve mood and anhedonia in particular circumstances: electroconvulsive therapy.

A third and final reason that I'd like to mention is that free falls in mice have been found to act on dopamine neurons in the ventral tegmental area, known to be involved in reward-related motivation. Possibly, fear triggers motivation in order to increase chances to escape from the threatening situation. This link between fear and motivation not only provides an additional explanation, but also a biological pathway through which bungee jumping might induce a change in behaviour and emotions. So, the idea does not come completely out of the blue...

**How is the development of your anhedonia projects so far? Have you got any interesting findings?**

We haven't even started yet! It always takes a long time and lots of preparatory work before you can actually lift off with large projects like these. But the first researchers have been selected and will start in October, so I hope there will be more to tell in the not-so-distant future.

**It could be expected that anhedonia is likely to receive more and more interest. Do you have any advice or words you'd like to tell future researchers?**

No. I think researchers should be autonomous thinkers, and decide for themselves which research questions and techniques are interesting, relevant, and promising enough to deserve their time and effort. So, the only advice I could think of is: Don't embark on a topic because it is considered interesting or hot by others; walk your own way.

■ BY LIWEN ZHANG

■ PHOTO BY ADRIAAN HEINO

## BCN LUNCH 2#: Creativity in science

The BCN Lunch is turning into a regular event – and a popular one too! The staff of Brasserie Het Paleis were busy making place for everyone at the second BCN Lunch organized by the BCN PhD council. Around 40 PhD students took the opportunity to share a meal and listen to the two talks about creativity in science. The advice was to keep your eyes open, look for inspiration outside the lab, and keep both feet on the ground when it comes to the data. This may sound like a contradiction, but Simon Verhulst and Bert Otten nicely illustrated that creativity in science is all about paying attention to connections and details, both when you work and when you take a walk through Groningen.

### 'Most published research findings are false'

This was the provocative beginning of the talk given by Simon Verhulst, Professor of Behavioural Ecophysiology. He was not just talking about fabricating data like the infamous Dutch scientist Diederik Stapel did. There are also more subtle ways of creating false results. We may be tempted to do a bit of cherry-picking when reporting our data; for instance by showing the results that fit our story while ignoring those that go against it. Shaping the data by removing outliers, not visualizing the data, and too little statistical power were also mentioned as common pitfalls. Simon reminded us about the responsibilities we have as scientists: You may be creative, but numbers are not like clay we can shape and polish until we get the most beautiful results.

### Groningen through the lens of a scientist

Bert Otten, Professor of Neuromechanics and Prosthetics at the Center for Movement Sciences, observes the world around him, often with a scientific perspective. With a selection of his photographs, Bert illustrated how he sees principles of his own research in everyday life. Take for instance a series of pictures of a woman captured at the 4 Mile run in Groningen. 'Just looking at her ponytail, it nicely shows the accelerations of her head. The tail moves backward when she sets off and forward the moment she is landing. Motion tracking can be done without computers and special suits!' Keeping a curious scientific mindset can spark new ideas and insights. If you look carefully, mathematical patterns may show up in the folds of a skirt or in the reflections in your breakfast bowl.



>> CONTINUATION OF BCN LUNCH 2#: CREATIVITY IN SCIENCE



## Reading tips from the speakers

### Simon Verhulst

**Paper:** 'Why most published research findings are false' - JPA Ioannidis <http://www.plosmedicine.org/article/info:doi/10.1371/journal.pmed.0020124>

**Book:** 'The visual display of quantitative information' - Tufte [http://www.amazon.co.uk/The-Visual-Display-Quantitative-Information/dp/0961392142/ref=sr\\_1\\_1?ie=UTF8&qid=1370519135&sr=8-1&keywords=tufte+visual+display+of+quantitative+information](http://www.amazon.co.uk/The-Visual-Display-Quantitative-Information/dp/0961392142/ref=sr_1_1?ie=UTF8&qid=1370519135&sr=8-1&keywords=tufte+visual+display+of+quantitative+information)

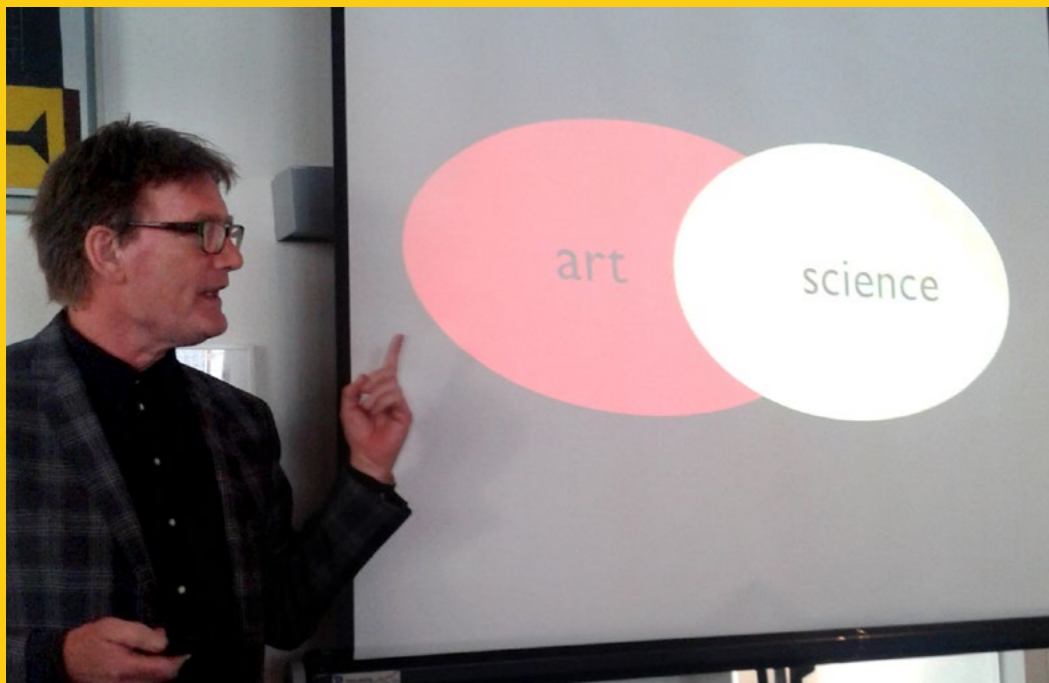
### Bert Otten

**Book:** 'Art, science & intuition' - Martin Kemp <http://www.amazon.com/Seen-Unseen-Intuition-Leonardo-Telescope/dp/0199295727>

**Book:** 'A universe of consciousness' - G.M. Edelman [http://books.google.nl/books?hl=en&lr=&id=SCntU3\\_BmtUC&oi=fnd&pg=PR1&dq=edelman+tononi+consciousness&ots=ZEAsrSTvgY&sig=6Mt1V6YfyqdluO1IRHIPwVy9Xb0](http://books.google.nl/books?hl=en&lr=&id=SCntU3_BmtUC&oi=fnd&pg=PR1&dq=edelman+tononi+consciousness&ots=ZEAsrSTvgY&sig=6Mt1V6YfyqdluO1IRHIPwVy9Xb0)

■ BY BARBARA NORDHJEM

■ PHOTOS BY AMARINS HEERINGA AND FUNDA YILDIRIM





## > BCN ALUMNUS COLUMN

# In search of happiness

In June 2006 I defended my thesis “Neuroimaging of visual field defects” on the topic of brain plasticity in glaucoma and macular degeneration. I wrote it under the direct supervision of Frans Cornelissen of the Department of Ophthalmology at UMCG and the NIC. Beautiful, fun, joyful, and fruity memories of those four years in Groningen are still popping up after seven years! I really had a great time!

A few days after our “promotie”, paranymp Sonja and I headed towards Japan. It was not only our (well-deserved) post-PhD trip, but I was going to be interviewed as well at the Laboratory of Brain Mapping at RIKEN since I had received a two-year post-doc JSPS grant. I ended up staying in Japan for three years. At RIKEN, I designed a high-resolution (4 Tesla) functional MRI experiment to map the brain areas related to motion and object perception in maximum detail. However, after one year, I felt I wanted my work to be less technical and more clinically oriented. I missed neuro-ophthalmology, working with patients, and my work being more dedicated to understanding pathologies. I decided to continue my research on glaucoma with Yoshida Sensei at the Jikei School of Medicine in central Tokyo. The two years spent working with Yoshida Sensei were very stimulating. We are actually still collaborating.

In Japan, I learned about harmony and humility as serene ways to be. The need to express one’s opinion at all times slowly stopped making sense. During that time, I deepened

my yoga and meditation studies and practice. After three years, the need to feed the non-scientist part of me had become very strong. After difficult arrangements, I left all behind and moved to the Himalayas. Happily, I had the chance to open the first yoga school in the Kingdom of Bhutan, a magical place.

I stayed in Bhutan for two years. During that period I did little neuroscience. I taught yoga at my school, at social centres, in touristic resorts, and even to the Royal Family. Bhutan is a small place and it is easy to get involved in projects. At the research level I was asked to find a way to better implement Gross National Happiness (GNH) – the political model of Bhutan. I am so glad I could make use of my research skills to contribute to a country’s happiness! In my free time I climbed thousands of Himalayan mountain ridges, always higher than one could imagine. This time in Bhutan was very special. I deeply connected with the culture, the way people think and behave. There was a sort of peace of mind all around. In the Land of the Thunder Dragon, people know that the appearance of things depends on the way one looks at them. The freedom that arises from the idea that all comes from our minds is a key factor in attaining happiness. Yes, it might sound straightforward, but to live according to this view is not so common in the West.

Even if I am half-French, half-Italian, was born in Barcelona, and have lived here and there throughout Europe, coming back after spending



> *It is so easy to fall into a routine in which we are no longer connected with the reason why we are doing what we do.* <

five years in Asia has not been easy. Aggressive and selfish behaviour are positively reinforced here. One might not be aware of it when living in the West, but coming back from a place where kindness and generosity are considered the highest forms of behaviour makes life here a bit confusing.

Back in Europe, it was difficult to find a position after my two-year break. I therefore enrolled in a Master’s programme in Humanistic Psychotherapy and kept on looking for a post-doc position in neuroscience... And finally found one!

Alongside my Master’s studies, I am currently working at the Department of Neurology at Klinikum Rechts der Isar, Technische Universität München. I am back in neuro-imaging, studying Multiple Sclerosis (MS). What attracts me the most after my journey is combining both of my worlds through investigating the effect of yoga on MS. I am also involved in a study on mindfulness in the brain. Munich is a great place.

Although I miss Bhutan and its magic, I am happy I landed here.

Life in science is nevertheless not easy either. Conditions are not always what they should be. I feel we are a bit in between everything, somehow forgotten, unclassified. One-year contracts are ridiculous. I just finished my master’s and, although it will be difficult to leave science, I am now ready to start working as a psychotherapist.

When I look back at the past seven years, I see that it is important not to lose perspective. It is so easy to fall into a routine in which we are no longer connected with the reason why we are doing what we do. I find it extremely important to know what we want and go for it with the awareness that we will always have an influence on the world.

■ BY JOYCE BOUCARD

■ PHOTO BY MARTIN PAVLOVSKY

# The science of movement

## > AN INTERVIEW WITH PROF. BERT OTTEN

In the Netherlands, summer is often referred to as “cucumberseason” (which means that few notable events happen). However, in terms of sports, the summer is a very interesting season. Cyclists race the Giro d’Italia and the Tour de France, tennis players play at Wimbledon, the hockey ladies and men just played the European Championship, and these are just a few main events. While we enjoy these events and get carried away with the euphoria and pain of the athletes, there is one man who looks at the athletes from another perspective. Namely, he sees them also as complex moving objects. This man is Bert Otten, Professor of Neuromechanics and Prosthetics at the Faculty of Human Movement Sciences, and he is one of the world leaders in the field of multi-joint dynamics. Given that he was recently interviewed by the New York Times and was a guest on “De wereld leert door”, it seemed about time that we also paid a visit to this interesting and enthusiastic man.

### Simulation of reality

Multi-joint dynamics is a challenging field, because the movements we make arise from the conjunction of multiple muscles, joints, and our brain. Prof. Otten designs models and develops software to simulate these movements, including situations of sports and rehabilitation. He has helped great Dutch athletes, such as Epke Zonderland, Ireen Wust, and Stef Clement, by modeling and analyzing their movements. Based on the information Prof. Otten provides, these athletes can make deliberate decisions about their training. Epke was even able to add a fourth flight element (he won an Olympic gold medal in the gymnastic horizontal bar discipline with the combination of three directly following flight elements, red.) to his exercise regimen after he talked to Prof. Otten. [Click here to see the exercise regimen.](#) In addition, after Prof. Otten advised Stef Clement which bike to ride during the time trial in the Giro d’Italia, Stef rode a time that only differed three hundredths of a second from the time predicted by the model. Prof. Otten admits that this last event certainly

is based on a bit of luck, but it also confirms that his experience and knowledge are largely tailored to his goal: theorizing and predicting movements as a result of a range of factors.

> *It may take some guts to predict your results that explicitly.* <

According to Prof. Otten, thinking of a reasonable theory and creating a model based on this theory is an important part of doing research. Unfortunately, it is not an integral part of science yet. In most of the current research projects, observations are done, results are analyzed statistically, and a conclusion is drawn. However, in this situation a lot of factors remain uncertain. Differences in results in multiple projects are



## &gt;&gt; CONTINUATION OF THE INTERVIEW WITH PROF. BERT OTTEN

attributed to differences in paradigms or individuals, but these attributions are not testable. This way a lot of space is left open for uncertainty, and strict predictions are hard to set. Prof. Otten stresses that a model, which is in fact nothing more than a mathematical-based, detailed theory, is a lot stricter than a theory per se. Your model's results have to resemble the results of your experiment, otherwise you have to rethink and adapt your theory. This demarcation of permissible variation in the results can be very clarifying, though it may take some guts to predict your results that explicitly.

> *Knowledge is power, certainly in the world of sports.* <

**Use those mirror neurons!**

Very enthusiastically, Prof. Otten discusses a project by one of his PhD students, Anne Benjaminse. This project was picked up by the New York Times even before the experiment was conducted properly. Otten and Benjaminse suggest that knee injuries might be prevented by appealing to our mirror neuron system and letting individuals learn unconsciously from their own movement patterns. While participants perform an exercise, they watch a short film of themselves performing that actual exercise. The short film shows the best trial of the exercise that is performed until then, thus where the combination of performance, speed, and knee load is best balanced. Based on the working of our mirror neurons, they state that we will adapt our movements only by looking at our own optimal movement. A large advantage of this method is that the learning process happens unconsciously. Therefore it is

likelier to be applied in a game situation where athletes do not have time to think consciously about the position of their knee. This idea might be a breakthrough in preventing and treating injuries.

In addition, this project also has potentially large implications for the world of training and coaching. Nowadays, coaching often consists of verbal communication between coach and athlete during training sessions. Following this theory and earlier research regarding the premotor cortex, these methods can be improved by changing the role of the coach to a critical observer during training sessions. The training can be discussed afterwards, with video fragments of the training. This would also resolve potential conflicts in the athletes' premotor cortex, because this brain area is involved in both processing coaching instructions, and in executing the movements at the same time. In fact, there are coaches who already apply this knowledge to their way of coaching. Knowledge is power, certainly in the world of sports.

**Internal feedback as indicator**

Though, as already said, movements in sports are only a part of the job. Prof. Otten is also involved in research related to rehabilitation. Recently, he has designed a prosthetic leg based on computer simulations. He explains that people who do not have a leg anymore are not able to properly balance on their prosthetic foot, because to do so properly, they need the information coming from the muscles of the lower leg. This newly designed prosthesis makes it possible for people to use the muscles in their hips to extract and use this information. At the time I spoke to Prof. Otten, the actual prosthesis was about to be delivered by the factory, so it is pretty exciting to find out whether it will work in real life; until now, it has only been tested by using computer simulations. Even though Prof. Otten

has immense experience and is fairly confident about the design, the model could be totally wrong.

At the end of our talk, Prof. Otten shows me some examples of his model interfaces. I can name practically any sport, and he has a related model. However, he emphasizes, measuring and calculating just because we are able to do so is not the best approach. In fact, for the athlete who wants to make a nice golf swing or for the lady with the new prosthetic leg, feeling the right movement is by far more important than absorbing all kinds of measurable facts. In terms of moving, our body has great learning capacity, which is based on our own feelings and feedback of what is the right movement at the right moment. So it seems that in the end, our body still is the best measurement device available.

■ BY CHARLOTTE WILLEMS

■ PHOTO BY ROB BISSELING

# Interview with Eddy van der Zee on his book: The vital brain

Last year, Eddy van der Zee published *Het vitale brein* (The vital/healthy brain) in an effort to make recent advances in studying the aging brain more accessible to the general public. He kindly provided a copy for me to read and took the time to answer my questions regarding the book and his work.

## ***What was your target audience? Who did you write this book for? Why in Dutch?***

In the summer of 2010, I received an email from an editor from the publisher Bert Bakker in Amsterdam, asking whether I was interested in writing a book on the topic of the ageing brain. She had read my article (written together with José van der Sman for the Elsevier magazine, entitled "Zo krijgt u een beter brein – hoe u tot op hoge leeftijd het beste uit uw hersenen kunt halen" – "This is how you get a better brain – how to make the best of your brain until old age") about the five stages of brain development from the baby brain to the ageing brain. The editor had been on the look out for someone to write such a book in Dutch for an audience such as NRC readers and beyond. Apparently everyone she had asked over the years decided not to take on the job. As I have been studying the (aging) brain and the way it works in learning and memory since the beginning of my Master's in Biology back in the 80's, I took the train to Amsterdam to discuss the matter. The final outcome of that meeting is the book "*Het Vitale Brein*" (The Vital Brain). The title was the result of a brain storming session of all editors of the publisher, as they thought my working title, "*Het Oudere Brain*" (the older brain), had a somewhat negative connotation. Indeed, nobody wants to have an old brain, although most of us want to get old.

One of the goals was not only to describe what the status is of the brain when you get older, but also to guide the reader a little bit through the underlying neurobiological mechanisms of brain ageing. Another prominent goal was to discuss what one could do to keep the older brain going. As I was in the middle of writing a textbook chapter on the ageing brain with some of my colleagues at the Department of Molecular Neurobiology, it seemed to be a good time to expand this chapter into a book. Moreover, we had plans to start a new bachelor course, named "the Neurobiology of Ageing" (which actually started in 2012), and for these reasons the time investment for the book came even more at the right moment.

In addition, it also gave me a great opportunity for public outreach. For me, it is important to explain to the public what our research means to society. My experience in giving public lectures is that the target audience is very eager to understand what is going on in their brain – especially the more educated elderly, as they often feel that ageing-related brain problems lurk around the corner. They are a great audience.



>> CONTINUATION OF THE INTERVIEW WITH EDDY VAN DER ZEE



> Given the whale, with a brain resembling ours, an age of over 200 should be doable. <



**Imagine that 20 years from now you are asked to update the book with all the new things we have learned in the meantime. What do you hope to be able to report on? Would it be knowledge of the kind that would change the message of the book?**

First of all, given the enormous amount of research currently done on the ageing brain worldwide, I think the book will need an update before 2032. It would be great to achieve a better understanding of the difference between adaptive and maladaptive changes in the brain. Not so long ago, all changes in the ageing

brain were considered maladaptive, and for that reason, pathological. Slowly, this view is changing. Many changes in the aging brain turn out to be adaptive in the sense that the brain changes in such a way that it remains functional. Interestingly, however, these adaptations come with a reduced capacity to acquire new information, but with a gain in utilizing previously stored information. Take for example the morphology of spines, the tiny postsynaptic elements of connections between neurons determining the synaptic strength and hence the strength of neuronal networks. A shift is taking place from plastic, small “learning” spines to stable, large “remembering” spines in the aging brain.

The message of the book is a rather straightforward one: the older brain isn’t a damaged brain with multiple flaws and severe loss of functions, but an adapted brain still capable of doing what it is meant to do: steering our behavior and making sense out of the chaos of stimuli that enter the brain via our senses. The difference between an older brain and a younger brain is that it is processing information differently in at least three brain regions: the dorsolateral prefrontal cortex, the hippocampus (e.g. the dentate gyrus/CA3) and the cerebellum (at the level of the Purkinje cells). In these regions, information processing is shifted towards intrinsic, already stored, data processing. As a consequence, people who are about 60 and older have a natural tendency to retrieve previously stored memories. This phenomenon is well known to (neuro)psychologists, but now we understand the underlying neurobiological mechanisms. And knowing these, we can start to selectively stimulate (or inhibit) these mechanisms, either pharmacologically or via interventions like exercise, mental training and specific foods. But besides these opportunities, it also helps to distinguish in a better way natural aging from pathological aging.

**To me it almost seemed as if the book had two parts: A part about the (molecular) neurobiology of the brain and the changes it undergoes during a lifetime, and a second part about the social and psychological effects of aging, mainly based on correlational/longitudinal studies. The first part sounded to me as if a decline in pretty much all neuronal functions and brain regions is to be expected as part of aging. Even in healthy aging. Is there a theoretical limit to how old our brains can get if we manage to keep the rest of the body working properly? That is, can we expect to extend our life expectancy much further?**

I think it is indeed the case that a certain decline in all parts of the brain is to be expected (but see the brain of the 115-year old Hendrikje van Andel-Schipper, with very few signs of structural decline). However, a striking observation is that this decline differs significantly from neuron to neuron, from blood vessel to blood vessel, etc. Some neurons stay healthy at old age, sitting next to neurons that do not. Which factors determine this fate? Can we determine this fate? Remarkably, even in such a devastating disease as Alzheimer’s disease, which destroys major parts of the brain in the last phase of the disease thereby resulting in severe dementia, even healthy neurons are present within areas strongly affected by the disease. At this moment, we don’t exactly know what the decisive factor for neuronal decline is.

Neurons can get old, far beyond the age of the oldest people, which is currently around 120 years. For example, the marine mollusk *Artica islandica* can reach an age of over 500 years old (including their simple brains, that is), and some bowhead whales and turtles with complex brains make it to well over 200 years of age. If neurons of these organisms can manage this, our neurons can potentially do the same. A neuron is

## &gt;&gt; CONTINUATION OF THE INTERVIEW WITH EDDY VAN DER ZEE

a neuron so to speak, although the neurobiological environment in which they have to survive differs strikingly between species. The problem with neurons functionally embedded in a neuronal network is that they cannot be replaced, in contrast to other cell types in the brain. On average, a neuron has 10,000 connections with other neurons. Re-establishing all these connections is a mission impossible for a new neuron. As such, for now it seems that the limit to how old our brains can get depends on how long we can keep individual neurons alive. Given the whale, with a brain resembling ours, an age of over 200 should be doable.

***In the later chapters of the book you emphasize that people should avoid chronic stress, remain involved in current affairs and their social lives, eat healthily, and remain physically active as long as possible to help the brain age healthily. This sounds like universal life advice: Is there a specific time in a person's life when such lifestyle optimizations are most/least effective?***

It is indeed somewhat of a universal advice for life. More and more, we understand the positive consequences of it at the brain level, and visa versa the negative consequences of it if you ignore the advice. The idea is that if you can show people how it works, rather than only that it works, it will encourage us to stick to this universal advice for life. Research has shown that one is never too old to start with this healthy life style. Given the earliest signs of declining brain function, which typically start to occur around the age of about 45-50, it may be wise to take the universal life advice more seriously if you arrive at this age. In the near future, however, it is very likely that more brain-specific advices will be available. Let's take physical activity. This is not always possible, for example, in the case of frail elderly. A new development may be vibration stimulation. We

recently discovered that the brain responds very well to brief periods of 30 Hz vibrations with low amplitude, both pre-clinically in mice and clinically in people ranging in age from 20 to 50+. It stimulates executive functions and attention. These are functions largely covered by the prefrontal cortex, one of the vulnerable brain regions during ageing. Vibration stimulation seems to be as effective as physical activity and suitable for any person as it does not put any burden on the body or mind. A future brain-specific advice could be to take a daily portion of 2 minutes of 30 Hz vibration.

***You point out that an older brain can actually have advantages over a younger brain. Especially when it comes to solving emotional conflicts and problems that require lots of factual knowledge and experience. Do you think this is primarily a structural advantage of the older brain or a function of the amount of experience that the brain can draw on?***

The morphological change in spines matches what people consider to be the cognitive life course as they get older: the older brain starts to work differently if it comes to learning and memory. It actually shifts from learning to memorizing. Memories can suddenly arise very vividly, even when some of these memories have not been retrieved (at least consciously) for decades. For me it is evident that it is the structural change in the older brain that causes the functional changes, rather than the amount of experience that the brain can draw on. Of course it is true that the effectiveness of this change depends on the past experience and the stored information available in the brain. But it is not just the consequence of this storage.

The challenge in the future is to combine the advantages of the young brain (fast acquisition of new information) with the advantages of the older brain

(remembering sometimes "lost" memories). Is it possible to change the older brain in such a way that it stays flexible in terms of learning new things without losing the advantage of memory recall? Or the other way around: can the younger brain be changed in such a way that it memorizes better without losing capacity to learn? For now let's start with the older brain: stimulating plasticity for learning without hampering the mechanisms for ageing-related recall would make a significant difference. Whether this is possible, however, remains to be seen, and requires a vast amount of additional brain research, both clinical and preclinical.

***What do you think is more likely: immortality in a biological body or in a virtual reality?***

There are (neuro)scientists fantasizing over immortality in a virtual reality, although most of them are critical about it. So am I, and the main reason is the amazing flexibility of the brain to form and adapt connections, changing the shape and number of our neural spines. Our brain is different every hour or so if it comes to connections. Some connections remain for a lifetime; others are there for just a couple of hours or even shorter. It is hard to imagine that this regulated plasticity can be mimicked by a binary code system. On the other hand, it is often just a reflection of the limitation of someone's imagination if one says that a certain scientific fantasy cannot be realized. But for now, I believe in better chances for immortality in a biological body than in virtual reality.

■ BY FLORIAN SENSE

■ PHOTO BY ANGÈLE ETOUNDI ESSAMBA

> A future brain-specific advice could be to take a daily portion of 2 minutes of 30 Hz vibration. <

# BCN Summer Symposium 2012-2013

**The BCN Research Master Summer Symposium was held at the end of the academic year to give first and second year students the opportunity to present their work. It was also a good opportunity to catch up with everyone you had not seen in six months. Hindered by a power cut, a fire alarm test, and a troublesome Skype connection, we had two interesting days.**

The symposium was a good mixture of the B, C, and N tracks at BCN. For example, we learned about the role of the protein lipocalin in Alzheimer's disease; how individuals respond differently to certain medicines and that within

a group not everyone responds the same; and the influence of small or big families on social behaviour in zebra finches. The first set of presentations was followed by poster presentations in small groups.

Keynote speaker Dr. Coretta van Leer-Buter, who works as a clinical virologist at the UMCG, taught us that there are eight different herpes viruses. Although they will not bother you most of the time, there is a good chance that you are a carrier of some of them. Prof. Jaap van der Meere gave a presentation on how cerebral palsy and ADHD could be approached in a more multifaceted manner. The last keynote speaker, Prof. Emeritus Jan van Hooff, spoke about his work on the chimpanzee colony at Burger's Zoo.

We were provided with more insight about their social relationships and reconciliation behaviour after fights.

At the end of the two days, awards were given for the best poster and the best presentation. And we all went home with a lot more knowledge, ready for the BCN-pizza dinner in town.

■ BY RENSKÉ BOSMAN

■ PHOTOS BY MICHIEL HOOIVELD





## > IN MEMORIAM

# Tim Maan

It was just a short message in the online Dutch media: On August 15th, a 20-year-old Dutch student died in a climbing accident during his holiday in Montenegro. A dramatic event that suddenly became personal when I heard that it involved a student that I had come to know just before the summer break. This psychology student, Tim Maan, was about to become pretty involved with BCN.

Two months ago, I was looking for a student assistant to work as an EEG lab manager at the Neuroimaging Center. Soon, Tim was suggested as the perfect candidate. Before the required forms were even completed, he had energetically cleaned the entire lab, to 'freshen things up'. In a single meeting with him, it became evidently clear that Tim was not only driven but also very intelligent and ambitious, with a genuine passion for science. He told me that he was really looking forward to beginning the BCN C-track Research Master in September. The first thing I did after coming back from holiday was to ask him to become a staff writer for the BCN Newsletter, which he happily agreed to.

Odd that one can already miss someone after only a single meeting and a couple of e-mails... On behalf of BCN and the Neuroimaging Center, lots of strength to Tim's family and friends.

Sander Martens – Editor-in-chief

Condolence registry: <http://timmaan.herdenkenwij.nl/>



# BCN Researchers, researched themselves

Science really is in the air at the BCN research school. While our students and scientists were busying themselves with analyzing the microscopic reality of psychiatric diseases, early predictors of neurodegenerative disease and the interpretation of animal behaviour, the PhD council decided to take brain research to the next level. Earlier this year, the researchers themselves were being studied (by means of a questionnaire), and their answers interpreted (in strict double-blind assessment), with the ultimate goal of glimpsing the human brain caught in the act of researching itself. Science full-circle! With a total of 105 responses, the tests indeed did go remarkably well. The BCN PhD Council is proud to present their results to all.

## Where are we located?

In total, 105 out of 199 BCN PhD students (53%) answered our questionnaire. There were considerable differences between faculties, with 71% of BCN PhD students located at the Faculty of Mathematics and Natural Sciences (FWN) responding to our questionnaire, while only 47% of those employed at the UMCG responded. The Faculties of Behavioural and Social Sciences (GMW) and Arts were both at 63%. Unfortunately, there were no respondents from the Faculty of Philosophy.

## What kind of contracts do we have?

17% of respondents carry out their research under a bursary contract, while a majority (65%) hold AIO contracts with employee status. 18% have other types of contracts. Included in this group are presumably medical graduate students combining their education with a PhD project (MD PhD). Also the so-called "sandwich AIO" may be included in the last category of other type researchers. Complete

certainty, however, could not be obtained due to privacy restrictions.

## How much supervision do we get?

PhD researchers were required to rate their satisfaction in regard to the supervision of their projects. On average, BCN PhD students claim to receive 1.6 hours of supervision per week. All faculties were more or less comparable on this aspect.. 71% of respondents are satisfied with the amount of supervision they receive. 19% believe they should receive more supervision.

## How do we rate the quality of our supervision?

PhD students were asked to specify their satisfaction with the quality of supervision. Most PhD students claim to be more or less satisfied with the quality of supervision they receive. 17% of respondents even rate the quality of supervision as perfect. 57% of respondent students rate the quality of supervision as good or generally good. Only 5% claim to be dissatisfied with the quality of supervision

they receive. There were no major differences between the faculties in the way PhD students rate the quality of their supervision. Remarkably, though perhaps not wholly unsurprisingly, there also appears to be a positive correlation between the reported amount of time received in supervision and the reported satisfaction regarding the quality of supervision. More appears to be better.

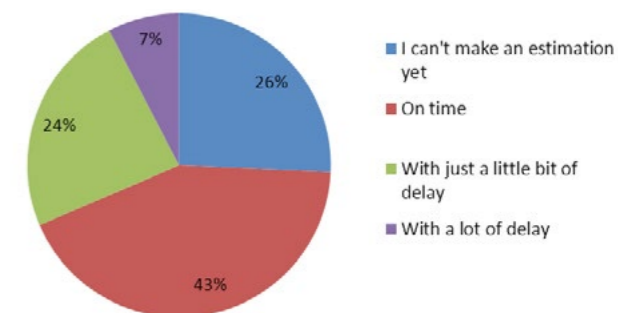
## Can we finish in time?

PhD students were asked whether they expect to finish their project on time. 43% of the respondents answer they do expect to finish within the time allotted, while another 24% expect to face only minor delay (less than 6 months). PhD students from the Faculties of Arts and Behavioural Sciences tended to be more positive about their chances of finishing on time than were PhD students from the UMCG and FWN (60% vs. 40%), who were more likely to expect a minor delay. Only 8% of the respondents expect to finish with a delay of more than 6 months, with no major differences between the faculties on this aspect.

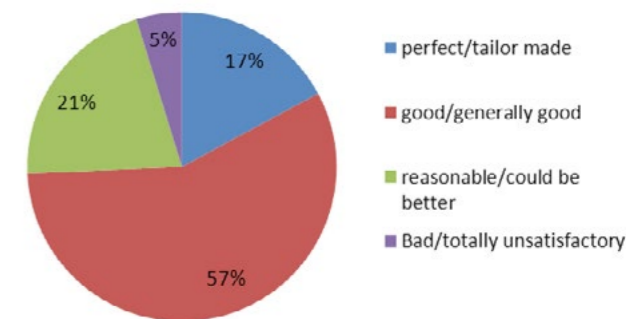
Earlier research, however, shows only 30% of BCN PhD students actually finish within six months of the planned date. This may point toward self-overestimation, although data finally settling this are only to be expected in a few years – or maybe a bit more time.

■ BY ERIN VAN BUEL

I think I will finish my PhD project...



Quality of supervision



> PHD AND OTHER NEWS

**BCN training programme registration form**

In July BCN normally sends a registration form for the training programme to all the BCN PhD students. On this form they can check the amount of ECTS credits that they have earned. This year BCN did not send these forms. In September all PhD students will get access to Hora Finita, the PhD registration programme of the RUG. In this programme, every PhD student will be able to check and add all courses and activities in which they have participated. BCN will no longer add educational activities, except for those courses and activities organized by BCN. More detailed information about Hora Finita will be sent as soon as it is available.

**BCN Orientation 2013: Starts September 6**

The Orientation Course for 2013 will start on September 6. The other course dates are September 20, October 4 and 18, and November 1 and 15, 2013.

If you would like to participate in the BCN Orientation Course, but you missed the first days of the course, please send an e-mail to [d.h.koopmans@umcg.nl](mailto:d.h.koopmans@umcg.nl)

**BCN Symposium 2013: November 7**

Although the discussion about the title of the BCN Symposium is still going on (should it be Brain Devices or Brain-Computer Interfaces or perhaps even a more fancy title), the themes for the afternoon sessions have been fixed: Multi-

electrode Arrays, Deep Brain Stimulation and Perceptual Implants. At this moment, two of the three keynote speakers have confirmed his participation: Jens Schouenborg, Lund University, Sweden and Maarten De Vos, University of Oldenburg, Germany. More up-to-date information can be found on the website.

**Agenda BCN Activities**

September 6, 2013  
 Start of the BCN Orientation Course

November 7, 2013  
 BCN Symposium:  
 Brain Devices/Brain-Computer Interfaces

March 13 & 14, 2014  
 BCN Retreat

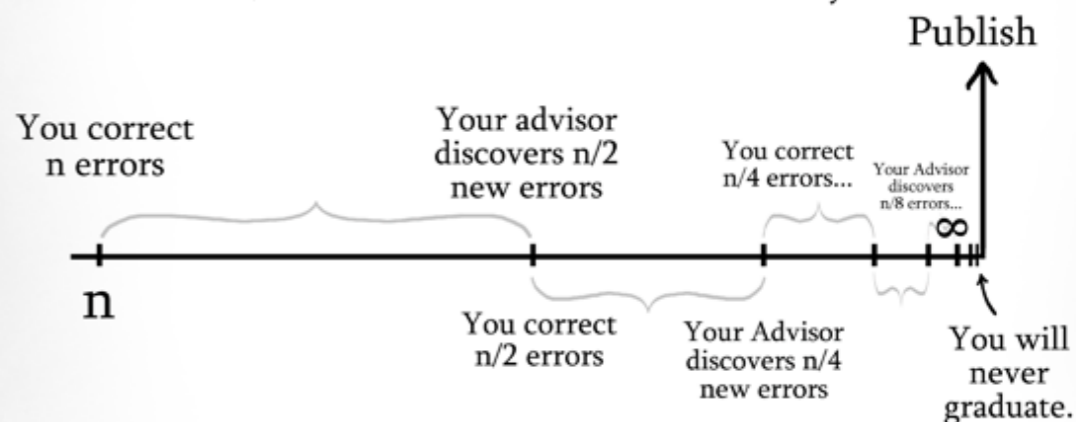
Check the website for detailed information!  
<http://www.rug.nl/research/behavioural-cognitive-neurosciences/>

■ BY DIANA KOOPMANS  
 D.H.KOOPMANS@UMCG.NL

A moment of Academic History  
**Zeno's Thesis' Paradox**

Around 465 BC, a young Zeno of Elea formulated this paradox in response to interactions with his advisor, Parmenides:

*"If for every n number of errors you correct on your thesis, your Professor discovers n/2 number of new errors, the number of revisions reaches infinity."*



Back then, they used real blood as ink.

JORGE CHAM © 2013

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## > MASTER STUDENT COLUMN

# Monkey Business

As a second year BCN master student from the B-track, I chose social behaviour in free-living vervet monkeys as the topic of my major project. Unfortunately these beautiful animals only live in Africa...

For five months my office was the South-African savanna, my home a farmhouse on a private game reserve without an address, only coordinates (S 28°00.327; E 031°12.348). Amongst my neighbors were elephants, warthogs, giraffes, leopards, zebras, three white rhinos, hippos, hyenas, jackals, giant porcupines, a great variety of antelopes, scary snakes, gorgeous insects, beautiful birds and other lovely little creatures. Six days a week we would get up in the dark, put on our dirty field clothes and hiking boots and set off before sunrise to run around the bush to look for the monkeys, trying to follow them the entire day and leave them at their sleeping sites at sunset. I have been back for over a month now, but whenever I see something exciting, I instinctively reach for my binoculars. When I see movement in a tree, I expect to see my lovely monkeys and when I hear an unexpected sound, I search for the nearest tree to jump in...

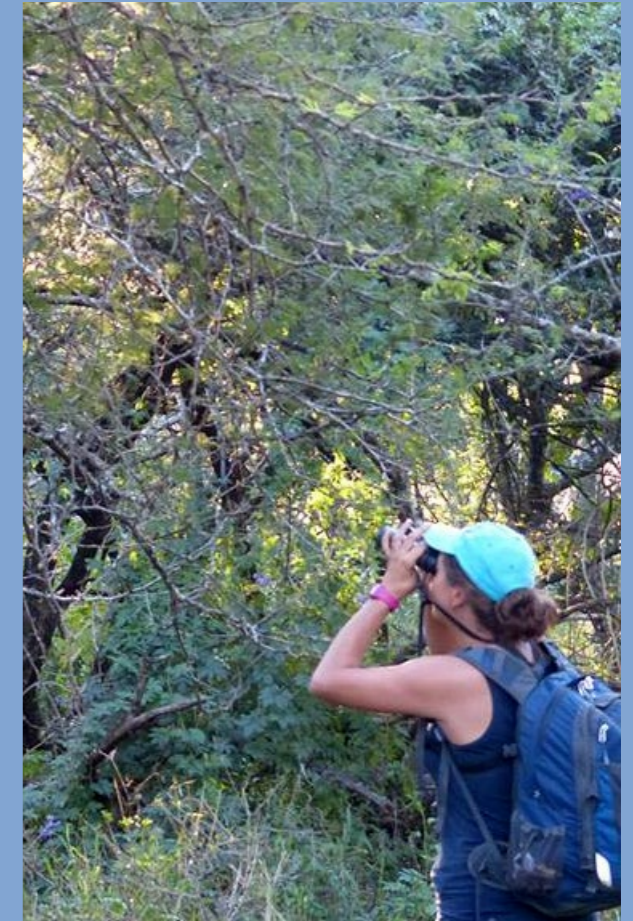
My project was part of the 'Inkawu Vervet Project', a research collaboration between the Universities of Zürich (Switzerland), Neuchatel (Switzerland) and St Andrews (Scotland), who are experimentally investigating the evolution

of social behaviour in vervet monkeys. In my project I focused on the monkeys' behavioural response to predator models. Vervet monkeys are an interesting species for predation studies because they produce acoustically different vocalizations that refer to predators with different hunting strategies. They respond differently and appropriately to specific alarm calls for ground predators, snakes, birds, and baboons. We recorded the behavioural response of a group of vervet monkeys to a moving snake model and a human crawling in a leopard suit. The responses were very intense and appropriate for the models presented. Unfortunately, free-living monkeys are not an ideal study species for a short-term project: they do not exactly behave the way you want them to. There were days where we set up the models again and again and the monkeys would simply not encounter them. There were even days in which we would not be able to find monkeys at all, and since my project was part of a collaboration, I had to spend time on the gathering of observational data and perform other experiments too. I was not able to collect enough data points to write an interesting thesis on these experiments. Therefore I am currently analyzing a database with natural predator encounters. I will focus on the question of how sex differences contribute to anti-predator behaviour, and how the intensity of the response relates to predator type and season. If everything goes well, I will go back to finish



the study with the predator models after I have finished the Master's programme.

Even though I had to adjust the focus of my project a little bit, I would not have wanted to miss this experience for the world! I have learned so much, not only about research, but also on the personal level. I have learned to carefully observe animal behaviour, to identify individual monkeys, I have slept under the most beautiful starry skies, ate hippo, set patches of bush on fire, hiked up beautiful mountains, and spent every day outside in close proximity to a great variety of wildlife. I got to know a fascinating



country with a lot of different ecosystems, beautiful nature, rich cultures, and a turbulent history that is still felt wherever you go and, I have met so many great and inspiring people from all over the world and enjoyed my work like never before! Therefore, I would like to advise current and future BCN master students to use the great opportunity you have in this challenging master to conduct your major project abroad!

■ BY LAURIEN TALENS

■ PHOTOS BY LAURIEN TALENS

## > ORATIONS

### Filosofie voor de wetenschappen

ORATIE

J.W. Romeijn

TITEL

Filosofie voor de wetenschappen

LEEROPDRACHT

Wetenschapsfilosofie

DATUM

2 juli 2013

In zijn oratie gaat prof.dr. Jan-Willem Romeijn in op de wetenschapsfilosofie. Een goed beeld van de vooronderstellingen van de wetenschappen is van groot belang voor het functioneren van die wetenschappen zelf, maar ook voor het op waarde schatten van wetenschappelijke resultaten bij het vormen van beleid, onderwijs, en zelfbeeld. Uiteindelijk raken die vooronderstellingen aan onze meest fundamentele overtuigingen. Wijsgerig onderzoek naar die vooronderstellingen kan beter niet gezien worden als een mooie maar enigszins marginale academische activiteit. Integendeel: het neemt in de academie een centrale plek in, stelt Romeijn.

De wetenschappen schotelen ons een beeld van de werkelijkheid voor, en vaak ook de middelen om die werkelijkheid te veranderen. De sociale, maatschappelijke, en soms ook persoonlijke impact van wetenschap is enorm. Maar wat zijn precies de aannames die daarbij gemaakt worden over wat werkelijk is? En hebben al die wetenschappelijke resultaten wel vaste grond

onder de voeten? De wetenschapsfilosofie geeft antwoord op zulke vragen.

In zijn oratie zal Romijn eerst enkele voorbeelden geven van hoe de wetenschapsfilosofie op die manier ten dienst kan staan van de wetenschap, en van hoe in de filosofie zelf over zulke zaken als werkelijkheid en vaste grond wordt gedacht. Daaruit zal blijken dat ook een andere interpretatie van de titel van de oratie van toepassing is: filosofie gaat in zekere zin aan de wetenschappen vooraf.

■ **EVELYN KUIPER-DRENTH, OP BASIS VAN PERSBERICHTEN VAN DE RIJKSUNIVERSITEIT GRONINGEN**

## > PROMOTIONS

### Glucose metabolic patterns in neurodegenerative brain diseases

PROMOVENDUS

L.K. Teune

PROEFSCHRIFT

Glucose metabolic patterns in neurodegenerative brain diseases

PROMOTORES

Prof.dr. K.L. Leenders

Prof.dr. R.A.J.O. Dierckx

CO-PROMOTOR

Dr. R.J. Renken

### Hersenziekten eerder diagnosticeren met FDG-PET scan

Neurodegeneratieve hersenziekten zijn hersenaandoeningen waarbij de zenuwcellen in bepaalde gebieden langzaam afsterven en verloren gaan. Bekende voorbeelden zijn de ziekte van Parkinson en de ziekte van Alzheimer. Patiënten met zulke hersenziekten hebben er belang bij dat er in een vroeg stadium een juiste diagnose gesteld wordt. Maar in de klinische praktijk is het lastig een onderscheid te maken tussen de verschillende vormen van parkinsonisme en/of dementie, omdat de symptomen in het begin op elkaar kunnen lijken. Laura Teune deed onderzoek naar vroege, onderlinge verschillen.

Teune onderzocht hoe het gebruik van FDG-PET scans (PET-scans waarvoor de patiënt radioactieve glucose, toegediend krijgt) het glucosemetabolisme in de hersenen in beeld

kan brengen. Zij ontdekte dat verschillende ziektebeelden verschillende ziekte-specifieke patronen laten zien. Deze reflecteren de onderliggende pathologische veranderingen van de aangedane hersengebieden.



■ PHOTO BY FACILITAIRBEDRIJF GRAFIMEDIA

## &gt;&gt; CONTINUATION PROMOTIONS

De promovenda stelt dat met behulp van een wiskundige rekentechniek berekend kan worden hoezeer het hersenpatroon van een patiënt overeenkomt met het groeps patroon van een bepaalde ziekte. Daardoor kan er eerder een juiste diagnose worden gesteld. Mede door dit onderzoek wordt het nut van FDG-PET scans steeds bekender en worden zulke scans vaker ingezet bij patiënten met een moeilijk te diagnosticeren vorm van parkinsonisme of dementie.

**Laura Teune** (Amersfoort, 1981) studeerde geneeskunde aan de Rijksuniversiteit Groningen. Ze voerde haar onderzoek uit bij de afdeling Neurologie van het Universitair Medisch Centrum Groningen, in nauwe samenwerking met de afdeling Nucleaire geneeskunde en moleculaire beeldvorming, het Neuroimaging Center, en de afdeling Wetenschappelijke Visualisatie en Computergrafiek van de Rijksuniversiteit Groningen. Het onderzoek viel binnen de onderzoeksschool Behavioral and Cognitive Neurosciences (BCN) van het UMCG en werd gefinancierd door het Internationaal Parkinson Fonds. Teune is in opleiding tot neuroloog. Zij promoveerde op 8 mei 2013.

## Development of moderately preterm-born children

P R O M O V E N D U S

J.M. Kerstjens

P R O E F S C H R I F T

Development of moderately preterm-born children

P R O M O T O R E S

Prof.dr. A.F. Bos

Prof.dr. S.A. Reijneveld

C O - P R O M O T O R

Dr. A.F. de Winter

Kinderen die 4 tot 8 weken te vroeg worden geboren, hebben meer kans op ontwikkelingsproblemen dan eerder werd gedacht. Dit blijkt uit de Pinkeltje-studie die UMCG-kinderarts en neonatoloog Jorien Kerstjens heeft opgezet. "Zo'n 7% van alle kinderen in Nederland wordt te vroeg geboren en het overgrote deel daarvan (70-85%) valt in deze groep," vertelt Kerstjens. "Het is een 'vergeten' groep die helemaal geen extra ontwikkelings-follow-up krijgt binnen de kindergeneeskunde, in tegenstelling tot kinderen die meer dan acht weken te vroeg worden geboren, de 'echte' prematuren." Kerstjens pleit voor meer bewustwording van het risico op ontwikkelingsproblemen bij matig te vroeg geboren kinderen omdat juist in deze laatste fase van de zwangerschap nog zo'n 35% van de hersenontwikkeling plaatsvindt.

Kerstjens vergeleek de ontwikkeling van matig te vroeg geboren kinderen met die van op tijd geboren kinderen en ernstig-vroeggeborenen (minder dan 32 weken

zwangerschap). Op vierjarige leeftijd vond zij bij 8,3% van de matig te vroeg geboren kinderen ontwikkelingsproblemen, twee keer zoveel als bij op-tijd geboren kinderen. Bij ernstig-vroeggeborenen kwam dit voor bij 14,9% van de kinderen. Op zevenjarige leeftijd scoorden de matig te vroeg geboren kinderen in vergelijking met op-tijd geboren kinderen minder goed qua IQ, ontwikkeling van visueel-ruimtelijke vaardigheden zoals puzzels leggen, aandacht, en selectief kunnen focussen op wat belangrijk is. "Lang werd gedacht dat het altijd wel goed zou komen met de ontwikkeling van matig te vroeg geboren kinderen, maar mijn onderzoek laat zien dat er bij een deel van deze kinderen wel degelijk sprake is van een langdurige ontwikkelingsachterstand", aldus Kerstjens.

Hoe eerder de kinderen worden geboren, hoe groter het risico op ontwikkelingsproblemen is, stelde Kerstjens vast. "We denken dat het komt doordat de hersenen van het kind zich in belangrijke mate in het laatste trimester van de zwangerschap ontwikkelen. Een te vroeg geboren kind heeft vaak al meer problemen gehad die samenhangen met de moederkoek, komt na de geboorte in een couveuse, krijgt andere voeding en heel veel prikkels die bij het uitdragen van de zwangerschap niet waren opgetreden. Daardoor ontwikkelen de hersenen zich anders dan kinderen die voldragen zijn." Kerstjens vindt dat er meer aandacht moet komen voor deze risico's bij de besluitvorming om een kind eerder geboren te laten worden.

Een aantal bekende factoren vergroot zowel het risico op vroeggeboorte als ook op ontwikkelingsachterstand na matige



■ PHOTO BY J. BOUMA

vroeggeboorte. Kerstjens noemt roken tijdens de zwangerschap en overgewicht van de moeder. "Ook meerlingen worden vaker te vroeg geboren. Het gebruik van zwangerschapstechnieken zoals IVF bij verminderde vruchtbaarheid leidt vaak tot meerlingen. Indirect is mijn onderzoek een pleidooi voor vrouwen om op tijd kinderen te krijgen," stelt Kerstjens.

Volgens Kerstjens steken we nu veel energie in de begeleiding van kinderen die meer dan acht weken te vroeg worden geboren. "Dat blijft belangrijk, maar we zouden ook meer moeten doen voor de matig te vroeg geboren kinderen. Het maatschappelijk belang om die groep beter te controleren en te begeleiden is heel groot, in feite veel groter dan voor de veel te vroeg geboren kinderen." In absolute zin zijn er in Nederland op de leeftijd van 4 jaar minstens

## &gt;&gt; CONTINUATION PROMOTIONS

twee keer zoveel matig te vroeg geboren kinderen als veel te vroeg geboren kinderen met een ontwikkelingsachterstand. Kerstjens denkt dat meer begeleiding in de eerste vier jaar deze kinderen betere kansen in hun leven kan geven. Wereldwijd ziet Kerstjens ook meer aandacht komen voor matig te vroeg geboren.

**Jorien Kerstjens** (Zwijndrecht, 1962) studeerde Geneeskunde aan de Rijksuniversiteit Groningen. Zij volgde de opleidingen tot kinderarts, werkte 10 jaar als algemeen kinderarts, en volgde daarna alsnog de opleiding neonatologie in het Beatrix Kinderziekenhuis UMCG in Groningen en de Isala Klinieken in Zwolle. Deze unieke combinatie maakte dat zij geïnteresseerd raakte in de ontwikkeling van matig te vroeg geboren kinderen en de Pinkeltje-studie opzette. Hierin worden verschillende aspecten van de ontwikkeling van matig te vroeg geboren kinderen onderzocht. De Pinkeltje wordt gefinancierd door het Beatrix Kinderziekenhuis UMCG, de Cornelia-Stichting, het A. Bulk Jeugdgezondheidszorg Onderzoeksfonds, de Hersenstichting Nederland, FrieslandCampina, Friso Nederland, Abbott en Pfizer Europe. Zij promoveerde op 13 mei 2013.

### Technical skills, the key to success? A study on talent development and selection of youth soccer players

P R O M O V E N D U S

B.C.H. Huijgen

P R O E F S C H R I F T

Technical skills, the key to success? A study on talent development and selection of youth soccer players

P R O M O T O R

Prof.dr. C. Visscher

C O - P R O M O T O R

Dr. M.T. Elferink-Gemser

Het proefschrift geeft inzicht in het proces van talentontwikkeling van getalenteerde jeugdvoetballers. De hoofdvraag luidt: wat zijn de verschillen tussen getalenteerde spelers die uiteindelijk profvoetballer worden en spelers die amateurvoetballer worden? Aangezien technische vaardigheden van wezenlijk belang zijn in het voetbal, lag de nadruk op de ontwikkeling van onder meer dribbelen en passen. Meer dan 500 getalenteerde spelers (10–21 jaar) zijn gemonitord terwijl ze op het hoogste niveau binnen hun leeftijdscategorie speelden. De getalenteerde spelers verbeteren het dribbelen nog na hun groeispuurt, dit in tegenstelling tot het sprinten wat na de groeispuurt een plateau bereikt. Van deze getalenteerde spelers beschikken de spelers die later een profcontract tekenen gemiddeld op hun 14de al over betere dribbelvaardigheden dan de latere amateurs terwijl ze allemaal deel uitmaakten van dezelfde jeugdopleiding. Alle voetballers uit de jeugdopleiding zijn heel snel bij de uitvoering van technische vaardigheden,



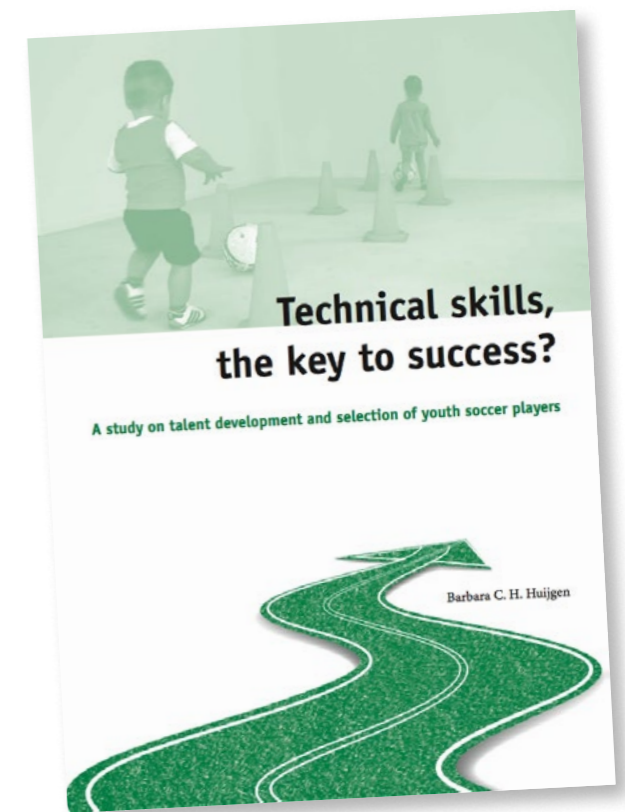
■ PHOTO BY BERT OTTEN

maar degenen die langer in de opleiding mogen blijven en daarmee meer kans maken om profvoetballer te worden, maken op hoge snelheid minder fouten dan de 'afvallers'.

Aan jeugdopleidingen wordt aanbevolen om de jeugdspelers periodiek te testen. De prestaties en de ontwikkeling van een jeugdspeler kunnen vervolgens vergeleken worden met de gewenste curves. Met deze informatie kan worden bepaald of een speler onder gemiddeld presteert en daarvoor specifieke training nodig

heeft om bepaalde aspecten te verbeteren. De spelers die op de goede lijn zitten op weg naar de top, zouden de opleiding moet voortzetten, omdat zij de meeste kans maken om uiteindelijk profvoetballer te worden.

**Barbara Huijgen** (1980) promoveerde op 29 mei 2013.



## &gt;&gt; CONTINUATION PROMOTIONS

### Development of aggression and impulsivity: modulation by adolescent social stress?

P R O M O V E N D U S

C.M. Coppens

P R O E F S C H R I F T

Development of aggression and impulsivity: modulation by adolescent social stress?

P R O M O T O R

Prof.dr. J.M. Koolhaas

C O - P R O M O T O R

Dr. S.F. de Boer

### Sociale stress kan de ene adolescent beschadigen en de ander juist weerbaarder maken

Negatieve ervaringen in de vroege jeugd zijn van invloed op de ontwikkeling van psychopathologie later in het leven. Het onderzoek richtte zich daarbij tot nu toe vooral op de ontwikkeling van depressie en angststoornissen. Caroline Coppens onderzocht de invloed van sociale stress in de jeugd op antisociale persoonlijkheidsstoornissen en excessief agressief gedrag bij de rat.

Attentieproblemen en impulsiviteit zijn persoonlijkheidseigenschappen die bijdragen aan de overgang van agressie in geweld. Deze eigenschappen zijn gerelateerd aan een slecht functionerende prefrontale cortex. De prefrontale cortex ondergaat tijdens de adolescentie grote veranderingen. Verstoring van deze ontwikkeling door blootstelling aan sociale stress zou een sleutelrol kunnen spelen in de ontwikkeling van gewelddadig gedrag.

Het doel van Coppens onderzoek was om bij de rat de interactie tussen persoonlijkheid en sociale omgeving tijdens de adolescentie op het volwassen sociale gedrag te bestuderen. Haar studies tonen aan dat sociaal verlies bij een adolescent leidt tot neurobiologische veranderingen in de prefrontale cortex en tot een verstoring van de ontwikkeling van agressief en impulsief gedrag. Impulsiviteit blijkt tevens een belangrijke factor te zijn bij het ontstaan van geweld.

De studies van Coppens ondersteunen de hypothese dat sociale stress in de adolescentie fase sommige individuen vatbaarder maakt voor het ontwikkelen van psychopathologie.

Daarnaast blijkt echter dat andere individuen het juist beter doen onder stressvolle condities na een eerdere ervaring met sociale stress. Het is daarom van belang om niet alleen naar psychopathologie als gevolg van stress te kijken, maar ook naar de vraag welke individuen juist weerbaarder worden en onder welke omstandigheden dit het geval is.

**Caroline Coppens** (1984) studeerde medische biologie aan de RUG, waar ze haar promotieonderzoek uitvoerde bij de afdeling Gedragsfysiologie, onderzoeksschool BCN. Het maakt deel uit van het Eurostress programma van ESF en werd gefinancierd door NWO/Eurostress. Zij promoveerde op 3 juni 2013.



■ PHOTO BY MARIA REDDER-SCHENK

### Modulation of microglial activity

P R O M O V E N D U S

V. Kannan

P R O E F S C H R I F T

Modulation of microglial activity

P R O M O T O R

Prof.dr. H.W.G.M. Boddeke

C O - P R O M O T O R

Dr. B.J.L. Eggen

### Mogelijk belangrijk doelwit geïdentificeerd voor reguleren ontstekingsreactie in zenuwstelsel

Histone deacetylases (HDAC's), een groep enzymen die histones (proteïnes die DNA verpakken en reguleren) in staat stellen om hun werk te doen, zijn mogelijk een belangrijk doelwit in het stopzetten van ontstekingsreacties in het centrale zenuwstelsel. Dat concludeert Vishun Kannan in een onderzoek naar microglia, de opruimers van dode of beschadigde lichaamseigen cellen in het centrale zenuwstelsel.

Microglia vormen het immuunsysteem van het centrale zenuwstelsel. Ze kunnen een ontstekingsreactie beginnen, ondersteunen zenuwcellen en ruimen dode cellen op. Bij diverse neurologische aandoeningen, maar ook bij gewone veroudering, verloopt dit proces niet goed. Microglia kunnen dan overactief raken met een voortdurende ontsteking tot gevolg. Kannan onderzocht hoe deze ontstekingsreactie kan worden gereguleerd.

Hij concludeert dat HDAC's in dat proces een belangrijk doelwit kunnen zijn. De promovendus

## &gt;&gt; CONTINUATION PROMOTIONS

komt tot die conclusie op basis van onderzoek in microglia-cellen. Kannan stelt vast dat wanneer de activiteit van HDAC wordt afgeremd, de ontstekingsactiviteit van de microglia dan ook wordt afgeremd. Daarnaast blijkt dat de ondersteuning van zenuwcellen door microglia ook gereguleerd wordt door remmers van HDAC-eiwitten.

**Vishnu Kannan** (India, 1981) studeerde Biotechnologie aan de universiteit van Kerala, India, en behaalde zijn Master in kanker-, cel- en moleculaire biologie aan de Universiteit van Leicester, Engeland. Hij verrichtte zijn onderzoek bij de afdeling Neurowetenschappen, sectie Medische Fysiologie, van het Universitair Medisch Centrum Groningen (UMCG). Kannan maakte deel uit van het onderzoeksinstituut Behavioral and Cognitive Neurosciences (BCN). Hij promoveerde op 1 juli 2013.

### Tracking referents. Markedness, world knowledge, and pronoun resolution

P R O M O V E N D U S

R.C. Taylor

P R O E F S C H R I F T

Tracking referents. Markedness, world knowledge, and pronoun resolution

P R O M O T O R

Prof.dr. G. Redeker

C O - P R O M O T O R E S

Dr. J.C.J. Hoeks

Dr. L.A. Stowe

### Alle informatiebronnen parallel gebruikt bij begrijpen anaforen

Ryan Taylor onderzoekt het verwerken van anaforen (persoonlijke voornaamwoorden zoals 'hij' en 'zij'), in het bijzonder de invloed van gemarkeerdheid van de anaforische uitdrukking (in termen van prosodische en/of morfologische kenmerken) en plausibiliteit van het antecedent (gebaseerd op wereldkennis). Een van de belangrijkste vragen in dit soort onderzoek is hoe de menselijke taalverwerker verschillende bronnen van informatie combineert bij het begrijpen van taal. Dit heeft Taylor onderzocht met behulp van uiteenlopende psycholinguïstische methoden en paradigma's, zoals leestijdregistratie, off-line keuzetaken, en ERP (Event Related brain Potentials) registratie.

De resultaten laten zien dat bij het begrijpen van persoonlijke voornaamwoorden alle informatiebronnen parallel gebruikt worden. Het werd echter ook duidelijk dat de taak die

de proefpersoon tijdens het lezen moest uitvoeren van groot belang is voor de effectsterkte.

Bij de keuze welke referent door het voornaamwoord aangeduid wordt, wogen gemarkeerdheid en wereldkennis duidelijk zwaarder dan 'order-of-mention' of syntactische informatie. Wereldkennis was bij uitstek een bepalende factor bij de keuze tussen de twee mogelijke referenten.



■ PHOTO BY MAURICE TAYLOR

De neurale processen die aan het begrijpen van voornaamwoorden ten grondslag liggen zijn ook onderzocht, waarbij met name gekeken werd naar de interactie tussen gemarkeerdheid en wereldkennis. Zowel accentuering als wereldkennis hadden effect op de amplitude van de 'P600', een positieve verschuiving in het ERP signaal. Accentuering van een voornaamwoord met een onverwachte referent leidde tot een kleinere P600, wellicht doordat de interpretatiemoeilijkheid vermindert door het beklemtonen van het verrassende element.

**Ryan Taylor** (Edmonton, 1983) studeerde Clinical Linguistics aan de Rijksuniversiteit Groningen. Hij verrichtte zijn onderzoek aan de Faculteit der Letteren van de Rijksuniversiteit Groningen (RUG). Hij promoveerde op 4 juli 2013.

■ EVELYN KUIPER-DRENTH, OP BASIS VAN PERSBERICHTEN VAN DE RIJKSUNIVERSITEIT GRONINGEN



## > ONE CAN ALSO LEARN FROM “STELLINGEN”

*“Geluk is het enige wat zich verdubbelt als men het deelt.” - Albert Schweitzer*

> Barbara Huijgen

*“Life isn’t about waiting for the storm to pass. It’s about learning to dance in the rain.” - Vivian Greene*

> Jorien Kerstjens

*“Inspanning is belangrijk voor ontspanning, maar ontspanning is belangrijker voor inspanning.”*

> Caroline Coppens

*Personal experience indicates that spending a lot of time thinking about ambiguity does not make one better at avoiding it in speech.*

> Ryan Taylor

## > COLOPHON

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Sander Martens

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