Content

The Journal of Neuroscience and Cognition offers authors the possibility to additionally publish their contribution online on our website. However, since the authors have to agree with online publishing and also need to sign a corresponding agreement form, not all of the content is available online. As the majority of the research articles and review articles contain results not (yet) published in official acknowledged journals, this content is only distributed amongst those associated with the Master Programme. In this document you can find the available content for this issue.

Preface

Dear reader,

Before you lies the 2nd issue of volume 10 of the Journal of Neuroscience and Cognition. What I appreciate so much about the journal is that each issue is a product of N&C students and no one else. What is special about this issue is that not only the content, but also the cover exists because of you.

For this issue, the Board came up with an interesting theme that we can probably all relate to: Brainstorm. When interpreting this theme, something sprung to my mind that I would like to share with you. Big companies like Google have special policies for their developers which allows them to spend time on unscheduled tasks. Employees can do what they like and come up with new, creative, and crazy ideas. Gmail is for example the result of a project that was kick started from Google's 20% policy. I am not saying we should adopt these strategies in academia as well. However, I would like to stress that taking the time to brainstorm can be important and result in new and exciting ideas and insights. Many of you have experienced academia during your internships, and you might have noticed that schedules fill up at high speed, and that the workload is generally quite high. What I would like to advise you is that sometimes it is ok to schedule a couple of hours that you can spend on thinking about new ideas, discussing new ideas with others, or working on new designs or methods, not because this is on your to-do list, but because it is fun and you like it. Creativity is key in science, and sometimes creative ideas need some time to surface, take that time.

Anouk Keizer
Senior advisor Journal of Neuroscience and Cognition

Editorial

As scientists (in training), we are often required to be structured and methodological, yet creative. Creativity is defined as the act of turning imaginative ideas into reality. It is characterised by the ability to find hidden patterns and to make non-obvious connections. Intrigued by this idea between science and creativity, we *brainstormed* and made it our current issue's theme.

By reading the reports of three principal investigators (p. 5-7), you can immediately appreciate how creativity is extremely linked to passion, curiosity, and initiative taking. I encountered these same qualities in the stories of Pierre and Albert (p. 33), who say goodbye to their coordinators' years, and in the ones of Elly and Stefan (p. 34-35), who brainstormed on their future goals.

If you wonder what you can do creatively in science as a student, have a look at the descriptions of the Dutch Neuroscience Meeting and FENS (p. 82-83), and enjoy the successes of your fellow students (p. 79-81). A starting point may be to remain up to date with fancy techniques (p. 36-37). But remember: the words "too much" may be counterproductive, as argued by the review of the book "Busy" (p. 76).

Concerning the academic content, let the research and review articles impress you: role of inflammation in neurodegeneration (p. 45), maturation of axons in human neurons (p. 8), and tDCS in major depressive disorder (p. 59). The creative twist is not missing, as shown by the study on obesity and the adipose tissue (p. 21), as well as by an analysis of the potential use of neuroimaging in court (p. 64).

Still wondering whether to pursue a career in science? Read the reports of PhD students (p. 72-73) and alumni (p. 70-71), who opened up on their experience. Furthermore, the interview to Prof. dr. Miedema highlights exciting possibilities for scientist (p. 39). Alternatively, if the word 'future' provokes a cymbal-banging monkey in your head, read the interview to Prof. dr. de Waal (p. 42) – monkeys are definitely not that bad.

We would like to thank the numerous submissions of both academic and non-academic content, without which this Journal would not be possible. Lastly, I would like to thank the Neuroscience and Cognition Journal's team: Marije for her precise minutes and help-out-with-everything attitude, Lisa for her great organisation and punctuality, Eline for her sprouting ideas and balance, Lotte for taking the initiative and for her strong opinions, Daniëlle for continuously challenging herself and for her adaptability, Nina for being an ace in the hole and for finding always the best deals, and David for his great selling abilities and for keeping the atmosphere light. The accomplishment of our journey also extend to our website www.journal.neuroscience-cognition.org, where we have recently introduced the latest non-academic content.

Wishing you an instructive yet pleasant and entertaining read,

Valeria Bonapersona
Editor in Chief

What made you choose to focus specifically on visual perception as your research topic?
Although vision is where I initially started, it is not my only research topic any more. However, my experience with vision largely guides my adventures into cognitive and neuroscience research topics and provides a useful perspective on new research topics.

Humans are visual animals. This is what attracted me initially to visual perception. You can easily appreciate the appeal of vision science by demonstrations and visual illusions. It is a fun topic and can teach us a lot about perception, cognition, and neuroscience. The importance of vision is also reflected in our brain. About 25% of our cortex is involved in processing visual information. Historically, vision is also the most understood. For example, the first cortical area that was discovered was the primary visual cortex in 1782 by Gennari. Furthermore, Nobel-laureates Hubel and Wiesel first described the function of cortical neurons in the visual cortex, the first fMRI measurements were done in the visual cortex, and I can give many more examples. The point is that the detailed knowledge of the visual system draws many scientists to vision. Not all these scientists are studying the visual system per se. Some use the visual system to investigate other neural properties, such as attention or consciousness. This makes vision a diverse research field that touches on many other research fields. I like this diversity.

Last, because there is a large knowledge base, the visual system is an ideal system to develop and validate new methods. For example, currently, the visual system provides a gold standard for high-resolution fMRI protocols to reveal columnar and laminar structures. We know where these columns are and where they terminate. Once we can reliably detect these features of the visual system, we can turn our attention to more unexplored regions of cortex. Thus, the visual system is also a hotbed for new technological developments. In our own research we focus both on more biological questions as well as on technological developments.

What are the things that drive you and make you enthusiastic every day?
I love research. Understanding the human brain is one of the final challenges of science and it is ultimately the question of who we are and how we work. In my research, I work on a daily basis with colleagues with a wide range of backgrounds, for example physicists, physicians, biologists, neuroscientists, psychologists, and software and hardware engineers. This is a wonderful dynamic and interdisciplinary field. In every project, there is always a point where you find out whether it is going to

work or not. For me, this point where new knowledge is gathered is the most exciting aspect of science.

If you have to describe in one or two sentences what you would like to accomplish with your research group, what would this be? In other words: what is your main message?
In addition to my professorship in Utrecht, I am now the director of the Spinoza Centre for Neuroimaging in Amsterdam. Therefore, I have a vision for my own research group as well as one for the Spinoza Centre. One is more focused on visual system and the other more on neuroimaging. They collide in what I believe is one of the most exciting challenges today. The brain is organised at different spatial scales; on one hand you have individual neurons and, on the other hand, brain areas. But there is a scale in between, where all the different types of neurons organize themselves in so-called hypercolumnar structures. These groups of neurons form a computational unit that repeats itself across cortex, which may be the most fundamental organization scale of the brain. Advances in ultra-high field MRI can image this organization scale in the human brain for the first time. With my research I hope to contribute to describe this computation unit of the brain and how it underlies perception and cognition.

- Prof. Dr. Serge Dumoulin
Department of Experimental Psychology, Utrecht
& Spinoza Centre for Neuroimaging, Amsterdam

From the beginning of the Master programme Neuroscience & Cognition, back in 2003, both Pierre de Graan and Albert Postma started as coordinators of the Experimental and Clinical Neuroscience (ECN) and the Cognitive Neuroscience (CN) track, respectively. During the past 13 years they have helped many students with their choices, doubts, and future careers in neuroscience – transmitting their knowledge and years of experience. As with everything, all good things come to an end. Pierre and Albert, we cannot thank you enough.

One of the brain's most important abilities is to reflect upon past experiences. This of course is a prime purpose of memory, in particular of episodic memory, one of my personal favourite cognitive domains. A directly linked ability is to predict possible futures. Together, these abilities make us humans what we are and allow us to interact with a dynamic environment.

I have been coordinator of the Cognitive Neuroscience track in our research Master since 2003. Looking back, I remember we started with a smaller group of students, but also supervisors and lecturers. Many aspects of the programme still needed to be developed. Elective courses had to be created, and also the fundamentals course gradually evolved into a format in which it stayed for a long time until a major revision a couple of years ago. What has remained throughout the last decade has been the enormous enthusiasm of students and supervisors alike. We can especially see this in extra-curricular activities as the Mind the Brain symposium and the Neuroscience and Cognition Journal. If anything, this is the showcase of what is going on in Utrecht in the field of neuroscience and cognition. As a coordinator, it has been an extremely great pleasure to have been so close to this fascinating mix of inspired scientific research. After 13 years I will stop as track coordinator. A good moment to look forward, and imagine how the N&C Master will do in the next decade. As many will know, Stefan van der Stigchel will take over as track coordinator. I am certain he will create new ideas, inspiration, and motivation. Recently, we have already seen the emergence of new methodological and thematic approaches, such as optogenetics, virtual reality, brain connectivity mapping, lesion symptom mapping with cognitive neuropsychology, and social neuroscience. I expect these and other developments will continue to rise and grow in our Utrecht Master.

- Prof. Dr. Albert Postma
Department of Experimental Psychology,
Helmholtz Institute, Utrecht University

New track coordinators

It still feels a bit unreal….as of the 1st of September I am the new coordinator of the ECN track. Many generations of ECN students were guided through their Masters by Pierre de Graan, and now I will take over from the master himself. Pierre was one of the Utrecht neuroscience researchers that incited my interest in brain research during my studies in medical biology in the 80's. I decided to do a PhD in neuroscience, which I did at the department of Neurology. Then I left Utrecht for almost 20 years and worked as a post-doc at the Max-Planck Institute in Munich and at the Netherlands Institute for Neuroscience in Amsterdam. Since 2011 I am a professor in Glia Biology at the University of Amsterdam and since 2015 also at Utrecht University. For those not aware yet….glia biology is important for neuroscientists. The brain contains ten times more glia than neurons, and glia are essential for healthy brain functioning. They are also the stem cells and the immune cells of the brain. In many neurological and psychiatric diseases these cells are activated and emerging data shows that this activation contributes to impaired neuronal communication and to cognitive decline.

"I would like to urge you to fully explore and above all enjoy the exciting research environment in Utrecht."

When I was asked to become the new ECN coordinator, I almost immediately said yes. My solid background in experimental and clinical neuroscience, my drive to teach and guide Master and PhD students, my passion for neuroscientific research, and my extensive national and international network in molecular and cellular neuroscience will help me to advise you. Students that have worked with Pierre will notice some changes. To be able to serve you best, I have opened a special e-mail address for ECN-track advise: ecn@umcutrecht.nl. Next to this, I have introduced a weekly open consultation hour on Tuesday's between 12.30 and 13.30 hr in my office (Str. 5.209), no appointment needed. Only emails sent to the ECN account will be answered and I will be strict in the consultation hours. In addition I expect from you to come well prepared to the consultation hour.

As a research group leader I have extensive experience in guiding Master and PhD students in their careers.

I know what is needed to pursue a career in research, but I am also fully aware of alternative career paths in biotech or pharma-industry, with funding agencies, or in communication. A research Master in neuroscience is an excellent preparation for all of these possibilities. Experience with doing research yourself and getting to know researchers is essential if you want to become a researcher, but also if your goal is to write about science or if you have an ambition to be involved in research management and funding. I am looking forward to meeting you all and to help you with shaping your future. My scientific career has brought me in several places all over the world. Seeing neuroscience communities in different cities made me realise, over the years, that Utrecht is a great place to study neuroscience. It has a long tradition in experimental and clinical neuroscience and there are many successful research topics in which clinical and fundamental neuroscientists closely collaborate. I would like to urge you to fully explore and above all enjoy the exciting research environment in Utrecht.

- Prof. Dr. Elly Hol
Department of Translational Neuroscience,
Brain Center Rudolf Magnus, UMCU

Why change a winning team? Well, most importantly, it is always good to introduce fresh blood after some period of time. New ideas, new energy, and a break with traditions. For the Cognitive Neuroscience track, this means that I will be the new track coordinator, starting from February 2017. Albert Postma has done an excellent job in building the Master to its current high quality and being an inspiration for generations of students. It is my pleasure and honour to continue this endeavour.

I am an Associate Professor in Experimental Psychology, member of the Young Academy of the Royal Netherlands Academy of Arts and Sciences, and proud head of Attentionlab, the latter being a group of post-doc, PhD, and Master students investigating visual attention and visual awareness. The aim of AttentionLab is to study 'attention' and 'visual awareness' in their broadest terms in the healthy population, but also in a clinical setting. We study attention and visual awareness using various methods, such as eye movement recordings, lesion overlap, and flash suppression. We study these functions in various patient populations, like hemianopia, visual neglect, and Korsakoff syndrome. Our aim is to provide a rich interaction between experimental psychology and neuropsychology with the ultimate goal to solve the puzzle about how we create a perception of our world.

"I would like to improve the visibility of the researchers for the students."

I enjoy the different aspects of science and I would like to see these aspects (and the enthusiasm) to be reflected in the Neuroscience and Cognition Master. We have many excellent researchers in cognitive neuroscience in Utrecht and this Master's program is the lively centre of this domain in Utrecht. My goal will be to stimulate this community as much as possible. You can all read books and look up the relevant papers; I rather want this Master to be the platform where you interact

with the writers of these books and papers and be motivated and challenged to reach the highest possible academic level. These years are crucial for your further development; it might be the first time you encounter the academic lifestyle and everything you learn here will stay with you for the remainder of your career, even if your future is not in academia.

In the next couple of months, I will take a close look at all the different electives to examine whether they reflect the full range of topics in which Utrecht excels. Further, I would like to improve the visibility of the researchers for the students. Many excellent researchers have great chances for research projects and it is my goal to make the connection between these researchers and the students. I am looking forward to it!

- Dr. Stefan van der Stigchel
Department of Experimental Psychology,
Helmholtz Institute, Utrecht University

Motor neuron-myotube co-culture system to study neuromuscular junctions *in vitro*

Christian D. van 't Hekke[1]

[1] Master student Neuroscience and Cognition, Graduate School of Life Sciences, Utrecht University, Utrecht, The Netherlands.

The *neuromuscular junction* (NMJ), the synapse between a motor neuron and a skeletal muscle, enables signal transduction from the neuron to a muscle fibre, which in turn facilitates muscle contraction. The formation of a NMJ is a multistep process in which interactions between the pre-synaptic terminal of the motor neuron and post-synaptic motor endplates of the muscle are essential (Wu, Xiong, & Mei, 2010). NMJ disruption is an important feature of neuromuscular diseases such as myasthenia gravis, and has been linked to early pathological changes in motor neuron diseases including amyotrophic lateral sclerosis and spinal muscular atrophy (Murray, Talbot, & Gillingwater, 2010). A motor neuron-myotube co-culture system allows investigation of the fundamental aspects of NMJ formation, maturation, and maintenance, but can also act as a model to examine NMJ defects in disease.

This co-culture system consists of two components: primary motor neurons isolated from embryonic mouse spinal cords and myotubes, which are muscle-like structures derived from a myoblast cell line (Fig. 1). It can be used to study synaptic morphology using immunocytochemistry (e.g. innervation and denervation), as well as to examine synaptic function with electrophysiology set-ups.

The advantage of an *in vitro* co-culture system to analyse NMJs compared to in vivo models is the ability to modulate molecular and cellular mechanisms. Functional experiments can be performed by interfering with gene expression of disease modifiers, for example by using RNAi, gene editing techniques such as CRISPR/Cas9, or by overexpressing constructs. These experiments are aimed to discover potential new roles of these proteins in NMJ formation and function (Vilmont, Cadot, Ouanounou, & Gomes, 2016). In addition, an *in vitro* system allows for more efficient high-throughput experiments. Furthermore, this co-culture system can be used with stem cell-derived components such as induced pluripotent stem cell-derived motor neurons and muscle tissue (Steinbeck *et al.*, 2016).

However, the main drawback of this system is that the artificial set-up is different from the physiological environment within the body. This could be ameliorated by, for example, enrichment of the co-culture with glial cells such as Schwann cells needed for myelination at the NMJ, inclusion of a microfluidic chamber to resemble the spatial separation between motor neurons and the muscle, controlling neuronal activity via optogenetics, or by transforming the system into a three dimensional structure.

In conclusion, the motor neuron-myotube co-culture system could potentially be used as a model system to dissect pathogenic mechanisms and act as a screening tool for therapeutic approache.

REFERENCES

Murray, L. M., Talbot, K., & Gillingwater, T. H. (2010). Review: neuromuscular synaptic vulnerability in motor neurone disease: amyotrophic lateral sclerosis and spinal muscular atrophy. *Neuropathology and Applied Neurobiology*, *36*(2), 133-156.

Steinbeck, J. A., Jaiswal, M. K., Calder, E. L., Kishinevsky, S., Weishaupt, A., Toyka, K. V., Goldstein, P. A., Studer, L. (2016). Functional Connectivity under Optogenetic Control Allows Modeling of Human Neuromuscular Disease. *Cell Stem Cell*, *18*(1), 134-143.

Vilmont, V., Cadot, B., Ouanounou, G., & Gomes, E. R. (2016). A system to study mechanisms of neuromuscular junction development and maintenance. *Development*, *143*(13), 2464-77.

Wu, H., Xiong, W. C., & Mei, L. (2010). To build a synapse: signaling pathways in neuromuscular junction assembly. *Development*, *137*(7), 1017-1033.

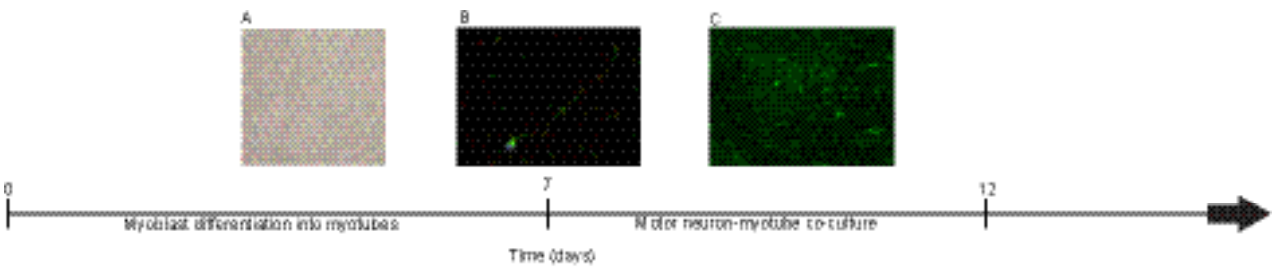


Figure 1. Timeline motor neuron co-culture system. A) Myoblasts differentiate into myocytes, which in turn fuse together and form myotubes. B) Isolated motor neurons from embryonic mouse spinal cords are plated on top of myotubes. C) After 5 days, motor neurons grow extensions towards myotubes. However, in this picture no synapses are formed yet. Co-culture system must be maintained for more than 7 days in culture to form synapses.

Prof. Dr. Frans de Waal is one of the world's best-known primatologists and ethologists. Currently, he is working as professor in Emory University's psychology department and is director of the Living Links Center at the Yerkes National Primate Research Center. He is also Distinguished Professor at Utrecht University. From his working spot in Atlanta, I spoke with him about his successful career, the existence of anthropocentrism, and about 'animal intelligence' – the topic of his new book 'Are we smart enough to know how smart animals are?', in which he is challenging the ancient belief that places human intelligence on an evolutionary pedestal.

What inspired you to study animal behaviour in the first place? What was your main goal?
Well, I am very attracted to animals. As a child, I used to have many fish – I actually still have many fish – and I liked birds. In my view, I am more like an animal-lover who turned into a scientist. This is of course very often the story of people who are naturalists or ethologists: it starts with being attracted to animals. You really cannot do this work if you are not. During my study, I ended up in a lab in Groningen where we specifically studied birds like jackdaws. Later I got offered a graduate scholarship at Utrecht University to work with primates. I think I would be happy with working with almost any animal; the primatology is more like an accident to be honest. I study primates primarily to learn more about them and to learn more about humans and human society – which is a logical step to make if you work with primates.

We humans often think that we have certain capacities that all other animals' lack, like our way of communication, but what do you think humans could learn from animals? What capacities do certain animals have that we lack?
I look at the cognition of humans and animals as serving their survival and their natural history. Each species has its own specializations and its own special features. Obviously, human cognition is most similar to primate cognition, since we are primates after all: we have hands, we have frontal looking eyes, and our senses are very similar. But I do not look at it as 'what do we have what other animals lack' or 'what do they have what we lack'. It is more like each species is adapted to its own environment. If you look at it in that way, then human cognition is very often just a variation on animal cognition. It has many of the same elements, for example when looking at memory; all animals need some form of memory. The same even holds for language, although this is the one capacity that I consider uniquely human. Nevertheless, if you look at language as a composition ofmany small component capacities, then many of these components can be found in other species.Other animals also have such unique capacities, think of echolocation in bats. Usually humans do not look at that as a cognitive feature because it cannot easily be compared to what we do, but it actually is very complex what bats do. I think that there is a bit of a bias in the way we generally

look at animals: we tend to look at them from our perspective – called anthropocentrism. We constantly compare them to our abilities and as soon as they do something completely different – like the echolocation in bats – we sort of drop it and label it as some sort of perception. Now, perception is not the same as cognition, but the borderline between cognition and perception is extremely thin and basically, without perception there is no cognition.

In your new book you discuss the much debated topic of 'animal intelligence' – can you explain what this is? It is often thought that large brains are needed to be intelligent or smart, what do you consider a condition for intelligence?
'Intelligence' often gets confused with 'cognition'. Where as 'cognition' refers to the processing of information, 'intelligence' is a bit of a narrower term and has more to do with how effective you are using your cognition. So, these are two different terms. Brain size is probably very much implied in complex cognition but the interesting thing is that many animals with small brains are also doing very interesting things. One of the examples is the process of face recognition. This phenomenon used

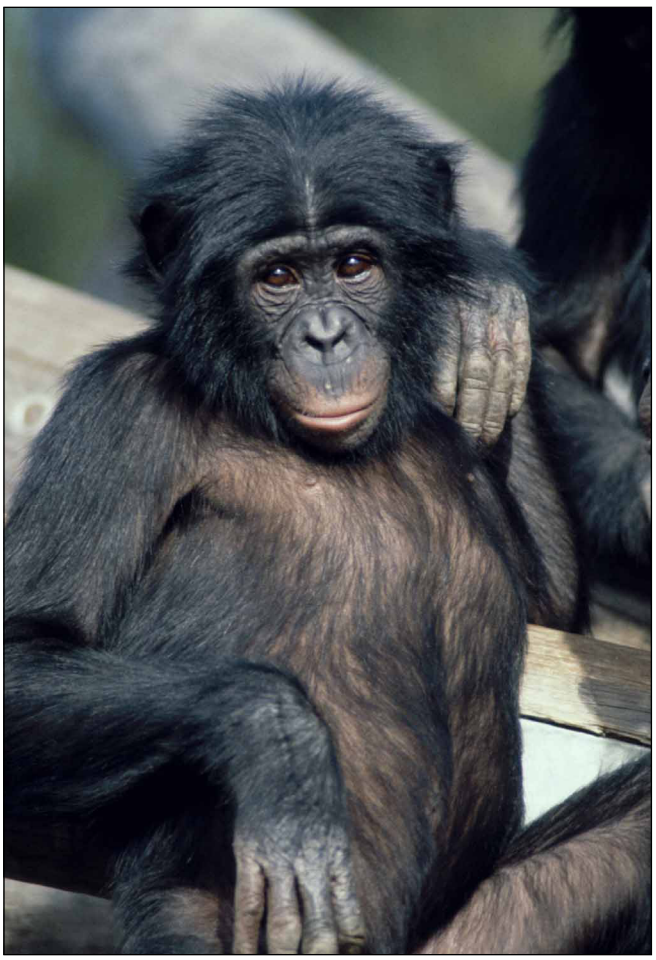
to be thought of as uniquely human - until we started testing chimpanzees and found that they actually are just as good as humans on own-species faces. The reason this had not been found originally was that chimpanzees had been tested on human faces, which they were not so great at. After that, we found that also monkeys are very good at face recognition tasks. And then people found it in sheep. So, no one had expected this in sheep – they all look alike to us after all – but sheep have very good face recognition of each other. Then there came a study on paper wasps, they have special facial markings and wasps seem to recognize each other' s faces that way! This is the story of all the cognition research that has been going is: we start with a capacity that is, we assume, uniquely human and we find that that capacity is actually very ancient and much more widespread through the animal kingdom than we originally thought.

For a long time, 'animal intelligence' was severely underestimated but since the last 20 years this concept has been taken much more seriously. Still, there seems to be a sort of taboo on the existence and also the acceptance of the concept of 'animal intelligence'. Why do you think this is and what would do you think should be changed about this?

I think that the taboo on its existence is by some sort of indoctrination. I remember that I was subject to this same indoctrination when I was a student in Nijmegen, because I was in a lab run by behaviourists. Behaviourists have this strong belief that everything can be explained by simple learning mechanisms and there is nothing else to it. In addition, they also have the view that all animals basically follow the same laws of learning, whether you are studying rats, birds, or even elephants, it does not matter – they must be doing things in the same way. So they talk about universal learning mechanisms and they underestimate differences between species. It originated in the US, with behaviourists such as Skinner and Watson. Under the influence of cognitive psychology, however, this behaviourism has been dying a slow dead. What has happened in the last 25 years is that a younger generation of scientists has realised that these laws of learning will not necessarily get you that far. Although they are very interesting and I am definitely not claiming that they are wrong, they do not explain any of the observed differences between species and donot help much with understanding complex cognition that we see in animals. The new generation of cognitive scientists is asking much more fascinating questions, in my opinion. If you read theirpapers, they do very much their best to exclude simple learning processes. For example, they are presenting apes or birds with a problem that they have never seen before. They may prepare them for the problem in certain ways, but the specific problem they have never seen before and they just observe what happens at the first confrontation with this problem. That is why these current studies are so convincing, because they deliberately exclude simple learning explanations.

Looking back at your career so far – I think it is safe to say that it is quite successful – what do you consider your biggest discoveries and achievements? What do you think has got you this far?

In terms of the discoveries made, I would say the big ones are the studies that have shown that primates reconcile after fights, a finding that has now been found not only in primates but in many different animals. I furthermore found evidence for empathy and there a now lots of studies on empathy in rodents and all sorts of species. We also do studies on fairness, we discovered that monkeys have a sense of fairness, which has led to studies of the ultimatum game with chimpanzees and things like that. In terms of my career, I think part of that success is



Lana, a juvenile female bonobo at the San Diego Zoo. Photograph by Frans de Waal.

definitely that I popularise. I know that many scientists, also in the Netherlands, look down on popularisation. They think they do not need that, that they can just stick with the scientific papers and everything is perfectly fine. However, if you do not have a presence on social media or in the press nowadays and you do not have findings that reach media-outlets, you get much less attention. For some reason, there is a big feedback loop between media attention and the citation rate that we take as index of our scientific career. Many scientists overlook this existing connection. So, part of my success I think is that I have always liked popularising and I have always liked to reach out to a general audience, telling them everything I know about animal behaviour, and being on a sort of mission of explaining how important it is that we know all about ourselves and about other species – I think that has certainly also helped my career.

"I study primates primarily to learn more about them and to learn more about humans and human society."

A promising future for neuroscientists?

Neuroscience has been very important in changing the attitude towards animals, because for the longest time it was maintained that animals are some sort of simple stimulus response machines. Humans were considered quite different and unique, and were always explained in more cognitive terms. I think that what neuroscience has done is to break down this barrier. If you study fear in the rat amygdala, you have to assume that the rat amygdala and the human amygdala do similar things in the brain. So neuroscientists assume that the rat brain, the monkey brain, and the human brain are doing very similar things in very similar ways: they assume homology. As a result of that assumption, they have broken down the barriers about emotions – since they are talking freely about emotions in neuroscience – by focusing specifically on the anatomy and functionality of the brain. I think the neuroscientists have been very instrumental in all of this and I hope in the future they play an even more important role in the study on animal cognition, because until now they have only scratched the surface of the mind. But they are going to delve deeper and they are going to be much more involved, I think.

We would like to conclude with our final question: do you have any advice for us students? Are there any professional skills or abilities that are important to become a successful scientist?

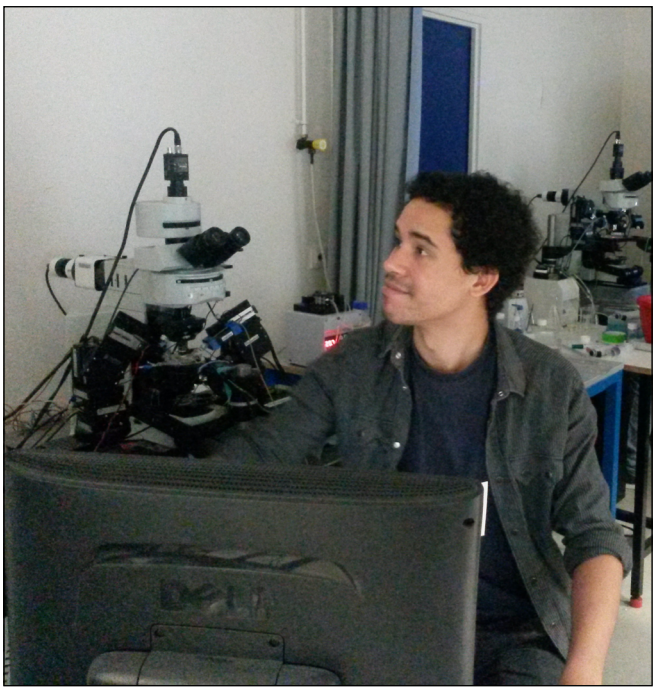
The usual advice is that you need to know what you want. Sometimes I meet students who want to go into a specific area because there is money there, or there is funding there, or there is a career there, but if your heart is not in it – I think you should not do that. You basically have to follow your passions and your interests, and then hope for the best. Grab possibilities that come along! It often happens to students that, when presented with a good opportunity, they drop it because it maybe is in another country, or they have a boyfriend, or it just is not convenient at that time in your life – I think that is the biggest error that you can make. Golden opportunities only come along once or twice in your life and if you do not except them, you are gone. Ultimately, there is almost never a second chance. Moreover, you need to, work very hard; this is absolutely a substantial part of it. I sometimes notice that students think they can work from nine-to-five so to speak, and never have to work in the evening or in the weekends. That attitude will not get you a big scientific career! The top scientists are all in it for 100%. They do not count their hours, do not look at when they have to work – whether that is in the weekend or in the evenings – that does not really matter. I personally have always worked in the evenings and in the weekends because I cannot write my books when I am at work, where there is a whole team of people that needs me. So, I need to work in the evenings and weekends to do the things I like to do besides doing research.

At the time of writing, I am finishing a fun and fruitful period of postdoctoral training in Paris, and I am about to start a journey to become a junior group leader. It is a good moment for me to reflect on some of the events that have occurred since I started the Neuroscience & Cognition Master programme in 2005.

I remember the Master well, perhaps because it was at this time that my neuroscientific interests took a somewhat surprising direction. I had entered with a background in cognitive neuroscience and was part of the 'cognition track'. However, during the initial Fundamentals course I became increasingly fascinated by the mechanisms behind the function of synapses. So much so, that I approached Geert Ramakers to discuss the possibility of doing an internship in his lab to get a better understanding of electrophysiology and synaptic plasticity. I soon realised that I loved directly measuring synaptic transmission and linking its dysfunction to aberrant behaviour. Yet, at this time I did not really believe that I would be pursuing this as a career. I thought that it was too radical of a move for someone with my profile. Instead, I viewed the insights I had gained during that internship mainly as valuable core knowledge that could aid me in the future, when I would be using 'human-compatible' techniques to indirectly assess such neural communication (fMRI, EEG, etc.).

"They insisted that with the right mind-set it was perfectly possible."

That outlook changed considerably about half a year after. I had moved to Cambridge and was in the midst of an internship where I focused on some of those aforementioned 'human-compatible' techniques. The experience was great, but now that I could compare, I realised that the study of synapses was what I really liked most of all. Luckily, an opportunity swiftly presented itself. Some vacancies for PhD students opened up in the joint laboratory of Roger Adan and Geert in the Rudolf Magnus Institute, and they offered me a position. Although I was enthusiastic, I still had some lingering doubts about whether full immersion in electrophysiology was truly the best career choice in the long-run for someone with my profile. I expressed this concern to both of them, but they insisted that with



the right mind-set it was perfectly possible, taking away most of my doubts.

What came next was a very interesting, fun, and challenging period as a PhD student, where I investigated the ways in which G protein-coupled receptors regulate synapses in the reward system. After my PhD, I started working in the laboratory of Manuel Mameli in Paris as a postdoc, using the latest optogenetic tools. This allowed me to study synapses in clearly delineated neural circuits, which I did in the context of drug addiction. After receiving a grant from the The Netherlands Organisation for Scientific Research (NWO), I am now about to return to the Brain Center Rudolf Magnus as a more independent researcher. I am excited to be using some of the latest techniques to explore how stressful experiences alter synaptic function within the reward system and, by doing so, affect cravings.

Looking back, I can say that the Master programme was instrumental in the path I ended up following. It really helped pinpoint my scientific passion. I am happy I did not shy away from pursuing it.

- Dr. Frank J. Meye
Department of Translational Neuroscience,
Brain Center Rudolf Magnus, UMCU

At the end of my Master I had worked 3,5 years part- and full-time in research. Many choices I have made in the past had been directed towards a career in Alzheimer research. However, sometimes it is worth to trust your gut feeling, taking these silent yet rising doubts about the plans you have made for your future seriously. For me it was questioning whether I actually wanted a research career.

What made me doubt, was the increasing frustration I felt when an experiment had failed again, without having a clue what went wrong and the feeling that the hours/weekends in the lab are useless. Patience had never been my strength. I like to get things done, to see results of my work without getting lost in too many details. Before choosing whether to quit research, I wanted to get a glimpse of the pharmaceutical industry. I got an internship in Alzheimer's disease research at Roche's headquarter. Coming from academic research, I was in heaven. We used kits for everything, which made work more efficient and results more comparable. However, the frustration stayed and I had no clue what jobs were out there for researchers who do not want to perform research anymore.

"Do not go for the big shots, they want people with working experience or at least a PhD, but focus on the smaller life science-specialised consulting-companies."

I applied for consulting positions without even getting one interview. Here is my first lessons learned: *Do not go for the big shots, they want people with working experience or at least a PhD, but focus on the smaller life science-specialised consulting-companies*. A recruiter at Roche told me that there are no entry positions in Big Pharma, but that I might have a chance at *Clinical Research Organizations* (CROs), and that ideally I should get an additional business degree. I was devastated! The second lesson: *CROs actually are a good start for graduates*. I have many colleagues today who started in CROs as a monitor or project manager for clinical trials. You get to know the job and contacts in the company which sponsor the trial. It was at the right place at the right time when I applied for the Medical Trainee programme at Roche Germany. Having

the internship at Roche in my CV was a plus and after the application process they offered me the position. Third lesson: *Apply for trainee positions – they are made for starters.* Fourth lesson: *Let them see your personality.* I had a complete black-out during the introduction round and that was probably even helpful.

For 1,5 years I rotated through different departments, such as Pharmacovigilance, Clinical Trial Organization, Medical Management, and Finance, and was mentored by experienced colleagues. Afterwards, I became the Medical Manager for one of our breast cancer products. My daily business is full of variety: Overall, my responsibility is the implementation of our medical strategy for the specific product. Among others, I am involved in the management and publications of our clinical trials, I am collaborating with medical experts and societies, and I am visiting conferences.

Up to this day, I am still benefitting a lot from my studies and my time in the lab. Getting things done still takes ages, because there are plenty of people involved, but in the end I can see what I created. Bad Pharma turns out not to be so bad after all.

For me, it was the right choice to look beyond the research-horizon and I am happy to provide you with some more details in case you have any questions.

- Stella Keitel
Medical Manager Oncology, Roche Pharma AG

I am currently doing two projects in the area of child psychiatry. In these four years (hopefully, because I am already in my third year) I aim to learn and understand more about the neurobiology of ADHD and autism in children using fMRI, EEG, and measures of cognition and behavior. I really enjoy doing research in humans in a clinical context, although I started my educational path a bit different.

In my bachelor (applied sciences, Saxion Deventer), I got to do several internships. I started out working with nematodes (little worms) to understand genetic repair at the Hubrecht Institute in Utrecht. After that I did an internship at the Biomedical Centre in Sweden, Uppsala, where I dissected mice embryos to study pain perception. Around this time, I discovered that I found the brain and nervous system super interesting and intriguing. Therefore, I chose to do my last internship at the Netherlands institute of neurosciences (NIN) in Amsterdam where I stained postmortem human brain material to study dopaminergic neurons in Parkinson.

I wanted to know much more about the brain and its fascinating complexity, especially at a more macroscopic and clinical level, and luckily I got admitted to the research master Neurosciences at the VU University in Amsterdam. During this master, I learned a lot about different aspects of the brain, such as 'everything that can go wrong'. Which is a lot! I did my 2 internships at the department of Psychiatry at the UMC Utrecht, where I worked in a structural MRI study in adults with bipolar disorder, and carried out a pilot study on a new stop task in children with ADHD.

As I went from nematode to mice to postmortem to men, I found out that neuroscience has many interesting layers where a lot of questions still remain unanswered. Nonetheless, I learned that doing research in humans is what got me most excited.

After my master's, I worked as a research assistant for a year, working on 3 different projects at once. Here I learned a lot of practical things about doing research, but I missed diving into the literature and learn new things about the human – psychiatric – brain. After a year, Sarah Durston (PI) offered me a PhD position on a project about the neurobiology behind medication response in ADHD, which I gladly accepted. I am still working on this project, and in addition I'm working on a new project aimed to investigate sensory processing in autism and epilepsy, together with a multidisciplinary team. Although every PhD track has its ups and downs, my enthusiasm has still not slipped, thanks to awesome research questions, inspiring discussions and fantastic colleagues.

"Although every PhD track has its ups and downs, my enthusiasm has still not slipped, thanks to awesome research questions, inspiring discussions and fantastic colleagues."

The most important advice for future PhD students is that you pick a project that has your interest. You have to be dedicated to it for 4 years –or more, so make sure it will be a topic that can keep you motivated. Enthusiasm and curiosity are the most important ingredients of a successful PhD!

- Chantal Vlaskamp
Department of Psychiatry,
Brain Center Rudolf Magnus, UMCU

On the day of my graduation ceremony, my mom kindly reminded me that it was only a few years ago that I had started university and had sworn to never work in a lab. Well, things can change.

My interest in the field of neuroscience arose during my undergraduate programme Biomedical Sciences, and further increased during the graduate programme Neuroscience and Cognition at Utrecht University. While further digging into the wonderful world of neuroscience, I learned that my main interest is to focus on investigating fundamental neurobiology. Nevertheless, I have always found it highly motivating that my work may eventually contribute to medical applications for neurological disorders. I further explored the field of fundamental neurobiology during my first research internship at the Hoogenraad and Wierenga groups (Utrecht University), where I investigated the role of motor proteins in synapses using microscopy and biochemistry techniques. My first research internship turned out to be a great experience, and caused some serious doubt about my former statements regarding lab work. More specifically, I highly appreciated the neurobiological topics of the projects, the innovative microscopy techniques, the collaborative atmosphere, and the high quality of science of these research groups. Hence, my experiences during this internship convinced me to pursue a scientific career in the field of molecular neuroscience. It turned out that Casper Hoogenraad shared this view, since he offered me a PhD position in his group - which I gratefully accepted.

For my second internship I was seeking for a different experience, thus I aimed for a small research group abroad using different techniques. I found some scholarships who were willing to support me financially and ended up in the Patrick group (University of California San Diego). During this internship, I examined the role of protein turnover at synapses using biochemistry and electrophysiology. My experiences from these two different internships enabled me to explore science in distinct contexts, which contributed to having a broader view on the international scientific environment. For my writing assignment, I wrote a research proposal and applied for the competitive *Boehringer Ingelheim Fonds* (BIF) PhD Fellowship, which allowed me to be well prepared for my PhD project and to obtain training in writing a grant. In addition, it gave me the opportunity to potentially provide my own funding for my PhD and to

be enrolled in the acknowledged BIF network.

That was it - I officially graduated and started my PhD eight months ago. I specifically enjoy having my own projects and being independent, while still discussing results and follow-up experiments with colleagues. Additionally, I also appreciate the variability of this job, including unravelling different neurobiological projects, contributing in interesting scientific work discussions, joining congresses, and guiding students. And the lab work I disliked so much 5 years ago…? It turned out not to be boring at all. While working in the lab, I continuously remind myself that all the experiments I perform are probably (and hopefully) never conducted before, which is quite exciting. OK, it may be obvious that I am currently a bit over the moon, which is a common symptom for starting PhD students. Therefore, I also find it important to point out the pitfalls of academia, as I do observe that pressure comes when time passes. Hence, in three year from now I may have to cope with significant higher stress levels. Nevertheless, at this point I enjoy my work every day and I am excited what tomorrow may bring.

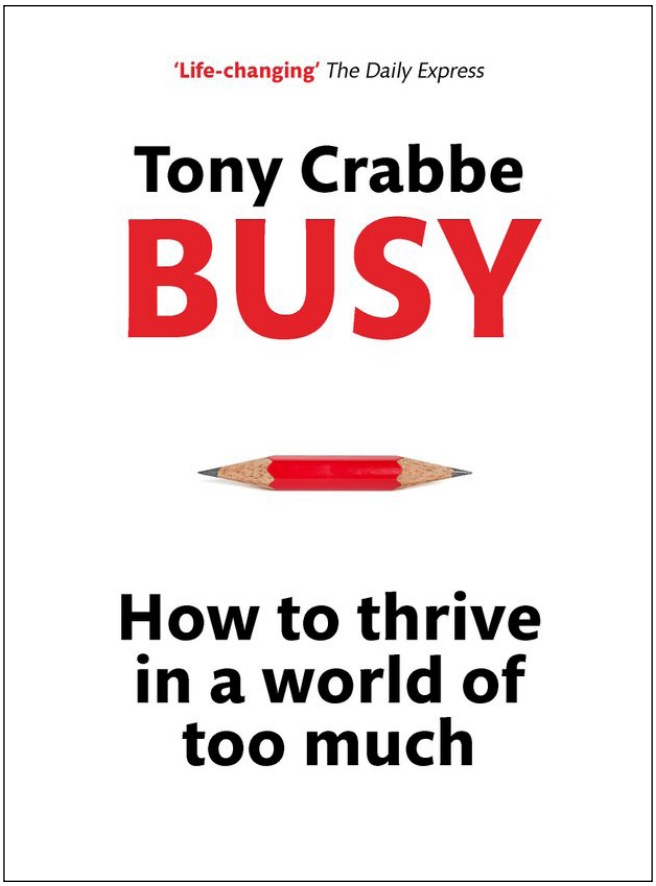
- Feline Lindhout
Division of Cell Biology, Department of Biology,
Faculty of Science, Utrecht University

Busy

by Tony Crabbe

The subtitle says it all: 'How to thrive in a world of too much'. In Busy, Crabbe describes the chaotic and over-abundant world we live in, and how we desperately try to win the 'more'-game. Tony Crabbe is a business psychologist and works for big corporate companies such as Microsoft and Disney. His work and book are focused on making behavioural changes to promote success. His book is a 249-page plea against busyness (and the pride people experience when busy), and promotes the benefits of undiluted attention. This book is not only a good read to re-think how you design and experience your work ethics, but it also shows a solid integration of proper scientific research conceivable for common man.

"Busy is an enjoyable light read which will challenge your own concept of success and provides practical advice on how to thrive in a world of too much."



The book combines single studies and complete books on specific topics, such as decision-making and the management of emotions. This stimulates further exploration of the claims made, and gives a complete and comprehensible overview of the topic discussed. The strongest feature of the book is its examples. Each claim or theory is accompanied with its own specific example. For instance, he illustrates the importance of setting your own boundaries by discussing the vice president of Microsoft, whom is highly successful although he never misses an important family-event for work-related events. By including these examples, the book offers insight in daily life applications of cognitive neuroscience and psychology, ranging from studies on the bystander-effect to the role of dopamine and norepinephrine. The book is divided into three sections: Mastery, Differentiation and Engagement. According to Crabbe, these three topics are the key to moving beyond busyness and thriving. Each section contains four chapters which will give you a theoretical framework on the topic, will guide you through questions and decisions, and finally will give you strategies to implement change. Although discussed in a corporate context, the step-wise questions and methods are easily translatable to a scientific context.

The book is obviously designed for "busy" people; for those afraid of being too busy to do any extra reading, the book starts with several methods to create time to do this. It also ends every chapter with a summary of the key points and an advice on what to do and what to experiment with to gain more insights. Although this gives the feeling of a self-help book, Crabbe explicitly mentions he does not provide the ultimate solution or quick fix. It is just his way of sharing his long-term struggle with busyness. Busy is an enjoyable light read which will challenge your own concept of success and provides practical advice on how to thrive in a world of too much.

- Rosyl Somai
Master student Neuroscience & Cognition

Dutch Neuroscience meeting – 9-10 June 2016

The annual Dutch Neuroscience meeting of this year was held at the Congress Centre 'De Werelt' in Lunteren, the Netherlands. Its two-day programme gave (international) senior researcher, postdocs, Ph.D. students, as well as Master students the opportunity to present their own work and exchange information and experiences in a casual way. Multidisciplinary lectures promoted the unification of field-specific scientists and careers and opened up dynamic discussions. The special attendance and motivating lecture of Prof. dr. Frans de Waal, renowned ethologist and primatologists, raised this Dutch conference to a higher level.
Especially for Neuroscience & Cognition students, this meeting is a unique first opportunity to present your own work at a national stage. The master stimulates participation by refunding the registration fee for a day of choice.

For an inspiring interview with Prof. Dr. Frans de Waal, see page 42.

Getting to know how the research world operates is, in my opinion, not only achieved by learning how to gather data, but also by seeing how knowledge is shared between scientists. Therefore, I applied to participate in the Dutch Neuroscience Meeting as an opportunity to get acquainted with this world and also to actively participate in this knowledge sharing by presenting a poster. From this experience I learnt that, although these meetings are long and take a lot of energy, they are most of all fun and informal! The opening lecture by Frans de Waal was really great. It was an easy beginning of the morning, without too many details. It gave me some food for thought of how we view animal behaviour in animal research. Next, I had to choose which parallel sessions I wanted to attend. During these sessions, I noticed that even experienced post-docs find it difficult to keep within time and that 15 minutes is too short to tell a complete story. Nevertheless, the chairs of both sessions I visited invited researchers that were able to present a clear and broad overview of research being done in specific fields. If you still need to find a spot for an internship, these meetings are heaven. You get to shop for subjects you find interesting, and can meet with researchers in those fields. Since these meetings are quite informal, it is easy to talk to researchers and to see what opportunities they have concerning internships. Also, I had a great informal talk with the closing speaker of the next day, Karim Nadar. The main downside of the conference was that the poster session was at the end of the day, after dinner, in a large room in the back of the conference centre. Nevertheless, there was a relaxed atmosphere and there were still many people. After the poster session you could enjoy drinks and music – there were even light effects which almost made it look like a club. After 15 hours I called it a day and I had to run to catch the last train home, with my head filled with new knowledge and a great first experience of attending a meeting and presenting my own data!

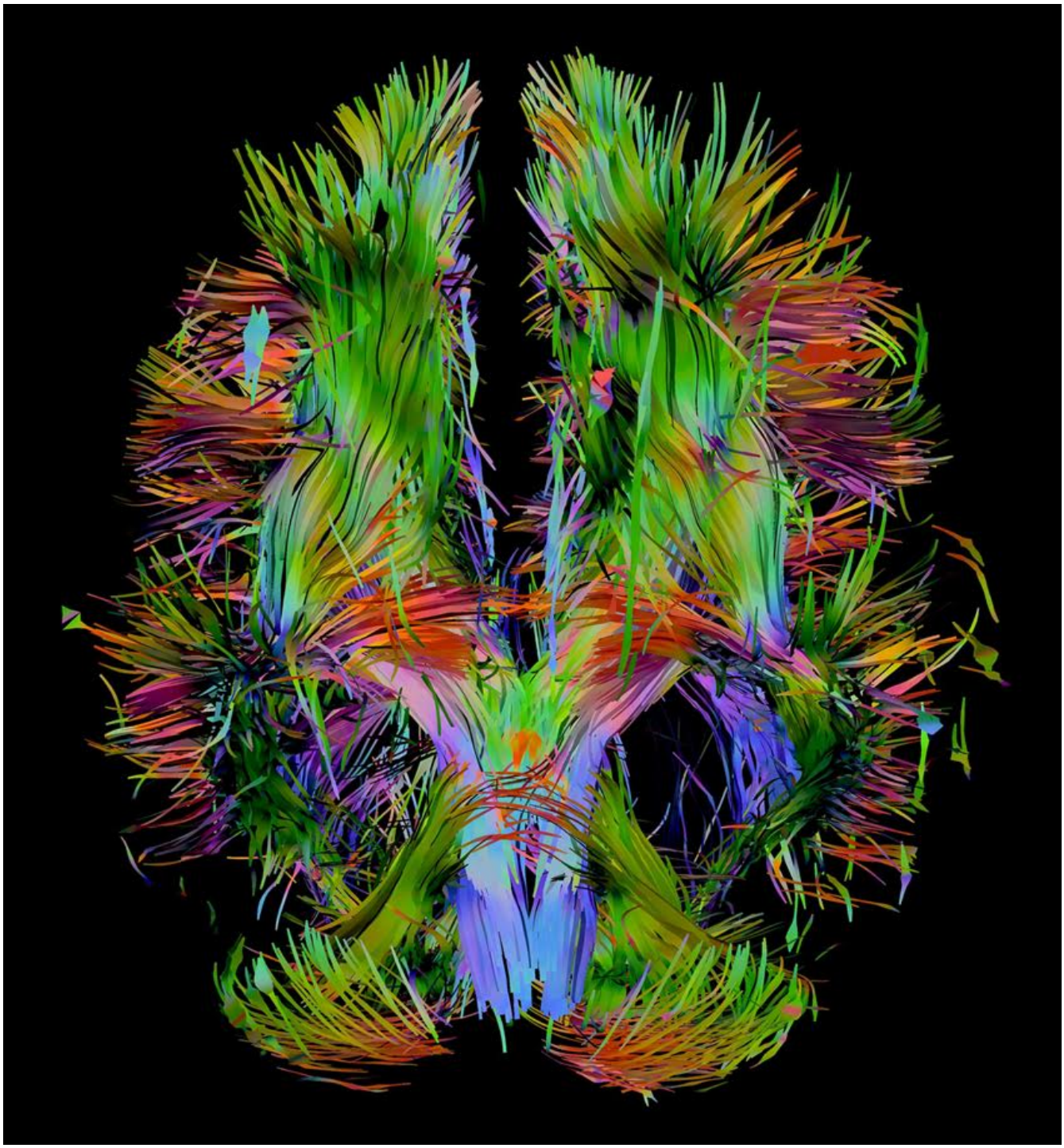
- Anna Hoefnagels
Master student Neuroscience & Cognition

FENS Forum of Neuroscience – 2-6 July 2016

This year's festive 10th FENS Forum of Neuroscience, organised by the Federation of European Neuroscience Society, took place in the cold but beautiful Copenhagen, capital of Denmark. Hosted by the Danish Society of Neuroscience, it was expected to welcome and unite more than 6000 international visitors. Four days full of plenary lectures, symposia, poster sessions, and lively social and networking events gave the public the opportunity to exchange knowledge, experience, and business carts.
Started in 1998 in Berlin, the biannual FENS Forum will return in July 2018 to its starting point to celebrate its 20th anniversary. For more information, check out the official website (forum2018.fens.org).

From the 2nd till the 6th of July, Copenhagen was the place to be for neuroscientists like us. Together with eleven other Neuroscience & Cognition students I travelled to the capital city of Denmark, where the 10th FENS forum of Neuroscience was hosted. This year, it brought together more than 5800 attendees from over 76 countries, who viewed 3352 posters and attended 82 sessions. For most of us the FENS was our first big international conference. For five days we were introduced to a countless number of impressive and inspiring studies that were presented during keynote lectures, seminars, and poster presentations. Furthermore, as the cherry on top, the presidential lectures were given by Nobel prize winners. John O'Keefe, for instance, gave an amazing talk about his work on the hippocampal cognitive map, while May-Britt Moser and Edvard Ingjald talked about grid cells and the entorhinal map. However, one of the most memorable events was when May-Britt Moser taught us how to celebrate winning a Nobel prize by simply shooting a spontaneous dance movie in your research centre. We have all started working on our dance routines, just in case... Besides trying to generate a critical opinion on science, we did a comprehensive assessment of the bike capital of the world as well. During these trips we found out about the large numbers of impressive buildings and the not so impressive little mermaid in Copenhagen. All in all, the combination of inspiring research, a beautiful city, and the company of my fellow students made this trip a great first experience with an international conference.

- Hilde van den Brink
Master student Neuroscience & Cognition



Agenesis of the Corpus Callosum
Diffusion Tensor Imaging (DTI) of an adult human brain with a rare birth defect called Agenesis of the Corpus Callosum (AgCC). In this congenital disorder the corpus callosum fails to develop normally, resulting in a complete or partial absence of the connections between the two hemispheres. Surprisingly, AgCC patients have a normal intellect, cognition and behaviour, and even a normal bilateral resting-state network.

See for more information: J. M. Tyszka, D. P. Kennedy, R. A & L. K. Paul (2011). Intact Bilateral Resting-State Networks in the Absence of the Corpus Callosum. The Journal of Neuroscience, 31(42), 15154-15162.

Seminar list

31 Oct 2016 17:00	**Dual inhibitory control of thalamocortical circuits** *László Acsády, Hungarian Academy of Sciences Budapest*	*Erasmus MC lecture, Rotterdam*
03 Nov 2016 16:00	**The Organized Mind: Thinking Straight in the Age of Information Overload** *Daniel Levitin, McGill University*	*Donders Instute, Nijmegen*
04 Nov 2016 16:00	**Molecular and cellular architecture of social behavior circuits in the mouse** *Catherine Dulac, Harvard University*	*Swammerdam lecture, Amsterdam*
7 Nov 2016 all day	**Science for Life Conference 2016** *o.a. Pamela Bjorkman, Frank Bradke, Peter Seeberger, Martin Chalfie*	*Jaarbeurs, Utrecht*
17 Nov 2016 16:00	**Life Sciences seminar: Infection and Immunity** *Cliona O'Farrelly, Trinity College Dublin*	*Life Sciences seminar, Utrecht*
17 Nov 2016 16:30	**A functional-cognitive perspective on the psychology of learning: Uncovering the pitfalls in learning related research** *Jan de Houwer, Ghent University*	*Sylvius lecture, Leiden*
25 Nov 2016 TBA	**Oligodendrocytes, life-long partners of neurons** *Bill Richardson, University College London*	*Swammerdam lecture, Amsterdam*
03 Dec 2016 16:00	**Learned Birdsong and the Neurobiology of Human Language** *Erich Jarvis, Duke University*	*Donders Instute, Nijmegen*
12 Dec 2016 15:00	**NeuroImaging & Psychiatry** *Jean-Luc Martinot, Université Paris*	*Herman van Praag lecture, Utrecht*
12 Dec 2016 17:00	**T-cell mediated neurodegeneration and repair** *Frauke Zipp, Johannes Gutenberg-Universität Mainz*	*Erasmus MC lecture, Rotterdam*

Additional information and seminars can be found at:
www.journal.neuroscience-cognition.org