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Interview with Joana Carvalho: Winner of the 2020 BCN Dissertation Award

How did you come to study in Groningen?
Before Groningen I did two internships: One in the US in Boston, at Harvard Medical School, and the other at Phillips research - a high tech company in Eindhoven. My experience at Harvard was academically very good for me, but socially I didn't feel that I fit in. I started to think academia wasn't for me. That's when I decided to do my master thesis with a company. I really enjoyed it, but what I understood is that if I wanted to continue doing research I should have a PhD. I applied to two PhD positions in the Netherlands because I knew I already liked it there. I chose Groningen because when I visited the lab they seemed very international and welcoming. Since I had already had an experience that was academically very good but socially not so nice, I really prioritized the social environment of the lab.

Why did you choose to do a project studying vision with fMRI?
I was a biomedical engineer so fMRI was my main interest. This project was unique because it gave me the perfect opportunity to develop my computational tools while also interacting with patients with vision loss. This allowed me to see the direct application of the work I was doing. There was also this aspect of studying plasticity in the brain; so a bit of fundamental research. I liked this interplay, which is sometimes hard to find.

Getting a PhD and winning the BCN Dissertation Award is very impressive, what kind of struggles did you face along the way?
It was very hard. I never had any difficulty in my Bachelor or Master but there were periods in the PhD that were very complicated for me. You work a lot, you don’t really see the results... at some point you fail so frequently that when something actually works, you start to question what you did wrong.

People like to share successes but they don’t often share the many failures. This was hard for me because I was used to being good at everything. Then I heard people around me saying ‘I got this grant’ or ‘my paper was...
Going out for beers is also part of the job. You have to remember there are things other than just your research.

accepted in this journal’ and that wasn’t happening for me. When you go to a conference or meet a big shot professor, you see his 10 big Nature publications but you never find out how many times he failed to get something published, or was rejected for a grant. It’s a shame because we all pass through the same spaces. Everyone fails, and I think people should share their failures more often. Success doesn’t come from nothing; there are many failures behind it.

**What do you think got you through the difficult parts? Determination?**

Yes, but I also liked my day-to-day job. I liked coding, I liked acquiring fMRI data, and I liked interacting with patients, so results weren’t the only thing that mattered. It also helped that I had a very linear path. From the beginning, I always tried to answer the main research question of my PhD project. Even when I failed I knew I was getting a little bit closer to answering it.

**Were you able to engage in hobbies alongside the PhD?**

Yes, I travelled a lot. In the first three years I would spend 3 out of 4 weekends outside of Groningen. I swam and did a lot of sports. The PhD is very stressful, and I didn’t have a lot of education about mental health. I saw a lot of
Then all of a sudden I got all these awards even though I had never won anything before. It was the push I needed to keep going.

How would you like to see your research implemented clinically or expanded upon by other researchers?
I did two things: one was to develop methods either to screen the visual field or to understand how your brain reorganizes. The other was to understand how the neurons change and how mathematically they can reorganize and build connections.

On the clinical side, the biggest goal of my work was to understand whether the adult brain can reorganize after a disease. It is important to know before applying visual restoration therapy whether the brain has the capability to reorganize, or whether it has already reorganized. If your brain is already not responding to visual information, even if your eye is completely restored, you will not see. This is very timely because these techniques of visual restoration are going from the experimental tube to reality. So it’s important to say okay now we can repair the eye- what happens to the brain?

In an ideal world my research would have two applications: the first is to prevent people from losing their vision by diagnosing earlier and the second is, after losing vision, understanding if they have the potential and the capability to have their vision rehabilitated or repaired.

You not only won the BCN dissertation award, but also the Marie-Curie grant and the Portuguese Woman in Science award. Have they opened up opportunities for you?
They have really increased the visibility of my research and I think they will be very helpful when I start to apply to more permanent positions in academia. But most importantly they have kept me motivated. I had the feeling that I was taking a long time to finish my work and I felt very tired. In December I received a manuscript back for another round of revision. I was very demotivated because I had been working on it for so long. Then all of a sudden I got all these awards even though I had never won anything before. It was the push I needed to keep going.

The Marie-Curie grant also takes some of the weight off my shoulders. I now have time to finish some of my unfinished work from the PhD. It’s a good message to other PhD students: don’t try to finish everything. Sometimes we get this feeling ‘I will only submit the thesis when I have done every little thing’ but that can take forever. You can have a good thesis with 4 of your works. Every time I read my thesis I found a typo and there was something I noticed that could have been done better... but at some point you need to let it go.

Did you take a break after your PhD?
No, and it’s my biggest regret. I was supposed to go to New Zealand in April, but then Covid happened. As soon as I can travel, I would like to do a big trip. I would strongly advise everyone to do it.

What are you doing now?
I moved back to Portugal where I’m still doing MRI and vision research but I moved to studying rats instead of humans. It’s easier to use MRI with higher magnetic field strength in rats because they are smaller animals and
it is easier to maintain a homogeneous high magnetic field in a smaller space. In Groningen, we have 3 Tesla MRI scanners, with functional MRI the resolution of the images was around 3mm3, so I could not distinguish between the 6 layers of human cortex. Now I’m scanning at 1003 so I have multiple layers and laminar profiles. I’m also still studying plasticity. I’m working with animals that have never seen light before, and now I can see what happens to their brain when they are exposed to light for the first time.

You’ve had experience in both industry and academia, which did you like better and do you think you will go back to industry at some point?
I really enjoyed working in industry, but when you work in science you have this feeling of working for the greater good. You agree with the values of your work. When you work for a company, whether it’s in imaging or wherever, you are working to make someone richer. You don’t get the freedom to choose what you want to do because you are being paid by the company.

Now I’m enjoying this project, but I don’t want to be an eternal post-doc. I’ll keep my options open. That’s the beauty of the PhD. You have the skillset to do a lot of things. Personally, there are so many ways I can feel I can succeed. Getting an academic position is just one of many.

As someone who has had a very successful academic journey, do you have any advice for BCN students on how to achieve this?
I got very lucky. In my group there are ten other women just like me, or even better. Even if I had never won anything, my work would be just as valuable. If you are not getting any awards, or your papers are getting rejected, it doesn’t mean that your work isn’t valuable. Do what you like doing, and follow what gives you pleasure. Everyone fails. It may look dark and long but it will end up fine.

■ BY LAUREN HANSEN-MANGUIKIAN
■ PHOTOS BY BARBARA NORDHJEM, BEATRIZ CARDOSO, AND L’OREAL FOUNDATION PORTUGAL
Coming from the beach in San Diego, I had no idea what I was in for here. Rain, rain, rain, and brains! I studied ecology for my bachelor at the University of California, San Diego. I did studies on plants, rivers, and insects. I loved being out in the sun and getting muddy for science. In my final year there, I had extra time so I took a philosophy of cognitive science class, which made me realize how much more interested I am in the results of cognitive science than those of ecology. No matter how much you study plants and animals, people will still destroy them, and to figure out how to stop that you have to know how minds work. I ended up leaving with a B.S. in Ecology, Evolution, and Behavior and a minor in Philosophy, but ready to start something new.

No more mud and sun, but I’m happy I made the choice to study Cognitive Neuroscience at the University of Groningen. I have had the opportunity to dissect brains, conduct and participate in EEG, fMRI, and behavioural studies. I have even explored using computer programmes to model the human mind or the foraging of bees. I realized though, that without good science communication, research won’t change the world. That is why I have chosen to write for the BCN Newsletter. I am adamant that breaking down complex concepts into readable pieces is a skill every researcher should have, and it should be honed and practiced often. I look forward to both helping researchers do this with interviews, and developing my own writing skills to engage readers in the broad array of research within the BCN.
From the Boardroom

After all the hard work in preparing for the event, the BCN Board was glad to see that this year’s Winter Meeting was a great success. It was held completely online, in Gather Town. We received a lot of positive feedback, and particularly on the nice atmosphere that was created in the virtual meeting place. The various options for social interaction, as well as the charming 90’s-style graphics that is used in Gather Town, have surely helped to accomplish this.

Another great success was the rating that the BCN research master programme got in the new Keuzegids. BCN continued its winning streak from previous years and was again rated amongst the top, if not the top Neuroscience master in the country. Scores such as these are very important for the success of our programme and will help to attract the best and most motivated students. Thanks to everyone who is involved in making our research master tick!

There is also a lot going on in BCN behind the scenes. For instance, we have been working on ways to further smoothen the Medical Ethical (METc) application procedure, to help young researchers along their way. A proposal that is currently being considered is to include more detailed information about the METc in the educational curriculum.

The Board has also been busy trying to improve the financial arrangements made with the participating faculties. There is good news from this front as well: The Faculty of Medical Sciences has agreed to increase our yearly budget, and the Faculty of Behavioural and Social Sciences has agreed to fully compensate teaching for our PhD students (next to our master students). These deals will create more room for BCN to improve its educational programme and to start new initiatives to foster scientific collaboration.

Finally, we have been working on the Nothing but the Truth conference, which was postponed due to the Corona pandemic. I am happy to report that we have decided to hold it in physical form on November 1st this year (mark your agendas), with online options added that we may fall back on in case of an Xth wave of the virus. In addition, we are also planning to follow up on this first meeting with another, two-day meeting in 2022. Not that there is anything wrong with online events, but the members of the Board are all really looking forward to these live conferences. We hope that you will be, too!

BY ELKAN AKYÜREK
No guts, no glory: Can a diet cure mental disorder? An interview with Hersenstichting grant awardee Iris Sommer
Iris Sommer is a Professor in Psychiatry in the department of Biomedical Sciences of Cells and Systems at the UMCG. Over the course of her career, she focused on studying schizophrenia, and its various subcomponents. However, when she came to Groningen three years ago, she decided to take a step back and look at brain disorders more broadly. To do this, she has recently been awarded 1.000.000€ from the Hersenstichting to investigate the interaction of brain health and gut health. We talked to her to learn more about her general research, how gut health can influence our brain function and the importance of interdisciplinary research in neuroscience.

“Can you tell us about your research background?”

“I have been doing schizophrenia research for almost 20 years; but when I came to Groningen three years ago, I had the goal to broaden my horizon a little more. In psychiatry, many diseases have similar underlying mechanisms and therefore can benefit from similar interventions. It is becoming more apparent that different diagnoses are not really separate disease entities, but rather more specific colours on a spectrum of shared symptoms and mechanisms. This is why I think what is most needed in psychiatry right now is to understand these very basic mechanisms behind our disorders. Unravelling this would be beneficial in making progress to understand individual vulnerability, but it would also help with treatment development. The treatments we
have right now in psychiatry work fine for most people. However, we often run into problems if a treatment does not work for an individual. Because we often do not understand the underlying pathways, we do not know how to react in those situations. This is why it is important to understand the underlying mechanisms of disease.”

“You have recently received a large grant from the Hersenstichting to focus on these shared underlying mechanisms between disorders. What exactly will you investigate with this grant?”

“This grant enables us to study underlying mechanisms in a transdiagnostic approach, this means we do not only focus on psychiatric but also on neurological patients. Overall, we believe that many patients across psychiatry and neurology can benefit from optimization of their gut health. For example, especially in Parkinson’s disease we have found abnormalities of the gut such as decreased barrier function and disbalance of the microbiome. Generally, we know that different mechanisms involving the gut can have negative consequences on the brain and we want to study if this can be reversed. If we optimize the gut health in these patients, will it also improve brain health? The nice thing about this is that we know much more about gut health, and it is much easier to optimize gut health than brain health.”

“Can you tell us a bit more about how you will study this?”

“The grant period will consist of three steps. The first part of the study will include patients with Parkinson’s disease, dementia, schizophrenia and bipolar disorder. The patients will receive an anti-inflammatory diet composed by Dr. Campmans at the UMCG, which is composed of nutrients that decrease the inflammatory degree in the gut, which in turn also positively influences the microbiome. This is done in a randomized cross-over design, so some participants start with the diet while the others continue eating as normal and after a wash-out period, the groups are reversed.

In a second part of the study, we will collect urine samples and Professor Sven Ijzendoorn together with Lianne Remy will develop innervated gut organoids based on the cells of individual patients. We can use these innervated...
gut organoids as a test set-up to inject bacteria, nutrients or vitamins and study how organoids respond. We expect that different psychiatric and neurological diagnoses will benefit from different probiotic mixes and using this set-up we can develop disease-specific probiotics, and perhaps even disease specific vitamins.

In the third part of the study, we will now apply this knowledge from the cell study on gut organoids and treat patients with disease-specific probiotic mixtures, which Winclove will prepare. I predict that a healthy diet will have a large effect on mood and fatigue. In an inflammatory environment tryptophan is metabolized into kynurenin whereas in an anti-inflammatory environment it can be metabolized into serotonin which boosts mood. It would also be great if we can slow down progressive diseases such as Parkinson’s by a change in diet but I’m less sure if that is going to happen.

“What role do you think the gut plays in disease development? Can it be a trigger in someone with a genetic risk factor, or is it a symptom of having the disease?”

“It is probably a mixture of both. Most patients have some kind of genetic vulnerability, as many proteins have functions both in the gut and the brain, so both organs may be affected. But environmental factors also play a role. Especially in schizophrenic patients, we see an a-motivational syndrome, which means that some patients do not display much initiative and poor self-care, and this often leads to unhealthy nutritional habits. This also touches upon a very important question in regard to the behavioural aspects of the study. How can we persuade patients with negative symptoms to continue their healthy eating habits? We tried to take precautions by ensuring the diet includes affordable foods and easy to prepare meals so that people across all socioeconomic backgrounds can sustain the diet. This way we hope to get patients to continue the diet after the study period.”

“If you look at the media right now, you can see big trends in regard to different diets and superfoods. Do you think in a couple of years the next trend will be about superfoods for your mental health?”

“I hope so! I actually think quite simple things can be “super” – for example, the traditional Dutch herring is actually very good for your brain and the same goes for kale. This realization is also what we share with our patients – we don’t want to put them on a diet based around Goji berries and chia seeds, but rather we want to develop diets that fit culturally and teach patients how to eat right.”

“This project is a collaboration between many departments. Why do you think interdisciplinary research is so important?”

“It is very important indeed, and especially in psychiatry. We cannot be educated enough to understand everything, so input from your colleagues is important to design experiments that can bridge the gaps between disciplines and to understand even complex phenomena. Collaborating with people from other disciplines is also nice because it drives you out of your comfort zone and into learning. This is inspiring to me personally, but it is also crucial for the development of your research. This project could never be done without Professor Teus van Laar (Neurologist), Dr. Benno Haarman (Psychiatrist), Professor Gerard Dijkstra (Gastro-enterologist), Dr. Hermie Harmsen (Bacteriologist) and Professor Sven van IJzendoorn (Cellbiologist).”

“I like the idea to think of collaborations as a way to keep learning throughout your career.”

“Yes, I’m a professor now and usually I do a lot of teaching and I hope to inspire people around me but even if you’re on top of the ladder you still need inspiration yourself. I draw a lot of inspiration from my colleagues from other disciplines who can teach me a lot and keep me vitalized.”

“As a final question – what would your advice be to young people in academia?”

“It helps if you’re doing what you’re passionate about. It’s really important to work on a topic that you’re intrinsically curious about, as this ensures that your work is also your hobby in a way. This is important for students to keep in mind, but equally important for us supervisors. We should really try to follow the passion from our PhD students and allow them as much space as possible so they can go their preferred way. This might be a quality to look for in positions and supervisors for early-career researchers.”

The traditional Dutch herring is actually very good for your brain
The experience of each PhD student differs based on what they encounter in the lab. Chris and Sarah had quite opposite and interesting timelines during their PhD, yet they have similar opinions about how their PhD degrees help them now. We had a conversation about their PhD, working with patients in the clinic and the great opportunities after your PhD.

Hey Chris and Sarah! Can you tell me a little bit about your project?

CHRIS: Hey! My PhD was about virtual reality (VR) assessment and interventions in psychiatry, mainly for psychotic disorders. I worked at the Psychosis department of the UMCG. This was really good for me as I did not know much about this specific patient group before I started. It is so nice to meet you. Which department did you belong to, Sarah?

SARAH: I worked in the Experimental Psychology department at the Heymans Institute. My project was about time perception and how our memory performance shapes our perception of time. In that context, I also worked with patients suffering from Mild Cognitive Impairment, individuals that have an increased risk of developing Alzheimer’s disease. I did most of my clinical work at a memory clinic in Magdeburg, Germany. Thus, I was also on-site and it was much easier to be directly associated with the memory clinic in order to get participants for the study. I wonder where we might have crossed paths, when were you on your BCN retreat?

CHRIS: I think in 2016. I actually started with a three-year PhD trajectory. In the end, I stayed for 6 years at the UMCG. I ended up getting involved in several other studies and teaching next to my PhD project. There were some really good opportunities, such as working on the HAMLETT project on anti-psychotic medications, that I enjoyed a lot. When did you begin your PhD?

SARAH: I started in 2017. I had 4 years for my project and I ended up finishing my work in 3 years. I started my PhD with a more cognitive neuroscientific direction and then realized quite early during my work that I wanted to include more clinical work in my project. I decided to also do a clinical master during the PhD to then integrate more clinical projects.

CHRIS: That’s impressive. Are you also currently doing clinical work?

SARAH: Actually life took a completely different turn than I expected. During the first lock down, I finished my PhD thesis and was mainly working out of Berlin. I then got involved in setting up the vaccinations in Berlin and now I am the head of two vaccination centers. So right now, I manage about 900 workers on a daily scale - which I did not expect at all to be doing after my PhD. It definitely shows that you acquire so many skills during your PhD that can be applied in many different settings.

CHRIS: Oh wow! What has your background been like? How did you get into this?

SARAH: Before I started undergraduate school, I did a 3-year apprenticeship to be a paramedic and also worked as a paramedic next to my studies. Luckily, we’re no longer in a time where one needs a completely linear CV.
for a career. During the lockdown I also helped out on the ambulance at a social organization that then approached me about getting involved in the vaccination process in Berlin. I am however happy to also still be involved in research and have a one day a week postdoc position.

Also having defended in COVID times, how was your defense ceremony? Were you able to enjoy it?

**CHRIS:** In the end, the entire ceremony was quite perfect for me. I guess we were still one of the luckier ones that could have some people around during the ceremony. I think there were about 30-35 people in total. And afterwards, my paranymphs arranged a tandem bike to ride through the Noorderplantsoen where several of my family, friends and colleagues were gathered. This was also kind of a goodbye party, as I got my PhD on Tuesday and moved to Sweden for my postdoc the following Sunday. What was your experience like?

**SARAH:** I was pleasantly surprised how nice everything turned out, under the circumstances. In some ways it made things even more special to have your family and...
close colleagues present. It would have been nice to be able to celebrate with all my colleagues and I really thought I would have a chance to do that in the following summer after my defence but with the current state I still don’t think that will be allowed to happen. I guess it’s also weird how the ceremony itself seems like a huge thing before it actually happens and soon after the ceremony, normalcy sets in. You move on to the next thing.

CHRIS: Yes, I agree. Did you move to Berlin right after your PhD?

SARAH: Already during my PhD when I did the clinical studies in Magdeburg I stayed in Berlin. But I also still have an apartment in Groningen. With the situation right now, all of the online meetings and doing the work remotely makes it so much easier to be abroad.

CHRIS: Definitely. I still teach psychologists in the Netherlands, online. Due to COVID, I have mostly been working from home. In Sweden there are very few restrictions. You can shop, go out to eat and do almost anything without any trouble. For me, it has definitely been the perfect country to stay in during COVID. Also, I really enjoy the nature and Sweden certainly has a lot to offer there.

SARAH: Where are you working in Sweden right now? What kind of work is it?

CHRIS: I am working at the forensic psychiatry clinic in Växjö and at Lund University. Here, I am continuing my work on VR. Currently, I am focusing on how we can use VR in the assessment of forensic inpatients. With VR, we try to bring the outside world into the clinic, and see how patients respond during social situation in VR. Also, Lund University offers some courses specially for postdocs which I am taking right now. However, I’ll be returning back to the Netherlands soon as I have received a fellowship grant and will start as a postdoc at the UMCG. Do you think you will become a clinical psychologist at some point?

SARAH: Oh, that all sounds really nice! To be honest, I don’t really know at the moment as what and where I’ll end up. I like taking it how it comes and it has been really nice to get a feel for a different work field in the industry. There is a completely different aspect of work-life here. One thing I really miss is the freedom of a researcher. You are in charge of your own time and projects and have a lot of freedom in that. I think that this is something that’s quite precious. I don’t think I was able to appreciate it as much before as I probably will now. I’ll see where I end up being. I’m sure that I will always be involved in research and it would be really nice to set up some experiments related to the vaccination work and see if there are some ideas that can be integrated.

CHRIS: I agree that the freedom of research is great! Especially now that I am in Sweden, if I’d like to take a hike during the day, I can do that, and work in the evening. But I can imagine that it is also good to have a combination of jobs like you, as dealing with this freedom can also be very challenging.

SARAH: For sure! Sometimes, you can feel rather lost during your PhD. It can feel like this big task that you need to achieve and you can feel quite pressured to fill up your time effectively and make the right plans. But it is also a skill that we learn during this period. We learn how to organize and motivate ourselves in doing our projects. The struggle I clearly remember was to deal with the rejection (such as publications in journals) in science. At some point you realize that we all experience this – its normal!

CHRIS: Yeah. At the beginning of my project, I think I wanted to do it all on my own. But over time, I have learned to let other people help me out. I think all in all, I had an excellent time working. That is probably why I ended up prolonging my project. How do you look back at your PhD journey?

SARAH: Yes! I certainly think that I was lucky with all the projects that I did. I know that a lot of people face a lot more complications. So, I definitely consider myself extremely lucky. I am also very grateful that I had so many opportunities to collaborate with people - which is always great. It was really nice chatting with you!

CHRIS: It was really nice to meet you guys! All the best!

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**One thing I really miss is the freedom of a researcher.**

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**BY ESHITA SENGUPTA**

**PHOTO OF CHRIS BY SANDER MARTENS**

**PHOTO OF SARAH BY CARINA DOLFING**
Disappointing fact: Humans are not rational. They make decisions not in line with their goals. All the time. These non-rational decisions depend partly on how options are presented. This is called frame setting. Let me give an example: you’ll get two options in a gamble. 1) Bet 50 euro with the chance of keeping 20. 2) Bet 50 euro with the chance of losing 30. Quite likely you will pick option 1. It’s the same. It just feels different. This is what is called a frame. We know from neurocognitive research that a key brain region involved in emotional processing, the amygdala, plays an important role in this framing effect. This suggests a crucial role of emotional systems in non-rational decision making. I am very human. I find myself making non-rational decisions all the time. I know that writing papers will make it more likely to get my next grant than writing a column. Yet, guess what I’m doing right now. My amygdala is on fire.

Currently I’m struggling a bit with my academic self and self-worth. I’m busy with too many things. Teaching, supervising BSc-, MSc-, and PhD-students, co-writing of manuscripts, and grant writing. These could be considered my core business of being a researcher. But I’m an academic too. If research is the weather, academia is the climate. And I care about the climate, in every sense. Academia is the context in which research and teaching can flourish. And thus, I often find myself saying yes to ‘community service’, joining networks and organizing activities aimed at making academia a more diverse and inclusive place. A place that makes use of everyone’s talents without asking everyone to be talented at everything. Because this is what I believe brings out quality.

You would think that everyone in higher positions and the government sees that fostering the best possible research and education is of utmost priority. And of course they do, but it’s just very difficult to let go of the weather. So when it comes to promoting people to higher ranks, individual productivity in writing papers and individual success in getting grants is what helps you best. It’s still risky to take another path. Luckily, there’s quite a number of (bottom-up) initiatives motivated to improve the climate. A great example is the Open Science Community, of which we are lucky enough to have our local branch: the Open Science Community Groningen. It’s full of young and ambitious people who believe we should improve the overall quality of research by making it a more open process. They, and many others including the very important Recognition & Reward movement, will change the system. For the better.

The evaluation moment for my talent track is approaching. So I’m more aware of my profile. Which I value differently depending on the frame I use. If I evaluate myself as an academic contributing to the local, national and international academic climate, every choice I make feels as a win. If I evaluate myself as a researcher in the more old-fashioned narrow notion of academic excellence, every choice for a non-core task feels as a loss. I choose the academic frame. The outcome is hopefully the same. It just feels much better.

■ BY MARIE-JOSÉ VAN TOL
Animal experiments continue to be one of the fundamental research methods in neuroscience. While an increasing number of processes can be investigated on a molecular and cellular scale, and at the same time we are able to build more and more complicated computer models of cognitive mechanisms, animal experiments still form a crucial part of the clinical and behavioural levels of analysis. This kind of work comes with obvious ethical concerns, and balancing the number of animals necessary against obtaining significant and appropriately powered results can be tricky. According to one of the three Rs of animal experimentation (Reduction, Refinement, Replacement) the number of animals should in general be reduced to the necessary minimum. From a purely logistical standpoint, increasing the number of animals involved tends to also involve more challenges and costs. However, small sample sizes can have drastic consequences.

A few years ago, a review in Nature Neuroscience found that many studies within the field of neuroscience were severely underpowered – while the “usual” checkpoint power value is 80%, the analysis found that it was in fact on average only 21% (Button et al., 2013). Power value effectively means that there is X % chance that the study will find an effect where it actually exists and (100 – X) % that it will be a false negative (a true effect will be missed). Importantly, lower power values also mean that a statistically significant effect found by a given study is less likely to be actually true. Moreover, when a study with small power does detect an effect, this will likely be inflated since small studies can only detect big effect sizes. This so-called “winner’s curse” is caused by their low power which means that small effect sizes will fly under the radar. While the main focus in the Button et al. review was put on neuroimaging studies, they also investigated this effect in neuroscience animal experiments, using the same method: calculating the average effect size from a meta-analysis (in this case, for sex differences in a water maze and radial maze performance), and working out what the required N per study would be to detect this magnitude of an effect with 80% power. While the typical N per study used in these experiments was 22 for water maze and 24 for radial maze, to obtain 80% power these numbers would have to be increased up to 134 and 68 respectively. For the typical N used, the effect size would have to be around two times higher to be detectable.

While the data above was based on one meta-analysis focused on a specific task and involving only 19 studies, a more recent publication in Nature Neuroscience focuses solely on power issues in animal research (Bonapersona et al., 2021). Taking into account 1,935 studies and using a slightly upgraded method, they found that the power was even lower – overall median of 15%. Even for large effect sizes, only 12.5% studies had “enough” power (80%) to detect the effects, and for smaller (and more often encountered) effect sizes the required number of animals drastically goes up drastically to 21 (for g=0.9) and 394 (for g=0.2) animals per group. To
obtain the necessary increase in power without having to use many more animals, the researchers propose a new method based on Bayesian priors.

In short, in Bayesian statistics the probability of a hypothesis being true can be updated with what we already know about a given parameter – this evidence is called a prior and can be integrated with our observational data (the likelihood function) to explain new observations, resulting in a posterior distribution which reflects our updated knowledge.

In this case, the historical control data from previous animal experiments are proposed to be used as priors. This can allow researchers to take advantage of the vast database of animal experiments already available and of the similarity between the control groups used in different studies. A simulation experiment described in the paper shows that combining the historical data of 83 “prior” control animals with 49 “new” controls allowed the study to increase its statistical power to over 80% – most importantly, while keeping the number of animals used constant. The simulation experiment concerned the effects of early-life adversity (ELA), however the prior controls were sourced from other experiments not directly related to ELA, only with the same test used (object-in-location for spatial learning). To implement this technique, an open-source tool is further introduced (RePAIR) which includes some statistical checks for the priors used – among others, it is possible to assess how strongly the priors should weigh in using an index describing similarity between the “current” controls and the priors.

Using control groups from previous studies examining similar phenomena as priors for new studies can allow for increasing the power without the ethical and logistical difficulties of increasing the number of animals used. As with any method, there are some disadvantages – most prominently, it introduces a new level of subjectivity by allowing the scientists to choose the index value themselves. Details about the reasoning are explained further in the article, however even when the value chosen was small (so that the prior did not have much “weight” compared to the current controls), the historical controls still significantly improved the power values. Moreover, since in general given control groups should belong to the same population, and, in animal studies in particular, many standardised tests are used, the similarity between historical priors and new control data should be relatively high. Naturally, to benefit from this approach appropriate data from previous (similar enough) studies is needed, which might not always be available. In this case, another solution proposed is to use previous data from the lab of the current experiment, which can also help in reducing the variability between the groups. Since many branches of neuroscience continue to rely on animal research, this method could aid in increasing the validity and relevance of the obtained data.

BY ALEKSANDRA CYWINSKA

References


“Using control groups from previous studies examining similar phenomena as priors for new studies can allow for increasing the power without the ethical and logistical difficulties of increasing the number of animals used.”
Develop your science communication skills in the Dutch brain olympiad (Brain bee)

Every year in January, several hundred secondary school children from around the country gather for a special competition: a brain competition. And we don’t refer here to the final exams, but a contest on who knows most about the brain. It’s a real competition, with rounds. In the first round, knowledge about the brain is tested, based on their study of the Society for Neuroscience’s Brain Facts booklet. In the second round, brain anatomy knowledge is tested. The third round is about diagnosing disorders on the basis of videos of patients. And then, the school champions are invited to take part in the semi-final at a local university in which there are open questions being asked by a panel of local professors. Until now, school children could only visit the universities of Amsterdam and Nijmegen. But in 2022 school children will also visit our great neuroscience school to compete. From Groningen, Nijmegen or Amsterdam, local winners move on to a national final round happening during the Dutch Neurofederation meeting. The winner of that round may participate in the international Brain Bee.

Until now, the Dutch brain olympiad has been organized three times, by a wonderful team that includes Fleur Zeldenrust (Donders Institute; you may recognize her from the BCN symposium where she spoke a few years ago) and Marijn van Wingerden (Tilburg University). And we, Marieke van Vugt and Marie-José van Tol, are excited to join this team, and make our future students and colleagues enthusiastic about neurosciences in Groningen. We will collaborate with Marvelous Mind and other university partners. And hopefully with you.

As you can imagine, this is all pretty exciting for the high school students. But apart from all the hard work and testing, the high schoolers also spend a fun day at the university, with a local brain-related exposition and a fun lunch. They also get to meet real researchers. This is where you come in: in January 2022, Groningen will also be a site for the Dutch brain olympiad, and welcome about 30 school children. For this to happen, we need approximately three PhD students or postdocs to help with promotion, practical organization on the spot (including designing the brain exposition), and communication with the national team. And don’t worry, you won’t be required to invent the questions the students will be tested on-those are designed by the national team. Preparations will start around June/July, and may take 1-2 hours per month until January.

So if you are excited about sharing your science with others, and potentially inspiring a kid to become a neuroscientist, please contact Marie-José van Tol (m.j.van.tol@umcg.nl).

For more information, see https://hersenolympiade.nl/en/

■ BY MARIE-JOSÉ VAN TOL & MARIEKE VAN VUGT
> BCN ALUMNUS COLUMN

Caroline Real Gregorio

Current position: Postdoc at the Translational Neuropsychiatry Unit Department of Clinical Medicine at Aarhus University

The shift between PhD and Post-doc was delayed by a year. When I finished my PhD, I was thinking either about taking classes at a private university in Brazil or coming back to Physiotherapy. However, I was not happy about the former decision and decided to get back to research. I am also a Physiotherapist by training in Brazil. However, back in 2013, a lot of universities did not allow a person with bachelor’s degree to be a part of their team as they only accepted Physicians. Thus, I started planning my project in order to apply for a postdoc. I had decided to accept new challenges in life, and it was then that I decided to join the world of Nuclear medicine. Thus, I proposed a study which analyzed the effects of treadmill exercise on Parkinson’s disease (PD) rat model by neuroimaging. In Brazil, I performed a few experiments with TRODAT-1 SPECT but the data did not correlate well with histological data, and it was the only option in Brazil to analyze dopaminergic system. Around the same time I met Prof. Erik de Vries from NGMB, UMCG. He was already a collaborator of the group that worked in Brazil. He suggested that I can come to the Netherlands for a proposed study. Thus, I visited the University Medical Center, Groningen for about 7 months to finish the Parkinson’s study. After the study was completed, I returned to São Paulo and I received an invitation to work at the Nuclear medicine department of HC-FMUSP in Sao Paulo, as a postdoc in a preclinical imaging laboratory. I stayed there between 2017-2020, and during this time was involved in multidisciplinary studies, including oncology, neurology, endocrinology. Subsequently, one of my master students showed interest in the field of Nuclear Medicine. Then, we contacted professor Anne Landau, who is an expert on PD and had radiotracers available for opioid system and synaptic density which was our focus. So, I started a collaboration with her, and we applied for a postdoctoral fellowship (Parkinsonforeningen Foundation). Making the decision to stay in science, or to take lectures in a private university was quite a struggling decision to make since in Brazil, professors from private universities were not involved in research. And to be part of public universities is also hard, since you have to do a writing test, practical test, and CV analysis. After an online meeting with the Translational Neuropsychiatry Unit Department of Clinical Medicine, I felt quite welcomed and was also excited since they have state of the art equipment for radiotracers. So, overall, I am happy with the turn of events after deciding to stay in academia!

■ BY KAVYA PRASAD
■ PHOTO BY TK RENATO
Just Keep Going! An Interview with the BCN Research Master Alumnus Tobias Navarro Schroeder

How does the subjective experience of this world come about? From reading books about neuroscience as a teenager to conducting studies about spatial navigation as an Associate Professor at the NTNU in Trondheim: Tobias Navarro Schroeder is looking for answers. Luckily, he found time to answer our questions about his experience as well. We talked about the BCN Research Master, his career path and the future of academia.

Can you tell us a bit more about your work and the questions you are trying to answer?
Generally, I am trying to understand how experiences are generated, how a memory is created, how a representation of the world is built in the brain and how we interact with it. Spatial navigation is something tangible and representations of space can be related to activity in the brain, which provides a powerful window for computation. Specifically, for my PhD project at the Donders Institute, I explored with Virtual Reality and fMRI how humans learn object locations. This research was based on studies in rodents that found single cells, so-called grid cells, which represent aspects of space in a map-like representation of the environment. These findings in rodents are being translated into a population fMRI signal in humans. It is great to see how spatial navigation can bridge gaps between disciplines.

Was it always clear to you that you want to pursue an academic career?
When I started reading books about neuroscience at the age of 18, it was already pretty clear to me that I wanted to go into that direction. However, I did have my doubts about the academic system and I continue to have them. During my undergraduate (a BSc in Biology from the UG) I read about the problems in academia, regarding publication bias or the influence of politics. I was therefore not too illusioned about the system when I entered it. A lot of my colleagues reached their frustration threshold and left academia when they became disillusioned with what they would find, the politics or the “publish or perish” mentality. There are seriously many things wrong with the system. All the incentives to cut corners, the flexibility of analysis parameters…I also came to the point where I thought: Do I want to be part of this system? The only way I could be happy in this environment is by doing my best to change it for the better.

Move ahead, step by step. If you know what you want, you are more passionate and more active to take initiatives and initiatives are rewarded.
Where do you see ways to improve the system in the future?
In my own group, I have started to try new formats of publications, such as a registered report. There is a lot of potential to improve the research process by increasing transparency and accountability. We are at the start of that with what originated in the replication crisis of social psychology. Unfortunately, the process is going very slow. The system is built in such a way that those who have been in it for a while usually have gained the most influence. Those would hold most of the power for change, however, often use to maintain the status quo that guarantees their privileged positions. It’s just human nature basically, we all have cognitive biases. Often, it can help to take the human factor out. Meta-science is a very important field of research. The goal would be to find the most efficient way to use limited funding in order to increase the knowledge of the world.

What advice would you give someone at the end of the BCN Master’s programme?
Be honest with yourself. About what you want to achieve in life, what your dreams are and how important they are to you. If your dreams involve a scientific career: Just keep going! Move ahead, step by step. If you know what you want, you are more passionate and more active to take initiatives and initiatives are rewarded. Because research is a creative process: We want to find something new and create new knowledge. Passion is the fuel to create something new! It is important not to get too stuck in these short-term goals like exams and assignments from the curriculum. Something that you created yourself by your own initiative can make you stand out rather than your grades. When I recruit people grades are the least important factor.

Is there anything that you didn’t learn during the Research Master which would have helped you in your career?
Mostly how to manage a new project and how to allocate time to it, as well as supervision skills. I think that generally, the Minor and Major Research Projects are the best possible training from the programme, since you get a glimpse of what actual research entails and it encourages you to take initiatives.

What was the biggest challenge in your career?
Drawing a line and ending a project that did not work out. I was trying to resolve the analysis for a year without success. I should have ended it much earlier but I really wanted it to work. I had to learn to say “No. That’s enough”.

What do you see as a broader goal for future science?
Basically, that all disciplines come together to understand the nature of this world, and how it gives rise to our human experience. I hope that neuroscience can provide a little piece of the puzzle.

By Annika Sauter
Mindwise: Artistic Evaluation in A Digital World

Art, as traditionally conceived, has the potential to touch and move people (you can read more about this in the Mindwise blogpost: ‘Mondriaan Moves: How art can move the body.’). We, as observers, tend to project our self and body into the artwork giving rise to an embodied experience and, as a result, distinct bodily sensations and movements are elicited (van Klaveren, Ueding, & Cox, 2019; Cox & van Klaveren, 2019). In this perspective, art can bridge abstract thinking and embodied experience (Dufva & Dufva, 2019). The question I am interested in answering through this post is whether, in the light of literature, experiencing traditional and digital art is comparable.

What is digital art?

Digital art is a term applied to contemporary art that uses digital technologies and digital media. This means that nowadays the artists can incorporate digital technologies within their artistic practices and dissemination channels. Net art, digital installations, digital reproductions, computer painting are only some examples of the infinite variety of art forms that are emerging as a result of technological progress. Social media and online galleries, exhibitions, and museum tours are the tip of the iceberg of the new ways to share the artworks with the audience (Samdanis, 2016). Such use of technologies raises interesting questions in terms of artistic and aesthetic evaluation, such as: can digital art move us in the same way as the traditional one does? Is it still an artistic experience if it occurs through digital engagement? These questions are waiting to be answered and they open up a new scientific challenge in the psychology of art field: the digital challenge.

Traditional art versus digital art

The underlying problem to this challenge is the tension between traditional art and digital art, which remains unsolved. From a historic-traditional school of thought, there is a resistance to the change of artworks’ nature. It is usually conceived as a break of the bond between the artist and their work, as the entire artmaking process is seen as more trivial and lacking the ‘human touch’ (Lugihi, 2014). Thus, for instance, creating a painting with graphic software is sometimes seen as a shortcut used by the artist to achieve a great piece of art in terms of color and composition, by erasing any mistake made with the “undo” button. This does not easily adapt to appreciative conventions. Whereas, if the artist creates the same painting using paintbrushes and oils, the greatness of the piece would be clearly acknowledged for the appreciation of particular effects (i.e.: color and composition) as well as of the high degree of difficulty (Thomson-Jones & Moser, 2019).

In contrast to this traditional point of view, it has been argued that the artistic experience is about what is provoked in the audience regardless of the techniques that artists use for making and sharing their work (Rani, 2018). The audience can still appreciate an amazing digital painting because of its unique qualities, not to mention the way it makes them feel. Focusing only on the appreciation of the techniques obscures the importance of the meaning an artwork intends to convey. Hence, a digital painting is not less beautiful or meaningful because of its digitality. Both art practices could still share the same cognitive, bodily, and emotional endpoints that could be investigated with established methodologies and conventions (Bentkowska-Kafel, 2015). Nonetheless, art is innovating at an intense speed.
and it is adapting to a constantly changing digital scenario. For this reason, the digital challenge may require a rethinking of artistic production, as well as its evaluation criteria (Lughi, 2014).

Digital art, together with the artists’ creativity, has made numerous pathways for intensifying unique art experiences and tearing down boundaries for imagination by using practices that seem to bring the impossible to life. For example, the audience does not have to imagine what it would be like to be in a painting, they can just experience it through virtual reality (VR). Thanks to techniques such as the Tilt Brush by Google and VR headsets, it is possible to walk into paintings almost like Mary Poppins in the chalk drawing. Moreover, the Internet offers ‘any place, any time’ digital access to thousands of different artworks, raising higher expectations of artistic experience in a museum (Thomson, Purcell & Rainie, 2013). In light of the above, we may also infer digitalization in art challenges our perceptions and affects the way we create and appreciate artworks.

At the dawn of the digital challenge

Until recently, digital art has been included in the field of Neuroaesthetics and psychology of art merely as a convenient stimulus in experiments. Few attempts have been made to empirically investigate the value and impact of digital art on the audience compared to traditional art experiences. These efforts mostly concern digital reproductions of paintings rather than fully digital produced art (see Siri et al., 2018; Reymond et al., 2020). Reymond and colleagues’ study (2020) on

1. The Wheat Field with Cypresses (1889) by Vincent-van Gogh as close as possible to the original oil painting exposed in the Metropolitan Museum of Art in New York City as a classical example of traditional art.
2. Digitally enhanced version of the same painting by rawpixel.com.
3. A digital painting by Steve Elliott created using the natural painting software ArtRage, inspired by the Van Gogh’s famous painting.

the aesthetic evaluation of digitally reproduced art is an interesting example. The study used manipulation of image surface (i.e., color saturation) of famous traditional paintings. It investigated whether laypersons’ liking and emotional reactions to digitized images would be influenced by color saturation. Indeed, results showed that increased saturation had an impact on
emotions like ‘surprise’ and ‘interest’, indicating that the participants found images with enhanced color saturation more surprising, interesting, and moving. Hence, laypersons found the original images more ‘boring’ than the ones with increased saturation. This study together with others about digitized reproduction of works of art, result in the idea that both types of artworks (real and digitized ones) can be considered as artistic products (Siri et al., 2018). They gave us a subtle hint of the ongoing importance of technology to art appraisal (Gamboe, 2014). Still, these studies are limited to the appreciation of traditional painting in a manipulated digital format.

The first study that uses original, born-digital works of art as stimuli has been conducted by Calbi and colleagues (2019). It evaluates eye gaze and explicit behavior while observing digital works of art. The results show the beholders’ body is involved in a relationship with the properties and the aesthetic judgment of the digital artworks. It constitutes small steps towards the study of digital art experience, even if it lacks an explicit comparison with traditional art or with non-artistic digital objects.

A literature review has suggested diverse critical perspectives on the traditional vs. digital art debate, here briefly summarized, concluding that it is now possible to compare the two art experiences without first considering the digital arts as an artistically significant category (Thomson-Jones & Moser, 2019). This would establish the basis for further investigation into the mysterious world of digital art and its experience.
At this time, the little evidence provided by research suggests the possibility of digital art as capable of evoking feelings just like traditional art. It created a small opening for the empirical aesthetics to face the digital challenge. It raises questions and open prospects:

- Does technology enrich art-elicited emotions and experiences?
- Are digital arts getting closer and closer to replicating the personal interaction of traditional art in a real-life environment?
- And, ultimately, can we feel the human touch through pixels and virtual experiences?

BY GEMMA SCHINO

FEATURED IMAGE BY
@TANNNPRO ON UNPLASH

Originally published by Mindwise

References


Why you should go abroad!

Going abroad during your studies can be daunting, and undesirable for many people. Maybe, studying in the Netherlands is already studying abroad for you. Maybe, you have no desire in going abroad or are weary of the fact that it can be challenging to be in an all-new environment without knowing anyone there. But either way, I want to make a case for going abroad for your minor/major thesis, for a collaboration during your PhD, or even just for a conference. I say this because throughout my education, I have my made a point of going abroad as much as possible. During my undergraduate studies, I spent a semester in Montreal, Canada and now, during my Masters, I am writing my thesis in Cambridge, England. These two trips have confirmed what I was already expecting when planning them. Going abroad is awesome. Not only is it a great personal experience, you getting to see a new country, experience a new culture and make new friends, but it also looks very good to future employers and will make your CV more diverse and interesting.
What is the unique contribution of going abroad to your CV? Employers have caught on to what I like to call the abroad-effect, and so they value seeing such activities in a CV. Especially, if you are able to bring referees over from these locations that will vouch for you as a person or your academic abilities. This will add a unique selling point to your CV and distinguish you from many other applicants. On top of that, such an experience is often great use as a conversational starter in interviews or informal gatherings. And, last but not least, it will simply help you expand your network by meeting new people who in turn will know very different people than the ones from your home university.

These were exactly the factors which persuaded me to go to Montreal initially. In retrospect, I can say that my six months there felt like a glimpse into a whole different world. The way of life in north America is just so significantly different to the middle European one, that I struggled with a full-blown culture shock upon arrival. The city looks and feels unlike anything you would find in Europe, and let me tell you there is a huge difference between going to a place for a two-week vacation versus going there knowing you are going to be living there for the next six months of your life. Luckily, I was able to quickly meet friends via international student organizations and meetings, and talking to them and relating to their experiences helped to dampen the difficulty of initial adaptation. After a few months, I already felt fully at home walking the streets of the city. The feeling I got out of actively moving myself way out of my comfort zone, to then successfully expanding it to encompass my new situation is second to none and I would not miss it, and the new friends I made, for anything.

Then, of course, there is also a negative side to going abroad: BUREAUCRACY. So. Much. Bureaucracy. But believe me, once you get past that it will all have been worth it. Going to another country for a period of 6 months is one of the most enriching, character AND CV building experiences you can get. What’s especially good about it is that you learn to be independent, to make new friends and to approach people you don’t know, like professors, researchers and colleagues, and to ask for help, collaboration or just a friendly chat. These are life skills which I
have found to be incredibly valuable in academia as well as industry careers, and I believe I cannot possibly overstate the importance of them when it comes to applications for new positions. On top of that, it will help you become a more self-confident, approachable and well-rounded person as a whole.

The personal development aspect aside, going abroad is simply and plainly fun. The way in which such an experience shapes you as a person might be difficult to grasp or even notice while you are doing it or even afterwards, but the immediately palatable fun is obvious. You get to experience a new culture, meet new people and explore new exciting places all with the comfort of financial support by your university and the knowledge in the back of your mind that should you not like it, you will be back home in 6 months anyways. As the current global pandemic (hopefully) comes to an end soon, going abroad will arguably be even more fun, since people will go back to doing fun things and activities with an extra ounce of excitement. So, if you enjoy indulging in some immediate hedonism which will simultaneously shape your personality and improve your CV, what are you waiting for?

■ BY JONATHAN BREITER
Coping with imposter syndrome: Confidence amidst Covid

The imposter syndrome is a constant fear that at any moment you are going to be found out as a fraud. In our personal and professional lives, we are often held with this crippling thought that people like us cannot possibly triumph. We actually live the possibility of hearing success from others and this thought can affect anyone. No matter their social hierarchy, educational degree and level of expertise.

The root cause of this feeling of this particular syndrome is not because we are uniquely flawed. But because we “fail” to actually perceive that everyone carries certain flaws within themselves. The imposter syndrome generally develops at an early stage of life when we start thinking competent people are generally not like us at all. This is due to the fact that we know ourselves from the inside whereas we know others from the outside. We are aware of our anxieties, drawbacks, incompatibilities and doubts and yet what we know of others is far more edited and narrowed down.

This unworthy feeling of one’s self has brought in certain self-destructive attributes and uncertainties in the era of Covid-19 and lockdown. For example, people that try juggling home-schooling with a full time job essentially find themselves setting high standards and are likely to exacerbate the feeling of the imposter phenomenon. In the pandemic, most of us have been working at home and often forget that their setbacks could be due to their home environment not set up for working from home, having to be involved in home-schooling or even bad internet. The constant worry of not being able to be productive has genuinely made people undervalue their true accomplishments in the past year. By doing so, they also overestimate the productivity of other people.

Since we feel that we are not doing enough work, we are likely to be overdoing it. Anxiety about the quality of work and working long hours, avoiding taking sick days or annual leave are driving us due to fear of failure.

How to overcome the phenomenon?
• Have an honest reflection of oneself and not the stories that have dragged oneself into adulthood.
• Recognize your skillset and put a time limit to ‘worry time’
• Accept praise

Share your ideas and talk about your performance without feeling insecure to your mentors or peers. Know the signs, and most importantly know that you are not alone. The simple truth is: You are talented and capable, and that everyone is susceptible to the imposter phenomenon; even highly skilled individuals.

BY KAVYA PRASAD
PHOTO BY SANDER MARTENS
Dear reader,

We appear to be in a strange twilight zone of the pandemic, where on the one hand the hospitals are at their limit, and on the other hand the lockdown is slowly being lifted. Perhaps, by the time you are reading this, things look better altogether.

In difficult times it is always good to have something to look forward to. We are curious to know what you are looking forward to when this Covid veil can finally be lifted. The moment you will get your vaccine, for example (although we understand there still may be many questions about when that moment will arrive). Maybe you look forward to being able to travel and finally visit your family and friends again. Or perhaps you already bought a ticket for a future event or festival.

As the council, we are very much looking forward to meeting many of you in real life again. We can imagine you are as well. Therefore, we would love to facilitate these meetings for the BCN PhD community as soon as it is possible. But of course don’t have to wait for us to organize anything. If you have ideas, you can contact us anytime and we can help you with organization and even arrange a budget. That’s what’s great about being part of a community like BCN.

Apart from the social benefits, we should not underestimate the value of BCN as a professional network. BCN consists of many different researchers from a large variety of backgrounds. And the best part of it is that they are all very approachable. We all know building a network is important for a successful career, so why not make use of the opportunities presented? The BCN retreat and the BCN winter meeting are great examples of this. A network cannot only help in achieving the next step in your career, but it can also help you in deciding what that next step may be in the first place, something we all know can be very difficult. For that reason, part of our lunch lecture series (every Thursday from 12:00 to 13:00) is devoted to BCN alumni who give a talk about their own career after their PhD, albeit in academia or in industry. These talks can broaden your horizon for possible career paths or may be an example of how to reach that specific goal.

For example, Erin van Buel, told us what it is like to have a career at a scientific literature publisher and gave some useful advice about how to increase findability of your published work. And Claire Kos showed us that there also exists a career somewhere in between science and industry, as she is involved in setting up, coordinating and carrying out custom research assignments.

Besides BCN alumni, we also invite esteemed researchers from over the world to give a talk in our lunch lecture series. For example, we recently had prof. Andrea Maier, who talked about the interest in ageing, and prof. Pieter R. Roelfsema, who talked about giving sight back to the blind. Additionally, we have had an interesting Q&A with the Medical Ethics Review Board of the UMCG and Marie-José van Tol, an assistant professor from within BCN, showed us in a very personal talk, that failure is inherently part of doing research.

The list goes on, but I’ll stop for now. We hope to see you soon and please feel free to contact us at our new email address: phdcouncilbcn@rug.nl.

Best regards,

The BCN PhD Student Council
Emile d’Angremont
Mayra Bittencourt Villalpando
Hermine Berbaryan
Alejandro Marmolejo Garza
Tiago Medeiros Furquim Mendonça
Magdalini Ioannou
Nad’ka Majernikova
Lenny Marapin
Theresa Marschall
Sterre van der Veen

Erin van Buel
Claire Kos
From left to right: Nad'ka, Alejandro, Emile, Lenny, Magda, Hermine, Theresa, Mayra, Tiago and Sterre
BCN Nothing but the Truth! 2020 - Update
The BCN conference Nothing but the Truth, originally planned to take place on October 19-20 last year, has been postponed due to the corona virus. The planning now is to organize a 1-day symposium on November 1, 2021 and hopefully a 2-day conference can be planned in 2022.

Extra Budget for courses and conferences
In 2021 there is 300 euro extra available for external courses or conferences. It is up to you which budget you would like to raise. Please use the reimbursement forms from the BCN website (https://www.rug.nl/research/behavioural-cognitive-neurosciences/education/phd/funding). Check the conditions on the forms and add all proofs of your visit and payment! Incomplete forms will delay the reimbursement. Please send this after you have taken the course/conference!!

Change financial support for thesis printing costs GSMS PhD students
BCN will pay € 250 as a subsidy for the printing costs, and - this is new - € 600 extra if the BCN training programme has been completed. Please check if you meet the criteria! Contact Diana if you want to be sure.

When your project started before 1-1-2019, the old conditions are still applicable (200 bonus for each item: speed, quality and education).

You can contact promoveren@umcg.nl to ask for a form.

PhD students with an appointment at other Graduate Schools should check the criteria of their own Graduate School. PhD students from GSH and GBSS will receive 250 euro from BCN, if the BCN training programme has been completed.

Looking for instructors!
BCN is depending on BCN staff members for the continuity of the BCN courses. We are looking for staff members to give feedback on the presentations during the BCN retreats (next edition: June 1) and instructors for the Management Competences courses. Please inform Diana if you like to contribute to the education of BCN PhD students!!!
Cool links

> Mouse Party is a fun and interactive game which demonstrates the effects of various drugs on the brain using an aquarium of lab rats: https://learn.genetics.utah.edu/content/addiction/mouse/

> Interactive 3-D brain, learning activities can be found on: http://www.brainfacts.org/

> At the website of the Society for Neuroscience you can find journal articles, up-to-date research, links to career information and funding opportunities: https://neuronline.sfn.org/

> Neuroscience for kids to keep them academically engaged during Covid19: http://faculty.washington.edu/chudler/introb.html

■ BY KAVYA PRASAD
BCN at the top of Neuroscience master programmes in the Netherlands

The Behavioural and Cognitive Neurosciences Research Master programme was again evaluated very highly this year by the Keuzegids Masters. Despite a lack of official ranking (due to corona), it was amongst the top if not the top Neuroscience master in the country.

Joana Carvalho named “Portuguese woman scientist of the year”

Joana Carvalho, winner of the BCN 2020 dissertation prize, was awarded the UNESCO-L’Oreal price for “Portuguese woman scientist of the year”. The good news does not stop there for Joana. She also got a personal EU Marie Curie Fellowship for her research proposal “Plastimap” to study plasticity of the visual system.

Joanna (second one from the left) together with her fellow awardees, answering some questions posed by the presenter of the online ceremony.
Mandemastipendium for Roald Lambrechts

In his doctoral research into the rare North Sea disease, Roald Lambrechts discovered that it is not the neurons but the glia cells that are responsible for the progressive illness. Glia cells support the nerve cells. https://youtu.be/oxhkHSEiBPE

UMCG Innovation prize Education for Hiske van Duinen

Hiske van Duinen developed an app with which all data from practicals can be stored and analyzed online. This makes it much easier to compare the data from practicals.
UMCG Innovatieprijzen 2021

Faces of Science

UMCG researcher Shiral Gangadin (Cognitive Neuroscience Center) has been appointed KNAW Face of Science, a group of PhD students who will create videos and blogs about their daily scientific work. It is primarily aimed at high school students to provide them with a realistic impression of what life as a scientist can be like.
https://bscs.umcg.nl/nl/2021/03/09/shiral-gangadin-iris-sommer-groep-een-van-de-12-nieuwe-faces-of-science-knaw/

Grant for UMCG research into VR exercises for more self-compassion

The UMCG has received a grant of € 65,000,- from the PPO educational institute. Psychologist and postdoc researcher Elise van der Stouwe, in collaboration with Wim Veling and Marieke Pijnenborg, will use the awarded money to start a study into the effects of a new application of Virtual Reality, aimed at stimulating self-compassion.

New mobile speech lab to study dialects and articulation

The Faculty of Arts of the University of Groningen can now deploy a new tool for linguistic research: the mobile lab ‘Spraaklab’. Spraaklab comprises a workplace for researchers and a separate, sound-proof room where state-of-the-art recording equipment can be used to obtain high-quality research data. The lab will be used for linguistic research, for example on patients with Parkinson’s disease, as well as for public events.
Spraaklab coordinator: Martijn Wieling

Jan-Willem Romeijn new dean

On April 1st, Jan-Willem Romeijn, professor of philosophy of science at the faculty of Philosophy, has been appointed as the new dean for the Faculty of Philosophy. He succeeds Lodi Nauta, who has been the dean since 2013.
https://www.rug.nl/news/2021/03/new-dean
Marvelous Mind and Mindwise both receive € 10,000 from KNAW science communication fund

Without our brains we are nowhere: Our brains determine our behavior. And that is why research into brains and behavior is the spearhead of Brain & Cognition, a research institute of the UMCG. It would be a shame to keep that knowledge of the brain locked-up and that is why researchers Iris Sommer, Marie-José van Tol, Janniko Georgiadis, Robert Schoevers, Sander Martens and their colleagues decided to share their research on the brain with a large audience: the outcome was Marvelous Mind. Since 2019, the brain researchers talk about hallucinations, depression, sexual experience, psychedelics, attention and memory. Not under a beautiful suspended ceiling, but in the beautiful cinema halls of the Groninger Forum. Full houses guaranteed. They give a short introduction to well-known (or sometimes less well-known) films, and afterwards there is an opportunity for questions from the audience. In addition to the film program, Marvelous Mind has developed a series of podcasts: De Bovenverdieping (the upper floor), together with radio producer Jelte Posthumus. Those podcasts have already been heard more than 2000 times. This is why Marvelous Mind has received 10,000 euros from the Science Communication by Scientists pilot fund: appreciated! The money comes from the Ministry of Education, Culture and Science and the Royal Dutch Academy of Sciences. It is intended to stimulate science communication. From now on, much more brain science is coming your way!

The blogging platform ‘Mindwise’ has also received a financial contribution of € 10,000 from KNAW science communication fund, for its structural effort in science communication. Since 2014 staff and students have been writing blogs on the online platform Mindwise about psychological research and education from Groningen as well as expressing their opinions on current issues based on their expertise. Mindwise will use the grant to continue these activities. In addition, the plan is to use part of the grant to train students and colleagues in the field of science communication.

A selection of one or two mindwise posts is republished in every BCN Newsletter. 

https://www.rug.nl/research/bcn-brain/marvelousmind/?lang=en
https://mindwise-groningen.nl/
New staff writers *wanted*!

Do you enjoy reading the Newsletter? If so, why not join our enthusiastic editorial team and make it even better? Regardless of whether you’re a master student or PhD student, it’s a great way to expand your network, improve your English writing skills, and be actively involved in BCN. Interested? Send an e-mail to Sander Martens, sander.martens@gmail.com!
Innate immune memory and transcriptional profiling of microglia

PHD STUDENT
Y. Heng

THESIS
Innate immune memory and transcriptional profiling of microglia

PROMOTORS
Prof.dr. B.J.L. Eggen
Prof.dr. J.D. Laman

COPROMOTOR
Dr. S.M. Kooistra

FACULTY
Medical Sciences

Microglia are the local immune cells of the brain. They are important for brain development, neural network formation, and protect against infections and damage. Chronic activation of microglia, like in neurodegenerative conditions, leads to perturbed microglia functions and contributes to brain pathology. The aim of the research by Yang Heng, presented in this thesis, was to characterize how microglia are affected by peripheral inflammation, DNA damage-induced aging and post mortem intervals. Systemic administration of bacterial lipopolysaccharide or fungal β-glucan changed the inflammatory response of microglia to a following inflammatory challenge, a phenomenon known as innate immune memory. Depending on the interval between the challenges, either an enhanced or a reduced response was detected. Immune training of microglia was also observed in accelerated aging mice that are deficient in DNA damage repair. Targeting this deficiency in DNA damage repair to microglia did not induce training, but resulted in microglia loss and replacement. Characterization of the gene expression profiles, or transcriptomes, of microglia has increased our understanding of their identity and function. Here, we demonstrate that the transcriptomes of microglia nuclei and cells are very similar, and that also includes nuclei from frozen brain tissue. This offers the opportunity to analyze large collections of already collected and frozen tissue samples. Brain tissue samples are collected after a post mortem delay, which had a surprisingly limited influence on microglia transcriptomes. These findings justify the use of the archived postmortem brain specimens to study microglia transcriptomes, under both physiological and pathological conditions.

Yang Heng (1990) studied Pharmacology at the Peking Union Medical College,
China. He did his doctoral research at the section Molecular Neurobiology of the department Biomedical Sciences of Cells & Systems at the University Medical Center Groningen. He defended his thesis on February 10, 2021.

Pinging the brain to reveal hidden working memory states

PHD STUDENT
M.J. Wolff

THESIS
Pinging the brain to reveal hidden working memory states

PROMOTOR
Prof.dr. M.M. Lorist

COPROMOTOR
Prof.dr. E.G. Akyürek

FACULTY
Behavioural and Social Sciences

Maintaining information for short periods of time in working memory, without its existence in the outer world, is crucial for everyday life, allowing us to move beyond simple, reflexive actions, and towards complex, goal-directed behaviours. It has been the consensus that the continuous activity of specific neurons are responsible to keep this information “online” until it is are no longer required. However, this classic theory has been questioned more recently. Working memories that are not actively rehearsed seem to be maintained in an “activity-silent” network, eliciting no measurable neural activity, suggesting that it is the short-term changes in the neural wiring patterns that are responsible for their maintenance. These memories are thus hidden from conventional measuring techniques making it difficult to research them.

This thesis proposes an approach to reveal hidden working memories that is analogues to active sonar: Hidden structures can be inferred from the echo of a “ping”. Similarly, by pushing a wave of activity through the silent neural network via external stimulation (for example a white flash), the resulting recording patterns expose the previously hidden memories held in said network. This approach is demonstrated in a series of experiments where both visual and auditory working memories are revealed. It is also used to reconstruct specific working memories with high-fidelity after different maintenance periods, showing that the maintenance of even a single piece of information is by no means perfect, as it tends to randomly and gradually transform within 1 to 2 seconds (for example purple becomes blue).


Detection of autism in childhood

PHD STUDENT
M. van ’t Hof

THESIS
Detection of autism in childhood

PROMOTORS
Prof.dr. H.W. Hoek
Prof.dr. P.W. Jansen

COPROMOTOR
Dr. W.A. Ester

FACULTY
Medical Sciences

The objective of this thesis by Maarten van ’t Hof was to identify factors to enhance the detection of autism spectrum disorder (ASD) in childhood.

This thesis indicate that the global age at ASD diagnosis is currently still relatively high, as results found a global mean age at ASD diagnosis of 60 months. More standardized research on the age at ASD diagnosis is needed to compare results and identify weak points in local or national healthcare systems and improve the early detection of ASD.

Research on the detection of ASD by Dutch preventive care physicians shows that they have low levels of specific ASD knowledge (e.g. early signs, diagnostic
Language impairments and resting-state EEG in brain tumour patients: Revealing connections

PHD STUDENT

N. Wolthuis

THESIS

Language impairments and resting-state EEG in brain tumour patients: Revealing connections

PROMOTORS

Prof. dr. Y.R.M. Bastiaanse

COPROMOTORS

Dr. D.D. Satoer

Dr. I. Bosma

Dr. J. Cherian Perumpillichira

FACULTY

Arts

Intact language functions are crucial for everyday communication. A brain tumour can impair these functions. We studied language abilities and their relation to resting-state brain activity in low-grade brain tumour patients, in search for predictors of language outcome after surgery. The brain tumours in this thesis include gliomas, which originate in the brain, and meningiomas, which arise from the meninges. Glioma and meningioma patients underwent thorough language assessments and brain activity registrations by electroencephalography (EEG). Two aspects of brain activity were evaluated: slow-wave activity, concerning activity with a low frequency, and functional connectivity brain networks, reflecting the extent to which brain areas interact.

It is concluded that low-grade gliomas can cause impairments in a variety of language abilities. Furthermore, meningiomas can induce language impairments (primarily in speech production and writing), despite the fact that these tumours do not infiltrate brain tissue. Many glioma and meningioma patients are presented with language impairments 1 year after surgery, but there is large interpatient variation. Our findings underline the importance of extensive language testing before and after brain tumour surgery.

With regard to the EEG analyses, the outcomes indicate that increased slow-wave activity and particular characteristics of the functional connectivity networks are associated with poorer language functioning before surgery in glioma patients, unlike in meningioma patients. Moreover, two predictors of language outcome after glioma surgery are identified. This line of research requires further investigation because it has the potential to improve clinical procedures, such as treatment planning, patient counselling, and language rehabilitation.


Time, tone and the brain: behavioral and neurophysiological studies on time reference and grammatical tone in Akan

PHD STUDENT

F. Tsiwah

THESIS

Time, tone and the brain: behavioral and neurophysiological studies on time reference and grammatical tone in Akan

PROMOTORS

Prof. dr. Y.R.M. Bastiaanse

Prof. dr. L. Nickels

COPROMOTORS

Dr. S. Popov

FACULTY

Arts

Languages of the world have several ways of expressing time reference. Many languages such as those in the Indo-European group express time reference
through tense. Asian languages such as Chinese express time reference through aspectual adverbs, while Akan (spoken in Ghana) does so through grammatical tone. The goal of this dissertation was to investigate grammatical tone and time reference processing in Akan brain damaged speakers with and without aphasia, as well as healthy Akan speakers. Using behavioral and neurophysiological methods, the results of this project showed that grammatical tone processing is problematic for individuals with brain damage. However, the problems with grammatical tone processing, particularly in individuals with brain damage leading to agrammatic aphasia, was largely driven by a past time reference deficit, and not grammatical tone per se. That is, individuals with agrammatic aphasia showed more difficulties in processing past verbs than the non-past verbs. This is because past time reference requires extra processing load compared to the non-past time reference. The dissociation between the past and non-past processing was also confirmed by the electrophysiological brain response of the healthy Akan speakers. The conclusion is that regardless of how time reference is expressed, whether through affixes (in Indo-European languages), aspectual adverbs (in Chinese) or tone (in Akan), the processing of past and non-past time reference show different underlying neural processes. Therefore, the findings of this project highlight the need for cross-linguistic studies, especially in understudied languages, in order to test and broaden the already existing neuro-linguistic theories.


A unified view of lateralized vision

PHD STUDENT
S.G. Brederoo

THESIS
A unified view of lateralized vision

PROMOTORS
Prof.dr. M.M. Lorist
Prof.dr. F.W. Cornelissen

COPROMOTOR
Dr. M.R. Nieuwenstein

faculty
Behavioural and Social Sciences

Left for the trees, right for the forest. The fact that humans have two brain halves, each with their own specialization, speaks to the imagination. The left ‘language’ brain is a commonly known example of brain specialization. Sanne Brederoo, researcher at the RUG, shows that the two brain halves are also strongly specialized for vision.

During the past 50 years, many studies were carried out to investigate the specialization of the two brain halves. With her dissertation, Brederoo shows that a number of such so-called specializations are in fact myths. Does this mean that the two halves of the brain perform the exact same tasks? Not quite, as that would be
Brederoo convincingly shows that both halves—each with their own specializations—are involved in vision. The left half is an expert in processing detail and reading words. (Not unexpected, given that words consist of letters: many small details.) The right half is specialized in seeing the bigger picture and viewing faces. (Again quite understandable, given that we usually view faces as a whole, rather than looking at the nose, lips, or eyes individually.)

In sum; both brain halves are active during everyday vision, each with their own specialization. In addition, Brederoo shares a remarkable finding: during the viewing of faces, a number of left-handed people use more of both brain halves instead of just the right one. So ... when you’re unable to see the forest for the trees, your left brain is working too hard. Then you’d better address your right brain in order to see the bigger picture again.


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**Neurolinguistic studies on the linguistic expression of time reference in Thai**

**P H D S T U D E N T**

W. Siriboonpipattana

**T H E S I S**

Neurolinguistic studies on the linguistic expression of time reference in Thai

**P R O M O T O R S**

Prof.dr. Y.R.M. Bastiaanse

Prof.dr. L. Nickels

**C O P R O M O T O R**

Dr. S. Popov

**F A C U L T Y**

Arts

While it is easy for healthy speakers to talk about and to understand sentences about events happening in different time frames: past, present or future, it is often hard for people with aphasia (language impairment after brain damage). My thesis investigates this communicative problem in Thai, a language that, unlike English, does not use verb tense to refer to different time frames, but instead refers to different time frames by the use of free-standing words (i.e., aspectual markers). Offline and online methodologies were used to tackle the issues of agrammatism and time reference. The study will help us understand aphasic speakers’ problems.
when talking about time and thereby provide more effective treatment to facilitate recovery of this important ability.


**Biological interactions in depression: insights from preclinical studies**

**PHD STUDENT**

R.E. Moraga Amaro

**THESIS**

Biological interactions in depression: insights from preclinical studies

**PROMOTORS**

Prof.dr. E.F.J. de Vries

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

**COPROMOTORS**

Dr. J. Doorduin

Dr. J. Stehberg

**FACULTY**

Medical Sciences

Major depressive disorder (MDD) is considered a major global health burden, being the single largest contributor to global disability and suicides. Because of its complex multifactorial nature and the variety of symptoms observed in this disorder, still around 50% of MDD patients show no or incomplete response to pharmacological therapies. In this regard, studying the molecular interactions and risk factors of MDD is a key step to improve our knowledge of the etiology and the differences in the treatment response between patients. This thesis aimed to investigate the contribution of several underlying biological processes on the development of depressive behavior in animal models, such as steroidal hormone and monoamine signaling and neuroinflammation. We found that PET imaging is a useful tool to study the effects of sex hormones in the brain in a menopausal animal model, but that chronic stress was not a strong risk factor for developing depressive symptoms in this model. In addition, we showed in a stress model of depression that repeated social defeat induced neuroinflammation, but that this effect was not counteracted by the fast antidepressant ketamine or caffeine. In this animal model, we also showed that social stress caused delayed changes in dopaminergic and serotonergic transmission when depressive symptoms had already resolved. Finally, we observed that antidepressant therapy during pregnancy had a detrimental effect on cognition in
the offspring. In conclusion, this thesis provides insight in different interactions between systems and risk factors, contributing to the general knowledge of MDD.

Rodrigo Moraga Amaro (1989) studied Biotechnology at the University Andrés Bello in Santiago de Chile, Chile. He did his doctoral research at the University of Groningen at the department Nuclear Medicine and Molecular Imaging of the University Medical Center Groningen. He defended his thesis on April 19, 2021.

Regional diversity in oligodendrocyte progenitor cells: implications for remyelination in grey and white matter

PHD STUDENT
D.H. Lentferink

THESIS
Regional diversity in oligodendrocyte progenitor cells: implications for remyelination in grey and white matter

PROMOTORS
Dr. W. Baron
Prof.dr. B.J.L. Eggen

FACULTY
Medical Sciences

Multiple sclerosis (MS) is a chronic disease of the central nervous system in which myelin—an insulating layer around axons—is locally damaged. Myelin can be regenerated by an endogenous process called remyelination, which ultimately fails in MS. Remarkably, remyelination is faster in the grey than in the white matter. For robust remyelination, oligodendrocyte progenitor cells (OPCs) have to mature into myelinating oligodendrocytes. This study revealed...
that OPCs from grey matter are better equipped for remyelination than their white matter counterparts. Cultured OPCs from grey matter are less mature, an important prerequisite for the initiation of remyelination. Furthermore, the maturation of grey matter OPCs is less hampered by inflammatory mediators and myelin debris than the maturation of white matter OPCs. The latter may be partially explained by the fact that grey matter OPCs process several environmental signals using a cellular antenna, the primary cilium. White matter OPCs are less receptive to these signals via the primary cilium. A surprising finding is that the characteristic binding of antibody A2B5 to cells directly isolated from brain apparently is not restricted to OPCs. The antibody apparently binds multiple cell types, which differ in the developing and adult brain. While these cell types are not different in the grey and white matter, transcriptomic analysis does indicate functional differences. Altogether, studies investigating the failure of remyelination in MS should take regional differences in OPCs into account. This can potentially lead to regionally differing therapeutic avenues aimed at restoring remyelination in MS.

Dennis Lentferink (1989) studied Behavioural and Cognitive Neurosciences, specifically focused on Molecular Neurosciences, at the University of Groningen. He did his doctoral research at the department Biomedical Sciences of Cells & Systems of the University Medical Center Groningen. He now works as postdoctoral researcher at the University of Virginia. He defended his thesis on April 21, 2021.

Bilateral neural correlates of treatment-induced changes in chronic aphasia

PHD STUDENT
S. Averina

THESIS
Bilateral neural correlates of treatment-induced changes in chronic aphasia

PROMOTORS
Prof.dr. Y.R.M. Bastiaanse
Prof.dr. G. Micele

COPROMOTOR
Dr. O. Dragoy

FACULTY
Arts

Aphasia is a language disorder that results from brain damage. Aphasia negatively affects communicative skills and leads to severe disability. Therefore, a reliable prognosis for aphasia recovery is essential. One of the main prognostic factors for aphasia is lesion localization. Several studies investigated the role of damaged or spared brain structures in post-stroke recovery. Nevertheless, only a few of them considered the anatomical properties of both hemispheres. Furthermore, despite the impact of communication disorder on patients’ lives, there is no evidence of how lesion characteristics influence communicative abilities and their recovery in aphasia. Therefore, we aimed to find the bilateral neural correlates for therapy-induced changes in spontaneous speech and communicative abilities in chronic aphasia. For this purpose, we applied the state-of-the-art neuroimaging technique that allows studying structures in the white matter of the brain. The results suggest that improvement at the group level is observed only in spontaneous speech but not in communicative abilities nor aphasia severity. Another important highlight is that performance in untreated chronic aphasia and post-treatment improvements do not rely on the same structures in the same way, and left and right white matter structures often act as antagonists. Spontaneous speech and communicative abilities in chronic aphasia depend on the intactness of the left hemisphere structures, while better post-treatment improvement in these variables is observed in speakers with more anatomically profound homologue structures in the right hemisphere.


EVELYN KUIPER-DRENTH, ON BASIS OF PRESS REPORTS OF THE UNIVERSITY OF GRONINGEN
> CHEEKY PROPOSITIONS

“The scientist is not a person who gives the right answer, he is one who asks the right questions. (Claude Levi-Strauss).”
> Maarten van ’t Hof

“Net als in het leven is ook bij een promotie de reis belangrijker dan de bestemming.” ['Just like in life, the journey is more important than the destination in a promotion trajectory']
> Maarten van ’t Hof

“Who controls the past controls the future. Who controls the present controls the past. - George Orwell, 1984”.
> Frank Tsiwah

“Fruitful and enjoyable collaborations are born at conferences, but we need to rethink the necessity to travel around the globe for them.”
> Sanne Brederoo

“Yesterday’s truths are today’s falsehoods’ should not be daunting to a researcher, but welcomed: it is science advancing.”
> Sanne Brederoo

“Feeling a sense of unease rather than pride in admitting to have worked after hours would make for a healthier academic work environment.”
> Sanne Brederoo

“Het behalen van de doctorale graad plaatst het zeer in ‘weledelzeergeleerde’.”
> Dennis Lentferink
Spread the knowledge, not the virus

1,5M