

## Profiles of Women in Science: Prof. Stephanie Cragg of the University of Oxford, Oxford, UK



The subject of our next instalment for the series “Profiles of Women in Science” (Helmreich, Bolam, & Foxe, 2017) is Dr. Stephanie Cragg. Dr. Cragg will be speaking at the EJN Special Feature Lecture on July 7 at the 2018 FENS Forum in Berlin, Germany. Our goal for the entire series is to bring well-deserved and long-overdue recognition to successful women throughout our community and to provide perspective, insight and advice for young scientists trying to make their way in this very competitive time.

### Dr. Cragg’s Research and Training:

My laboratory focuses on understanding dopamine neurotransmission in the basal ganglia, its regulatory mechanisms and dysfunction in neurodegenerative disorders and drug addiction. We are a founding group of the Oxford Parkinson’s Disease Centre.

My first degree was in Natural Sciences at the University of Cambridge (1993), and my DPhil (1996) explored neuronal dendrite function at the University of Oxford and New York University, as a Mary Goodger Scholar. I held Junior Research Fellowships and a Beit Memorial Fellowship in Oxford, which comprised stints

at New York University and the University of North Carolina. I developed expertise in real-time electrochemical detection and established our program of study into how dopamine transmission is governed, as well as the function of related circuits. I joined the Department of Physiology, Anatomy and Genetics in 2006 to take up post as University Lecturer, and Tutor for Medicine at Christ Church, and was made full Professor in 2014.

I am an Associate Editor of the journal *npj Parkinson’s Disease* and a Co-Director of the Oxford Parkinson’s Disease Centre.

<https://www.dpag.ox.ac.uk/team/stephanie-cragg>

I had the pleasure of speaking with Dr. Cragg in April 2018.

### 1 | EJN: HOW DID YOU DECIDE TO BECOME A NEUROSCIENTIST?

S. Cragg: How do we ever really decide what we’re going to become? Or do we retrospectively realize that is what we have become? I suppose my decisions along the way were influenced by realizing from an early age that I was always quite fascinated by the world around us and why we were the people we were. How we think. How we act. How we process information. How we reason. So I’d always been drawn into thinking about the brain and was always interested in how we translate our thoughts into actions as well. How that substance in our head can actually mean we can physically move our muscles.

I was also always interested in brain disease—Why the problems with the brain’s degeneration manifest through certain symptoms. I think I became particularly drawn into it because I became quite interested in pharmacology—I was fascinated by the biological link between us and things that seemed quite different from us, like plants. I began to be aware that constituents of plants, everyday plants, had conserved

building blocks that could interact with human biology and could even change human brain function.

I remember learning about things like Deadly Nightshade; it was a poisonous plant, and makes you hallucinate, and in fact its Latin name, *Atropa belladonna*, refers to beautiful lady, because in the Renaissance it was used to dilate pupils to make you beautiful. The active compound in these plants is the drug atropine, an antimuscarinic agent, with several clinical applications that include treatment of secretory and heart disorders through to treating poisoning by nerve gases and historically has also been used to treat Parkinson's disease. I was really fascinated, the more I learned, by such molecules in the wider world that interacted with human brains and bodies.

My interest in the actions of nicotine and other psychoactive substances soon followed. I also found fascinating the overlap between the brain systems targeted by drugs of addiction and by neurodegenerative disorders like Parkinson's disease. Both scenarios affect the functions of dopamine neurons. On the one hand, addictive drugs lead to excessive motor programme selection, and on the other hand, in Parkinson's, we become unable to select motor programmes. And so through exploring neuropharmacology, I found my way into neuroscience, and particularly into a long-lived interest in dopamine!

That's what I did my DPhil on and so it all just sort of rolled from there. Once the ball starts to roll and you realize you love research, you love the opportunity to be able to form and then test hypotheses, to watch empirical data sets grow in support of your hypothesis, or even to challenge your hypothesis to really make you think, then that generates more questions, so you want to keep going.

## 2 | DO YOU REMEMBER ANY DIFFICULTIES ALONG THE WAY—OR ANY CHOICE POINTS WHERE YOU REALLY HAD TO THINK SHOULD I GO LEFT OR GO RIGHT HERE?

I do remember in my early postdoctoral career there was a particular tension in science: Do you continue down a similar path that you think might be a long fulfilling rewarding path with lots of questions, or should you diversify to think about different questions? I remember in those early days wondering whether I should deliberately try and change my tack or whether to stay in the same field.

How did you decide?

How did I decide? I guess I really liked what I was doing. Maybe there were more risks in moving, and it felt that there were fewer risks in continuing along the obvious path that was ahead of

me. You also balance it alongside other things in your life, don't you? Where your support network is, and where your partner is...

## 3 | DID YOU HAVE A MENTOR OR ANY ONE PARTICULAR PERSON THAT YOU RELIED ON?

I had two really strong mentors early in my career, who were both women. They were my two DPhil supervisors. They are both very strong and inspiring women. They are Susan Greenfield at Oxford and Margaret Rice at New York University. I worked closely with both of them during my DPhil and for a while afterwards, spending time in both Oxford and New York. At the time, I probably took for granted that my key mentors were both women. I didn't question it—I was a woman, so why would I question that my supervisor might be a woman? I only began to realize later that it was very unusual that I would have two female supervisors. Women, of course, were less represented in neuroscience, especially then. I think looking back that very much helped to normalize, for me, that women could be scientists with fulfilling careers.

## 4 | DID YOU IMAGINE THAT THE GENERATION BEFORE YOU HAD A MUCH MORE DIFFICULT TIME BEING A WOMAN IN SCIENCE?

I think I did, yes, because there were less of them. There also weren't that many women who, this is a delicate thing to raise.... I suppose I worried that the women who were successful had needed to make a choice to choose their careers as a priority in their life and didn't always have children. I think many had chosen their career over everything else because there was no other way to really succeed. That's definitely changing—thankfully.

## 5 | DO YOU THINK YOU EVER WERE DISCRIMINATED AGAINST? OR SOME WOMEN HAVE SAID THEY WERE SELECTED, OR HAD DIFFERENT OPPORTUNITIES, BECAUSE THEY WERE FEMALE?

We never really have the full insight into why and when we're selected or not. I know that I, like many women colleagues, are often asked to serve on selection committees or similar where gender balance is required. A disproportionate burden of faculty duties can then sometimes fall on women, meaning women can spend more time on these duties than men. We need to redress this.

Of course, I sometimes worry that I'm selected for some things like talks, because I'm a woman. That can be undermining. I don't want to be selected because I'm a woman. I want to be selected on the basis of merit.

Being a token woman at science events is an interesting thing, because on the one hand we might feel that being selected as a token woman undermines our contribution, or our own feelings about the value of our contribution. But on the other hand, we also have to accept that we do need a culture change, and if we are chosen to be a representative, then we are helping to normalize women in science for women who will follow. Others won't necessarily know that you were the token woman. So, I have sort of come around to the idea of happily embracing it. I try not to question why I'm invited. If it's something that I think I should contribute to, then I will try to embrace it—and hope that it also makes the career more accessible for women.

I think it's all too easy to feel undermined, to undermine yourself and to have insecurities, instead of just taking the opportunity, if you're given this opportunity, to use it to the full. Use it to showcase your team's work. Use it for a positive outcome and not question it. I do nonetheless still think I am sometimes asked because I'm a woman, but the worst of that is when male colleagues openly ask or comment about me being invited because I am a woman.

## 6 | YOU'VE HEARD THEM SAY THAT OUT LOUD?

Yeah—That's audacious, right? Hopefully that's part of the culture that is changing, because it's really not helpful and certainly not empowering.

I've talked with male colleagues about being the token woman, and how they might feel if the tables were turned. They will typically say "I'd love to be selected. I don't care why I'm being selected. The chance to talk about my work is great." It is interesting that they don't feel undermined by it but rather see the positives. Token women should probably think more like this more of the time! Of course, the topic of how best to redress inequalities is fraught with many issues, but I think that we as women have to take up good opportunities, make the most of them to publicise and promote the science being done in our laboratories and our trainees, and maybe we'll even change culture.

## 7 | DO YOU WANT TO TALK A LITTLE BIT ABOUT JUGGLING MULTIPLE DEMANDS ON YOUR TIME?

I have kids in a dual career family which makes things hard work! And particularly when the kids were very young, I felt

I wanted to prove I could do everything. I felt I was of a generation of women in science with young children really trying to manage it all. I would often note other women at similar career stage to me who like me, if there was a long faculty meeting, would be there to the end having made extended childcare arrangements so that we could prove our level of commitment. Meanwhile it was becoming quite cool for the dads to openly say "Oh sorry guys, I've got to knock off now. I've got to go get the kids." And everyone would say "Oh he's a cool dad. He's got it right. He's doing his work well and he can be a dad. That's cool." But when my kids were young, I think I and other mothers would not so publicly allow our children to influence our work mode. It felt it was important to show that having kids was not compromising how I could do my job, whereas the men didn't seem to question how it would feel to be seen, to also be a father.

Now, thankfully the culture has changed. And more of my colleagues have children, and many are in dual career families, so more and more of us understand the demands. Plus I'm more established, and so feel less judged by being a mother—it is part of what I am. And I think more and more that it is important that we openly acknowledge and discuss the other parts of our lives, to find ways for all parents to accommodate their lives and bring up their children alongside their careers. But kids are still a juggle! My husband and I divide the week up to take our turns at fielding the kids after school or doing the really long work days. I don't generally get much time to myself. But I do take the train to work and I've learned to love my commute—it's uninterrupted time to myself to think and organize my head, plan and sort of clear the decks a bit. Very rarely do I use it to just switch off at all.

## 8 | ANYTHING YOU WOULD LIKE TO SAY ABOUT BEING A WOMAN IN SCIENCE?

One thing relates to what we don't like about our jobs—there are so many knockbacks. There are always knockbacks in research. Experiments can be difficult, arduous and even fail. And the rejections are enormous and on every level. I think that it's really important that we don't take anything personally, which some of us as women might be particularly prone to do. If you've developed an idea, you've worked day and night crafting an application, a paper, for months, years even, only for it to be crushed by an anonymous reviewer (not at EJN!), it can be totally demoralizing.

We have to not take anything personally. I see some of the careers of women start to suffer because they do take it personally. I think that you have to acquire science resilience and also have a great network for support—colleagues, collaborators, mentors to help you move on and redirect—if we build a good network of scientific support, we will have a

saner perspective on our worth. We should always try and find ways to overcome obstacles, not dwell on problems, and focus on what's achievable and achieve it.

A little while back you were talking about how women need to not take things personally, to keep moving on. Do you think that's a male-female gender difference, or...

Gosh, this is a minefield. And I don't have the evidence to state this objectively, but it just seems to me, from my observations and talking to many women at mentoring events, that women scientists can be likely to take those things personally, dwell on them for longer, and for it to impact negatively on their views of their own worth and their potential career. For men, it doesn't seem to make them change their views or decisions about themselves or their job in the same way. That's just my observations.

## 9 | ANYTHING ELSE YOU WOULD LIKE TO SAY ABOUT BEING A WOMAN IN SCIENCE?

I would like to make the point that we probably have to continue to push for ways to make things easier for everyone with multiple responsibilities.

While it's a better time than ever to be a woman in science, and it's quite commonplace now at meetings for there to be some kind of forum to discuss how best to promote equality and diversity in neuroscience, I think that we all still need to remember we're not there yet and that we still have to push our departments, even the conferences that we go to, to make it easier for people to have families. We have to push our faculties and departments to avoid school holidays for key meetings, and we should be pushing conferences to make it more routine to provide childcare facilities—to make it more possible for anyone with childcare responsibilities to attend. As a community, I think that we could do more to accommodate that we scientists are also humans with lives.

In the UK, we have an initiative called the Athena SWAN Initiative, <https://www.ecu.ac.uk/equality-charters/athena-swan/>, and it's really formalized universities in STEM subjects to try and provide opportunities for people, for women, to succeed in STEM subjects. It has made institutions set targets they should work to, to address gender imbalances and all sorts of things related to the way we work. It's been quite useful that we no longer as individuals, have to stand up at faculty meeting to say "Ah, do you think we could change the time of that meeting so that it's more family friendly?" because we can say instead "It's more Athena SWAN friendly" to meet at that time. We can make an objective general statement that doesn't have to be about our own personal juggle.

It's been a fantastic thing that's really developed in the last ten years. Departments have to work towards different medal levels, bronze, silver and so on. Some funding bodies have even started setting some conditions about the Athena SWAN level an institution might need to qualify for funding. That's a fantastic move—promoting equality with funding.

## 10 | WHAT DO YOU LIKE BEST ABOUT YOUR JOB AND WHAT'S YOUR LEAST FAVOURITE PART OF YOUR JOB?

I do love seeing the science grow through interacting with members of my team. I love my meetings with them—where it's me and them in the room, time together, nothing can disturb us, and we talk about the data they've acquired, what it means, what we'll do next and how to develop the emerging picture. I just love seeing the story grow and for only our minds and tools (and funds!) to limit our horizons. I love seeing the confidence and insights of my team grow as we develop their experiments and build the narrative of their discoveries towards publication. It is thrilling when the manuscripts finally come together, a complete jigsaw of many pieces, and are ready to set sail for peer review. I think that's really thrilling. I love talking at meetings about our data and getting feedback and seeing it become incorporated into the field's view of how things work. That's made a difference and that's really fulfilling.

What don't I like? I suppose I don't like that we spend so much time writing applications for things that don't get funded. The funding pool is so small and too competitive. I don't like that there doesn't always seem to be a correlation between what we think is a really good question to address or is a really good finding to publish and success in terms of grant funding or publications.

## 11 | DO YOU DO ANY TEACHING?

I have a joint university faculty appointment with an Oxford college tutorial fellowship, which is relatively unique to the Oxford and Cambridge system. I lecture and do lots of small group tutorials. When I'm teaching, I love it. I feel very privileged to interact with such bright and interested students. But it does also feel that it's a distraction sometimes from, I suppose what I like best, which is the research. Teaching is one of the many draws on my time. As a trustee of an Oxford college, I have many hats to wear, which of course is also fascinating. But we often say, on a good day, that the joint appointment feels like the best job in the world—it's so very diverse, with great colleagues and such a beautiful place to work.

And on a bad day?

You feel like you're just being spread too thinly over too big an area.

## 12 | WHERE DO YOU THINK NEUROSCIENCE WILL BE IN 2030?

Currently, there is a huge effort in tool development, for better tools to give us better specificity and selectivity to control the way neurons can work, to manipulate and to record cell function. Optogenetics is one of the big hitting tools to really change the way we do science.

Those tools are becoming really mainstream in research and will become even better and more sophisticated. We'll be able to tailor those tools to routinely control subpopulations of types of neurons, not just say dopamine neurons, but molecular subtypes of dopamine neurons through intersectional or other approaches. Our tools to manipulate and identify the functions of discrete subtypes of sets of neurons will be better. We'll have much more precision in the way we manipulate and study the functions of those neurons from molecules right through to behaviour.

I'd like to think as well that we'll have much better cellular as well as whole organism models of disease. I think that we've yet to really fully capitalize on how good we've become at doing neuroscience, in order to transform understanding

of neurodegenerative disease in the way that we'd really like to. In about ten years, we should be really starting to shift pace, starting to chip away at that a bit more. Hopefully, the genetics will be better, the tools will be better, the models will be better and disease stratification will be vastly better understood too. These developments will altogether put us in a better position to address both normal brain function and dysfunction, to understand neurological diseases, and to give us more ways to think about treating them.

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### REFERENCE

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