Mona - A lot of it is figuring out where the barriers actually are and what can change at the system level, because we have a lot already, that's emphasising maybe a little too much at the individual level. So we think if you do these things, you can overcome these challenges, but that's not a good long-term strategy.

Kat - This is the Suffrage Science podcast: How women are changing science, brought to you by the MRC London Institute of Medical Sciences. I’m Kat Arney and over the coming series we’ll be exploring the journeys of women in science - reflecting on progress we’ve made and the challenges still to be addressed - through conversations with an incredible group of women scientific leaders, who have all received one of the Suffrage Science awards over the past ten years.

We’ll be hearing from inspirational figures from the world of science like former Chief Medical Officer Sally Davies, space scientist Maggie Aderin-Pocock and engineering champion Hayaatun Sillem, so make sure you’ve subscribed to the Suffrage Science Podcast through Apple podcasts, Spotify or wherever you get your podcasts so you don’t miss a single episode.

This time I sat down for a chat with neuroscientist Mona Xu, who was one of the Suffrage Science life sciences awardee in 2014, receiving her award from fellow neuroscientist and collaborator Bianca Acevedo, and handing it on to Uraina Clark in 2016.

Born in China, Mona moved with her family to the US when she was five. She grew up in New York and stayed there for university, gaining a BA in psychology from New York University, followed by an MA and PhD from Stony Brook University in the state.

Following a postdoc at Brown University, she joined the faculty of Idaho State University, where her teaching and mentoring has been recognized with awards from her institution and others, and she’s one of the Association for Psychological Science’s Rising Stars.

Mona’s research focuses on applying the tools of modern neuroscience to understanding close personal relationships, especially romantic love. So I had to start by asking her what first set her off on the search for love.

Mona - I'd always just been very interested in relationships because they're so impactful and important. And yet the science of them is still relatively new. And so it was this really interesting marriage, so to speak between arts and humanities, right? A lot of love is talked about in those areas. And using science to kind of look at something that's really fuzzy, that people don't agree on the definition, they don't think of in terms of it's something you can study scientifically and to say like, yes, you can. And I think the beauty of science is when we learn more about things and we get closer to the truth, that's such a good feeling and it's just the most beautiful thing when you are able to really understand something better than you were before. And I think that's what I think of when I think about love research. I know some people think it's something that is mystical and we shouldn't study it because then it'll take all the mystery away. But for me, I think the more we understand it, the more we can appreciate it and we can really recognise what it is and, and see how it affects so many things in all the applications and how to enhance those experiences.

Kat - So let's dig a bit into your work because you use imaging techniques to look inside the brain. There's lots of neuroscientists doing that, but you're kind of coming at it from an interesting angle to understand emotions and really complex emotions like love. So, what got you into that idea?

Mona - Yeah, I got into it really circuitously. So, I started grad school wanting to study romantic relationships and that's partly what I did, but I had no interest or didn't know I had any interest in the brain, and there was just an opportunity that came about to learn some neuroimaging and to approach the question of love from this new methodology. So, some of the questions I had, came from the readings in the literature about romantic relationships and especially culture, and a lot of romantic relationship research is self-report and there's some great things that you can do as self-report, but it becomes really tricky to untangle what is actual experience and what is culturally influenced reporting of experience. So, I read a lot about, you know, there's these potentially huge differences between how European Americans or Europeans and Americans, white Americans feel about love and experience love versus, say, East Asian individuals. And so there were all these studies showing that, you know, maybe Asians are less passionate or maybe they think about love more pragmatically or more negatively. And it was really hard to tell, is that a real experiential difference or is that just, one group is more used to talking about love and talking about love in this very shout-it-from-the-rooftops kind of way. And maybe another group is more modest about it and it seems like bragging if you're talking about it too positively. So, it was really intriguing to think about, can we bypass self-report completely and just see what's going on in the brain, because if it's very similar, then that tells us the experience is quite the same even if people talk about it to themselves and others differently. The cultural differences is interesting and important, but it doesn't really let us know if the experience is different or not by just asking people. So, I replicated a study of early stage intense, passionate love - so that period in the beginning, when people are just over the moon about each other.

Kat - The "woo-hoo" phase!

Mona - Yeah. So that was done in the US and I replicated it in Beijing, China, and we saw essentially almost identical brain activation patterns. So, at the experiential level, as far as neuroimaging was showing us, it was very similar, even if people were reporting slightly different things.

Kat - I find this absolutely fascinating because this tells us like the human feeling of love - this like deep emotion that I guess also is quite personal to everyone, you know, you feel love in your own ways, it's actually the same thing going on in your brain. And I think that sometimes I get a bit frustrated, like my partner's not a big, you know, hearts and flowers kind of guy, but I find it really comforting to know it's the same in his brain. He is just, his cultural kind of brain thing is telling him not to express it perhaps.

Mona - Yeah. And that's a really good point too, about, you know, there could be very different cultural or gender norms, in terms of what is appropriate for expression. So, you know, we could put them in a scanner and see what happens when he looks at a picture of you, even if he's not saying anything

Kat - There's so much tied up there, because I guess for all of us, you know, we have like, how do our families express love? And and even what media and cultural things, you know, films must really play into that, if you're into one kind of film or other kinds of culture.

Mona - Yeah. And there's certainly many different types of love and there's neuroimaging research on maternal love or friendship love, or even agape love, unconditional love for a stranger, when we do good things for other people, even if we don't know them.

Kat - How does it feel when you look at the scans? When you're sort of doing your experiments and you're like, "Oh, that's love".

Mona - Yeah, it's been great. I think back to when I did those studies and we've had some participants who get really interested and they want to see pictures of the brain and we'll show them to them. But what's interesting is some of them will say, "tell me what this means, so am I actually in love?" And you know, we have to step back and say, no, no - this is not us "reading" you and being able to give you a checkmark or not, it's a subjective experience. So you are the only one who knows, but we can see: where is the activation? Is it in your reward regions? Is it, you know, more or less under these situations? And what is it similar to? So for those in the early stages, it's very similar to drug addiction patterns, which is a fun kind of finding, but it can look different for other types of relationships as well, and help us understand, for example, what makes long-term love lasting and still highly satisfying.

Kat - Is there a difference between that kind of initial dippy falling in love phase and the long-term love phase? Like, cause everyone says, Oh, just like, it's this burn and then it's gone - how, how does it change or does it change? You get couples who are like, 'Oh, we're as in love as we've ever been.'

Mona - Yeah. So Bianca Acevedo who gave me the pendant, she's done some great work on this, including some longitudinal stuff where she follows newlyweds and you can kind of see the change. In general you do see changes where in the beginning you have a lot more of those intense reward activation areas. And then over time you start to see activations in attachment systems and systems that are there for other types of love as well, for long-term bonds like maternal bonds in serotonin rich areas, which might also help explain why strong, long-term relationships are protective for things like depression, but she's done some work showing that there are people, it's not the majority, but there are people who say, "30 years in, I feel just the same as in the beginning". And when you scan them to look for those intense reward regions, you do get those activations still for those people. So those people are not making it up or lying to themselves. There's something going on, where they have those early stage patterns, as well as the benefits of the long-term. And they don't have as much of the potentially negative stuff in the beginning where the relationship is volatile, or you're not sure about how are they thinking about me? Like they haven't answered my texts yet. What are they, you don't worry about that 30 years in, but you still have the benefits of the: ‘I look at them and I still just feel great’.

Kat - So what are you trying to find out now? What's the next thing that you're trying to investigate?

Mona - Yeah, that's a good question. So I am not doing very much neuroimaging anymore - where I am, we don't have a MRI scanner, but because of where I am, I've started to become more interested in rural health - my PhD is in social health psychology, so I've always been interested both in relationships and in health and particularly behavioural health. So, I've started doing some work with rural Idahoans and looking at things like physical activity. In terms of relationships, students in my lab are still working on some relationship variables like attachment. Also looking at things like being single, because we need to really understand that too, we can't just focus on couples and, I teach a human sexuality course so that's another direction I might head in is studying sexuality a little bit more. And then finally I've been teaching and mentoring for a few years now and becoming more and more interested in that. So that's actually an area that I'm starting to do some research in.

Kat -We’ll come back to Mona soon, but now it’s time to hear a few words of advice from another Suffrage Science awardee, Dame Sally Davies.

Sally - So the best piece of advice I was given was: always ask the person who's quietest in the room. They may have the answer.

Kat - Let’s return to our conversation with Mona Xu. Mona received her Suffrage Science award in 2014, and I wanted to know what it felt like to be nominated.

Mona - Yeah, it was really amazing, in part because it was a surprise, I didn't know that was coming, and it was a really formative part of my life. I had just finished up my postdoc and was just starting my job here - so my very first full-time faculty position. So a lot of transition - I grew up in New York City, and I did all my education and training on the East Coast. So moving to a small place in Idaho is a bit of a transition as well. It felt like a really good time to be like, Hey, I'm here, I'm establishing myself as not just as a student or working in someone's lab, but I have some recognition hopefully. So that was really nice. And it felt really welcoming to be part of this, now global, I know the scheme came from the UK, but it's, you know, women are everywhere. And so it felt nice to have community with the scientific world, even though I was halfway around the globe.

Kat - So who did he pass it on to? And why?

Mona - I gave it on to Dr. Uraina Clark, who is at the Icahn School of Medicine in New York. And she does some just phenomenal neuroimaging research, including in HIV and, you know, as a black woman scientist, she also has written some really powerful pieces about racial inequality, especially in biomedical sciences, which I think is just so important, especially now.

Kat - I think what's also interesting is that your work touches on this problem that we have is that so much of research - in particular biomedical research is just centred in the white Western experience. And my background is in genetics and genomics. And so many of the databases that we use for fundamental biomedical research that you want to be applying to everyone is just based on this really narrow part of the population. You know, 20% of the world is white. Most of the world isn't white, but 90% of our databases are from basically white European ancestry populations.

Mona - Yeah, absolutely. And we're starting to see some really good pushes to change that both in terms of the data that we collect, but also the way we talk about data. So even if your data is very WEIRD: Western educated, industrial, rich, and democratic backgrounds, to let people know that this is not potentially generalisable. Here are the next steps we need to really make it more diverse, these samples. And then also whose voices we elevate when we think about science, when we teach science. So, are we continuing to teach with just a few classic articles that were written a long time ago by often now, dead white dudes? Or can we really start to dig and see - because it's not that diverse people are not doing research. It's often that it's out there. We're just not citing it as much, or we're not talking about it as much or giving it the same platform on media or awards. And a lot of that has to do with our connections. And this is my social psychologist, brain talking. So, journalists have, for example written about, you know, who do they call when they need an expert? And it's often the name that first comes up when you Google a topic, but they want the expert. And if that's always a white man, then they get quoted and then they get more interview requests. And it's this vicious cycle where you get less and less diversity because you're always turning to, you know, these few faces of a few fields.

Kat - So coming into sort of a related topic that I really want to talk to you about. So there was a paper published just before Christmas that caused, let's say a bit of a stir. It was a paper published in nature communications that suggested that basically women scientists having women as mentors, that this was actually bad in some way that it actually led to fewer citations, basically women mentoring women was a bad idea in science. And that the best thing was for basically women should be mentoring men, not sure what works out, like who should be mentoring the women, but this really kicked up a fuss because it kind of turns on its head, this idea of like, you know, women mentoring women, and it's a good thing, and we should all be mentoring each other. And it's, you know, this is how science grows and develops. So I know that you and your colleagues did sort of publish the scientific equivalent of a hot take on this. So tell me a bit about the story about what you thought when this paper turned up and, and your response to it.

Mona - I read the article and it did create quite the stir on social media. And so, you know, just on my Facebook, I kind of vented a little and was like, you know, someone who's eloquent should put something out about this because it's just, methodologically their study was so flawed. And then the conclusions they stated were very strongly stated, even though they did a correlational study, no causal ability to make inferences and Nature Communication actually publish the review process. You can see the reviewers say like, "Hey, you're making too big of a thing, you can't say this is causal. Here's all your methodological issues". And it still ended up getting published. And anyway, I posted that and a number of friends and colleagues, some of whom I've never worked with before and across a number of disciplines were just like, why don't we write this? Right. It'll be one of many and there have been quite a number. So we were put together just a little short response. The pre-print is out on open science framework and we submitted it to nature communications as sort of a rebuttal. They ended up not accepting it because the paper got retracted. So, they didn't think they needed these rebuttal pieces if they were going to retract it. But we're still kind of pursuing maybe a different type of article sort of more broadly about the topic.

Kat - Just to sort of dig into this a bit, because I think this is an interesting question of how did they do this research because you're like, okay, how do you study, like mentoring between women? So how did they do it? And then what did they get wrong about this? Because I'm interested in how can we do this better as well?

Mona - Yeah. So, a couple of the main issues were where they were starting from in this question of who is a woman and what is mentoring. So, who is a woman, they used a computer algorithm to gender people based on their names. And as you can imagine, that is problematic. So they, in their articles say that they used a database that was like 3 million names across all these different disciplines. But if you look at their supplemental material, they actually state that in the final dataset, they ended up excluding over half of the people that were in the database originally because the algorithm couldn't gender them to a high enough quality level. Right. And as you can imagine, probably what happened too, is that if you have a very non-white name, you're probably more likely to be mis-gendered as well. So that's one giant issue with who they're saying is a woman is very questionable and then their definition of quality mentorship, and that's their term, quality mentorship means number of publications and citations. And then they have a measure of 'big shot experience'. So, if the mentor is a big shot or not, and again, that's based mostly on citation and kind of impact, which is not the same thing as being a quality mentor, by a long shot.

Kat - Because it was about whether people were on the same paper, you know, someone was a co-author and all this kind of stuff.

Mona - Right? And so the other piece of this was as long as you were on a paper with someone else in your discipline, and that paper had 20 or fewer authors, and you were beyond seven years past your PhD, anyone who is under seven years is considered your mentee. So you are a mentor to anyone you publish with, regardless of if you've ever had contact with them.

Kat - Wow. You know, I left the field of science a while ago, but like, that's not really how it works!

Mona - Right? It was not strong science. We were all very surprised that it got not only accepted, but accepted in such a high impact journal.

Kat - So this does beg the question, what does good mentorship look like then for women scientists? And also how, how do we measure it? Can we measure it and should we measure it and how would that help?

Mona - So, absolutely I think we should be studying mentorship, but we should, if we're studying mentorship, we should really be studying mentorship and not saying citation count is equivalent to mentoring, right. That's such a, I would think such a different thing that you wouldn't even have to defend that they're different, but you know, here we are. So, when we think about mentorship, you know, we want to think about it I think one: in terms of it's a two way street, right? It's a relationship. And also, especially the person with less power, the person who's learning: what are they getting out of this relationship? Are they really getting something of value? Are they getting training? Are they getting support? And there's a lot of things that go into that, that don't equal 'we write together and we publish together or we get a lot of citations together'. And there's lots of research that suggests, especially for women or minorities, having a strong mentor who can provide support, is really important for future success retention in the field, right? Not, feeling lost and excluded, and that may or may not have anything to do with a formal writing relationship where you publish together.

Kat - So there is this idea that, you know, you can't be what you can't see, and that's why we need better representation and all these kinds of things. But when it comes to finding a mentor, should it be that like women should only mentor women, people of colour should only mentor people of colour? How do we go forward in a way that is really constructive?

Mona - Yeah, that's a great question. I don't think we can ever make rules about who should or should not mentor others. With the exception, of course, if, you know, if you are a harmful mentor, you should not be allowed to mentor others. But I think what is important to keep in mind is, people have more than one mentor and they have different mentors for different things and at different stages in their career. And if you're a woman or you're a minority, or you're dealing with issues that it's really helpful to have another woman or another minority to talk to, certainly seek one out and it doesn't have to be a formal mentor, you can have informal mentors as well. But I think it's just making sure that everyone has a community and has supports in place so that they are able to reach their potential. And, you know, science is tough enough without additional barriers or additional issues that you have to overcome, so whatever we can do to make those connections and make those mentorship relationships work including making it more explicit that if it's not a good match, you can find someone else or you can leave that lab or maybe even that sub-discipline; transitions are difficult, but you shouldn't white knuckle your way through a research project or a training program just because the fit isn't good with you and your mentor.

Kat - So thinking about the future of your field and the work that you're doing in mentoring and increasing diversity, what would you like to see happen? What really needs to happen to improve the situation for women in science, for minorities in science?

Mona - Oh, that is such a good question. I don't have all the answers at all. I think right now, a lot of it is figuring out where the barriers actually are and what policies and what can change at the system level. Because I think we have a lot already, that's emphasizing maybe a little too much at the individual level. So, we think, okay, if you do these things, you can overcome these challenges. But that's not a good long-term strategy. And I think, in an odd way that the pandemic is forcing us to think also about things like accessibility in a way that we have not had to before. So, this can be a really good opportunity, for example, say, many schools have waived standardised testing requirements, or many schools are doing interviews by video now, and that lowers a lot of barriers. Is there anything that would prevent us from doing that indefinitely, but also at the same time, I think the pandemic has emphasized the disparities we have in so many systems and healthcare and education: who does caregiving, who has to step away from work, How is work divided and valued or even considered work or not? So, the data we're seeing, for example, that women are publishing less is really disheartening. And so, we need to figure out, you know, what can we do as a science, as a field to make that not an issue anymore, right? So that the next time something like this happens, we don't see a huge step back in science.

Kat - Thanks very much to Mona Xu

Next time I’ll be speaking with space scientist Maggie Aderin-Pocock about being a black woman in research and the media, her dreams of leaving the planet, and her work engaging the next generation of girls in science.

Maggie - I do target my talk to engage with girls who might not consider careers in science. I want them to aim high. So, have a crazy dream, just like I had. It doesn't matter what it is, but know that they're so much more capable than sometimes people give them credit for, or sometimes they even know themselves. So, I want them to be reaching high, but also I want to give them a sort of a wide range of options. So, science might not be for them and that's fine, but know that there's something out there for them and that they don't have to narrow down their field of view because they think, ‘Oh, women go into these subjects’ where they can go into any subjects and thrive.

And before we go, here’s a final word from Sally Davies about her hopes for the future

Sally - We all want change. And I'd like in the future to see true equality and diversity. I want us to have lots of women, but also people of colour succeeding, leading, and being much more obvious parts of our society,

The Suffrage Science Podcast: How Women Are Changing Science is presented by me, Kat Arney, with audio production by Georgia Mills. It is produced by First Create The Media for the MRC London Institute of Medical Sciences Suffrage Science scheme. Find out more and read profiles of previous awardees at [suffragescience.org](https://www.suffragescience.org/) and follow @MRC\_LMS on Twitter and the hashtag #SuffrageScience for all the latest news. Until next time, goodbye.