Tamsin - Some people just couldn't believe that this kind of uppity young postdoc was going around telling everyone what she thought about climate change and how to talk about climate change. When there were all these various serious professors, who've been thinking about this for a lot longer than me and had it all figured out. I made some amazing friends, but I also rubbed quite a lot of people up the wrong way.

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 computing professor Wendy Hall, former Chief Medical Officer Sally Davies and space scientist Maggie Aderin-Pocock, 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 award-winning climate scientist Dr Tamsin Edwards, whose work focuses on quantifying the uncertainties of climate model predictions, particularly for the ways in which the melting Antarctic and Greenland ice sheets contribute to sea-level rise. She is also the director of the MSc in Climate Change: Environment, Science and Policy at King’s College London, and leads the university’s Climate Hub.

Tamsin is a Lead Author of the forthcoming Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report, and contributed to 2019’s IPCC Special Report on the Ocean and Cryosphere in a Changing Climate. She regularly advises the UK Government on climate science and science communication, and is an expert communicator herself, both through social media, her writing and most recently her BBC Radio 4 series with Tom Heap, [39 Ways to Save the Planet](https://www.bbc.co.uk/programmes/m000qwt3).

In 2015, Tamsin received one of the Engineering and Physical Sciences Suffrage Science awards, being handed her piece of heirloom jewellery by physicist and broadcaster Professor Kathy Sykes. Not only did Kathy want to recognise Tamsin for her work, she also wanted to acknowledge her growing role in communicating the complexities of climate science to the public.

We started our conversation by going right back to the beginning, to find out why she got involved in climate science in the first place.

Tamsin - My kind of origin story that I normally tell is in primary school, maybe even when I was about seven or eight someone came in and talked about the ozone hole and the hole in the ozone layer at my school. And I remember being really shocked that we were having this kind of damaging effect. In the eighties there was obviously Save the Whale and general kind of pollution and acid rain type stories as well. And then kind of in terms of science, I didn't really think about science as a thing. I liked maths. Probably the first time I properly started thinking about science was after I'd already decided not to do physics. I then decided I'd made a mistake. So I’d decided at school that physics was easily the most boring of the sciences and chose not to do GCSE. I just did chemistry and biology separately. And then I read A Brief History of Time, Stephen Hawking's famous book, and really loved it and really thought I got the hang of most of it. And having talked to other people who said it was the most baffling thing they'd ever seen, I thought, Oh, maybe this means physics is my thing. And it kind of matched with the maths as well. So then I did physics A-level just having read a couple of textbooks over the summer. And then a physics degree after that. And then, yeah, I got distracted by particle physics for my PhD, which was kind of harking back to the Stephen Hawking type stuff. And then eventually came full circle back to the environmental side of things by sort of combining it all together with climate modelling and climate science. And that very much combined some of my other least favourite things as an undergraduate, probably my least favourite things were statistics and coding. And that's literally all I do now, but it's also like a wonderful subject for a generalist because you can learn a bit about a lot of things and that's partly why I love it.

Kat - And what are the kinds of things that you are looking at now in your modelling career?

Tamsin - I have been very much a jack of all trades, master of none type person. I've kind of bounced around a lot of different topics, but I got really interested in the core theme of uncertainty really through the first project that I did. So after my PhD, I did a postdoctoral research position using the Hadley Centre climate model. That was great, but the particular emphasis of it was kind of quite a lot of interesting, quite philosophical stuff around uncertainty. And I got very into it through this amazing statistician who is still a guru and a friend of mine called Jonty Rougier. And I just kind of fell in love with the whole idea of how do we work out, how confident we are in our predictions with climate models, when we're much, much more limited with the data that we've got to actually test them with. And that whole thing of, well: how do we actually figure out the range of possible futures when we've only got a really very tiny amount of data compared with how complex the climate system is and how long earth history is.

Kat - Do you find that amazing because I'm a biologist, so think, well, you think something about how cells work or how a body works and like, okay, let's get a mouse or some cells in a dish and test it and we can test it thousands of times in real life. I guess then you've got to do this in a computer. You've got to do thousands of experiments just in a computer and then work out like, well, I don't know. What do you think is the right answer out of that?

Tamsin - Yeah. I went from my PhD in particle physics when you're sort of trying to discover the Higgs boson or something, and you have to have 99.9999% probability

Kat - You want to be really sure you found that little thing!

Tamsin - Yeah! But in climate science, we can never get anywhere near that kind of confidence level. And often it's much more like 50:50, two thirds, this kind of thing. It's immensely, immensely complicated. And there's a great weight of responsibility that comes with that. This sort of huge uncertainty but huge implications, which is a really horrendous combination for stress I would have said. But it's something that is a kind of a rich vein, I think for thinking about what science is, you know, it's so different from your normal kind of lab science where you can control things, as you say, have an experiment where you repeat things, you measure things lots of times. It can be much closer to philosophy in terms of, of making predictions about the future that you may not even see in your lifetime, whether you were right. You know, and there's a certain degree to which you can test your computer models and your theories and stuff for the future, but there's a kind of a limit to how much the past can tell you about the future as well. And so it does feel like a very different branch of science to be in long-term prediction. It's not the only area of science that's like that, I think really huge scale galactic evolution modelling, you know, stuff like that, you can see parallels in other fields. Yeah, it's a tough one. But I, as I say, I love the fact that it's so incredibly rich and diverse in disciplines. So you kind of get to pick and choose from a lot of different areas of science.

Kat - One of the things I find actually interesting hearing you talk, and I know that you've had a personal experience of cancer recently is that some of it feels a bit similar to the work I used to do at cancer research UK, when people would ask me like, what's my chances of survival? How long have I got? And you go well for you, on an individual level, yeah, we can kind of impute all this stuff, but you are an N=1. And I guess that's the same with the planet. We've got one planet, it's going to go on one trajectory in the future. We can guess based on what we know, what we can diagnose about it and what we know about sort of systems that are like this, but ultimately it's like, you kind of got to have a guess and fingers crossed and see what happens.

Tamsin - Yeah. There's loads of parallels. I think maybe the closest equivalent with something like that is attributing extreme weather events to climate change is obviously quite similar that if you get a particular flood and people say: is that climate change, is that human climate change? And you can say, well, the odds went up because of human climate change but whether you can really say an individual event is caused by it is pretty difficult unless you really got much, much bigger odds. One thing I've been really aware of in climate science at the moment is thinking about future greenhouse gas emissions, because climate modellers normally make predictions of climate change for different scenarios of greenhouse gas emissions, like from very high emissions to kind of middling through to very low optimistic scenarios, because we don't think we can predict, what those emissions will be, because it depends on too many human variables that we can't predict. But increasingly, now that we've got the Paris agreement and lots of kind of concrete policies and pledges, and some of which are quite specific in terms of like in the UK, we have dates for when we, make petrol and diesel cars not sold anymore, or when we're phasing out coal or whatever, you start to actually pinpoint and actually predict future emissions. And that's kind of a bit equivalent, I think, in something like cancer to trying to figure out what future treatments might be like for people's survival, because you know, someone getting cancer in 20 year's time, it's just going to be a completely different situation from someone getting cancer now, I think in terms of the treatments that are available, survival rates and so on, and just like it is different now to 20 years ago from now.

Kat - No, absolutely. I mean, I've just written a book about cancer and my sort of first memory of it was my grandfather being diagnosed in the eighties and there was pretty much nothing. We didn't have any of the hormone therapies, any of the treatments we have now, the treatment was, was basically actually castration because it was prostate cancer. It removes the source of the testosterone that drives the cancer. And now you fast forward 40 years and incredible amounts. And, you know, someone very close to me is going through prostate cancer and just the range of treatments, how early you can diagnose it in my own lifetime has changed completely. And so, yeah, I think, you know, we have to assume that progress is going to happen. Is that a safe bet?

Tamsin - Yeah, no, definitely. And in fact, it's caused some quite interesting sort of arguments and communication complexities, I'd say in climate science, because we quite often have predicted for high emission scenarios - partly because we thought that those were plausible if we just kept accelerating our emissions and partly because it's useful to span the full range of possibilities so that you can then kind of interpolate and say, well, if the emissions are half that, maybe the climate change would be half that amount. And that's quite useful too, to look at that maximum possible climate change under the maximum possible emissions. But now that we've got more policies and pledges bringing down those emission predictions, we start to say, well, are those still useful? Is it misleading to think about the very high accelerating emission scenarios when we don't think that's going to happen? On the other hand, people who are pessimistic about policies and pledges and say, well, these are basically just promises, we don't know if they're going to come about and so on and so it's still important to look at the high end. You know, there's quite a lot to try and talk about in a way that sort of accurate and principled and useful and you know, you're talking about conditional probabilities, you're talking about what happens if this, what happens if that, you know, it's quite a lot to put together.

Kat - Yeah. And then I feel a lot of parallels with the current situation that's happening around Covid and like almost the sort of parallel conversations about, you've got sceptics on the one hand or the people who say, well, if we do this and we could do that, or the model that we should follow is to try to get to zero Covid or it's, let's just let it go and see what happens. Or the complete denial of like - this isn't even a real problem. And it's been fascinating to have followed some of the climate debate and it's almost the same tones of voices and the same kinds of arguments coming out again and again,

Tamsin - And often the same people as well who are sceptical. And the scenarios thing is really similar because obviously there are all these predictions, right, at the beginning, particularly in the UK of how many deaths there would be if there was no action, then kind of later on people say: Oh, well look, the scientists predicted this, but it didn't happen. And obviously failing to say, because we didn't do nothing, because we had things like lockdowns and social distancing and all of that stuff! And that stuff can be either lost by accident or on purpose, that kind of information. So the same might happen with climate change, right? I mean, we might reduce our emissions so much that we, more or less, meet the Paris agreement. I think it's hard to completely hit the Paris agreement, but we might get fairly close. And so there will be more climate change, but it won't be at that worst-case, end-of-things, that we've obviously been making predictions for as well. And so people might well look back and go, "Oh, it was all for nothing, oh, the climate scientists were over-predicting", but the whole point of it was we took action and so it wasn't that worst-case scenario!

Kat - Exactly. And you've got that intersection between personal action and political action as well. And you want individuals to like do the right thing, but you also need governments to do the right thing. And you've got to find the right arguments that work to convince both of those audiences.

Tamsin - That's a really interesting parallel. I mean, I think for Covid, off the top of my head, I think that it's much more, I think, about the sum of individual actions and that's a bit less true for climate change because ultimately what we need to do is decarbonize our energy systems. And that's not something that individuals can do. They can use less energy and they can choose certain types of energy, but ultimately they don't have the power to make those big structural systemic changes. Whereas Covid kind of is about the small scale interactions, day to day. There's lots of structural stuff that supports that in terms of jobs and finance and health, obviously. Off the top of my head. I think that individual actions are perhaps a bit more important for Covid.

Kat - Yeah. And I think that's interesting about where you send the messages then, because if you're trying to get people engaged in climate change by going like you've got to recycle all the time and never get on an airplane when you're like, there are enormous coal-fired power stations in China. Just go away basically the argument, but yeah. Then we'd go: okay, have a mask, don't hang around loads of people right now, it's a different kind of message.

Tamsin - There's loads of arguments and interesting evolution of all those arguments and stories. I mean, I think a lot of climate scientists will kind of differ about how much to emphasise individual actions and so on. One of the interesting things that has been pointed out recently is that some of the actors in climate change in terms of say big oil companies, it's in their interests to emphasise individual action, cause it slightly takes the focus off them. So you'll see, even on Twitter, you see Shell or BP or something will say, "what are you doing for your bit on climate change?" It's like, well BP and Shell, what are you doing for your bit on climate change?

Kat - I'm sticking two fingers up.

Tamsin - Yeah. So I think I don't want to completely deemphasise the individual action actually. And I actually had a student recently who said, I'm very demoralised that you've said, individual action is not enough. I was like, “it's literally true”! Like you can't, it's literally true that individual actions are not enough now to fix climate change or to prevent big climate change. It doesn't mean that they're not important at all. And it very much can have a knock-on effect onto the structure of course, the individual actions, but just adding up the increments together, isn't enough on its own. You need the big picture changes.

Kat - One of the whole themes of Suffrage Science is connecting the idea of science to the fact that women can vote. The fact that you need to have a voice, that the more women there are in science, in leadership, having a voice, the more we can change the world to be more equal. And, you know, in terms of climate science, what do you want to see in terms of the next generation of scientists coming through? Because obviously, you know, you can say, well, individual actions, yes, no, but if individual people decide to go and be climate scientists or then go into policy where they can actually have an effect, how do we get that pipeline really going of more diverse people wanting to go through, follow this through and then get into roles where they can affect change?

Tamsin - The thing with climate science and climate change is I think it's not really about saying what should happen in the future because actually it has been happening in the last ten years because who's one of the most powerful voices of change in climate science and climate change in the world? Greta Thunberg! And just across the board, certainly in terms of communicating climate change, in terms of climate scientists, there's absolutely loads more women doing it now and lots more diversity of voices. I mean, there's always a way to go, but it's a lot better than it was even five years ago, but certainly 10. And lots and lots of the young people who've been having a huge impact have obviously been young women, not just Greta, but around the world from other countries as well. So I think that trajectory has already been quite strong in the last five years, which is amazing.

Tamsin - You know, I run a master's program at Kings and I think that's probably about two thirds women. I think climate science is pretty well-represented generally, more than my original field of physics at least, even though some of them are, but they come from other fields as well and backgrounds. So it's definitely heading in the right direction. And I think there's been a lot more written as well about having women in the room in terms of climate action. You know, people like Caroline Criado Perez has written about this in her book and, um, you know, and others as well have even sort of tried to measure climate policies from different countries: they tend to be stronger and more effective if women are involved than if they're not, there's been some research on that. So, you know, people are kind of aware of the need and the benefits of having women in the room.

Kat - We’ll come back to Tamsin shortly, but now it’s time to hear a few words of advice from another Suffrage Science awardee, Kathy Sykes, who handed her award on to Tamsin.

Kathy - The best advice I've had, came from an inspiring woman, Dr. Susan Pringle. I wanted to get into science communication and she said to me, go to the conferences, get an overview, network and get some experience.

Kat - Let’s return to our conversation with climate scientist Tamsin Edwards. The theme of the 2015 Suffrage Science event where she received her award was “Is the world of science pale, male and stale?” As a young woman with bright blue hair, Tamsin is a long way from fitting that description. But this meant that when she started to talk about climate science in public in places like blogs and social media, it was a pretty lonely experience.

Tamsin - There weren't many women doing it. And there certainly weren't many junior women like post-docs. I think some people just couldn't believe that this kind of uppity young postdoc was going around telling everyone what she thought about climate change and how to talk about climate change. When there were all these various serious professors who'd been thinking about this for a lot longer than me and had it all figured out. And I made some amazing friends, but I also rubbed quite a lot of people up the wrong way. And some of those people have come around in one way or another and maybe some haven't. Bu it was much more of a monoculture of communicating climate change at that time. There's a lot more people doing it and there's a lot more ways of doing it and there's a lot more kind of flexibility in what people think, how people think one should talk about climate change. Whereas before it was very rigid and it was very defensive and it was very well, I say defensive, it was aggressive as well. It was very confrontational and very sort of dogmatic and trying to have a very uniform, unified way of talking about things. And I think people have finally realised how damaging that can be, that you need to have different approaches to talk to different people and different things will resonate with different people.

Kat - And it's interesting, because you kind of expect that you go out and you start talking about a controversial subject or a subject where there's different opinions and you expect the sceptics to throw the insults at you and say: you don't know anything, you're just young, stupid, whatever. But when the call is coming from inside the house, like when it's your own field saying, shut up, sit down, you're not doing this. That must feel quite hurtful.

Tamsin - The worst, yeah. It's when it's senior colleagues in your own field and you just think, Oh God, am I ever going to be able to get a job as a climate scientist? Because at that point I was just on contracts, of course. Yeah. Definitely some of the stuff that was thrown my way was very gendered from both sides, from the sceptics, but also from people on my side, in quotation marks who didn't like the way I was going about things. If I had a pound for every time someone called me naïve, and I used to be saying exactly the same things as colleagues of mine that were male and maybe at the same point in their career. And I'd be saying identical things. And of course, would they get called naive? No. And I had a few, I had a few kind of more nasty misogynistic ones properly, but they were pretty rare. And they were mostly from the kind of slightly unhinged end of the kind of random email end of the spectrum. It was always kind of muddled up, I guess, gender and age and career stage, the two sort of often came together. So sometimes it was hard to separate out.

Kat - So now you're one of the lead authors of the forthcoming intergovernmental panel on climate change, you've contributed to major reports. You've been involved in policy, leading role in communicating climate science, involved in this radio series about 39 ways to save the planet. How do you cope when people still question your authority and how do you believe that you have the authority to do these things?

Tamsin - Well, it's interesting. I was just about to say, I'm not sure if people question my authority anymore, but no, they do! The IPC is an amazing sort of stamp before authority, particularly outside climate science. People really see it as this badge of honor, which is quite a privilege to hold that position of trust, I guess. And then, the other thing that kind of contributed more probably with my own colleagues to getting trust and respect in my views was getting a couple of big papers out, when you get the big Nature paper or whatever, people kind of go, Oh, actually you can do science! And even stuff like, obviously just getting a permanent job, just getting a lectureship back in 2014 helped a lot. I still sometimes have arguments, but I can't remember a recent time when I've had the sense of it being gendered, which is good.

Tamsin - I think, again, that comes with that feeling that I've more or less proved myself and I've got to a career stage where people, in general, have a level of respect. And then if they're having a go at you it's normally within the usual realms of scientists arguing with each other. And I feel as though they would be similar with a male colleague of the same career stage and opinion. So luckily I feel that as I say, the two sort of go together: gender and career stage and expertise, you know, they can get quite muddled up. And I think once you've kind of more or less proved yourself as a scientist, then people see you as a scientist and not as a woman can, which is good.

Kat - The theme of your Suffrage Science award in 2015 was, "Is the world of science, pale male and stale?" and so looking back on what you've just said, it would seem that certainly for you it's changing. Does it feel like your field is changing?

Tamsin - Yes. I guess the actual field of climate science, probably, is similar, and was always sort of fairly good on the gender ratio, I would say, but it's more about the face of climate science in terms of public communication that it's improved. And I guess that was a big part of Suffrage Science. It wasn't just about being a scientist, it was being a communicator and the person that nominated me, Professor Kathy Sykes, is a phenomenal science communicator, TV presenter, who was just one of those wonderful people who just champions, who just, she was probably one of the first people who really just saw a bit of promise, a bit of interest or whatever, in me as a communicator and just went all out to support me. She invited me to a training day, she got me my first Radio 4 gig, which was actually talking about the Higgs Boson, and she nominated me for this award.

Tamsin - So I owe her so much for thinking about me as a science communicator in that field. Which is sort of separate from, from whether climate science itself is dominated by the classic stereotype. And I think she gave me a lot of encouragement and sort of strength and bravery to tread that path and she was one of a few people to do that at a time when you really felt like you were putting your head above the parapet and getting shot at, with being a climate scientist in public, and now it really doesn't feel anything like that. And it's partly because there are so many more of us doing it and a much wider, more diverse group of voices in terms of people and then their viewpoints, but also of course that the public views and momentum on climate change has shifted. And so scepticism is less popular and less kind of socially acceptable. I would say climate scepticism, it doesn't mean it doesn't exist, of course. And so it's just a lot less scary being a climate scientist in the public eye now compared with when I got the suffrage science award, when really you needed all of the support and the enthusiasm and the chivvying from your cheerleaders and mentors and so on like Kathy Sykes that you could get.

Kat - Who did you hand your award onto you and why did you pick her?

Tamsin - I handed it onto an Iranian scientist, Zohreh Azimifar. And that was due to a very memorable trip I took to Iran when I was invited to a sort of interdisciplinary conference. And we had a bit of a tour of the country as well. And I went to Shiraz and met scientists from the University of Shiraz. And I just was so struck by her strength and power and charisma as a female scientist, physicist and engineer in Iran. I had a wonderful time on this trip and met lots of wonderful people, but I was at this event, I was having a slightly challenging set of conversations with some male scientists who... We were not gelling, let's say. And she spotted, I think, my body language from across the room and she came over and she was just so amazing at taking control of the situation and asserting, I guess her and our authority as female scientists. You know, I don't blame these male scientists I was sitting with. There was sort of, you know, we got off to a bad start. I, you know, it just wasn't working, but it was obviously somewhat gendered in the sense that everything in Iran is gendered, everything that you're wearing and everything that you can or can't do. And for her to just come along and yeah, just be this incredibly funny, strong, charismatic scientist, very, very successful, in her country. And I just thought, well, you know, the Suffrage Science awards are wonderful to pass on within the UK. And I'd really benefited from that, but really who needs it more is an Iranian woman scientist who is going up against all kinds of extra barriers and challenges and needs that boost and that confirmation, and potentially that trip to London for the award ceremony much more. And so it was a real pleasure and it meant that I've kept in contact with her. She came to the awards, she passed it onto another Iranian scientist after her. I'm hoping that the awards stays in Iran or places like it for a long time, because I think that's an incredible connection to make with the scientists able to come and visit and to, to make those kinds of network connections at the event as well.

Kat - It does give me the feeling, thinking about all the Suffrage Science winners that this network is important. And, and like you say, not being the only woman in the room and the more women are in the room, the more we can advocate for each other advocate for ourselves advocate, for the kind of science that we want to be doing for the future

Tamsin - Have a moan in the corner of the room...

Kat - Go to the ladies together!

Tamsin - Yeah, and we all know what female friendship and support can be like, because you know, when you're forced into those situations, you see women really stepping up for each other. But yeah, I was just very impressed and struck by Zohreh. And I'm very happy that she has gone on to do even better things since

Kat - Thanks to Tamsin Edwards.

Next time I’ll be speaking with computing legend Wendy Hall about what happened to all the women in computing science in the 1980s - and whether the ZX Spectrum’s marketing department is to blame - and whether we’ll ever be watching Netflix on Mars.

Wendy - Possibly in my lifetime, we'll see people on Mars. We'll certainly see more people on the moon and we're certainly going to see the internet going up to the satellites and a whole new power struggle there because if you go to Mars, you're going to want to take an internet with you.

Kat - You're going to want Netflix on Mars. It's going to be a long journey!

And before we go, here’s a final word from Kathy Sykes, about her hopes for the future.

Kathy - In the future in science, I'd like to see public engagement, absolutely embedded in decision-making about science and policy.

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.