

Hypotenthuse Ep 8 - Christina Pagel

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SPEAKERS

Christina Pagel, Maymana Arefin, Malcolm Chalmers

- M** Malcolm Chalmers 00:08
Hello and welcome to Hypot-enthuse the podcast of the faculty of Mathematical and Physical Sciences at UCL, or as we like to call it MAPS. You may have noticed that the presenters voices have changed somewhat. A huge thanks to our previous hosts, Sophie and Laura for all of their work. I am your new host Malcolm Chalmers. I am the comms and Marketing Officer at the maps faculty. With me today is my co host, Maymana Arefin, who is a graduate of the Natural Sciences Program at UCL and is currently studying for a master's in the department of Science and Technology studies.
- M** Maymana Arefin 00:40
Hello.
- M** Malcolm Chalmers 00:41
And we have today our first guest with the new hosting setup, which is Professor Christina Pagel, of the clinical operational research unit here at UCL.
- C** Christina Pagel 00:50
Hi,

M

Malcolm Chalmers 00:51

Christina became a professor in 2018, having become director of the clinical operations research unit in 2017. Having joined it in 2005, I think, yeah, definitely in a long time. So having obviously done our research before this podcast, we were looking up Christina's Wikipedia entry, as well as being a winner of the LYNN THOMAS impact medal, and a former Harkness fellow, we discovered that, after an undergraduate BA in maths from Oxford University, Christina has an MSc in mathematical physics and MA in classical civilization, an MA in medieval history, an MSc in Applied Statistics with medical applications, and a PhD in space physics. So to begin with, how did that kind of academic background happen? How did you find yourself going through all of these different fields?

C

Christina Pagel 01:44

Well, it started at a level when, you know, you have to pick between arts and sciences. And I love both, I always really loved history. But I knew that I wanted to be at that point, I wanted to be a physicist, and you have to study sciences. So I did like double math, physics and English a level. But I part of the reason I chose that is because I knew you can go back to art subjects that it isn't kind of a linear progression in the way that mathematics is. So I went down that path. But I always knew that I wanted to study history again, at some point. And so I did my undergrad. And then I did a master, then quantum theory, actually at King's College. And then I kind of finished it and I thought I don't actually know what I want to do. And I was, like 21. So I thought I'd do a part time degree in history and work at the same time to fund it. And then by the end of it, I'll know what I want to do. And then by the end of that, it was the year it's going to age. The year that Independence Day, and Armageddon came out. And I watched them and I was like, I want to save the world. I want to be an astronaut. So then I got in touch with the European Space Agency and said, Hey, I want to be an astronaut, or do I have to do look, I'm not gonna go the pilot route. But can I go another route? Unless you they sent me a letter back saying thank you for your application use of our programs. And I went back and I said, No, I'm not asking you for Java asking you for advice. And then I got quite an apologetic phone call, saying I'm really sorry, what you have to do is do a PhD in space physics, which I'd never heard of as a thing. They said, you know, Imperial does space physics. So I was Oh, okay. So then I called up Imperial, or you emailed Imperial and I said, Hey, you know, I haven't done any physics. That's a level, what would you let me do a PhD in this subject? And they say, well come in. And I did and and then they were like, Yeah, all right. It was a bit, a little bit more informal. They said, Yeah, but that to me is you've wanted to have a mastery, like a bit of a problem as people think you're really clever. So they tend to give you the benefit of the doubt. Like, for instance, the MA. And classical civilization was meant to be just art subject. Yeah, I can imagine. All right, then. The next Yeah, so then I did a PhD in that. And then I went and did a postdoc in America.

Yeah. And interplanetary electrons is what I was doing, how they scatter between Sun and the Earth. And then while I was there, the space shuttle Columbia blew up. All space flight kind of came to a halt for a number of years. of no astronauting for me. And then I kind of had to decide what I wanted to do. And in that time, the bit of physics that I was studying my interplanetary physics wasn't really funded anymore in the UK. So it was kind of do I stay out in America forever? Or do I come back and you know, my family's here and, and actually, by that stage, like doing space physics gets you to a lot of really cool conferences, because they're all were telescopes. I say Hawaii, you know, Chile, you know, but I realized that I was working on a really obscure problem. That didn't actually matter. Like it didn't affect anyone's life. If I did it wrong. If I did it right. There may be 10 people even in the world who would care about the papers that I wrote, wow. And I kind of realized that I wasn't one of them anymore. So I thought, well, what can I do? And I knew I wanted to come back to London and I kind of selected all the universities and found UCL found where I work now the clinical operational Research Unit applying maths to healthcare. So I kind of stopped them worked out what their CVS or I was like, hey, a lot of these people are ex physicists. So, yeah, so then I emailed them, and I was like, give me a job give me is amazing. Have you asked me, but I kind of like then

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Malcolm Chalmers 05:32

this is turning into careers advice podcast. This is amazing. Absolutely. This is not the kind of history you would usually expect. I did a level maths, and then I did a degree in maths and then a master's in math. This is inspiring, honestly.

C

Christina Pagel 05:53

Well, so then, I mean, it wasn't quite like that. So they had to obviously advertise. And then I was obsessive checking them a page, When are they going to advertise and advertise because my job was coming to an end in the States. And eventually, I am, director, I said, Look, I'm not saying you have to give me the job. But if you don't advertise it, at least, I'm going to have to take this other job offer that but when I did have another job offer, and then sure enough, the next day, pops up, and I applied, and I got it. I'm still here. So that's kind of how I got into this. And it has been, like, I've never regretted that decision at all it has like since I started what I believe being an academic as a bar has changed in response to my work. And I have a very different philosophy now than I did when I joined. But actually the work I do and, and I love the fact that what I do matters to people. So that is definitely keeps inspiring me, but I also haven't forgotten history. So then in 20, no 2008, I did another medieval history, one at Birkbeck, which was brilliant. Like, I did this whole essay on 10th century wills by women, and what that tells you about women in society, and it was just like, it's really cool. You think, hang on, what does this mean? And it kind of

challenges you to think in a really different way. And I found that maths was quite useful, because what math teaches you is to look at what's not there. So when I'm looking at the evidence, you're always thinking about, like, what isn't in the evidence? What don't we know about why do we know about it? And you get quite a kind of different perspective, I think,

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Maymana Arefin 07:19

yeah. Whereas Would you say that the medieval history stuff, it's looking at what is there and kind of working the other way around? Or what would you say the differences are?

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Christina Pagel 07:28

So for instance, um, I did my thesis all about the katha heresy in France in the 1800s. And the confessions, they have reams and reams of confessions. And I just been reading and psychology weren't quite recent about false confessions. And it's become much more acknowledged that pressure will make people confess the things they didn't do. And until then, if I looked at the historical literature, like modern academia about their confessions, they assume that what people said were true. So I looked at it from point of view is actually it might well not be true, given we know the psychological pressure these people are under. And then can I find evidence of false confessions by coordinating people's because often, they gave more than 1234. And then I could actually I constructed timelines, I was like, shall Okay, it wasn't registering. And then I kind of had this in my thesis, he couldn't have been there, because I know. That was kind of just really, it was just so interesting. And then the stats that was for my job, I kind of realized, well, I do maths and health, every time I meet someone that Oh, you do stats? And I was like, No, I didn't do that. And I thought, you know what, I'm just gonna do stats. And then I can say, Yes.

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Malcolm Chalmers 08:46

It's all the impetus for all of these different studies you've done. And then statistics at the end is like, I'm just tired. Just to shut them off. So, I mean, it was nice. So that now leads on very well to the current work that you're doing. So you had your inaugural lecture in December 2019.

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Maymana Arefin 09:11

So the inaugural lecture in December, which you gave was called putting operational research into the heart and the heart into operational research. And you were exploring your current work, I believe about children's health surgery and modeling the risks around

complications that can come from that surgery. So do you mind telling me a bit more about what you spoke about in that lecture and kind of what led you to want to give it in the first place?

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Christina Pagel 09:36

Sure. I mean, in terms of what led me to want to give it Yes. Mass told me I had to give great. It's not like, like, I really want to give a one hour lecture by my friends. I know that's a bit actually then once I, you know, I was thinking about doing it. I thought it would be quite nice to use that. Like if you're not going to reflect on your career for your inaugural like when are you going to do it, so Like Viper can listen to me, do I have something to say that's not just this is why I've done over the last X number of years. And so I kind of focused on that whole program of work that we've been doing since about 2010. Because it really did change how I view my role in society and UCL. In the mass community. It's all about looking at what happens to children who have surgery on their heart, it's almost always because they have some kind of congenital defect. So like, most commonly, it can be like a hole in the heart, which is kind of close up. But it can be all kinds of things. So you get born with like your, your aorta, annual vena cava, so the artery coming out on the artery going in, like the wrong way around, right. So that's really bad. Or some people get born with just half a heart, also really bad. And anything in between, like those things can go wrong. And typically, you need then an operation in your first year or two of life, right. And it's still kind of the leading cause of death among children. I mean, it's still rare, then you die from it. But it's still quite an important burden of disease. And it's something that once you're born with it, you have it for your whole life. And it's not just one interaction with the healthcare system. It's a lot of interactions in 97 people, some people might remember they had the Bristol heart inquiry, yes. Where they looked into Bristol, and they found that they had more deaths than you would expect for babies born with this condition. And that started really the push in the UK to start auditing outcomes and deaths, particularly in hospitals. And so the national congenital heart audit was set up in 2000. And from then on every single procedure performed on it on a child with death, heart disease had to go into that. And then they started about five years later, actually publishing the number of deaths for each hospital. But because as I said, so much can go wrong with the heart. And it carries completely different risks. And so it's actually not just you can't just compare the number of deaths, because hospitals because it really matters upon who they're operating. So someone's killed specialize in the really high risk children, and they will have more deaths. And that's not because they're bad. No, and it's probably because the conditions are sort of exactly as you've explained, but at the same time, you do want to keep track of it. Yeah. Because you want to know, how can we improve? Are we improving? What can we learn from each other? And so what you need for that is what's called a risk model, which is effectively a formula that tells you the chance of someone

dying, given that you know, what's wrong with them, how old they are? Are they underweight, they're premature, all these things that really make a difference to your chances of a good outcome. So it started off with us building this risk model, this formula in 2010, to 2012, where we work with conditions from Great Ormond Street. And we developed a good model now work pretty well, that finished in 2012. And then straightaway, we're thinking, Well, you know what, next, we actually want to help people use it, because often, things just end up publication. Yeah, but just publishing a formula doesn't make something happen. So then we got a bit of extra money from the National Audit body to actually worked with some hospitals to develop Excel software. That meant that they could just take the data that they're collecting anyway, stick it in there, do some cleaning, checking, run the formula, and then tell them how they're doing compared to what the formula expected.

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Malcolm Chalmers 13:14

Was it a deliberate choice to choose something that would run in Excel? Because it's so common? The software?

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Christina Pagel 13:19

Yes, because that's what people use. And so I think one of the things we've learned is that any barrier, even a barrier that adds two minutes to your day doesn't happen. So yeah, it was always a deliberate choice to do in Excel and, and I worked with them quite a lot to make sure it was as easy as possible. So the order of the columns is the same as the order they put it in. It gives them extra stuff, like I would clean all their data and sort it and highlight it nicely. Give them nice error messages, because then actually help them with their own data. They could keep that up today. So we developed that software. And the National Audit buddy wanted to use it for the first time for their public reporting. And they put quite a lot of pressure on us and said, you know, can we have it? Can we have a monochrome? It's not quite ready, and then eventually it was ready. And originally, we plan to give it to the audit body and all the hospitals at the same time that we were just licensing it through UCL business, right. So we were just that said that I said, Okay, you can have a prototype week earlier. And then they were testing it internally. And what happened was that deliberately, I designed into it, that if you are missing, if some of the patient records are missing really important information, like age weight, it won't calculate a risk for that patient. It says it's, it's meaningless. Yeah. And you have to go back and you have to update that record on the grounds that the hospitals wouldn't know, you know, what the date is, and you know, what, the ages and all that kind of stuff. The National Audit body when they tested, it, obviously couldn't update any missing data. And they didn't without going back to hospitals, which they would do if they were actually publishing it, but the

time they were just testing it. And so what they did is they just removed any data that was missing any of that information, which is again, if you were just testing it to see how it works. Not a big problem, what happened was that one of the hospitals, a third of their records had no weight, which isn't ideal. But it had never been used before that information, so they had no way of knowing it was going to be really crucial. So they just took that out. And none of those patients with a missing weight had died. So then what you have is, in the rest of that data, they've got all the deaths, and only two thirds of the survivors. Okay, so when they run it, it looks as if they had this massive, which they didn't, yeah, but it looked as if they did. And then internally in the audit body, they sent it around and said, Oh, look, it's expensive, funny, because they hadn't really realized quite the implications of what had happened. And then the audit director saw it. And he without their permission, if the steering committee would do without the permission of anyone working there without consent, he then leaked it to Bruce care that the medical director at the time, okay, and I can tell you this, because it all came out. And he didn't have any of the context. He just got an email saying this hospital has a really high rate, which it would do it. Yeah. And he felt I have to do something about this. And the next day, he shot the unit at the hospital suspended surgery. So I work hard. I wake up like it was Easter, Good Friday and Easter. And I saw the headline this hospital so heart surgery suspended really high mortality.

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Malcolm Chalmers 16:23

Oh, wow. effects. And I just for the listener, Christina is holding her head in her hand shock.

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Christina Pagel 16:31

Mine an email, I went into academia to make an impact, but I wanted to make an impact. That isn't the impact I was envisaging making. I have to tell you, you know, and, and I just say, and then like the press just I mean, partly because it's Easter, right? There's not much going on. But the press this and just ran with it that the telegraph had this headline 20 children may have died needlessly at heart unit. And I read that and I thought, firstly, that's not how averages work. Secondly, what if you were a parent who, Whose child is about to have surgery, they're always just had surgery there. Well, if your parent whose child died that, like how does that make you feel? I just thought it was so irresponsible. Yeah, they also had this graph on the first page, which is the worst graph I've ever seen in my life to this day. I know obviously, you can't see on a podcast, but I will just say that the head that the title of it is average death rate is 100%. Which if that was pretty bad, like it was just so bad. You can just about

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Malcolm Chalmers 17:30

just about make out amongst the various streamlines, and yes, it genuinely does say on the telegraph website, their average death rate 100%.

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Christina Pagel 17:38

Yeah. And then it said that the hospital in question had a death rate of 300%. And I said, that means that every child they're operating on, they're going out and killing another two. And then people started calling for Busquets zine. The Archbishop of Canterbury led a pilgrimage to hospital for no particular reason that I work out. But it was all kind of very hostile. So the next day we, I realized when someone told me Oh, they're missing Wait, I know I haven't. So then I went up to them with my boss at the time. And we worked with them for a couple of days to correct their data that we riana it showed that actually they they were in what you would expect. And about a week later, the hospital reopened, it is huge, a full audit with direct data resign, which I think is a good thing. Yep. But then by that stage, we'd released this new risk formula. Yeah, for the hospitals. The first they'd really heard of it was in the hospital being closed. And you know, surgeons being doorsteps. It was really quite bad Matic and they were furious. About everything. Yeah. So then, we went on a tour of the hospitals, to basically explain to them why we had created it to say no, it wasn't about judgment, it was to support you in how you're delivering care to help you make decisions. This is not how we intended it to be used. This is new, we don't see this as a legitimate use what happened and kind of tried to smooth things over. And then actually people started to use it. I mean, it's mandated screens. Now it's been used ever since. And people liked it. But it did kind of change how I felt about academia, because I always thought, well, I wanted to useful mass. Well, this was useful maths. But it wasn't useful enough. Because actually see where you know, if you're creating harm, is that actually useful? I also, you know, a lot of people especially mathematicians tend to think, well, it's not my problem, how people use my work. I didn't do that. But I thought, well, he says it then yeah, maybe isn't my problem. But if no one else is going to solve it, then actually there maybe it should be my problem. And if I'm going to do something that can be used to judge performance of a hospital, then I do have responsibility for how that's communicated, how that's understood how it's used.

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Maymana Arefin 19:52

Now, this sounds really like a kind of baptism of fire then really, yes, you're Yeah, you're kind of I really understand why. After that experience, You'd be hyper aware of kind of the social consequences of the work that you're doing. Yeah. And do you feel like it's changed a lot? The way that you view academia and your role within it, you mentioned that it has an end, I was wondering how, sir,



Christina Pagel 20:13

yeah, well, so then, a couple of years later, I applied for another grant to do to update the rest model, because by that stage, as soon as you start using something, people start putting in more data. So the data got a lot better. But that also meant that the model was outdated, we had to update it. But when I applied to do that, at the same time, I applied to produce a website that actually explained what it did, and how it can be used. And that was kind of working with this charity, since about science, who do a lot of work on public communication of science. And not only did they get funded, but NIH or the Research Council actually came back to me, so we want you to spend more money on the public engagement side, we didn't hear you're being ambitious enough. So why change it? To give more money. So we ended up having like this 15 month process, where we had four workshops with both journalists, representatives at the Royal colleges, doctors and just kind of pop members of the public and then a separate group of parents whose children have had heart surgery. Yeah. And you know, after 15 months, we had four different workshops actually designing what should go in to this resource, you know, do they, you know, what do people understand about a risk model? What do people understand about how outcomes are made and how the NHS monitors it? We work we'd like David Spiegel, health is great. in Cambridge. He's a professor of the public



Maymana Arefin 21:35

understanding his name rings a bell? Yeah. Did you wrote in a guardian? Yeah, at the end, when it came out, totally recommend that. So for anyone listening, the headline was making NHS data public is not the same as making it accessible, we can and should do better, which exactly summarizes well, is the Yeah, it's it's a great sort of takeaway message. Really? Yeah. Actually, in an age where we're kind of obsessed with getting more and more data, that doesn't necessarily mean our literacy of that data is going on.



Christina Pagel 22:06

And, and also, what was happening until we did this website is that they would publish the report every year, but it'd be a PDF 15 page PDF that you have to dig through an NHS co signing mine. Yeah, exactly. You're doing that. Yeah, that's, and I don't think so having it? Yes, it's available. It's not, they're not.



Maymana Arefin 22:23

That's an interesting point. I think often with academia, when you have when it's all open access, and the results are there, that doesn't necessarily mean people are reading them,

or carrying that matter. So they don't really see the use of a website, which actually makes an effort to include people who

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Christina Pagel 22:38

also had, like an experimental psychologist from King's working with a, and that was great. But he's he that we literally had, like experiments where we would test the use of the word chance versus probability versus lung and see how people reacted to it. How is it appropriate not appropriate, like talking about like, talking about deaths from heart surgery? very inappropriate. So we couldn't use that word, for instance?

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Maymana Arefin 23:03

That makes sense, because the subject matter is so emotive, exactly getting

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Christina Pagel 23:08

that language, we shifted the whole frame from mortality to survival. Because partly what wasn't being emphasized in any of it was the UK has some of the highest survival rates in the world. It's like 98%, now of children by the month of surgery, and it was used to be, you know, back in the 1990s, you 80% I mean, it's gone. Massively huge amount to improve. Yeah. And so we kind of did that. And it completely changed the content of the website, like Originally, I thought, all we're going to do is just show them what the audit body does. And just explain that we know with a bit of cartoon bubbles, we didn't understand what the body was producing. It kind of did things in terms of ratios. But it turns out, people don't know what a ratio is. Or even things like they would describe the ratio, this is actual slash predicted, people didn't know what the slash was. And it was things that I would never have realized. That is it's my because my life female, and kind of what was a plot of dots with some confidence intervals around it. People when as a bar chart, because of how it was colored. And it was things like that, that made you realize you can't present it as settle things. Yeah. So important time. And then the parents are saying that we didn't know survival was that high? Why not? Right? Yeah, they presented as a ratio, there is no absolute numbers there. Right? So we presented things as absolute numbers, and we changed the look of everything. And then they said, right, we need some key messages. You know, you keep telling us You shouldn't compare hospitals to each other, you should compare them to what the formula tells tells us to expect. So why are you putting everything in a table? Because that just invites comparison, like, Oh, good point, it's changed individual to say all those kind of little decisions

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Maymana Arefin 24:43

They all add up to how its recieved yeah

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Christina Pagel 24:47

kind of went all the way down to we kind of develop animations of of how risk formulas work for people who are interested in that kind of second layer information. But in it, you kind of have to show CINAHL rays of what can happen either lots of different realizations of what can happen. You know, we're really stuck because we're going to have to show cartoon children dying. What is the sensitive way of doing it? And it was kind of literally like, do we fade them out? Do you put a black square around them? Do you like really thinking about the trickiness? And they actually, and they kind of ended up saying just just fade them out? blank. But things like that, where, you know, there shouldn't that shouldn't be a decision made by me. No, I really see. And so we ended up with a really nice website, everyone really liked it launched in 2016. But what it showed me was that the parents and other members of the public really valued, both being asked, but also actually having access to that information that it did matter to them. And I just thought, you know, this is the NHS, like, if we're not making it available, and what are we doing, you know, so and then. So that kind of was that project. And then following on from that, now, whenever we work in this field, which we're now doing, like another three or four projects in it, we have a patients and families involved right from the beginning. So we did a project looking at complications of heart surgery. And we chose which complications to measure with the families directly, because of that, we put in two things that we measured that we weren't going to measure one was feeding problems, okay, which is really interesting, because clinicians did not think of it as that important, partly because they weren't really intensive care clinicians and surgeons and intensive care, the kids don't really feed because they're cheap fed, of course. And as far as efficient, long as they get their food, somehow, we care more about, you know, the heart and whether that's working. Whereas the parents are saying you don't understand if my child's vomiting four times a day because they can't digest is it completely disrupts my life, I'm constantly panicking, they're not putting on weight. So that kind of became a huge deal. And it turned out to be really common about one of the 10 have some kind of service. Do you

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Maymana Arefin 26:45

feel just got that kind of leads on to a question I was wondering from that Guardian article, I was a really came across that you want to involve key audiences right from the start. And I was talking to Malcolm a little bit about this, because I think as far as I know, that seems quite an unusual decision for someone who's based in academia, a lot of the time, it's actually quite difficult to kind of get the stakeholders or the audiences you want

involved right from the start. But do you feel you made that decision as a response to kind of seeing that the priorities were different? And those experiences from parents were really important? Or was it something you had in mind from the start that you kind of then followed?

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Christina Pagel 27:18

No, it was a response to seeing or Firstly, to what happened? Yeah. And but then once I had worked with families and parents and patients, I just thought, what do we do, like if we're not measuring the things people care about? And we can't communicate what we're measuring? And so what I mean, that's, that's really kind of how it came to me. So I do and I have now do a lot of work with parents. I don't want to particular training and it's not something a mathematician would do. Exactly. But for me, it means that I know that what I'm doing, I'm giving people the information that they want. And it's my job as mathematician to make sure that information is right. Yeah, meaningful. No, I mean, it definitely has changed how I approach

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Maymana Arefin 27:55

No, I find that I find that really admirable. I think the thing that really stood out to me from that that article and from what you're saying is that it really seems you don't kind of view your role in academia is just, it doesn't end as you hand over kind of this magic formula. And that really comes across because there's so much work to do before that that formula is devised, and then afterwards as well with the communication. So

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Christina Pagel 28:16

I think there are kind of different ways of being an academic, right, you can be an academic, because you absolutely love your subject, and you want to find new results move forward the frontiers of science, I'm not doing that I don't invent new mathematics, I want to have an impact on society, and make a contribution in my own way. And the way that I can do that is through academia. And so for me, academia is a vehicle, okay, rather than the fundamental goal, and there's a place for all of it. Yeah. So that, to me, is what kind of drives me and if I felt that I would make a better contribution outside of academia. And then I leave,

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Maymana Arefin 28:48

I was wondering, actually, on that note, can you think of a moment that's actually really stood out to you as kind of driving you to stay in this particular field in inspiring moment,

maybe I just, I feel like so much of the work you do must be quite emotionally loaded, kind of seeing people in quite difficult situations and helping with the decision making around that

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Christina Pagel 29:07

working with doctors makes you feel quite humble back in God years ago, we were doing some work with a lung surgeon, okay, that's in Thomas's, and I can't why we're having a meeting at St. Thomas's, and we got on the left. And this person came in, and he was like, Professor treasure. He's like, you know, you saved my life. I'm so grateful. I just want to thank you. And, you know, and you do kind of think, well, no one's ever gonna come up to me and say, I can see that you've saved my life. Well done, you know, and you kind of, yeah, I thought, oh, should I you know, is this a better way of creating an impact? And I thought, well, I probably wouldn't have been a great doctor and quite clumsy. I think the world has been saved by me not becoming a doctor. But But and there aren't that many people who do the kind of math I do so I think I'll maybe this is where

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Maymana Arefin 29:49

yesterday, and I'm sure that the impact is still definitely there. Maybe just less kind of directly.

C

Christina Pagel 29:56

Yeah, there is this thing that did happen to me like literally just In November, I was giving a talk kind of about this work at a conference. And afterwards, this guy came up to me, and he is a research nurse at London hospital. And he'd been working with us on the complications after heart surgery project. And at the end of that project, we'd also work with families to produce an information sheet about what happens, like, what are the chances of your child's developing complications? What does it mean, what type of complications are there? Yeah, we've kind of sent out the PDF of the information leaflet, if you like. And then the project ended me ran out of money. But he he actually has been using and he wants me, Christine, I want you to know that I have been using your information sheet with parents because we've sent it to a partner hospital. And they they really like it. And he actually told me the story. It's actually it's a sad story, okay. But he said a family had come up to him just last the week before, and their son had developed a complication and died. Okay. But they said to him specifically, that having that information had really helped them come to terms with it, they said, We were felt like we were prepared that things can go wrong. And it really helped us to have that and to understand and maybe to come to terms but easier with what happened. And he was I

wanted to let you know, and I just thought Actually, yeah, if that helped, like one family, that's part of it, then that that means a lot to me. And that's not mathematics, but that is communication, and it's about having a responsibility for your work and, and caring about what's done with it.

M

Maymana Arefin 31:20

I wondered as well, I guess, being involved in the NHS for some time. Now. Definitely my experience. I've seen how the NHS is under a lot of strain at the moment. And I wondered whether you saw an effect on on how your work is being delivered,

C

Christina Pagel 31:33

when not so much in terms of my work, but it doesn't have enough money. Yeah. And you see it and you see it every day. Yeah, even, you know, Great Ormond Street, which is one of the most specialized, most well funded hospitals, you know, it's difficult. And it's not just about having enough money is really difficult. They're finding it, especially in London to recruit nurses. Brexit is going to make that harder. Yeah. But partly, especially for nurses like living in London can't do it. Mostly people that people I met at Great Ormond Street, they commute in for two hours, three hours, and then they might stay in London for night and go home. And I mean, it's a real struggle to try and what you've what I've seen in the NHS is the system has relied on people's goodwill has relied on more, more people working for free, effectively over time masses of over time, because they care about their patient. Yeah. And at some point, and I think now you're starting to see it crumbling, that they just can't keep doing that. And people are leaving, and then it just gets worse and worse and worse. I think it's worse than things like primary care, specialist care still tends to be quite well funded. It's quite a small community. Yeah, it's not it's not great. And that's partly why, you know, sometimes I do question my role, because yes, I can do things to help. But fundamentally, what they need is better resourcing has been underfunded for 15 years now, while 10 years and I can't do that.

M

Malcolm Chalmers 32:56

You mentioned Brexit in passing? Yeah. Obviously, how I like to mention it nowadays. Basically, in as little as possible. You wrote quite a few articles over the last few years, from what I can see kind of looking at the actual, the figures and the statistics behind it, and how those didn't necessarily match up to what people's opinions were, what people believed



Christina Pagel 33:20

are the kind of breaks at work that I did, over about two years of doing kind of quiet, big public surveys, but trying to answer are slightly different questions to what was out there to try and really understand what was driving people's attitudes towards Brexit. And one of the things that came out really strongly of that was this idea of sovereignty, that among people who voted leave there about 30% of people who voted leave who put immigration as their number one priority, above everything else. But the rest, it was control over our in laws making our own trade deals. And immigration came quite low down, actually. And I think I hadn't until I saw that data says I on 10,000 people, it wasn't kind of two people that I I am like your typical London remainer. And I hadn't really quite appreciated that sovereignty really meant a lot to a lot of people. Because it doesn't mean that that to me. And I guess I thought it was a cover for immigration, but I did I genuinely then don't think it was I think maybe one of the first surveys to show that. And I think what I'm interested in now is seeing how much do people still care about that now, effectively, you know, we have exited with certain transition, but in you know, next January, in theory, we will have this sovereignty that people wanted and I kind of wondering, how will that play out? And will people still really want it? Well, they think it's worth what's happened, you know, I don't know, I didn't know what happened to the economy. I don't know what will happen to employment. I don't know what will happen, you know, who do people blame for whatever will happen or who do they credit? And so what we did, and this is something I actually learned directly from doing the website is before we did the survey, I did little surveys, specifically online only with leavers today. Test the wording and say to them, what do you think we should ask? Does this mean something to you? Because I didn't believe so I there's no point me asking the questions about that statue. So I have to ask questions that are relevant to the people that I know that I don't understand as well. And I didn't I didn't need to ask what people like me think because I there. So I think that is kind of what set it apart as well as that we tried really hard and would spend several weeks, if not months, really thinking about what our questions are, what the priorities are, what the actual languages, we had, like 1015 different versions of an immigration question, and asked it and said, Okay, which one of you actually mean something to you? And we gave space people to put free text and it was just really useful. And it did change, like, I wasn't going to put in control over our own laws, because I just didn't think it was a thing. And then he became a bit. Yeah. And yeah, and that was a tough one. So is that



Maymana Arefin 35:52

kind of thing where that surprised. But it doesn't really shows the power of kind of stepping outside of echo chambers really. And I wondered whether, would you be interested in kind of doing this? What sort of services to see how it has changed since?

C

Christina Pagel 36:06

Yeah, of course, like, I really wanted it, but I have to get money to do it. Yeah. And the thing is, like survey data like this, you can't do it as a research grant. I mean, you can't have a year long lag, you just have to do it. And then so you kind of they don't cost that much money. It's like between five and 10 grand ago, but trying to I'm not gonna spend my money. Yeah, but it's kind of who will give you that. And luckily, you know, we had found people at UCL gas money, grand challenges, some from King's College, actually, their European unit, we have a little bit of money from the people's vote campaign wants you to say things like that. But that is a real struggle. And it's how do I fit that into my day job and but one thing I'd be really interested in now his identity, and this idea of how people's identity shapes what kind of relationship they want with Europe in the future. So one that we had, like my friend and I, who is not UCL, but we did all our Brexit work together. Yeah, she has this hypothesis that people who hold multiple identities already, like, say, minority ethnic and British, yeah, Scottish and British. I don't know me, I'm German and British, you might find it easier to have also European identity. But we don't know, you know, that's just the hypothesis and interesting, but you're all you know, is it different? If you have identities that you choose, like, say, Londoner, or identities that you're born with? Like ethnicity? Like, like, it's kind of like, how do they shape our future and how we want to have relationship because I think if we don't understand what people actually want, now, you've kind of got this idea with Brexit to that. And it just gets to be the government that decides what that relationship is that actually what other people want it to be, it's something I'd be really interested in understanding. It's not.

M

Malcolm Chalmers 37:50

No, of course. So with all of the process that you went through, with your research we were discussing, and all the processes that you went through with the surveys to try and get accurate information from leavers. If you were to talk to an early career researcher right now, or someone doing a PhD, or somebody who is at that very initial stage of doing their research, do you think there's any kind of general advice that you could give to them, so that they can avoid making mistakes? Are there any things that people may be don't look out for early in their career that you've learned over the course of last 10 years is important to look for?

C

Christina Pagel 38:26

It really depends on why you're doing it. So for me, the questions I asked now, when I think about what research I want to do is Does it matter? And who does it matter to? And can I involve those people in my work from the beginning? What I guess I have learned is not to be scared just to change field. Like sometimes I now what I do tend to be driven by

what I think needs doing. So for instance, I'm just starting, I'm working on a project with the Health Foundation all about periods. And we're trying to quantify the burden of menstruation on women, which I think is this massive one. I have I don't know anything about what I know about periods. I have them, but I don't know anything. I know exactly. But it's that Well, actually, you know, it doesn't seem that this particular bit where it's been done. I think we should do it. And how do we do it? And who do we need to involve? And it's not even about you know, me leading out it should be about what needs doing, who can do it, and how do you facilitate that? Do you care about it? If you don't care about what you're working on, then what's the point? I mean, I suppose that's kind of why I ended up leaving physics. I still love physics, but what I was doing was something I realized I didn't care about Yeah, I mean, I think a lot of people especially now my nieces are actually just using the A levels but people feel like what they decisions they make now. The decisions for life. And that isn't true. You can change like either a PhD in space physics with no Physics for years. That's amazing. And I switched to this I didn't know any operational research, not a thing. I've never done a course on it in my life. Now I'm a professor of it. So you know apart from having massive imposter syndrome It doesn't matter. You know, you can switch Yeah. And and if you're genuine nice person to work with and you care about it, and you're sensible and and you want to do things right. And you're good at learning, if you've got a PhD, you can learn stuff, then then don't be scared to learning stuff. Yeah. And you can change career at any time. I've still got a career change in me.

M

Malcolm Chalmers 40:22

Do you have any ideas what it might be? Or is it just some some blank space left for a master's in future?

C

Christina Pagel 40:28

Oh, no, I think political science. Yeah. That wouldn't make sense. Yeah, I think I'd like to have a bit more grounding in some of the basic theory. Yeah, that'd be interesting. I really like game theory, but I'm not sure you could just do a master's in game theory on its own, I'm sure. Somewhere there would be this like a course on it.

M

Malcolm Chalmers 40:47

So having discussed all of this work you've done in the last few years, Christina, what's next?



Christina Pagel 40:51

Actually, we have literally just heard that. We've been funded on a new EP SRC hub for mathematics and AI in healthcare. Wow. Which is really exciting. It's actually led by Professor Rebecca Shipley, who leads UCL healthcare engineering, but it's involved Kaoru, where I work. It involves Department of Mathematics Department of Computer Sciences. And we're working really closely with Great Ormond Street and UCL so huge, and it's going to be completely China kind of update models of physiology using real time high frequency data from intensive care. And think about what how can we learn better physiology to actually improve patient's care on the ward? And I think that's just going to be really exciting. So that's kind of completely different.



Malcolm Chalmers 41:38

That has increased Yeah, yeah. It's a mishmash of different disciplines. There



Christina Pagel 41:42

it is. And it's really interesting, because I my role is really to kind of broker between the really technical side and the clinical side and think about how do we, how do we involve patients in the public. So Becky, and I will be really thinking about how do we integrate it and make it work? Yeah, so it's quite cool. Yeah.



Malcolm Chalmers 41:57

Well, thank you very much for your time, Christina. This has been Hypot-enthuse the podcast of the faculty of mathematical and physical sciences. I've been Malcolm Chalmers, my co host is Maymana Arefin. We've had our guest Professor Christina Pagel.



Christina Pagel 42:11

Thank you for having me.



Malcolm Chalmers 42:12

And we'll be back next month. Thanks very much