



# **Julia Sutcliffe**

Interviewed by

**Jane Bird**

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By Zoom

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**Archives of IT**

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*Welcome to the Archives of Information Technology where we capture the past and inspire the future. It's Friday 30<sup>th</sup> June, 2023 and we're talking on Zoom, as has become customary since the coronavirus pandemic. I'm Jane Bird and I've reported on technology and the IT and telecoms industries for newspapers such as The Sunday Times and the Financial Times since the early 1980s. Our contributor today is Professor Julia Sutcliffe, who was appointed Chief Scientific Adviser at the Department for Business and Trade in February 2023. Julia provides science and engineering advice to the Department's ministers and senior officials. She champions an evidence-based approach to decision making and builds internal scientific capability. This involves working with a network of departmental Chief Scientific Advisers and the Government Office for Science to resolve issues and maximise insights across government. Julia spent 26 years at BAE Systems where she focussed on innovation, aerospace, defence and security. Before taking on her present role, she was the company's Chief Technologist. Julia sits on multiple industrial advisory boards, councils and committees and is a Fellow of the Royal Academy of Engineering and the UK industrial representative on NATO's Science and Technology Board. She's an advocate for STEM subjects and for diversity and inclusion.*

*Julia, welcome. I'm very much looking forward to hearing more about your life and experiences in the worlds of science, technology and business.*

Thank you, Jane, it's lovely to be here.

*So if we could start at the beginning then? You were born in Manchester in the late 1960s, and were you, did you have a happy family life, a good childhood? You had a couple of brothers, I think. Was it a good time?*

Yeah, had a very happy childhood indeed and in those days, it was interesting, wasn't it, sort of growing up in the, I suppose in the seventies, you know, I have fond memories of watching programmes like *Tomorrow's World* and things like that, that were sort of, you know, it was bringing science and technology and the latest innovations into the living room, so course there were only – what – three channels to choose from at the time on TV. Makes me feel really old, just thinking about that. So

yeah, very happy. None of my family per se did science or technology as a trade, but I sort of very much like discovering things and, yeah, it was, my grandparents took me to Jodrell Bank when – that's the big radio telescope in Cheshire – when that had opened, and that was one of those moments where I was just struck by the fact that science and technology could answer a whole set of things, a whole set of questions, and actually you could, people did that for a day job.

*Yeah. So what about at school, did you, did your teachers inspire you as well? Did you study science and technology at school at all?*

Yeah, I did. So, I've got very fond memories of lots of teachers who were supportive and inspirational, and indeed, I studied, certainly at O level, sort of focussed in on science, and then at A levels studied physics, maths and chemistry. But it was, yeah, the sort of pathway of going into science was probably something around that kind of, that age of wonder, I suppose, in the sort of late seventies, early eighties. I remember going to see the opening of the Humber Bridge, my mum took us there to go and see that and it was sort of seeing these great feats of science, engineering and technology. I also recall spending an afternoon on a windswept airfield in north Yorkshire, I think it might have been Easingwold Airfield, where the Harrier jump jet came in to land. And again, just seeing something huge and complex like that, a piece of new technology, I just thought was fascinating. So that certainly sort of made me, I think, want to head down in the direction of science and technology by the time I'd got to O levels and A levels as they were, yeah.

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*And you'd gone through state schools, hadn't you, but were they co-educational, or was it a girls' grammar school you went to?*

So, I went to a girls' grammar school in York and that was probably a great, it was just a great environment. I have lots of lifelong friends that I made there. But then from completing O levels went to a sixth form college that was co-educational, again, a state sixth form college, and that was absolutely fantastic as well, and again, I've got

lifelong friends that I met there. So it was, both environments were super-supportive and it was, yeah, good...

*So you didn't run into that, the sort of sexist view that those were the subjects for boys to do?*

No. It didn't occur to me that that was what anybody might think.

*And that was obviously something from your family background as well as from your schools?*

Absolutely, yeah. I've sort of only known sort of encouragement really. I mean I do recall my, in fact both of my grandmothers were telling me stories of – certainly my grandmother on my maternal side – they, her and her sister both passed exams to go to the sort of, have a scholarship to the private school, so I mean this is obviously way, way long ago, but couldn't go because they had to go out to work. So I felt very fortunate that in my generation I was lucky enough to be able to succeed at school and then go on to university. So very fortunate position to be in.

*And you'd decided fairly early on that you wanted to study science and engineering at university did you? Because you did, did you do physics at Nottingham?*

That's right, yes, did a degree in physics at Nottingham and a PhD in physics as well, so yeah.

*And that was a good experience too then?*

That was a great experience, yeah. Fantastic. Again, really, really supportive lecturers and supervisors that, yeah, they were brilliant. It was obviously quite a male-dominated course, but it didn't strike me as, in any way, shape or form, limiting what you could do as a female in science and technology. It was entirely supportive and a, yeah, brilliant environment.

*It sounds like you've been quite lucky from that point of view when one hears stories from other women perhaps who've suffered a lot more from sexual discrimination. Then did you go to MIT to study AI?*

No, I went from the university I spent some time, just took six months off and spent some time travelling. I really wanted to go and visit India, Nepal, also on the same trip went to Pakistan and also Thailand. I was really keen, having spent so long at university, to go and see something of another part of the world and see how other people lived. And that was a brilliant experience, I was so lucky to be able to do that. And so then when I came back to the UK after that I was keen to, yeah, get a job and so I went to work at British Aerospace as it was then, and as part of my role in the organisation, a number of years later I did some coursework with MIT. But I didn't study at MIT, yeah.

*Okay. So, and you hadn't done the sort of milk round at university then, you'd had, you'd taken time out. It sounds a bit like you ended up at British Aerospace slightly by accident rather than by having kind of done work there during internships and that kind of thing.*

Yeah, I hadn't, definitely hadn't done an internship or anything like that, and certainly, at the end of my studies wanted to just go and- I'd always had this ambition to travel to somewhere that was beyond the scope of sort of family holidays or anything like that, or beyond the scope of Interrail. And so that was a real ambition to go and do that. So I was determined that that's what I wanted to do. But then having come back to the UK, as I say, after that, needed to find employment and in those days, you know, you didn't have a whole set of things and resources online that you could look through, so it was a case of looking through the national papers and applying for things that were advertised. So that's what I did. I went to have a look at a few companies, and really enjoyed the sort of the interview process at British Aerospace. It was, they were a great set of folks that interviewed me there, I liked the questions, and so, yeah, so I ended up going to work there in Bristol.

[00:10:06]

*In Bristol? And so you started and you ended up spending 26 years, so that obviously worked out very well.*

Indeed.

*So could you talk a little bit about your sort of route through that? Because I think the first role was being a higher scientist, then you went to Australia, I think, perhaps.*

Yeah, that's right. So when I first went to work with the team in Bristol I was part of the research team there, I was working at the corporate research centre, and I was surrounded by scientists, physicists, metallurgists, chemists, engineers, so certainly felt very much at home in that sort of atmosphere. And we were really pushing the boundaries of robotics, of early-stage sort of Wi-Fi networks, for example, of autonomous systems using Artificial Intelligence, of data fusion, of different materials and sensing technology. So it felt like we were doing some cutting edge sort of applied research, and of course had a network of academics that we worked with closely, so that was great, sort of having done a PhD to then see that on the other side in industry, and the benefit of that kind of strong relationship with academia. And so I spent sort of three years at the corporate research centre [brief interruption]... and as part of that, met a team that we worked with that were based at Sydney University. So Professor Hugh Durrant-Whyte and his team, who we had collaborated with when he was based in Oxford, moved out to Sydney and in arriving in Sydney he was engaged in the Field Robotics Centre, which meant that we could drive some of the technologies that we'd been working on to the next sort of level of demonstration through using small aircraft systems. And so essentially through that sort of dialogue and that collaboration I ended up visiting Australia and met the team that were based at the Melbourne office, who were sort of keen to utilise some of the skillsets that I'd sort of acquired at the corporate research centre. So that's a big company working really well, does corporate research and then fields it out into the sort of operating parts of the business. And so yes, I also still very much wanted to travel and explore, so I had the opportunity to move across to the Australian arm of the business, which is what I did, which was a fantastic sort of time over there. I had sort of ten brilliant

years working with the team there. And as I'd sort of focussed in the UK, certainly in Australia the focus was on, you know, Artificial Intelligence, data, you know, digitisation, autonomy, that kind of thing, across a whole range of systems and working with the defence customers to support them in their kind of developing views of how they could utilise these new technologies that were really coming into the fore because of the availability of massive computer power and good communications. It sort of really sort of opened up the sort of aperture for a whole range of other technologies. So that was brilliant and I spent, I was fortunate enough to work with an awesome team of people and spent sort of ten years working in different parts of Australia, spending time in some various different flight test locations down the coast of Australia and in the sort of, in the outback, doing flight tests, and I've stayed in some fairly salubrious places, such as old sheepshearers' huts and things like that, but always working as part of a team to kind of push the boundaries and see what the art of the possible could be. So that was a really, really rewarding and exciting time. And of course...

*That was during... that was from... so you joined British Aerospace in '96, I think [Yes], and that took you up until about 2010, that period of time.*

That's right, yes. So, between '99 and 2009, yeah, in Australia. So that was fabulous. I made so many wonderful friends out there, and of course, being in a sort of large organisation, a global organisation, had the opportunity to make links into the States, obviously links back into the UK, so again, that sort of network of scientists, technologists, engineers working across sort of national boundaries, really, to collaborate and push the frontiers. So that was really an exciting time, that was great, really good fun.

[00:15:30]

*So then did you, in 2010 then did you come back to the UK?*

I did, I came back to the UK and joined the sort of aircraft, sort of headquarters of the aircraft part of the business really, which is in the north-west of England, to work on a range of new technology programmes and new demonstrator programmes, new aircraft programmes that were sponsored by, you know, the RAF, the Royal

Australia... the Royal Air Force in the UK, and actually co-sponsored by other air forces too. And I think that's one of the interesting things about that industry, is it's a well-connected industry but it tries to solve some really hard science problems, it really does try and drive technology when you think about the number of things that need optimising, the number of challenges that need solving to make something incredibly complicated, very highly integrated do a set of really challenging things at the limits of capability and get it to work every single time, reliably, repeatedly, is quite an engineering challenge. And, you know, you'll know from your experiences, engineering is an entirely collaborative process, it involves many, many people, each sort of doing their own part of the puzzle and then bringing all of it together. So actually it's a really, it's a real team sport, and that environment is something that science, technology and engineering offers. And so people often think of, you know, individual scientists working in a lab, but my experience is very much that it's a team sport, and the teams are often huge and they're globally based and they collaborate very well.

*And when you're bearing in mind that we at the Archives of IT, we are focussed on the IT side of it, presumably your view of IT and computers, and I guess you would have been, you would have perhaps started using them at school in the sixth form, did you, and then...*

Yeah.

*It's a kind of, it's a subset, I mean very much a subset of what you were doing, I suppose, the IT side of it?*

Oh yeah, definitely. I mean the IT sort of journey over the last couple of decades has been absolutely phenomenal, hasn't it? So I remember at, in fact at university we had a computing room which had communal computer facilities that were accessible by the sort of postdocs and postgraduates, with sort of shared email accounts. You didn't have your own personal computer sat on your desk in the way that we do sort of today that allowed you to sort of have emails across the world. We had computing, obviously, in the laboratories, but that was typically compute power for writing programs and operating systems, it wasn't the sort of personal compute capability that



we are so used to today. And then of course, in all of the systems that we created, they all have compute power and processing power embodied within them. And actually, it's been the development of that processing power and the affordability of it that has really powered the kind of, the sort of the fourth industrial revolution if, you know, the technologies of the fourth industrial revolution, the internet of things, the sort of, you know, everything that we see around us today and much of which we take for granted has come from that huge availability of computational power and the data networks that go with it.

[00:20:36]

*So you wanted to take a broader view, though, you didn't want to just look at that aspect of the technology, the IT, you came at it much more from a, well, a physics initially, but then an engineering point of view, it's the engineering side of it which really kind of fires your excitement, by the sound of it?*

Yeah, I suppose the integration of all of those things to create something, I'm really interested in the sort of the scientific discovery, but then how that translates into application and things that we can utilise today, which is how I suppose science transitions into innovation and engineering. But much of what we have would not be possible without the sort of compute power revolution, so that's been fundamental to, you know, things that, if I think about when I first started at BA Systems, or British Aerospace as it was then, one of the first things I was asked to do was undertake with Edinburgh University a review of the state of the art of AI, okay, so that's 20-plus years ago. And my PhD, just five minutes before that, had been in the area of sort of quantum mechanics. Now, I could not have foreseen that winding the clock forward to today, Artificial Intelligence and quantum technologies would be on the lips of the Prime Minister, but they are. But it's because we've got the computational power and the ability to share data across sort of networks of scientists and researchers that is enabling this kind of rapid pace of technological development. So things that were a pipe dream become reality today.

*Yeah, yeah. So, that period of time that you were working on the aircraft systems and so on, that was until about 2014, is that right? Then you started looking at training services?*

Yeah, so I think it must have been around about that time, I then became Head of Engineering for Training Services, and that sort of probably brought me closer again to some of the IT systems, as you call it. So we were looking at creating sort of training environments and particularly the synthetic training environments, by which I mean the simulators that would allow us to deliver training. And the kinds of training we're talking about is, you know, pilot training for aircraft, training maintainers to maintain those aircraft systems, etc. So quite complex technical training, and if you think about previous generations of how training was delivered, you can sort of see that now there is far more training delivered in a really repeatable, tuneable way, in a simulation environment. You know, you can create contexts and environments that have high quality, high accurate, repeatable synthetic simulations of aircraft behaviour or different subsystems, etc, that allows you to deliver training in quite a different way. And so, again, as I mentioned, engineering is a really collaborative process, we worked with teams across the world, to understand what were the training needs, cultural differences, in the way training is delivered. And indeed, we worked with a number of the Formula 1 teams to look at how do they train racing drivers and how does that compare with how we train fast jet pilots, for example. So, lots of crossovers between different industrial sort of sectors, if you like, or application sectors, so that was fascinating.

[00:24:46]

*Well, that kept your involvement for quite a long time, I think. You seem to have been working on that for a good five years or so?*

I think so. That was about five years, yeah. Then I became Chief Technologist for the Air Sector, which was an absolutely brilliant job. I was so fortunate to get that job, it was, you know, the first person in that post. And that, I had the privilege and the opportunity in that role to sort of define the technology sort of strategy across the sort of the sectorial business which was, that stretched both from the UK, also into

Australia and Middle East and other territories in which the company operated. And of course, at that time there was, you know, lots of excitement, if you think about it, sort of in the UK we have the industrial strategy just come out. We started to see this emerging picture of digital technologies, AI, data science, and so it was a really brilliant time to bring that language into the broader sort of strategic narrative and start thinking about those partnerships and ecosystems that would need to be developed and how we would work with academia and industry to really drive forward in those areas. So that was absolutely fascinating and, again, as ever, had the opportunity to work with some really brilliant people.

*Yes, I was going to ask you somewhere along the line, who would you highlight, you know, particular mentors or individuals who had been very influential in the development of your career?*

It was, I mean it would be really difficult to pinpoint one person. I would say that I have been lucky in that I have gone out and sought people that could support me and I have always seen encouragement and support from people that I've spoken to. I think it's great to have mentors, people to bounce ideas off outside of your day-to-day delivery, your day-to-day job, if you like. I certainly think that's been really useful. And so I've always, yeah, I've felt that I've gained a lot from being able to talk around topics with people outside my sort of immediate sphere. That's been really useful and I would encourage people to do that.

*And that's as much a function of your own willingness and enthusiasm to communicate, presumably, as of an individual who says I can see, Julia Sutcliffe, that you are destined to do this or that you really ought to, you weren't pushed into things by other people, by the sound of it?*

I don't think so. I think the, you know, we always used to say the person that manages your career is you. So... And there are so many opportunities out there, but if you can develop that confidence to be able to communicate about yourself in a way that is authentic for you, then that's always really helpful and you'll find that people are usually more than willing to help and support and guide.

*I imagine that it was partly helped by the fact that you clearly had a very strong sense of your own interests and not perhaps exactly where you wanted to go, but what you wanted to be doing with your life from an early age, that would make it easier, I assume?*

I think that's a really interesting question, isn't it? I think some people seem to have these career plans that are written out way into the future. I wasn't somebody that had one of those, but you're right, Jane, I did have a clear view, or an understanding of the things that I enjoyed and the things in which I felt I could add value and the balance that I wanted to have between certain things. And so, yeah, I've always tried to sort of maintain doing things that I thought were interesting, working in environments that I've enjoyed, because when you do that, you get more out of it. You put in the discretionary effort, you enjoy the teamwork. And so I think finding what is right for you is something that is important, really, if you can do that.

[00:29:28]

*I mean, what was your main motivator? I mean, was money important to you?*

I think when I, certainly when I came back from travelling after my PhD, absolutely I had to get a job. Did I look for something that would pay more than anything else? No. I think for me it was a balance, I wanted to do science, I wanted to do engineering, that's the sphere I wanted to be in. So that was clear. And then, as a female as well, I've had, you know, I've had a family as I've been working, and so being in an environment in which you are supported by your employer and being in a partnership where it is a partnership and you support each other, so being able to sort of maintain the career and the career direction, if you like, requires support around you. So even though we were out in Australia I had a very supportive employer and so I was able to strike that balance.

*And you didn't think about leaving BAE Systems at any point, or you weren't seduced away?*

[laughs] I enjoyed the people that I worked with and, as I say, certainly for me when I was, you know, raising my family, having my children, being in an environment in which you're supported is really important, was really important to me. And so I was very comfortable with that balance. I don't work for them any more, I left just recently, having had an absolutely brilliant time, but just an opportunity for a different challenge, a different perspective on things arose.

*So the job as Chief Scientific Adviser then wasn't one that you had identified, you didn't apply for the job?*

Well, I did apply for the job but before doing that I don't suppose I'd had much inkling around what a Chief Scientific Adviser actually did, obviously, like you and everyone else, we will have seen Patrick Vallance on the TV during the Covid-19 pandemic. But yeah, it was an opportunity that arose and the more I sort of spoke to people about it, I thought, the more I thought this could be a really interesting challenge. And I felt that, you know, the great experience and the learning that I'd sort of gathered at BAE Systems would be a good springboard, an opportunity to add value in a different way, but to use my industrial experience to support from within government. So that was kind of the opportunity and the challenge.

*So how has it been? Are you allowed to say?*

It's been brilliant. It's been, again, such a lot of, again, lots and lots of people that are so dedicated to what they do, everybody working to try to do the right thing, it's an amazing time to be a scientist or an engineer. You know, for the first time in my career, we've got the Prime Minister talking about the importance of science and technology, stressing how important it is that we are equipped with the appropriate STEM capability, and indeed, STEAM capability, to really, you know, use technology to innovate, to create new business opportunities. And so it's just a brilliant, brilliant time to be into science, technology and engineering, because you've got government calling out for it, you've got industry wanting to invest and innovate, and you've got this sort of global environment in which everybody's on that page. So it feels like a really exciting time. And of course there are some really significant challenges that

face us at the moment, some fairly strong headwinds, and so the opportunity to utilise technology, science, as part of that solution is a real imperative.

*Well, it's great to hear you speaking in such an upbeat way, because my impression is that a lot of scientists and technologists out there are very worried about in a post-Brexit Britain about our being isolated and there not having been a resolution to the Horizon project, for example, and what the UK's going to be involved in participating in initiatives like that sort of globally, and potentially that we've become, you know, a less significant and important partner to other players round the world. Is that not your impression, or how do you see it?*

[00:34:41]

I think I would simply say that I think there is a really good opportunity as someone who is a scientist, technologist/engineer, to make a difference at the moment. I won't comment on individual government policy and decisions in this forum, but I would say that both in the UK and globally we are seeing governments invest in science and technology skills and capability to a level that has not been there for a long time. So if you are in this space I feel as though there are opportunities and, you know, and we need more scientists and technologists and engineers desperately. So it's, there's plenty of challenges to go at.

*Indeed. Well, you're, so encouraging STEM subjects in schools is one of your sort of campaigns or missions, isn't it, in life? How are you proceeding on that?*

Yeah, so I'm looking to get involved in, well, as part of my role I am the government science engineering professional lead within my department, so there's a range of things I'll be getting involved in there. When I was in my old role at BAE Systems, I did a lot to support science, technology, engineering, STEM, there by being part of the Women into Engineering campaign and supporting speech nights with sort of 16-year-olds, and females particularly, to grow the diversity, and for them to sort of see living examples of females who have careers in science and engineering, so that's really important. And I will continue to do that.

*So are you optimistic that we can improve the situation, because it's still very divided between males and females studying and taking careers in science, isn't it? It's taking a very long time.*

It is. And we have to, we have to improve that, because we have a shortage of scientists and technologists and engineers in the UK, and if we do not try our absolute hardest to encourage those elements of our society that might not feel it's a natural place for them to go or a natural obvious choice in school, then we will forever have a dearth of science, technologists and engineers, we'll be forever under-supplied in this area. But, if we can embrace diversity and inclusion and actually bring science and technology, engineering as an opportunity for everybody, then that's going to go some distance to bridging the current gap that we have. So we must do better. We don't have a choice.

*Well, obviously as a female in your role as you are, you're a fantastic role model hopefully to inspire young women who are thinking about moving in your direction. So that's to be hoped, I suppose. Yes, what about your work on these various advisory boards? For NATO and so on, how do you find that?*

That was really fascinating and inspiring. So NATO, recently – and I'm talking about over the last sort of few years – published a new science and technology strategy under the leadership of Dr Bryan Wells, and in that they articulated how they need to utilise science and tech to really generate the best possible capability across the NATO allies. And so they as a large organisation, as an example of what other sort of corporates and other governments are also thinking, which is, actually, we need to use science and technology now to make sure we're at the forefront of developments, the forefront of product development, the forefront of business development. And so it was a great example of trying to do that in a collaborative environment across the member states, who are all different, at different levels of maturity in terms of science and technology, different levels of investment, different levels of aspiration, but the common thread running through all of that is the importance of this technology revolution that we're seeing.

[00:39:37]

*So your others – and are you still doing those roles, then?*

No, I've stepped down. I was the UK industrial representative on the Science and Tech Board, so I don't, now that I'm no longer working for industry I've stepped down from that particular one. But I, yeah, contribute to a number of others. And I think what I would say, without going into the details of who they are and what we do, I would say that, you know, they are opportunities to see science, technology and challenges from within a different sector to the one that you're most familiar with. And I think, as I've sort of indicated to you, science and engineering is a massively collaborative sort of operation, the opportunity to learn quickly, to accelerate by sharing ideas and thoughts, is so important. And then sharing ideas and thoughts with engineers, scientists from different sectors to the one that is your home sector, that's another source of inspiration and another great way to sort of get those crossover ideas and indeed, many technologies now are what we used to call in sort of defence and civil sector as dual use, but actually are pervasive across many, many industrial sectors. And I think that's probably an interesting thing for people coming into the space, or people considering science and technology A levels and degrees, is that sort of prospect of being able to translate your skills across multiple different sectors and corporations, because the skills are so transferrable.

*Yeah. And we all have to be committed to lifelong learning now anyway as well, don't we?*

Exactly.

*So people need to understand that the job they do now may not exist in ten years' time or, yeah. So what would you identify as the greatest changes to society because of your work? I know that's quite a big question, but...*

That's a difficult question because having spent most of my working life in a large organisation, it's a huge team effort. So there isn't, it's very difficult to point at something and say, that was my personal contribution that's made a massive difference to society, that's not going to be able to do that for you. I suppose the



changes that I've seen, so again, with the advent of compute and data, I think the ability to share quickly across large networks is this kind of accelerating effect that we're now seeing in certain branches of science. And, you know, some of the recent developments that we've seen, if I sort of think about AI, we sort of spoke earlier on about me doing a review of the state of the art in AI when I first started working with British Aerospace, and you know, who could have predicted that a couple of decades later, you've got AI that solved the protein folding problem. And it feels as though we're at a pivotal point in which if we can apply some of the technologies that a number of us have been maturing over the last number of decades, we could really transform certain industries and certain sectors. You could envisage, you know, a health service that's incredibly proactive because of its ability to predict from datasets, etc, and I think I can sort of sense potentially large societal changes coming because of the advent of some of the technologies that we're seeing today. So, but that's a very roundabout answer and that doesn't answer your question specifically, but I suppose that is something I would reflect on, the changes that are coming, really.

*So in the context of AI, for example, which side are you on? Should we pause and, you know, try and work out how we're going to regulate the development of AI, or should we just keep going hell for leather and try to make sure we get there, don't get left behind.*

Yeah. So I definitely do not advocate pausing. I don't think we should stop because I have no idea how you would make that work across the world, how you would enforce that, that seems an impossible thing to achieve. I actually think we do need to regulate and we need the brightest minds and the most careful and clever, thoughtful people from a number of different walks of life and sectors to try and understand what would be an appropriate regulatory framework and indeed, you'll see that, you know, the UK has... is busy in that space, so is the US, so is the EU, so is China. So, you know, this is something that is being carefully thought through globally and I think we do need some form of, definitely, some form of regulation, but it's going to be dependent on what is the, what's the application, what's the risk, what's the risk to society from different elements of it. So... and that's going to vary. But it is something that has galvanised a lot of opinion recently, and so if we can establish some international standard, that would be really helpful.

[00:45:31]

*Well, the EU of course is attempting to do that. I mean is this another area where the UK may be losing influence, do you think, or do you feel that we are still being regarded as trailblazers in this area?*

I think the UK, regardless of what's happened or, you know, post-Brexit, etc, we have an incredibly strong academic reputation, I think four of the top ten global universities. We also have a very strong reputation in IT, in AI, sorry. And indeed, the number of start-ups in the AI space is a huge number and we are seen as having a very vibrant community in AI and, as I say, very strong academic record. And also we are seen as having a very strong regulatory record. And so I think on this particular topic, on this particular challenge, we're sort of seen as being a very competent voice, I would suggest.

*So you think there is a genuine prospect that we will work out how to regulate this industry in the short term?*

I mean I think that will happen, I think that's necessary. I think it's also worth just sort of pausing and thinking about, you know, AI is an incredibly broad umbrella term for a whole host of things. Things that are absolutely benign that we utilise all the time, you know, in our daily lives, whether it be an app on our mobile phones, whether it be something that pops up and says, well, you've just bought this, do you fancy buying this, right the way through to complex models that predict weather patterns, right the way through to some of the stuff that you've seen on ChatGPT and things like that, and large language models that have hit the press recently. So, when you think about regulation you have to think about that whole scope and what it is you're trying to achieve. AI's already pervasive, we use software in almost everything, so there is an element of software decision making that happens in most devices that we're blissfully unaware of. So I think it's- and often when we are, AI has provided some really good capability for us and it's important not to stifle innovation. So we need the right balance of regulation that is going to protect us from those things that we think could be harmful, but actually not stifle innovation and the

rich vein of sort of discovery that we've got going on at the moment and the need for us to utilise AI to solve some of the genuine challenges that we have ahead.

*So, what would you say is your proudest achievement, looking back over your many achievements during your life?*

Definitely having my children.

*Yeah.*

If that's an achievement, but I mean that's... [laughs] that's, yeah. If you're just talking about career...

*Professionally, yeah.*

[00:49:15]

Yeah, yeah. So professionally, I think, what am I most proud of? I think professionally, the thing that I have – let's do this two ways – the thing that I have most enjoyed in my profession is the opportunity to work with lots of really different people, clever people, all committed to what they do on a vast range of different problems and challenges. That's been fascinating, really enjoyable. No two days have been the same. And the sort of, it's the sort of, yeah, the energy that you get from something like that has been really wonderful. So that's been really enjoyable, the people that I've worked with. I think the thing that I'm pleased that I have achieved, although I am not done yet, when I look at my career, is that I am glad that I have been able to sample both the large-scale corporate, also get an understanding of academia, and also have some understanding of the broader ecosystem through some of my engagements with small/medium-sized enterprises that I've been lucky enough to have over the years. I think the other perspective that I've enjoyed also is being able to see technology at the kind of laboratory stage and then all of those things that need to line up to get it into service. So to go from technology to something that you can trade in a competitive global market requires all sorts of things to line up. So having a perspective on that, having been able to create a perspective on that through

my learning as I've gone, I'm pleased that I've been able to do that. And then finally I would say I'm pleased that I've been able to sample work in a sort of a global context, so working in the UK but also working in Australia, I think the inspiration and insights you get from working in a different culture, a different place, they're fantastic, that's been really good. And then most recently, working in government, again, a different context, a different setting, trying to solve a number of the same challenges but with a different set of levers, if you like. I suppose that's a really long way of saying the variation, within that science and technology lane, there is a lot of variation in it, and I've enjoyed that, that richness of challenge, of environments, of locations in which to sort of work.

*And that sounds like you would definitely recommend young people to go into engineering. I mean what would your advice be if they're sort of sitting on the fence here thinking, you know, shall I, shan't I, maybe banking would be better, I'd get a lot richer, you know, or maybe I should, you know, go for something completely different.*

Yeah. So I personally feel that if you want to make a difference, if you want to see the world, if you want to work with lots of different people, if you want to address some challenges that are going to make a difference to society, then science, technology and engineering is a great career path for you. There may be other career paths that also offer those challenges, but if you're thinking about science and technology and engineering, it provides you with a landscape in which you can plot your own path, and that can be a global pathway, it can be through multiple different sectors. There are huge opportunities. There is a shortage of scientists, technologists and engineers at the moment, so if you are thinking of going into that space, you won't be without demand.

*And in terms of advice, what would you say?*

What, do you mean in terms of career advice or...

*Yes. I mean I know that's a big, big term, but anything that springs to mind?*

I suppose the most useful piece of advice would probably be to be open-minded, to always be open-minded to different ways of doing things, to different approaches and to different sort of innovative solutions, I suppose. That's something that I've enjoyed. Actually not having a fixed idea of absolutely what I wanted to do and when has probably allowed me to be a bit more, I don't know, a bit more agile maybe, or...

*Yeah. And in terms of your, of solving problems, I mean that's the, you know, it's very often the disruptors or the, you know, they say innovation, well, you've talked about being part of a large corporation and innovating, but there's another view which says that real innovation has to come from outside. Do you agree with that, or you don't agree with that, probably, I guess?*

[00:54:29]

I think, no, I think innovation is, how do you define innovation? It's either using things, but to do something in a different way, or using something brand new to do something that you currently do, but you've done it in a different way. So it's that element of something different, which might be new technology, it might be old technology, but applied in a different way. And innovation can come from anywhere. Ideas and thoughts about how to do things slightly differently, nobody has the monopoly on that.

*But a lot of corporations, I mean Kodak, for example, have made that mistake of not being agile, of not being innovative.*

Absolutely, yeah. Well, it's always easy to feel that you have a good product set, and if you take your eyes off the sort of broader, you know, ecosystem that is developing, technology and, yeah, then you do that at your peril. Nothing is fixed, is it?

*Absolutely not, no. So I guess, is there anything that you would do differently if you were to have your time again?*

[laughs] D'you know, I don't know. I mean, what would I do differently? I'm not sure, maybe you'll have to ask me in ten years' time when I've finished.

*I'm sure you won't be finished in ten years' time.*

[laughs]

*I'm sure you'll be going on for a very long time after that.*

Well, it would be hard not to, given that it's actually such good fun.

*And that's tremendously important, isn't it, to try and enjoy it.*

Definitely, definitely.

*So, is there anything else that we haven't talked about, Julia, that you'd like to mention?*

Maybe the only other thing that I would possibly touch on that we might not have touched on, is that as well as the sort of corporation side of things, as well as obviously we've touched very briefly on the government side of things, there's also a large body of capability, both within academia, and I would say within the different institutions and the public research facilities and, you know, the Royal Academy of Engineering, for example, you know, the British Academy, the Royal Society. And so these are, you know, learned societies, and the sort of professional organisations like the Royal Aeronautical Society, Institute of Electronics and Technologists, these are other large bodies of scientists, technologists that are supporting science, technology and engineering. So again, just a message to younger people, if they're sort of baffled at where to go, you can always reach out to these other institutions as well, are only too happy to help, and actually are desperately seeking sort of the voice of younger people, or those people that we don't hear from enough within science, technology and engineering. So just a shout out to those groups as well that do brilliant, brilliant work.

*Well, that's great. Thank you, Julia, it's been a pleasure speaking to you and I look forward to doing so again in another ten years' time when you've got a whole list more proud achievements. But for the time being, thank you very much.*

Oh, thank you, Jane, it's been lovely to speak to you.

[end of recording]