



# Dr Hayaatun Sillem CBE

Interviewed by

**Jane Bird**

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Via Zoom

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*Welcome to the Archives of Information Technology where we capture the past and inspire the future. It's Tuesday, 30<sup>th</sup> November 2021 and we're talking on Zoom, as has become customary during the coronavirus pandemic. I'm Jane Bird and I've reported on the IT industry for newspapers such as The Sunday Times and the Financial Times since the early 1980s. Our contributor today is Dr Hayaatun Sillem, Chief Executive of the Royal Academy of Engineering, where she leads a team of some 140 staff and oversees a budget of more than £50 million. In 2019 the Financial Times named her the fourth most influential woman in UK engineering and this year Computer Weekly ranked her the seventh most influential woman in tech. Dr Sillem is a leading voice on diversity and inclusion in and beyond engineering. She co-chaired the Hamilton Commission on improving representation of black people in UK motorsport with Sir Lewis Hamilton. She is frequently a speaker at industry events and regularly appears in the media. In 2020 she was awarded a CBE and this year received honorary doctorates from Imperial College London and UCL, and an honorary fellowship from Queen's College, Oxford. Dr Sillem, welcome. I'm very much looking forward to hearing more about your life and professional experiences and your ambitions as Chief Executive of the UK's National Academy for Engineering and Technology.*

Thanks so much, Jane, I'm really happy to be here today with you.

*Lovely. So perhaps we could start with when you were born and – in London – and growing up and so on. What was all that like and when did it happen?*

Yes, so I'm actually still living in Shepherds Bush where I was born, and it's changed quite a bit since then. I come from a family from a very mixed ethnic background, so my father is from South Africa, but his ancestors were probably from Indonesia. And my mother is half-Indian, half-English. My father was a special needs teacher. My mother, rather unusually, started out as a ballerina but ended her career as diversity consultant at the Home Office. It was a very positive experience for me growing up in London, this is a wonderful place to be if you come from a mixed ethnic background. And I think I grew up in a family where there was a very strong sense of values and the importance of who we had to be as people. There was also a very strong emphasis on education because my father was the youngest of nine children in

Cape Town and he was the first in his family to get a secondary education. And thanks to one of his sisters he actually was able to go on to study at college, train as a teacher, so in my home education was prized very highly, I never took that for granted. And I think, yes, coming back to the values led aspect of my upbringing, my parents really encouraged me to self-reflect, to be somebody who thought about my interaction with the world, my interaction with other people, and from quite a young age to take responsibility for my actions and for what I could do to improve a situation. It was really a kind of, I guess you might call this, there's a growth mindset or a self-coaching mindset and that's been incredibly valuable to me throughout my life.

[0:03:36]

*And did you have siblings or were you an only child?*

Yes, I had an older brother, absolutely, who was extremely clever and went on to have a career in finance.

*And you obviously went to school, you went to school locally, did you? Did you go to school in the private sector from an early age or were you state educated at first?*

Yes, I started off at a state primary school, where funnily enough, my children now go. So it was a sort of local community-based primary school, very, very diverse intake. But then my parents were keen for me to go to a private secondary school. It's back to this valuing education as an agent for change in people's lives. So I went to Godolphin and Latymer, a school in Hammersmith, and that was quite, I think quite a stretch for me financially – well – for my parents financially to be able to send me and my brother to private schools, even if we had scholarships or bursaries. But there is no doubt that that struggle did lead me to have an excellent quality of education and I think that that combined with being able to go on to Oxford, going on to a PhD has undoubtedly helped to give me both confidence for myself, you know, my internal self-perception, I've seen I can thrive in groups that maybe don't reflect what my home life and the people I mixed with at home were like. But also I think there's something about those quality indicators being taken, rightly or wrongly, by other people as a reason to believe in your abilities. And as someone who's always gone

through my life and my career feeling that I look different, that I feel different from many of the people around me in my career, I think that's been a very helpful point of assurance that I do deserve to be where I am, it signals that I should be taken seriously, it's ultimately been very important to my social mobility. But as I said, I'm not saying that I necessarily believe that should be the case, but in my case it really did have, it has had a positive impact for me, undoubtedly.

*The fact that you went to leading-edge academic institutions, you mean?*

Yes. Yes. And it's partly about the quality of the teaching and it's partly about the qualifications I was able to secure, but I think it is also about learning to mix in peer groups which you otherwise wouldn't have encountered. So you almost find a way to show to people that you fit in with a group that you might not intrinsically feel comfortable with. And as I said, I'm not necessarily saying the world should be about adapting to fit in in that way, but for me personally it helped me navigate my career and helped me feel more assured than I would otherwise have felt in encountering new and otherwise intimidating environments.

[0:06:38]

*And what about mentors? I mean at school did you have particular inspirational teachers or people that, you know, really had quite an effect on your life at that time?*

Gosh. I think at school there are lots of, there were lots of teachers who were very good at their subjects. I don't, there isn't one that might stand out and say they made all the difference to me. I think at that stage of my life probably my parents were still more influential because of those values that I talked about and because of the fact that they understood me. I think, if I look at later on in my career, there have been loads of extraordinary people I've had the opportunity to mix with and I think you can learn from almost everybody, I've had all sorts of, you know, managers and directors who had very different styles, but if you have an open mind and you want to learn and you're thinking about self-improvement, you can always, always gain insights from seeing how other people operate and I've found amazing generosity amongst successful people all over the place. I've pretty much universally found that if you ask for advice or feedback it's willingly given. But ultimately I think probably the

most influential group of mentors, apart from my parents, would be my peer mentors. So I'm a big fan of finding other people on their journey, people who you have a shared experience and empathy with who you can connect with and build a kind of, almost like a circle of trust with so that you can talk about what you're experiencing so you can advise each other. I think sometimes we're too busy looking for role models sitting on pedestals instead of realising that they might be sitting in the seat next to you if you're lucky. So that group of peer mentors and peer coaches has probably been the most influential of all.

*Okay. So I notice that you didn't just do science, you did chemistry and biology, I think, for A level, but you also did Russian, so you were obviously quite broad ranging at that stage, and you had done an English AS level, I think? So clearly you hadn't focussed in just on science at an early stage, or had you?*

No, not at all. I found it incredibly difficult to clarify what I was going to do for a career because I think I was one of those people I guess you would call an all-rounder in the sense that there was no one, no one aspect of my academic life which was so far ahead of the others, I was just quite balanced in terms of my skillset, and interests too. And I think it is a real weakness of our education system that you're forced to choose, so that if you want to have a career in science or engineering or medicine you effectively have to commit to that and sacrifice other subjects that might be really, really enriching. I don't think it's healthy that it's so easy to drop science subjects and I don't think it's so healthy that it's so easy to drop arts and humanities either. So I was one of those people that tried to squeeze through with a bit of both, and it served me well, but to be honest, I had already by the time I'd chosen my A levels realised that I could go on to study biochemistry at a university without that being a real blocker to my choices. But for most STEM subjects you're really quite constrained in what you have to do at A level and I think that's a massive pity.

[0:10:03]

*Yeah. Yes, unlike in America and other parts of the world where it's much broader.*

Yes, I mean, you know, it's surely in all our interests that we encourage people to develop broad and balanced skillsets and to explore interests as well as the things that

they want to do for their careers. And we might talk a bit later on about how the world of work is changing, but I think, I think the idea that you pick a set of subjects when you're 14 and that effectively determines the, you know, the parameters at least that you have to stay within for your career is ridiculous. How many of us are well placed at the age of 14 to make those decisions? And realistically, you know, if I say conservatively I'm going to have a 50-year career, you know, you don't want to do the same thing for 50 years, you want to be able to transition between different pathways. And so, again, that's another reason why being able to retain a bit more breadth I think is a big advantage.

*Right. But you did do a Masters in, you were studying, funded by Cancer Research, I think, weren't you, for your PhD? So obviously at that stage you were thinking of biochemistry or science.*

Absolutely. So I did what they called an MBiochem and Masters in biochemistry at Oxford first of all, and then I went on to do a PhD, as you say, funded by Cancer Research, Cancer Research UK or Imperial Cancer Research Fund – it changed its name halfway through. And at that stage I was fully committed to a lifetime of working in a lab as a cancer researcher, but unfortunately that turned out not to be a viable career option because in the final year of my PhD I developed very severe chemical sensitivities that meant that one day I had to walk out of the lab and I was never allowed back in. So I was able to complete my PhD no problem, but of course it left me with this rather more discombobulating decision to make, which was what on earth do you do if you're not going to go and continue in cancer research. And as a result of that I stumbled into the world of science and engineering policy not really knowing anything about it. I didn't know, I didn't have- I think I'd say I had almost no visibility of careers beyond a lab-based research career, which is not a good thing in itself, I would suggest. So I literally fell into the world of engineering policy by happenstance and then of course, you know, the next chapter of my career began, which has also been in its own way very enriching and very positive, but it certainly wasn't what I was planning when I started out in biochemistry.

[0:12:36]

*Yeah. Okay, so, well it would be good to talk a bit about that change and your role in engineering, but perhaps it would be also a good moment to look at IT because this is an archive for people who are interested in IT. So maybe just to pause and think how do you, what your exposure to computers had been by this stage in your life and sort of how it was?*

Yes, well my children find it, I would say, horrific that [laughs] when I was at school I was still resorting to the Encyclopaedia Britannica to find out the background research for my project and really it was only when I was at university that search engines became something that were accessible, email was still quite new. When I wrote my essays lots of them were still handwritten at university, I spent hours of my life that I will never get back queueing in libraries to photocopy journals and periodicals. I mean it makes me sound like a museum piece. [laughs] But it was literally at that point that computing was becoming a much more visible part of our daily lives. And so by the time I was doing my PhD, computers were already very, very core to the research endeavour. So it was in that sort of quite short window between going to university and finishing my PhD that I think it became a much more mainstream part of life, so we would have much more routinely used the online platforms to access periodicals, scientific papers and so forth when I was doing my PhD. We used fairly basic software but still important software for imaging and managing the images that were core to how we analysed our research results and presented them to the world. And I think processing power had already improved significantly by then, which made things like image management a lot more comfortable. So yes, that, there was quite a rapid development, as I said, between my starting out in biochemistry and finishing in biochemistry.

[0:14:47]

*Okay, so then you joined at an early stage the Royal Academy of Engineering in 2002, was that really your first job?*

Yes. I must say, I would never particularly recommend my career path to anybody, it somehow worked out very well for me, but it's a slightly odd sequence of events. So because I didn't have any understanding of what do you do if you had a technical

background but couldn't stay in research, I think I applied for three jobs: one in science publishing; one in science communication; and one in science policy, or engineering policy as it happened, because those were the three things that I had managed to work out as being accessible to me. And I just happened to get the engineering one first, so I ended up working in the Royal Academy of Engineering as an engineering policy adviser, still slightly scratching my head as to what engineering was and policy was. So it was a great learning opportunity and whenever you make a sideways move in your career it always takes a little time to orientate yourself in your new, in your new career context. So I think that there's a very important process of mapping your landscape that happens when you transition into a new sector or a new domain. And so that first short spell at the Academy gave the opportunity to do that. It was, I would say, quite a sleepy organisation at the time, a big culture shock for research, and I didn't feel like it was somewhere which I wanted to spend an extended amount of time in, so as soon as I could really, I went off and managed to get the job that I had seen that looked most exciting from my vantage point, which was working as a committee specialist at the House of Commons, working for their Science and Technology Select Committee. And I left the Academy never ever thinking I would go back, which was a good life lesson for me – don't burn your bridges. And I had a really interesting and stimulating experience in the House of Commons. I think it was a wonderful part of my education as a citizen and I'll always feel privileged to have worked in parliament, so I think it's very, very easy to be an armchair critic. There's lots that you can sit there and complain about and sort of roll your eyes at, particularly if you do have expertise in IT, technology, science. But by working in parliament it helped me understand much more deeply what the motivations and pressures were that influence the day-to-day behaviour and experience of MPs. And ultimately I think it's not healthy for democracy if our technical community isn't willing to get more involved with our political community because those with technical skills and knowledge are absolutely crucial for supporting better decision making and I think, you know, we can help articulate and explain the choices and trade-offs that are being made when ostensibly political decisions are being made, policy decisions are being made. And we can all say in the context of engineering technology, help give really valuable advice about how do you convert a policy objective into reality, that policy implementation part of it which is a really challenging part of how policy gets delivered. And if we as technical people aren't willing to insert ourselves into the



debate, you know, kind of go into the fray, I don't think we should complain if the decisions that are taken then don't make sense to us. So I enjoyed the first part of my career in the lab, I had that joy of the intellectual stretch, I enjoyed being able to be curiosity driven and feel I was making some, you know, difference through working on cancer research, but I was really surprised and excited at being able to take those skills that I'd gained, the research, the analytical thinking, also the self-sufficiency, you know, the independence that you get when you do a PhD into that next chapter working in the world of policy.

[0:18:41]

*Yeah. And that was two thousand and sort of four to six, kind of timescale, is that right? So you had been at the Royal Academy of Engineering up until 2004, a couple of years, had you? Did you do international development or something, I saw while you were there?*

So that was the next career chapter, Jane. So my original time in 2002 to 2004, it was about 18 months, I was effectively learning the ropes of policy. So I, we did some interesting projects, I did one on the challenges of complex software projects, so that was one of the first policy reports and studies that I, I suppose helped initiate and then shepherd through to completion, which of course is a subject that never leaves our lives, and some of the basic principles of that are around managing complexity, around never forgetting that these are business change projects, so you can obsess about technical specifications, but if you don't understand the business change that you're trying to deliver, don't engage with the human dimension of how that change is going to happen and be accommodated and absorbed into the organisation then you're unlikely to get the outcome that you originally specified. But I also, we did things like we set up a network for policy practitioners called Policy Net, which was a fun experience for me, building a community, I guess, of policy practitioners at that stage, there was lots for the very senior people, lots of, you know, dinners and events, but very little for those people that did all, I would say, the donkey work. And at that time science and technology policy was a really niche area, there were very few of us working in it, it wasn't a kind of a visible career path in its own right. Now it's a hugely important tranche of careers and much more widely known about. So those early months and years in the Academy helped me get that grounding and I was able

to take those core skills into my role in parliament. Then I did some subsequent work with parliament providing advice as a, what they call a specialist adviser, so these are people that come in to provide a bit more of an expert perspective to support the staff and as the staff support the MPs in their enquiries.

[0:20:56]

*Okay, so then, after what was- so the next phase, was that in international activities then that you became involved after that?*

So while I was at parliament there was a general election and I would have been able to have a relatively quiet period in my day job, as it were, and I'm not the sort of person that would see a quiet period and go, oh well that's good. I thought, oh, surely we can fit something else in here. And very fortunately I was allowed to set up as a *convent* [? 0:21:27] with the Department for International Development, so another of the enquiries – well – one of the main enquiries I worked on when I was in Parliament, we did an amazing amount of, there was an amazing amount of variety in terms of the topics we covered, from the use of science in, use of forensic science in the law through to how different STEM subjects are funded at universities, through to human embryology technology, you know, it was incredibly diverse, it was a great kind of intellectual exercise in retaining agility. But one of the main enquiries I worked on in parliament was the use of science and technology in UK international development policy. And as a result of that enquiry the first Chief Scientific Adviser post was created in DFID, the Department for International Development, as it was then. So I went to work for the first Chief Scientific Adviser at DFID, because I thought it would be great experience to see what's the world like when you go to the other side of the fence. So in parliament you're critiquing, you're fulfilling a role of holding people to account and that's really fascinating, but I also, I'm quite big on empathy, I want to understand how it feels to be on the other side of, on the receiving end, if you like, of that kind of critique and advice. And so by working in the government department that was having to implement the recommendations in the report it gave me a really valuable opportunity to see the world from that complementary perspective. So I went to work for a fantastic person called Professor Sir Gordon Conway. He was an expert in ecology and we supported, myself and a small team, supported Gordon in developing the sort of the embryonic science and

innovation strategy for DFID, which of course includes technology and IT and it was both about how DFID used and consumed evidence in support of its own policies, but also how it supported capacity building in developing countries in areas that related to technical skills, scientific skills. It's a really, really interesting area. And as a result of that experience I developed an aspiration to work in international aspects of science and engineering policy. So I didn't want to stay at DFID, I had learnt by then that it wasn't an organisation that I would thrive in, I prefer smaller organisations where you feel you can have more personal impact, perhaps more autonomy. And as it happened and to my great surprise, I found myself attracted to a job back at the Royal Academy of Engineering. So they were wanting someone to come and set up their international activities and they particularly wanted somebody who had experience of international development because they wanted to establish capacity building partnerships with the engineering community in sub-Saharan Africa. And so that was then the next chapter of my career.

[0:24:28]

*Okay, so looking overseas then, or internationally, how – let's talk about London a little bit – because did you feel that the UK tech scene and engineering and technology was very far ahead, was it the question of kind of going out there and teaching the rest of the world how to do it, or how did you see, what was your approach to it?*

Yeah, it's a very, it was a very interesting time. So this was around 2005/2006 and what I guess you saw is that whilst it was undoubtedly true that the technological sophistication and maturity in the UK was extremely advanced, and therefore we had a huge amount of expertise that could really be usefully deployed in support of the objectives and the priorities in developing countries, you also saw that because of the age of our technological infrastructure in the UK, because we were early adopters, because we were early drivers of these technologies, you actually ended up with a strategic opportunity in countries where they didn't have existing infrastructure. So, you know, the most widely cited example of that is mobile telephony, whereby the combination of the, you know, the requirements in developing countries, you know, necessity being the mother of invention, and the fact that there wasn't an existing, an incumbent infrastructure that you had to either upgrade or displace meant that you

could really innovate in quite a radical way. And in, you know, it later, sort of they developed a bit of traction around concepts that were variously called frugal innovation, reverse innovation. I mean innovation's just innovation. And I think most people now see that different contexts provide different opportunities to innovate in different ways and there are market opportunities where, for example, you have huge numbers of people that don't currently have access to a particular type of service that mean that, you know, there's a genuine business opportunity as well. So I think we were still maturing our understanding of how that dynamic would work, but it was already clear then that it was a gross over-simplification to imagine that capacity building would be kind of, you know, a uni-directional activity. There's always got to be mutuality in capacity building.

[0:26:56]

*Yeah. Great. Okay, so you stayed in international development for quite a while then, did you? Then you moved back in 2011, is that right, to Programmes and Fellowship?*

So eventually I essentially progressed into a director role at the Academy. So that was fantastic and I will give all credit to the Academy for promoting me to be a director when I was six months' pregnant, so I did a very short stint before I went off on maternity leave, and I think it's always good when organisations are willing to do something like that and that was somewhat of a break from tradition at the Academy that they did that and I benefited tremendously and hope I'll be able to give back as well. So then I was in a senior leadership role at the Academy, covering a wide range of activities, so all of the programmes, including research and innovation activities. We helped to create the first enterprise hub at the Academy, so I worked with a fantastic engineering entrepreneur called Ian Shott, to set up our first, if you like, accelerator at the Academy that enabled us to support both early stage entrepreneurs and also more established SMEs on their sort of both start-up and scale-up journey. And that was a very exciting time for us at the Academy. And I also oversaw the fellowship process, so the way that we elect Fellows to the Academy and then engage with them. And it just gave me that experience of senior leadership, which of course is necessary, the kind of managing budgets and people and contributing to the overall

organisational leadership that, you know, is a necessary step along the career progression pathway.

*Well, I guess you didn't take very much maternity leave, by the sound of it?*

I took nearly six months and I did the same for my second child and came back part-time originally in both cases. So it's a bit subjective as to whether that's a lot or not, but for me it was great, I thoroughly, thoroughly enjoyed my maternity leave and thoroughly, thoroughly enjoyed coming back to work. I'm one of those people that doesn't claim to feel lots of guilt about being a working mother. I think everyone in my family agrees that I would not be a better mother if I just stayed at home all the time, I'd be awful, I'd be depressed and I don't think one should have to apologise for that at all. So it's never, it's never quiet, it's not that you, I think, ever achieve a sense of perfect balance, but for me I think it's made me better at my work, having children, and it certainly makes me a better mum having a job that I'm really passionate about.

*Yeah. So it's really hats off to the Academy for being quite broad, open-minded, compare with other organisations at that time.*

Yes, at that time, that's right. I think we've all come a long way and I hope that Academy has come a long way too in terms of the flexibility that we see as being entirely compatible with your career. But in those days it was still relatively unusual and I was still quite young to be appointed as a director in the context of the organisational experience in that era.

[0:30:06]

*So you stayed in that role till 2018, is that right?*

I wasn't... yeah, more or less. I became Deputy Chief Exec a couple of years before that, but then...

*Ah yeah. I see. So that was a big step up, was that a huge extra responsibility?*

Yes. I mean I think a CEO job is always qualitatively different from any other role. It's, you know, the first CEO job anyone does I think is, it's one of those demarcation points in your career, it's one of those milestone appointments. And I was delighted of course to have the opportunity to do this. I mean the beauty of being an internal appointment is that you have a really realistic view of what's going to be involved and you can think very hard about whether you want to do it and it's the right thing for the organisation. And then ultimately of course I was really delighted that the organisation placed its faith in me. And it was a big stretch, it is a big stretch, but I always think that the frustration of doing a job that's too small for you or where you don't feel fulfilled is much, much worse than the stress of doing a job where there is the right kind of stress because it's challenging, because it's, because you're ambitious for the organisation, because you're progressing and learning. So I think, you know, stress due to lack of control is a lot harder to manage than stress due to the fact that you have control or autonomy over a big portfolio. So I remind myself of that all the time. And I was also, I was also fortunate, I suppose, that I was given the chance to do a job when I was very different from the people who'd done it before, so I was the first woman to be appointed to the job, I was the first person who comes from a minority ethnic group, and actually for sort of living memory at least, my predecessors all came from the armed forces, they were ex-services personnel. So it was a real break with tradition to have an internal appointment who just looked so different from anyone who'd gone before and I've tried to make the most of that, I guess, to help to challenge perceptions in a world where unfortunately people do still have quite a narrow mental picture of who engineers and technology professionals are and what they do. And so that's a very important part of our work at the Academy.

[0:32:38]

*Indeed. So just to sort of bring us up to date with that role then, so you now are Chief Executive, when did you become Chief Executive?*

At the very start of 2018.

*Right. And so perhaps you could highlight sort of your proudest achievements since becoming CEO and what your sort of objectives are for the future, what your hopes and aspirations are?*

Yes, so I suppose there's a more externally facing one and an internal one to that, so I think we just talked about the diversity and inclusion challenge that engineering and tech faces, and it's relatively unusual that you can effect change just by being you. In some sense that's what I've been given the chance to do and, as I said, I'm trying to make the most of it. So we still have an engineering profession that is only comprised of about fourteen and a half per cent women and it's, you know, 2021, and that's a UK statistic. And, you know, that's an unacceptable place to be, so...

*One four? Fourteen point five per cent, did you say?*

Yes. And unfortunately, when you look at all the other associated stats, whether that's, for example, the number of women taking up careers – sorry – taking up subjects that lead to careers in engineering and tech, again, you know, we can see that if you take engineering specifically it will take us till 2085 to reach gender parity amongst those who are entering higher education in engineering. If you look at diversity statistics related to race and ethnicity you see that we are, have, if you like, an over-representation compared to the population at large, amongst those who are choosing engineering higher education, but then a real differential in their transition into engineering roles, which is really troubling. So you're seeing a huge drop-off between the people who study engineering and come from black and minority ethnic groups and those who end up in the workforce. And I could go on and on, but the point is, we have a massive, massive diversity deficit in engineering and this really matters because engineering and technology are everywhere in our lives. The people who develop, deliver, maintain, upgrade our physical, digital infrastructure, the products and services we all rely on every day are currently way too unrepresentative in the society they serve and that is not good for us as a profession. We know that diversity and inclusion, diverse teams and inclusive leadership have all sorts of business benefits from improvements in health and safety to creativity and innovation, to talent retention, motivation, you know, productivity, you can go on and on and on. So it's not good for our engineering technology community if we are not able to attract and utilise the best talent to deliver the best outcomes, but equally it's not good for society that we don't have people with true diversity of thought, diversity of backgrounds who are contributing to the designing of the infrastructure that underpins

our world. So it's an incredibly important task for us to tackle and I do believe that through my appointment and the work that the Academy has done – and it is of course a massive team effort – we are making progress on that. And I would just say alongside that, that there is, there is an internal part of this, I suppose, and my proudest achievement is that I've stuck with it. So most of my career I've felt headwinds, I've felt that sense of differentness, maybe isolation, I've had to do battle with that internal voice of doubt that so many of us have and I've never let go, I've always tried to go back to that mindset instilled in me as a child around taking responsibility, thinking what are the levers in my control that will help me solve or surmount or circumvent the problems I'm facing. And I've definitely gone through the times where I've thought, oh God, it's just too hard, I can't do this, and then I pick myself up and I've dusted myself down and I've thought, I'm not happy with giving up for that reason. It's good to have people who don't need, who don't crave power, who don't see themselves as invincible, who don't see themselves and they're people who are currently in leadership roles pushing on, because unless we all stick with it, things won't change, they won't change fast enough. And alongside that I'm also proud of the fact that I've progressed in my career whilst also maintaining my commitment to my family. So I made a promise to myself years ago that I wouldn't let my family just have the leftovers, you know, I didn't want their experience of me to be tarnished by the fact that I'm working hard and, you know, quite demanding jobs that I'm passionate about and I think I've kept that promise so far, so those are the things I would point to, Jane.

*You've got through the hardest bit, I'd say, I guess your children are kind of quite grown-up teenagers, by the sound of it, so...*

Well, they're ten and 12 so...

*Oh, not quite then.*

... we've got a few hurdles to come!

*Oh, you have, I'm afraid. You're probably just entering the difficult bit.*



Thanks for that. [laughs]

*I'm sure you'll triumph. Right, okay. So that's great, so are there any – just going back to sort of you mentioned mentors and you've named a couple of them already - are there any other people that you would sort of call out who've had a big influence on your career?*

[0:38:10]

I always find it difficult because I feel that by calling certain people out I'm also risking excluding people, so as I say, I think I've learnt from all the people I've had the chance to work with. I mean, so I mentioned Gordon Conway earlier and he was someone who I think was a really inclusive leader and I also learnt something very concrete from him which was the power of storytelling. So he was brilliant in using the power of storytelling to bring to life scientific and technical concepts. And I think that we probably still underrate this in the technical communities that we spend time in. So it's a very human instinct, isn't it, to relate to the story as individuals and I think there's a huge opportunity for us to keep humanising technology and engineering. These are very high social impact careers, but yet, when you ask people what they think about, they think about the sort of the technical and the mechanical aspects of it, rather than these as being entirely human-centric, life changing, problem solving career paths. So I think that was a concrete thing I learnt from him. Sir John Parker was a very influential President of the Academy, a great kind of captain of industry and, you know, I just saw him operate in a way where, you know, when he greeted our receptionist he gave them that same feeling of having his full attention for the moment that he greeted them as anybody else around him, and you know, just that sense of integrity and consistency in the way you conduct yourself as a leader was very powerful. But as I said, you know, the people who probably have, in a really practical sense, shaped my experience of the working world, I would call out my friend Elspeth Finch, she's a fantastic engineering entrepreneur...

*Sorry...?*

Elspeth Finch. She's a fantastic engineering entrepreneur and we do peer coaching sessions, so we meet up regularly and we work through some of the challenges that

we're experiencing. And when you can find somebody who understands your world, is not a competitor in it, but understands the shape of your professional landscape and can give you the right kind of challenge, you know. Sometimes I think we use our friends and family to just make ourselves feel better and to tell us how hard done by we are and to be endlessly sympathetic. I don't really think that's what most of us need, you need to have that moment and then you need to be thinking okay, so back to that what's in my power to do that's going to improve my situation. And so Elspeth is the kind of person who is really challenging, but in a totally supportive way, I never doubt that she has my best interests at heart. And it's really great to have someone where there's, you know, mutuality, you can do that for each other. So there are a few names for you Jane, I'm not going to give you more, but there are many others who have been wonderfully inspiring in their own way.

[0:41:00]

*Yes, yes. Okay, so what about change – political, economic, social, technology – all these areas have changed enormously since you sort of have launched yourself on the world of technology. What would you perhaps highlight, the greatest changes that have been affected by your work or that your work's been involved in?*

Yes, well gosh, that's a huge question, [laughs] because working at the Royal Academy of Engineering of course we are technology agnostic and so we roam all over the place and enjoy the freedom to do so. Well, if I go back to areas where maybe there's an intersection point with my own, I guess, personal career experience and interest, I would pick out the world of engineering biology. So when I was, back in the day I was working in the lab in cancer research, I had absolutely no idea that if we made a fantastic breakthrough in the lab there would be this army of people, not least engineers, who would have to work to convert that potential benefit that we had created into an actual benefit that people experienced, because you have to, you know, to make sure that you can produce, whether it's a medical device or diagnostic test or whatever it is, or a drug, that can be manufactured consistently at scale, that can be delivered safely, cost effectively, with an appropriate business model to people where they need it, and so forth. And, you know, I think this kind of, there's been a historical over-emphasis on the wonderful great minds that produce breakthroughs and an under-emphasis on the teams of people who then actually deliver the benefit

who, if you like, do the innovation that builds out from that research which ultimately produces an improvement in people's lives. And so what I've been super-excited by is engineering biology as a emerging set of disciplines, I would say, where you draw upon the power of IT, but also the engineering system view, the engineering tools, the scalability, modularity to help us do incredibly novel things within biology. So bringing those engineering tools, techniques and mindsets into biology and medicine which is positively disrupting both how we do biomedical research and how we develop biologically based molecules, parts, materials, processes at scale, and that in turn gives us loads of potential to produce new materials, to find new ways of manufacturing, new treatments for disease, new approaches to bioenergy, all sorts of different approaches. So it's a platform technology, or set of platform technologies. And, you know, if you just look at the past year, I think the work that Google DeepMind did on AlphaFold, super-exciting in that...

*Alpha... sorry, on AlphaFold, did you say?*

AlphaFold, yeah. So this is, this is deploying AI to predict the structures of protein based on their sequence, which is one of the grand challenges in biology, so it's incredibly difficult to establish the structures of proteins, the three-dimensional structures of proteins. And that is vital because proteins are kind of the workhorses of the cell, so if you want to be able to do all sorts of things in medicine, you need to understand proteins, it's a very, very fundamental part of our toolkit. And it's not that AlphaFold can do everything perfectly yet, but it's an example of how applying technology to the domain of biology and medicine is going to radically disrupt both how we do the research and what we can deliver from the research that we do.

*In what way? Make it much faster, more accurate? What's the change going to be?*

Well, faster is definitely important, because, you know, some people have spent half their lifetimes establishing the structures of protein. But I think it's more than that, I mean we are changing, I would say we're almost changing the scientific method based on the tools that technology's now offering us. Not the fundamentals of scientific method, but the way that we apply it in the context of research and the ability to get much faster, to, for example, candidates for drugs or vaccines. You

know, those are areas where the impact of these new tools is so powerful that I suspect we're going to have to look back ten years hence and understand exactly what the disruption means. Because it will impact on the sort of the partnerships, it's not just about how quickly you publish a scientific paper, but, you know, what are the teams that are going to work on these problems. I think we're on the brink of moving towards a much less siloed way of doing science and technology and research. We're still, I would say, quite bound in these disciplines that have served us well historically but don't really reflect the multidisciplinary nature of all the challenges that we're facing, so if you, I think that- I don't know if you want me to move into the climate challenge, for example, or if you'd rather I'd stop.

*Yes. No, absolutely, please do, yeah.*

[0:46:33]

So, you know, tackling the climate crisis and finding a more sustainable way of living is, I think, the biggest global challenge confronting us all. And you look at that, and it's a massive systems challenge, we have to simultaneously transform a huge range of vital and interconnected systems. So it's transport and housing, it's energy and manufacturing. We have to both mature technologies that exist, develop the technologies that will then come into play later in the trajectory, so probably the majority of the technologies that will get us to net zero, we might already have in some form, but they're not mature, they are not ready to be deployed at scale. So there's that technological advancement. Alongside that, you've got the need to develop the business and economic models, the financing, you need, we need to think about how we're going to effect these sweeping societal cultural behavioural changes, we probably need new institutions. And so, you know, you look at this and you think, we cannot tackle something like this in disciplinary siloes, it just makes no sense, this is an inherently multidisciplinary challenge. And so I think that we will start to see in the future new ways of working that combine the strength of the different disciplines, and I think we'll see a new appreciation of people who move laterally in their careers. The idea of bringing your training and your perspectives from one set of disciplines into a different profession is very exciting, I mean it's happening but not enough. Tech is good, I think, compared to some industries, in welcoming people with different backgrounds. I think engineering, the rest of engineering is a bit slower, but

this kind of lateral mobility, people who are, if you like, multilingual in technical subjects and societal subjects I think will be massively important. And I also just want to say as an aside that when we think about net zero, I'm always concerned that we think holistically about the sustainability challenge, so let's think more about the circular economy. It isn't all about delivering net zero, it's also about living in a more sustainable way where we reduce and design out waste, where we also think about biodiversity, not just climate impacts, everything is interconnected, this systems mindset that engineering is so used to is so fundamental to tackling the kinds of challenges that we're now facing at a societal level. [0:48:53] And actually, if I can keep going on, there's one more feedback loop I'd like to point out, which is that there's a really strong connection between the sustainability challenge and the issues that we were talking about earlier in relation to diversity and inclusion because as lots of people have pointed out, we need to be concerned about the equity of our energy transition. It's not as cool [? 0:49:11], but a just [?] transition. And more generally, I really feel it's vital that those of us working in engineering technology take more ownership of how inclusive the outcomes of the products and services that we're designing, delivering and deploying actually are. You know, it's one thing to look and see who are the faces round the table, it's one thing to be able to point to how inclusive the culture is in our organisations, but it's another thing to say are we designing and producing products, services, infrastructure that meets the needs of all groups in society and today the answer is we aren't. So there's a huge challenge for us in making sure that we embed [incomp 49:52] of professional excellence much, much more commitment to empowering engineers and technologists to confidently approach societal challenges such as sustainability, to confidently navigate the ever more complex ethical landscape that we're facing, to be inclusive leaders and to bring that socio-technical systems approach that I've been talking about, the fact that we are producing technical systems but those technical systems all involve an interaction between real people and technology. Are we today training people and allowing people to upgrade their skills in a way that makes them really well equipped to tackle all of those societal needs? No, not yet. So it's a work in progress and I think something incredibly important for us to pick up the pace on now.

[0:50:43]

*Yeah. And it is quite counter to the way, to history really, I mean the siloed mentality, as you've said, is very embedded, isn't it? And arguably, as disciplines become more and more advanced and in depth it's more and more difficult for people- well, people just become more and more specialist as their areas become more complex. So actually achieving that breadth is a huge challenge.*

It is, but as I said at the start, I think we have an outdated mindset around careers. We shouldn't really think about 'a career', talk about career chapters, you know, I've already alluded to that sort of telling my story, but I think we should go into our careers with an expectation that we will have discrete career chapters and we can consciously and deliberately prepare ourselves so that they build on each other but aren't necessarily in a continuous smooth progression. You know, there are countries that I would say like Singapore which have become a lot more serious about accreditation and signposting for skills upgrading, that's really important for people who want to stay within the, you know, for example, you work in the automotive industry, you have to cope with the transition to electrification, but at some point you might also want to move into other growth areas like renewable energy. So unless we have really mature systems to support people to navigate those career transitions, we will be missing out on so much talent and we will not be able to meet the skills needs, we already, you know, before the Covid crisis, before EU exit the engineering profession was talking about skilled shortfalls of up to 50,000, or up to 59,000 actually, professional engineers, each year that we were lacking. And so we need to be more creative on how we're going to keep generating the skilled workforce we need, but at an individual level I think it's also fantastic to be able to not feel that, you know, you're kind of straitjacketed in terms of the choices you have. But there's still a gap at the moment between that potential and the reality and I think there's a huge, huge challenge for careers advice in schools. I mean I can see our ten and 12 year old, really the most useful thing they're being told at the moment is just that the jobs that you do probably don't exist now. But that doesn't really help inform career choices. So I would like to see tech and- the tech community grip this career, the kind of the career information deficit that exists and help people to better understand their choices at all career stages and parents and teachers as well. So in our very small way at the Academy we are trying to do that, so our This Is Engineering campaign.

There's a social media-based campaign that is challenging outdated narrow stereotypes of engineering as this highly gendered career, usually involving a man wearing a hard hat and a hi-vis jacket, which is such a gross distortion of the reality of modern engineering careers and doesn't convey this high social impact creative future facing career that those of us who are in this world know that it is and it can be. And by going to social media, by going to the channels where young people are already consuming information, by using digital marketing experts to help us shape the messaging, we're trying to contribute in our small way to this incredibly difficult set of decisions that young people have to make around careers, because at the end of the day STEM, engineering, technology degrees give you many more choices. You know, they are passports to all sorts of future careers, you don't have to know that you definitely want to be a chemical engineer to benefit from taking a chemical engineering degree. So this is just one small part of the picture, but it's an important part of our efforts to contribute to this sort of updating and upgrading of careers information that I think is sorely in need of transformation.

[0:54:41]

*Absolutely. Well yes, I mean you've anticipated to some extent one of the other questions on my list, which is really what your advice to young people would be today. So I don't know whether you want to sort of summarise that?*

I think for young people today, the advice I would give is learn what makes you tick and where you thrive. A good job has what I call lots to love and lots to do. So in other words, has things that make you feel motivated, make you feel satisfied, that make you feel I'm happy here. But also lots of things where you know you can make a difference, there's still that potential for positive impact. Every single job will have its challenges, it will have its stresses. There'll be the parts of your job that don't thrill you, so it's very important that the quotient of things that excite you is large enough to outweigh the quotient of things that won't necessarily enrich your daily life. I think, you know, when your heart's in what you do for your work, then the difficult bits always feel worthwhile and I think it's really important to think about what's the difference that you want to make in the world. That can be about, you know, what's a great thing you want to do, what's a great impact you want to have, but it can also be how do you want to make the people you work with feel. My dad's,

one of his great sayings was, 'It's results that count'. And it can sound a bit brutal, but actually, well his point was, it's all very well to talk about what you did, but it's the result of that that matters. And I think if you include within that how did you make people feel, it's quite a powerful, almost like Pole Star for the sorts of decisions that you make and how you behave every day and I think if you start thinking about that from the very beginning of your career it will stand you in good stead. So you already are better able to filter out some of the options that you'll be given. And I think every one of us is more powerful than we probably believe we are. Every single person is a leader or an influencer to someone, to your friends, to your family, to your community and our collective experience in society or an organisation is the sum total, it's a composite of how each and every one of us treats each other and behaves every day of our life. So I think it's really important for people who might feel like they're at the bottom of the career ladder or the career climbing frame or whatever you want to call it, to own that responsibility and to feel that, you know, they can use that power to be a force for good, hopefully doing something transformational in the world. But even if that's not what they end up doing or it's not what they want to do, they can still make a huge difference. And it goes without saying, Jane, that I believe that engineering's an amazing career for making that positive difference in the world.

[0:57:23]

*Yeah, absolutely. It does. So money, I mean I guess that's another of their big motivators. Financial gain, that hasn't ever been a big driver for you, I take it? Or has it made you rich, being an engineer?*

[laughs] Well, so just to get on record, of course there is a clear salary premium for people who choose engineering technology degrees, engineering is one of the, consistently one of the most highly paid professions and you can go on to use your engineering degree to enter all sorts of other highly paid professions, so I think it's worth just getting that on record. Personally, no, money has not been a great driver for me, purpose is the thing that is so important. Purpose and fit with organisation culture and values is the important thing for me. But I also think it's very easy to say that when you have enough to be comfortable, which I clearly do. So I think, I grew up in a family where we did not take money for granted, it was something I was acutely aware of being a constraint in our life and I have always, always been grateful



in my professional life that I have never had to worry in that sense. So I think, you know, it's easy to say I'm not motivated by money, I would say money is not my primary driver, but if I didn't have enough to be comfortable and to be able to give, for example, our children the start in life that they, you know, that obviously we would love them to have, I would be telling you a different story. So it's my privilege that's enabling me to say that it's not my driver.

[0:58:55]

*Yeah, absolutely. So, looking back, is there anything that you'd say you'd do differently if you had your time again?*

Yes, I'm not a big person for regrets. I tend to think you do the best that you can and you try and learn from it and that's probably what matters most. I would say that if I look back at my younger self I worried a lot. [laughs] I lived with a huge amount of anxiety. And one of the lovely things about getting older is you just stop feeling you need to bring that level of anxiety into your life every day, so if I could persuade myself to have less anxiety about everything earlier, I would do that. But maybe that's just a reflection of where you are, I think you have to look back at yourself with a degree of compassion because, you know, you bank the learning as you go and that enables you to say, oh, it's easy to relax and not worry so much. But that's probably my main regret. [laughs]

*Yeah. You have quite a lot of non-executive roles as well, don't you? Is that important to you?*

It's very important to me. I should also say that as of the start of 2021 I also took on the role of Chief Executive of the Queen Elizabeth Prize for Engineering Foundation, so that's a subsidiary charity for the Academy but it is a separate CEO role and the Queen Elizabeth Prize for Engineering is the world's leading engineering prize. It's there to recognise ground-breaking engineering that has had, ground-breaking engineering innovation that has had a real impact on humanity and that's another fantastic opportunity to recognise the impact that engineers have on all of our lives and to inspire the next generation in process. And alongside that, I do have, as you say, a busy non-executive portfolio, and for me, as someone who's spent quite a lot of

time in one organisation in terms of my own career, I feel it's a really important way of making sure that I can learn from other organisations so I don't become too narrow in my outlook. It's also a way of me giving back, so my non-exec roles at the moment have all been pro bono, so it's my volunteer effort, if you like. And I also am somebody who likes to keep on learning and growing, and so it's a way of making sure that I don't get sort of stale, I don't plateau in my day job so that I can keep on drawing on insights and, you know, the kind of the different sorts of exposure that I have. So to give a couple of examples, over the past year I chaired the government's Innovation Expert Group, which advised on the development of the government's innovation strategy, it was published last July. And I also, as you mentioned at the start, co-chaired with Sir Lewis Hamilton, his commission on improving the representation of black people in UK motorsports, specifically in STEM roles, many of whom of course are engineers. So that was a wonderful experience to be able to work with somebody who is, you know, an extraordinary person, one of the most successful racing drivers ever in history, and I really admired the way that Sir Lewis didn't just say, well, I want to make a difference and this is how I'm going to do it, but he said I know the problem that I want to solve and what I really need help with is understanding what does the evidence say about the most effective way to deliver that change. And I think that's a fantastically humble and thoughtful way to go about trying to leverage his privilege, if you like, leverage the status he has as an influencer, as a force for change. And it was a really sobering piece of work to see how deep the problems are for young people from black backgrounds who want to pursue careers in engineering and in motorsport. And, you know, reminders to us all that just because we've made it through the system it doesn't in any way imply that the system is fair, that there is equity in experience, that is equity in opportunity. So the Academy is working hard with Lewis and his foundation and with our pre-existing diversity and inclusion programme to try to make sure that we draw on those findings to break down those barriers and to improve the opportunities and experiences that people from all backgrounds have. Engineering technology are amazing careers, the evidence shows that there are high levels of job satisfaction, that there's a salary premium, that they have higher security in many cases than other careers that might be facing more impact from technological disruption. And it's only right that they are accessible to people from all backgrounds and all parts of society.

[1:03:37]

*Great. What about the Science Suffrage award, what did that involve?*

The Science Suffrage award was a lovely surprise in my pandemic year and I think the - so it's for women who are making a difference in different parts of the world of science and engineering – and the thing that really made it special for me was the fact that I was nominated by a fantastic inspirational engineer called Karen Holford. So the way it works is that one year's winner passes it on to a nominee of their choice, so it meant a huge amount to me that Karen singled me out, because I have such respect and admiration for Karen. She is now, she's recently become the Vice-Chancellor at Cranfield University, but she is one of those people who is obviously an outstanding engineer and leader, but for whom her definition of excellence always has diversity and inclusion embedded within it. So a real privilege to be singled out by Karen.

*So what do you see as kind of your major challenges over the next ten years or so or indeed for the whole world of engineering?*

Yes. Well, the Academy produced a strategy last year that took a lot of work because it was one of those step changes in strategies, it wasn't a sort of incremental, just tweak last time's plan, and we made within that our overarching goal harnessing the power of engineering to build a sustainable society and inclusive economy that works for everyone. So we didn't lack ambition. But those two, those twin pillars of sustainable society and inclusive economy I think pretty much summarise what our collective priorities are. So I've talked about the climate challenge, the sustainability challenge and I've talked a lot about inclusion, an inclusive economy is really making sure that we also contribute not just to an economy where everyone can participate and gain the benefits of, the fruits of innovation in engineering technology, but also an economy which is resilient, resilient to pandemics, resilient to the impact of rapid automation disruptive technology and global competition. So I think it's quite a simple articulation of the sorts of challenges that we face and I suppose that within that the skills challenge is a vital strand, so we have three areas of activities in the Academy: one is talent and diversity, the other is innovation and the third is policy and engagement. And again, those three strands of activity really summarise how we're trying to contribute to those twin goals of sustainable society and inclusive

economy. And because the Academy has a, as a national academy you have a leadership role within the engineering profession, because as we've discussed, engineering technology is shaping our society and our world in such a profound way, I'm in an enormously privileged position of knowing that what we do at the Academy has the potential to really impact on society in a way that I don't think that many jobs give you the chance to. So for me that's a great motivator each day.

[1:06:46]

*And looking at – I mean is this just for the UK or is there an international role, bearing in mind you have had quite an international scope in your work in the past.*

Yes. We're a national academy but we have a global outlook, engineering is a, technology are global communities, global endeavours. And we work extensively with partners internationally and we support engineers in the global community. So the way that we articulate is that sustainable society has to be inherently global objectives. There is no point trying to think about sustainability in an entirely local context. The local perspective is important, but true sustainability can only be achieved if you think about it in terms of the global impact of your actions. Inclusive economy is primarily a national focus for us, so that helps distil out where our priorities are in relation to innovation, for example, in relation to the work we do in different parts of the UK to foster more talent circulation within the engineering community, to foster entrepreneurial ecosystems, for example, to support STEM engagement to enable more people from different backgrounds to participate in STEM careers, but it doesn't mean to say we don't do some of that work internationally because there is of course a feedback loop. We need global innovation to be happening to help us to reach our climate objectives and all of our UK engineering community is intimately connected with the global engineering community as well. So sustainable society, primarily global focus, inclusive economy, primarily UK focus.

*Dr Sillem, thank you very much for your time, it's been a pleasure talking to you.*

Thank you very much Jane, I've really enjoyed our conversation.

[1:08:31 end of recording]