# Andrew Rogoyski

Interviewed by

**Richard Sharpe**

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By Zoom

*Welcome to the Archives of Information Technology. It's Friday the 30th of March 2023, and in the Archives we capture the past and inspire the future, and I'm sure you are going to find our contributor today is a great inspiration to us all. I'm Richard Sharpe, and I've been covering the IT industry, first of all computing, and then the broader IT industry, since the 1970s. And there is a saying, and I couldn't find out who actually coined this phrase, cometh the hour, cometh the man. And the papers and media are full of AI today. This week there was even, on BBC Radio 4, a Moral Maze argument, a discussion, about AI, and there's 1,000 eminent scientists, computer scientists, who have written a letter saying, 'Whoa, hold on, we want you to slow down a bit.' So, who better to have at this time to talk about his career and also his attitude towards AI but this man, Andrew Rogoyski. Andrew is the innovative and partnership director of the AI Institute of the University of Surrey in Guildford, where there is a statue of Alan Turing no less, because he spent some time in Guildford before the war. And, he went on to do numerous things, and we shall mention him again.*

[00:01:31]

*Andrew, you were born in November, was it,* [redacted]

Yes I was. Yes. [laughs] As far as my recollection goes.

*Right. You don't recall it I imagine. And what were your parents doing?*

Well my father was, well, spent his time as an antiquarian book dealer. He started off at Sotheby's, an auction house in London – well, no, it was Hodgson's, it got taken over by Sotheby's. So my earliest memory of that was being taken to Hodgson's in Chancery Lane, and being allowed to go in the book lift, because they worked down in the basement, and they had this lift for transporting around the ancient tomes that they were cataloguing and assessing. And they, they snuck me on to the lift, and, allowed me to go down a floor. This sort of, there's a, there's a definite sort of smell to old books that I've had all of my life, the sort of, the vellum and the, and the various accumulations of age that, that I certainly remember from the auction house, and, certainly remember at home, because my father then went on to become a, an independent antiquarian book dealer, so I lived with old books as part of the family for, for many many years in my childhood.

[00:02:57]
*Had he been born in Poland?*

He had been born in Poland, and came over as a, as a refugee in 1939, so, with his family who were also escaping. His father was a, a senior civil servant, and, he used to tell stories about escaping the advance of the, the German front in France, literally by hours, you know, at one point, you know, the Swastika flags were being raised over one side of the town square while my father and his father jumped in a car and escaped. And he also tells the harrowing tale of him arriving by, by ship in Liverpool on his own, having been shipped off from Portugal I think it was as a, whatever he was, eleven-, twelve-year-old boy on his own. So the idea of, of actually making that escape, and arriving in a strange new country, not speaking the language, at that age, is, is you know, something that I think is profoundly terrifying, and something that, I never properly understood, but, other than to think I, I have no idea what I would have done in those circumstances.

*Was he attached to Poland, did he go back?*

He didn't go back. He was attached to Poland, he had many Polish friends in the UK over the years. He tried to teach me Polish as a language and I failed dismally. My sister is, is a much more accomplished linguist. She did the arts and the languages; I did the sciences. And so we sort of split it up between us.

[00:04:33]
*And your mother?*

And my mother… So she was a… Her parents, or her father was in the Army, he was a brigadier in Egypt. She was actually born in Cairo when they were on, whatever you call it, when they were placed out there. Her father was a brigadier in the Sappers, so he used to go around blowing things up, and infamously was in charge of blowing up Krupps in the post-war demolition where the Brits went around destroying a lot of the, the land, or, a lot of the structure. Whereas, some of the other allies put them to better use, and I always think that was quite an interesting reflection

of, of the times. And I've got some family photographs somewhere of these enormous concrete buildings with, you know, metre thick walls with deep cracks after they had been, you know, had the demolition applied to them, which I always thought was very impressive as a, as a boy. But my mother spent most of the war in a boarding school in St Swithun's near Winchester, and, actually didn't see her parents for, five years I think it was.

*Ooh.*

So, you know, was a, a war child in a sense, as many were in that age. [pause] But they, they met, strangely, many years later in a, in a garage. They had a, a common interest in vintage cars, and, and my mother saw my father sort of underneath some car with a spanner in hand and so on, went over and kicked the tyres and said, 'Call this a car?' [both laugh] and, and you know, the rest is history, as they say.

*[laughs] So… And November 1961. In the UK, in Manchester, the Atlas machine was being developed, a real breakthrough, named the supercomputer, as they later called it. There were apparently about 5,500 computers in the world in 1961/'62. And there are more than 5,500 computers on the campus of Surrey University where you work, so that shows you the progress. At the same time, a lovely programming language, which always baffled me, but I was intrigued by, was being designed by Iverson, APL. Have you ever used APL?*

I haven't used APL. I think my earliest, my earliest languages were, probably 6502 assembly, BBC BASIC, and FORTRAN, FORTRAN IV and then FORTRAN 77. So I didn't really start playing with computers until my teens when they became accessible to, you know, us at home as it were. My earliest memory was, at school we had a computing club which ran, you know, hole-punching, we had to sort of punch cards and send them off to, I think it was Imperial, for, for processing, which was, kind of took the, the zing out of it, when you had to wait a week to find that you had completely mis-programmed something. But, allegedly, one of our teachers at the time was one of the very first, earliest hackers, and had been prosecuted as such, which I always thought actually made him ideally qualified for the job of teaching computing to us at that stage. [both laugh]

*They were also planning at IBM and developing what became the IBM System/360, a massive contribution to the, to the industry and to the structure of it. And, and then by '65 we had got Gordon Moore, who died this year, just earlier this year, promulgating his law: well it wasn't really a law, it was just, it was a recollection of where they, where they had been, and where they wanted, could go. And it became, well, it, it became a bit of a law didn't it, by the industry saying, OK, if that's what we've got to do, that's what we've got to.*

[00:08:45]

*Where were you educated?*

I was educated in London, in a school called Latymer. So, in Hammersmith. And, yes, I, I don't have particularly fond memories of school, I have to be honest. I remember one of our alumni was Hugh Grant, he was in the year above me. So that was my claim to fame at the time. We had, we had quite a few interesting alumni for that, and still go on. But I, I had sort of established an interest in science. I think as a, as a small boy used irritate the teachers, I think I was one of those disruptive, probably nowadays would have been classified either as ADHD or, or, I often suspected that I am slightly on the Spectrum, so my family tell me. But that's a longer story. But… Yes, science was definitely my thing, it was real, it was practical, and I could do things with it, and I could sort of seek to understand the world. And that's what I, I went on to study astrophysics at university, and that was, that was, for me, a sort of conflation of the interest in science but also the sort of, the wonder of science, and I was, you know, the study of the stars, and, being influenced by some of the early science fiction programmes at the time, many people my age remember fondly things like *Star Trek* and *Dr Who* and all the rest of it, which as a, a young boy I was fascinated by. So, I think that sort of informed some thinking, that and the growth of actually access to computing, which sort of hit me at the age of, what, sixteen and seventeen or something like that.

*Were you sporty?*

Um… [laughs] Honestly? No. You know, I, I enjoyed the occasional, you know, game of tennis, or football or whatever it was, but I was pretty useless at it. So, no.

*Presumably you were supported well by your parents. Did your mother or father go to university?*

So, my mother didn't. My father did but dropped out. So they were, they were very keen on both my sister and I having a good education, but I don't think they received a particularly good education in the formal sense, probably because of the war, you know, and the, and the time that had disrupted their upbringing. But they, they saw the value in it, and I think, historically, and, and culturally they, they were very keen that, you know, we, we had that good education.

*Latymer, that's not a state school, is it?*

No, it's not. It was an independent, and I, I, at the time I think I was on some form of scholarship, because, antiquarian book dealers, unless you are one of a rare breed, don't earn a lot of money, I have to say. So, I was able to scrape my way through, and get support for that position at Latymer.

*And presumably when you went to university, you then got, as well, the old County Council grant for tutoring and for your living?*

Those were the halcyon days of actually having, you know, free access to, to being a student to a degree course, yes.

[00:12:07]
*Yes. Yah. And where did you go to university to begin with?*

So, I went to university at a place called Queen Elizabeth College, which was based in Kensington. And it, within, I think it was a year or something, we got gobbled up by King's. It was the times where a number of universities were merging. Maybe that's going to happen again, I suspect. But, we, we got taken over by King's College London, and in fact our physics department at Queen Elizabeth took over the King's… So different departments had different eminences as it were, so we took

over physics. So I ended up being a King's person for my first degree and my PhD, which I stayed on to do at King's. So, yeah.

[00:12:58]
*What was your PhD in?*

So my PhD was entitled, I remember the full title, 'Characterisation and Optimisation of a Laser-Generated Plasma Source of Soft X-rays'. So what that was about was, using very high-energy lasers to vaporise, create plasmas of substances, very very hot energetic gases, and then use those as sources of soft X-rays for things like lithography, VLSI, so chip design, chip lithography, X-ray microscopy, and other applications. So the idea, at the time you could only do it with a synchrotron, so we used to work at Daresbury, the synchrotron that they had there. They later built the bright source in Harwell. And the idea was to, to come up with something that, you know, we could build in a lab, rather than have a national facility. So we had a very large Class 4 laser that took up half the room, and then we, you had a vacuum chamber, and, I spent several years building this system and then using it to, yeah, well to characterise but also to use it in sort of, lithographic applications. And that then, we did a lot of work with Rutherford Appleton Lab, which is still there, the Central Laser Facility, a laser called Vulcan and a laser called Sprite. So Vulcan was a, a huge infrared laser, and Sprite was a, an ultraviolet laser. And we were, you know, doing the same sort of experiments and ideas building in those. And that's where my first sort of published scientific paper came from.

[00:14:50]
*And what was the use of computing then, in that PhD and that research work?*

Yeah. So, so computing in, in my, in the early stages, was, for two things really. One was, I, I persuaded my supervisor to buy me a BBC Micro, which had the, the sort of, the wonderful facility of, one, having a built-in interpreter in the form of BBC BASIC, which was I think quite a few people's introduction to, to computing. But it also had a, a nice input/output port, and I used it to control all my experiments. I used it to control the equipment, the, the sensors, the laser, and, some of the, the applications, all from my BBC Micro. So that's where I ended up learning 6502

assembly, to drive things like stepper motors, and to activate high-voltage sensors and also the laser firing as well. So that was one application. And I rather enjoyed that, because it had very real physical manifestation. The other was, I did some, what they call hydrocode development, so, computational fluid dynamics with plasmas, so, the added complication of having electrostatic forces at play in fluid dynamics. And we ran some big codes on the Cray supercomputer at the Rutherford, which you had to talk to through an IBM 3090, through JCL I think it was. And so, that's where my sort of FORTRAN skills got honed, was writing and amending these, these hydrocodes which had been developed over many many years, and different researchers had added on different bits, and developed new things, and as the facilities got more powerful we were able to do more interesting things with them, including the visualisation and sort of graphical side of things, so that we were able to interpret the outputs of these, these simulations in a more meaningful fashion. And that also took me into the world of X-ray lasers and, which were becoming a thing in the Eighties with the Strategic Defence Initiative in the US who funded, you know, the Ronald Reagan 'Star Wars' project, created a lot of interest, and into inertial confinement fusion. So, the facilities that we were, we had at Rutherford were doing ICF, internal confinement fusion, which is now at the stage where, I think recently reached energy break even. So, so that was one of the… There were sort of two competing technologies for fusion, one is ICF and one is the sort of, the, the Torus, which we had also down the road at Culham. And so, those were my experiences of computing, those, were very much applied physics. And it was, it was at a time when a lot of my peers, most of my PhD peer group, were all going into the City to become bankers of various different shapes and forms, and I felt rather lost and lonely [laughs] being the only sort of remaining academic and researcher. And eventually I gave way and joined industry, using my, my computer skills to open the doors there.

[00:18:44]
*You mentioned assembly and FORTRAN. There is something quite wondrous about writing in an assembler language, isn't there? That degree of superb control.*

Indeed. And you're very close to what the computer is doing. There is that enormous distance that, that currently exists with modern computer systems. You know, you almost feel like you're controlling the hardware, and that level of abstraction.

*Well you were.*

Indeed. Indeed. And, you know, it was a lovely way to, you know, for controlling systems, to contrast systems. It's very satisfying to sort of write a line of code and get some, you know, really quite obscure sort of, screen of hex, and then see a system come to life, and things move, and, you know, when you get it wrong it's a physical thing that goes wrong and stuff. And it's great fun doing that.

[00:19:40]
*You also mentioned FORTRAN, which was the first major programming language that I was taught. And, and I still think it is a massive, really is a massive breakthrough, and really a very elegant language, compared with the dog's dinner of C, or C++.*

[laughs] Yeah. Yeah. And, subsequently… I, I… I loved BBC BASIC for the utility, you know, I could knock things together in a… I liked Pascal too. I, I had a brief fling with Pascal, which was lovely to use. There was a thing called Delphi, a Pascal compiler, by, and I can't remember who made it now. Famous at the time. And it was, it was beautifully fast and easy to use. But nobody else seemed to be using it, which was a shame, because I did have some fun with that. But FORTRAN became my main sort of scientific programming language. And then later C, as I went into industry and found that more of the, because at the time, then, we were all working on early SUN workstations and early Mac workstations, in C. I started using C++, but, I think, fortunately I never really had to use that seriously; I preferred the lower level languages.

[00:21:04]
*You moved into industry. Were you particularly, in your academic research, influenced by anybody? Did you have particular mentors?*

[pause] I think… There were a number of people on the physics side who I was in spired by. And, there was a… I mean there was my supervisor, who was very good, Alan Michette, no longer with us, Professor Alan Michette, at King's. He was always

very good as a supervisor, because he let me make my own mistakes, and, didn't try and tell me what to do in the lab, and, he was very encouraging and supportive. There was another, Professor Geoff Pert, in York University, who I worked for for a year or two when I was at the Rutherford labs, it was his grant funding. And he was a very, very respected plasma physics expert and had written all sorts of complicated software, you know, was the originator of the many of the hydrocodes that we went on to develop. And then there was Steve Rose, also, Professor Steve Rose, at the Rutherford Lab, who was a, who was a lovely guy, still around, at least I think he is, and I think he's at Imperial now. And, he was just a very kind and gentle but thoughtful scientist who was very encouraging to my ideas, and one of my last parting acts before leaving Rutherford to join industry was, we came up, or, I, I came up with an idea over coffee, you know, as you do in the labs, you have your coffee break in the morning and everyone gets together. And he and I were talking about something and I came up with this idea. And we, we got quite excited, and we published it in, Applied Physics Letters I think, which was, you know, the quickest you could get something published. It was only two pages. So it was quite fun at the time, it was one of those, those nice things. And it then went on to be quite well cited. But that was my, my last proper academic paper I think for a while, with Steve on that, which was, which was nice. And then, you know, there were a much wider collection of scientists and, and so on that I was interested by. But strangely, not so much on the computing side, other than to be, growing awareness of the sort of, the industry, and, you know, the availability of machines that you could buy in the shops, you know, these PC things that started becoming available. So, I didn't follow the industry too, too closely at that time, just, just was an avid user.

[00:23:59]
*But you did move into the industry, in 1990, is that right?*

That's right. So I moved to Logica, a company that was, did all sorts of very interesting things, and for the first few years at Logica when I was, I was there, we did, I spent most of my time doing contract research for the likes of, what was then the Admiralty Research Establishment, and the Royal Signals, that went on to become DRA and DERA and then split into QinetiQ and Dstl. And so yes, I've had a bit of an orbit around that, that community. But that was, that was quite a nice introduction

into all sorts of interesting scientific problems that were getting solved using computers, before Logica became more a mainstream IT services company. It was very much sort of beard and sandals then. We had people working on speech recognition systems, on knowledge-based systems, expert systems rather, agent based systems, and that was my first sort of touchpoint with proper AI, or at least what's now seen as AI. And then of course, you know, the, the sort of downturn in that, so my first AI winter. So, yeah, there's a lot to tell there I guess.

[00:25:18]
*Now, you are stepping into the, the scream of AI, which, shall we just for the sake of it say, it started with a man whose statue you have on your campus, 'Can machines think?', 1950, no less than Alan Turing, his, no , not his last break , but one of his greatest contributions, as far as I could see, to the development of computing. And, we have this period in the, through the 1950s, including the first AI programme, 1955, 1956, Dartmouth Summer research, the whole coining of the concept of AI, right the way through really until '74, I would say, from about '52 to '74, we've got a very strong blossoming of the hopes of AI. You did some work for early neural network, and signal and image processing techniques, and when you were first at Logica. What was that about?*

Well, [laughs] some of it I can't tell you about, to this day, but, I was involved in quite a lot of work in what was called passive sonar, so, interpretation of sound as received by underwater sensors, so listening for submarines and ships, at enormous distances. So, a combination of signal processing and a variety of different, heuristics, and then what we then later went on to recognise as sort of early AI algorithms. So, that, that then went on to some of the image processing applications. We got involved in a whole variety of different projects. And probably one of the most interesting one was an expert system we built in the sonar domain, which was a, which used Lisp, and it used a symbolics coprocessor, had a dedicated disk processor. So that was in the days where we believed that AI was, expert sys-, it was expert based where we would have deep elucidation interviews with human experts, and abstract that knowledge, codify it into, you know, our knowledge base system, and then use that to perform the, the task as a, an automated task. And the great thing about that was that, it provided, it was built on explainability. So that, the expert

operators could come along and see this, you know, this screen, these, this machine churning away, but it could follow its reasoning. So when it made a conclusion, you had a, a textural description of how it made that conclusion, and the things then triggered it to do that. Which is one of the great challenges of current large language models for example, is the sort of, the black box problem. But, a way…

[00:28:33]
*Sorry. Would you explain the black box problem?*

Yes. I mean without going too much into the sort of, the, the neural network side of AI, the, the big problem is that, neural networks at scale are very difficult to understand how knowledge is codified within, you know, thousands, millions, billions now, of weights within a complex mathematical structure that is the neural network. And, so you end up with a system that, that becomes a black box, i.e. you know what information you put in, you know what's coming out, but you've no idea actually what went on within it. A bit like the human brain. We know what we're seeing, what we're feeling, what we're touching and so on, but we don't know what's going on within the individual neurons. And if we did, we couldn't necessarily understand what an individual neuron's activity, how that related to the wider concepts of knowledge or action and so on. And that is a problem for current very large neural network AI implementations. Which has real, real problems. If you imagine it, an AI system making a decision about whether you get a mortgage, or it's driving your car. If something goes wrong with that process, explaining how that went wrong and correcting it, is not, is not straightforward at all, and in many cases it's not possible. So, the nice thing about expert system, it's very logic-symbolic based. But, it fell foul, as nearly all expert systems did in that time that went on into that AI winter, was the maintainability of those systems, was that, you know, putting in new human, as the human became more expert, new things arose, it was very expensive in time, human expertise, to, to correct and update that system. And that's what, that's sort of what did for expert systems. And in parallel, we were playing with things like agent based systems, we were playing with the early neural networks book . These were tiny neural networks, you know, literally, you know, two or three layers, hidden layers, and, you know, dozens of neurons, that still took plenty of time to, you know,

it took hours and hours, days, to, to train. Absolutely, you know, vanishingly small in comparison to, you know, what is being deployed these days.
[00:31:10]
You mentioned Moore's Law. There's a new law out, although it hasn't got a name, on AI, which, whereas Moore's Law was, compute power doubles every eighteen months, this AI, over the last ten years, the size of compute required for a, for a large AI model, has doubled every three and a half months.

*[laughs] Three and a half months.*

Yeah. So, it's gone up by a factor of 300,000 in the last ten years, which is why the large, the large language models, the generative AI, at the moment is out of reach for most people, then the hyperscalers, the, you know, the Microsoft, Google, Amazon and so on, there's very few people who can afford the scale of AI that's currently needed for those types of AI.

*Well let's call that the Rogoyski law, shall we?*

[laughs] It's not mine. It was actually a piece of work done by OpenAI in the early stages. So… Unfortunately it doesn't have a scientist's name to, to tag, but…

[00:32:15]
*And that wasn't the first winter, was it, of AI. Because in 1972, in this country, the Lighthill report came out saying, 'Oh this AI stuff is not going to get anywhere. We shouldn't be doing it. There's not enough hardware power to do it,' Another winter you just pointed to…*

Yes.

*…with the, with Rogoyski law. And it's, you know, it's going to be, it's difficult to do, and, wham, public funding stopped, a lot of private funding stopped. A winter of, of careers stopped, and university departments closed, people were fired, lots of those companies, fledgling companies just collapsed, did they not? And then it took another, a decide before it was revived really in '82, wasn't it, I think, with the report*

*by Dr Roger Needham, and Swinnerton-Dyer, just before the beginning of Sorry saying, 'Oh, we should look at this again.' But that then was expert system. So expert systems ran into the ground, you are saying?*

Yes. [laughs]

*So we've got, at least a third winter of, of AI, and we seem to be in a, a spring or summer of AI at the moment. You stayed in Logica for about eleven years.*

That's right, yes. Yes.

*You became an operations manager, and a programming manager.*

Indeed, yes. I sort of, made the mistake of [both laugh], being quite good at running teams of people and so on. So went on, and I ran a business unit called Surveillance Systems, which encompassed all sorts of interesting applications of AI for, sensorsfor infra-red imaging to sonar systems side of it. I had one of my chaps, I remember him setting one of our Vaxes to crawl the Web as it was. This was in the extremely early days. Left it over a weekend and found, whatever it was, several hundred servers, you know, was the first example that we had of, you know, that this was this Internet thing that we didn't quite understand. He then went on to become, actually a very senior person in Apple, still there to this day. But, you know, that was what we were, we were going from individual workstations and systems, into the, exploring the world of, of network computing. And I remember one of my bosses at the time telling me that email was a thing that would never catch on, he couldn't understand the point of it. You know, all those sort of classic, classic things. Lots of my… Yes, I remember several other, [laughs] short-sighted comments, you know, various people, you know, who couldn't see that change was coming, and, some of us younger ones were sort of saying, no, this is big, it's going to change the world we live in. And we were right.

[00:35:29]
*You were. How were you as a manager? Normally people who are very good at technology can become very bad managers.*

[laughs] Well that's set me up. [pause] I think I was all right. I don't… I was never quite as sort of red in tooth and claw as, as… So, you know, the thing that motivated me as a manager was always getting the best out of people. So making them feel valued, making their work understood, and showing that I understood it and valued it. And that required me to keep in touch with the sort of, the technical side of things with the language of what they were building. And so that's always been a facet of, of how I have approached managing technical teams. I like to be close. It's what's enabled me to keep close to technology and then return back to academia many years later, as I still try to speak the languages, and I can communicate about the complexities and the, you know, the, the opportunities with these technologies as they develop.

[00:36:33]
*Can you wield the axe?*

Um… I have had to. I didn't enjoy it. It's not something that I think any person with a shred of humanity enjoys. But, yes, I remember I did a, a year in, the end of my Logica career, for the first… I took over the retail banking unit after ten years in, you know, science and engineering in the defence world, space and defence world, and then did a year in retail banking, which was a, a very different world. But they loved the sort of, the discipline and the approach that I brought from the, the Government side. I ended up running this retail banking unit, and ended up having to make quite a lot of people redundant, which was a, not a nice experience, either for them or, or for us as the team who were doing it. But, yes.

[00:37:33]
*Why did you leave Logica?*

Because, I was, I was not impressed with the, with, I didn't want to continue working in the financial services area, at the time. I've always been quite mission-oriented in, in my, my pursuit of technology, so, you know, how is this helping people, how is this going to keep us safe? So I understood that in the, you know, the defence and the space world, but I didn't understand it in the financial services world. And, purely by happenstance I got approached by a small company in Guildford called ESYS, who

are a consultancy in space, and, had done a lot of work with the European Commission, with the European Space Agency, and, that was, you know, that brought me back to my astrophysics first degree. And I thought, you know, this could be fun, it could be interesting. They were recruiting me with a view to succeeding the MD. So, the idea of sort of running a small company, this was about thirty people at the time, appealed to me. So I decided to sort of, go from big corporate to, to small, small business, you know. And that was a great experience, you know. Logica was definitely becoming big corporate, it had grown enormously under the, the leadership of Martin Read, but it also changed its nature enormously, and was becoming a mainstream IT services company, as opposed to the sort of, beard and sandals, doing really interesting stuff, which I had joined. So, it kind of felt that we were on different trajectories anyway.
[00:39:23]
So I joined ESYS, and we had great fun. We dd all sorts of interesting thought leadership world work across Europe, from science missions to Jupiter, to the idea of introducing mobile phones in passenger aircraft, which is now a thing, you know, but we were, we were doing work to, not only with us but we were collaborating with a variety of European partners, and that was great fun, working with German, French, Italian, and other partners, gave me a sort of wider view of how these, these organisations work together, which was…

*How are you at languages?*

Still pretty rubbish. [laughs] Schoolboy French, and that was about it. That was a depressing thing, is, they all spoke excellent English. So… [laughs] The cultural differences were interesting though. You know, lots of…

*Talk about those.*

Ah, well… You know, when you are dealing with the Italians, the French, the Germans and so on, they, they have very fundamentally different approaches to how they get things done. Italians are, it's surprising, they lived up quite a lot to their stereotypes, the Italians were very relationship-based, you could agree something with a handshake and a sort of nod, and, you know, where the completer-finisher in me

wanted to sort of get something written down on paper and know that it was, you know, cast iron, it was very much more, you know, a smile and a, you know, that's how things happened. The Germans could be… You know, some, some of the ones I worked with were tremendously bright, but on the commercial side they were ruthlessly, you know, particular to the letter. If you… You know, you thought you had delivered a great piece of work, but then you find clause 4.3.9 buried in the, you know, the yellow pages sized subtext of the contract hadn't been fulfilled, they would haul you over the coals for it. So you had to… Oh it was a different sort of discipline. And so forth, you know, there were lots of different experiences from that.

*I was on some European-wide publishing ventures for a company called VNU, Dutch-based, and, I absolutely agree with you. We all went back into our national stereotypes. In one meeting, a Frenchman said, 'Well, yes, in practice this will work, but in theory it won't.'*

[laughs] Yes.

*And the Brits were just banging their heads on the table. Incredible stuff.*

Yes.

[00:42:09]
*Now, you started… When you moved to Isis[sic], where you stayed for three years, you start a pattern of twelve years, really quite a lot of job-hunting – job-jumping, from job to job. Three years at Isis[sic]; two years at QinetiQ; four years at Charteris; one year at Defence Strategy and Solutions LLP; and three years at Roke Manor Research. What was happening?*

So… So at the… You know, there was a school of thought that three years was the ideal time to, to spend at a company. The reality was that, three years in ESYS was, was good fun. Not Isis [laughs], that's a different, that's a different affiliation. ESYS started to experience some, some market headwinds, and, at the same time I got approached, I got tapped on the shoulder by QinetiQ, who said they were looking for someone to run part of their space business. I quite liked the idea of joining QinetiQ

because it was doing some hard science, it had facilities, it had real things again, which, while the consulting side, you know, from ESYS, was, was great fun, and we, we had a lot of influence, I still liked the idea of getting back into engineering and science. So I jumped ship to QinetiQ. And then, two weeks after joining QinetiQ my MD, who had recruited me, resigned, to go off to Nottingham University, and, I thought, well, in for a penny, in a for pound, I put myself forward as the, the MD, and got accepted. So I took over the managing directorship of the QinetiQ Space Division. And then realised what it was like to run an organisation that was previously civil servants, many of whom didn't want to be privatised, and, you know, had joined as, you know, lifetime scientific civil servants. And the, the cultural problems that that led to, combined with Carlisle Group's relentless drive to promote QinetiQ as a, as a, you know, as a major commercial organisation, created some real challenging environments. And I lasted a couple of years and I think, realised that the, the management culture and my view of how to run people were just very divergent at the time, and we went our separate ways. So I then joined Charteris, which was another consultancy, but specialised in delivery of large technology systems. So there was about 100 people in Charteris, so we had a, a practice of Microsoft technologies, but we also had a whole collection of very senior, very experienced, what I will refer to as sort of silverbacks , people who had been there and done it, quite a few ex-Logica people there, who were basically, we were hiring them out as expert witnesses, as senior programme managers, as strategists and so on, across a number of different market sectors, but notably in Government, notably in areas like GCHQ. So I ended up running their government business with clients like GCHQ and the Home Office, and, and so forth. And again, doing some very influential work from innovation to, you know, sort of policy, the very early days of cyber then, cybersecurity. And, I, I got kind of, lured by another company, called Defence Strategy and Solutions, which were very similar to Charteris.

*Did this mean physical moving for you?*

Sorry?

*Sorry. Sorry to interrupt. Did this mean physical moving for you?*

No. No, I, I've managed to, keep my geographic centre pretty much bound in and around the south-east, and Guildford. So, [inaud].

[00:46:37]
*Tell me about the BskyB versus EDS case.*

Oh. [laughs]

*If you can*

Yeah, not… I wasn't the expert witness, but, two of my expert witnesses were on that, and that went on for, a period of, oh I think that was two or three years behind the scenes, and, was an extraordinarily large and complex case. In fact, I think it was the largest, when they eventually settled, it was one of the largest settlements that had ever been declared in that area. But we did quite a lot of business advising many sensitive, you know, IT contracts, computing contracts that had gone wrong, many of which never reached the public eye, because they were settled out of court. If you got to court, then it was, you kind of, you know, you've missed the opportunity to control it. But it was fascinating, some of the stories, which I can't repeat. You heard about the, the behaviours of organisations on both sides, and, you know, from over-promising and wild claims, you know, the classic salesman promises this, and the engineer delivers that, writ large, and, very complicated, and, very illuminating, very educational.

*What do you think, in your, in retrospect, and given those all-important years you spent at Charteris, why do these big systems so often fail?*

Oh, lots of different reasons. One is, divergent understanding of what it is you're trying to build. So, there, there was, and to an extent still is, a fashion for sort of, writing your requirements and saying, 'This is what our system should do; go away and build it.' And, you will go away and build it, spend many years, you know, many millions of pounds building it, and then realise that the requirements that they wrote at the beginning weren't right for what they wanted, and that actually what's been built is, is not what's needed. You know, in very simple terms. And the art is to actually

keep those potentially diverging threads aligned by very close, you know, work with, with a client, and very good contract management as you go along. So every time you realise that something isn't going to work out, that it's not really what they should have been asking for, that you can work with the customer to, to realign that, make sure it's in the contract, and, make sure you progress on it. But all the problems I remember seeing over many years, not just at Charteris, was, was where that divergence occurred, where you thought you were doing the right thing as a supplier, but the, the customer had just, effectively asked for the wrong thing, or misunderstood what it was they were trying to build. And big complex systems. It is very hard to start off with a blank sheet of paper and say, 'This is what it must do,' with no real, you know, no real evidence or understanding of how to, how this system will behave in, in real life with real users and real data and real customers. So that's often where the divergence occurred.

*And does not divergent often occur mostly… Sorry. No. I shall rephrase this question. It seems to… I get the impression that a lot of this happens in the public sector. Do you get that impression? And if you do, why particularly the public sector?*

I think it happens all over. I think, the commercial sector is more flexible about how it runs, you know, how it corrects those, and, and how much risk it takes. The public sector does seem to have run into a lot of problems, I think partly because they are bound by rules about public sector spending, the element, the amount of risk that they can take on, their emphasis on the, you know, the, the enormous contracts, the very onerous contracts that they place on their suppliers, all of which makes for a much more brittle way of developing software and complex systems. I remember in the very early days of, of Logica, we experimented with what would then become, later be sort of recognised as, you know, time boxing and, sprints and things like that. Prototyping software. In fact that knowledge-based system that I mentioned, the expert system, was a, was done in a stage of prototypes, which was my first lesson in actually the power of, non-waterfall methods as it were. So, so to actually try and solve, try and give the user an idea of what it was that, that you were going to build, at a very early stage where it's correctable, where you can throw bits away that don't work, where you can identify the hardest problems, and really try and solve them in

isolation before you bolt them into a bigger system. And I always thought that was a much better way to work, in the same way as you build a jet aircraft. At the time, it wasn't, you know, build it from scratch and it's going to be perfect the first time you assemble it. It is, prototype all the individual elements, make sure they work on their own, then make sure they work in early systems. Like the space engineering approach, where you have models that you build up from the sort of basic engineering, things like heat transfer and energy usage to the eventual, you know, complex systems that you bolt together. It's that prototyping, layered approach that is much better for humans to understand and to see that they're making the right progress. And I think, there was a, a huge tendency for Government contracting of IT, which still appears today in many areas where you, you follow, effectively a waterfall. You know, you are spending public money; this is the requirement; go away and build it. And that's what you should build, regardless of whether it's the right system, whether the performance was going to be awful , and so on. So, I think that's, that's probably why public sector has more trouble than others.

[00:53:05]
*You moved to Defence Strategy and Solutions LLP in 2010, until 2011, one year there. Then…*

Well, nearly two years.

*What?*

Nearly two years, but…

*Nearly two years.*

Yes. No, we were, we were a very influential, very high-powered consulting business, but as is the case with small business, we lost an anchor client. There were, there was a big retraction of the defence industry at that time, and we just, you know, we, we couldn't sustain ourselves on that business. We tried to find new customers to fill that gap, and, we didn't. So it was great fun while it lasted, but the company eventually folded some, whatever it was, fifteen, eighteen months after I joined it.

*That, there's no correlation between those two things? [laughs]*

Well I started wondering at that point. [laughs] I worked for, I think three small companies, and none of whom exist any more. Bu then, if you look at the attrition of… It's, it's a brave person who starts up small companies now. You have to have, you know, not only the backing, the confidence, but you do have to face the, you know, the reality that many companies fail.

[00:54:24]
*One of the threads of debate that continually crops up within the Archives is, why doesn't the UK have big companies that survive?*

So, I, I think it's a cultural problem, it's a, institutional problem. We don't have the same attitude to risk in the UK as exists in the America. We don't have the same culture towards entrepreneurialism. We have the world's, you know, we have some of the world's greatest inventors. We're great at being creative. But I was talking about this very recently in the field of AI. It seems to me that in the US, being a, a sort of, an IT entrepreneur is, is similar to being a rock star, you know, it's one of those aspirational things that as a youngster you look at and think, I want to be, you know, I want to be that, that next billionaire. You know, in the same way as, as kids might look at, you know, Harry Kane or something, they want to be a Premiership footballer, they want to be a, a YouTube influencer, earning millions doing all the, you know, whatever they're doing. But the attitudes are very different in the US than the UK between people who are in their sort of late teens, early twenties, who are the lifeblood of these start-ups, you know. And I do think it's that mindset, you know, when I was in my teens I wanted to be a rock star, you know, I played guitar in bands and things like that, but, you know, that, that's kind of what you wanted to do, to express yourself and, and to, to be famous and earn money and, and do the stuff. Very few people were talking about, I want to start a, you know, a computer company, or… It's very different in the US now. You know, it's almost… There is a, a huge cultural divide there, which is this sort of, pursuit of the rock star thing. In, in the UK rock star envelope, compute, AI, you know, that kind of tech entrepreneurship, just doesn't hold the same attraction as it does in the US. And I

think that, that's a lot of the reason why we don't see that progression. You can go on to look at, you know, have we got the right banking, the right venture capitalists and so on. You know, do they have different attitudes? Yes, they do, but I think on this, you've got that groundswell of talent that's saying, I'm just to have a go at this, because I want to be, you know, I want to create a great company. Not the same in the UK.

*That's the difference between God and Larry Ellison isn't it?*

[laughs]

*Yeah? God doesn't think he's Larry Ellison. That's the difference.*

Yes. [laughs] Yes. I must remember that.

[00:57:19]
*Roke Manor Research. That was also around Government issues, was it not?*

So Roke, Roke is a, is a, extraordinary little company. Not that little. So I had two bites of Roke. So, I worked at Roke and did a lot of work in cybersecurity, so the early work that I had done in Defence Strategy and Solutions, we were consulting with deep dark parts of Government about the, the worry, the emerging worry over cybersecurity, and then we started working, you know, we were advising companies who were looking at cybersecurity as the thing to be in. Then the company folded. I joined Roke Manor, and was looking at their national security business, and I ended up being seconded into the Cabinet Office for a couple of years during that time, into the Officer of Cyber Security and Information Assurance. Well it started off as OCS, became OCSIA. So this oversaw the national programme for cybersecurity, which spent 860 million, whatever it was, over various different government departments, and was a joined-up approach for Government to take cybersecurity really seriously, right the way across the piece. We had serious ministerial support, we had international profile and so on, and it was a good example, it was an example of good Government policy-making that sort of, kind of got cybersecurity as a, as an emerging problem, and saw the importance of things like international leadership, saw the

importance of, making different Government departments aware, so it wasn't just a, you know, it wasn't just GCHQ and the CESG banging the drum about it. It applied to everything from tax to healthcare. And I think made a difference. So that was, that was great fun to be in with, with, for the two years that I was at Cabinet Office, because I was there as a proxy for industry, and as a sort of strategic consultant. So, was directly involved in a number of different initiatives, and I ended up writing the UK strategy for cyber export, because we decided that the UK was quite good at this stuff, and that we ought to be exporting our expertise across the world, and the ministers at the time were very keen on progressing this as a, as a thread for economic growth. So that was very interesting, you know, right the way through to Marcus Willett's launching the export strategy that I've written, and, in the, the old Westminster War Rooms, which was, which was a nice touch, through to then going on to help with drafting the first export controls on cyber, and the, the fascinating realisation for many people who had been involved in export controls in Government who were used to thinking about controlling green boxes going across borders, and having to get their heads around this sort of, ephemeral digital stuff that could be provided to anyone anywhere from anywhere at the touch of a button, and how you controlled that, and often how you controlled technologies that weren't dual use, they weren't defence; they were, you know, things like social media, or social media profiling for example, that actually were designed with purely commercial ideas in mind, but actually became tools of state oppression when used in the wrong way. And these were, these were very sort of complicated and emergent issues in the digital world that we were then starting to live in.

*Are you a political person?*

No, not really. I am, I am a liberal by leaning. I am… Yeah, I'd probably stop at that.

[00:01:22]
*Oh fine. That's fine. Was it a success, this export drive?*

[laughs] Really difficult to measure, but I think so. We certainly built quite a profile, nationally and internationally, on cybersecurity, and I would argue that that's still

going on. I think it's become more integrated to the DNA. I think more people are now, accept the need to think about digital security. I think it's very much part of the weft and weave of modern computing systems. And so I think, there was a Government success in that, I think there was a, you know, there was an international interest in it. Certainly Americans were interested, the Russians were interested for different reasons, and made, you know, kept us all on our toes. But I think there's been a number of companies that have succeeded, I think there's, there's a lot of… I think there's a lot of awareness within the, the world of computing now about cybersecurity, that there wasn't ten years ago, or 20 years ago. So I think in that sense, yes, it was a success.

[01:02:33]
*I think we need to move now and focus directly on your current role, if we may. Because in 2020 you joined the AI Institute at the University of Surrey. I mean on the side of Stag Hill in Guildford, a lovely, a lovely place, a lovely campus. And we need to, to focus directly on AI if we may. Is that OK?*

Yes. Yeah yeah.

*Good. OK. Now, were you one of the 1,000 who signed a letter this week which said, hold on a minute, Microsoft and Oracle – [laughs] not Oracle, sorry, Microsoft and Google, wait, we want to stop, we want a moratorium on development?*

Well, they wanted a moratorium on GPT-5, I think. So they, they weren't saying we should stop development or research, but they were saying, before we let things get too far advanced, we need to have a, a cold hard look at what is, what we're about to do. Because, we're getting closer to the point where some, some breakthrough may occur. So some argue that, you know, we're, we're getting closer to AGI, to artificial general intelligence; we're getting closer to the singularity, the point that AI starts to design themselves and run away; we're getting closer to the idea that we may not be able to control an AI that we develop. Now, there's a lot of debate about, the pros and cons and the realities of those, but I do think we need to treat those topics very very seriously.

*Did you sign the letter?*

I tried to, but the servers had crashed, because everyone was trying to do that, and so… [RS laughs] It was slightly intimidating filling in the form where, after you put in your details it asked you for your sort of accolades, and, it gave an example, 'Are you a Nobel Prize winner?' and… [RS laugh] Which I thought, well, [laughs] OK, I'm not…

*You were able to say, 'Not yet, no.' [both laugh] Not yet.*

That wasn't an option on the form.

*But I did come up with Rogoyski's law. Would you like to know about it? No. [laughs] So, a lot of people have, have written about it. Well, there was, Professor Nayef Al-Rodhan, a neuroscientist, Geneva centre for social security. 'The moral basis of intelligent machines are the result of human programmers. However the fundamental nature of AI technologies will change when they learn how to behave and adapt their behaviour based on their environment.' So there is built-in bias, is there not, in AI systems?*

So, current… And we've got to remember that AI systems are, it's a huge envelope. So although the current furore and, and focus is on large language models, that's only a small part of what AI has, has been looking at. You know, we mentioned earlier expert systems. Well they're, those, those kind of disciplines haven't gone away. Things like fuzzy logic, things like, you know, some of the sort of search AI, AI in the census and so on. There's a lot of different disciplines within AI, and we've got this, this hotspot at the moment which started with, you know, machine learning, deep learning, and then, you know, what we're currently looking at with the sort of large language models, which started with, well it started with Geoff Hinton in 2012 when he showed that neural networks could be used to good effect for image recognition with his ImageNet work, which kind of created a whole buzz of excitement, neural networks were back, having been dropped, forgotten about for at least ten years previously. They were interesting again. And then, 2017, 2018, when Google's

*Attention is All You Need* defined the transformer architecture which has then been, which then sort of informed these large language models.
[01:06:43]
So, we are kind of, you know, the interesting thing that the release of ChatGPT in November ’22 did was, it catalysed, it made accessible to, you know, anyone who had an interest, to have a play with an AI system, and in a very accessible way, the fact that you were exchanging messages, you know, as a very advanced chatbot, really sort of, gave everyone pause for thought, you know. And then going on into image creation, sound creation, and other forms of generative AI. And I think it’s, it’s that sort of, that’s, there’s been the tipping point there; it’s not just the advance of these very large AI models which is a subsection of the wider AI work, but it’s also the engagement that people for the first time realise that this AI could have my job, you know, or, if I’m more forward-thinking, I’m going to use this AI as part of my job, and enable me to work faster, which is already how some people are adapting.
[01:07:40]
But yes, they built on enormous corpus of text that’s trawled from the Internet, from books, and from, all sorts of other textual sources, and they contain bias, because they are what human beings have written over many years, and some of it, you know, for example the Reddit feeds is, is one of the, the feeds that have been used in GPT, and they can contain some fairly extreme pieces of human writing, and that gets absorbed into the model. And then part of the model building is to then try and adapt and modify the, the grand model as it were, to, to de-emphasise and to capture, you know, catch some of those, those occurrences, when users are interacting. So yes, bias is built in, because of who wrote the material that these systems are being trained on. And, some, not just bias but toxic elements contained in these models. And currently you can’t build those large models without those datasets, and without, you know, in those datasets, having some stuff that you don’t think represents humanity particularly well. So bias exists, yes, among other problems.

[01:09:11]
*There’s also the mention of copyright, is there not?*

So, yes, and that’s, that’s for… [laughs] That’s for the, the courts to decide. So, I think, you know, one of my colleagues at the university has been pursuing a patent

application in which an AI is named as a co-inventor. So what they did was, they ran a piece of software that designed a piece of packaging, and then they patented this packaging. And in doing so, the logic was that this packaging design was created by this piece of software, so therefore, it should be named as a, as an inventor. And, they have been successful in South Africa and Australia I think from memory, and not… I think the UK Patent Office is taking it to the Supreme Court. The basic thing, it's not about being vexatiously, not about, you know, making vexatious patent applications; it's about showing that current laws on intellectual property, which actually underpin a lot of how we maintain our economy, because if you can't protect intellectual property, you know, what do you, what, where does your competitive advantage, how do you protect products et cetera, is… The law is inadequate for the age of creative machines. And, that we need to have, you know, some really, new thinking on what intellectual property, what copyright looks like, not just on a national basis, because of course it has to operate on an international basis for it to mean anything. So, [inaud].

*But equally, as they hoover up this information, these expert systems are actually infringing other people's copyright, aren't they?*

So that's, that's one of the, the arguments. And some of the, you know, some of the models that, you know, you have been able to reverse engineer the, the inputs, and show that the model is, is drawing upon specific pieces of copyrighted or intellectual property. The larger models, that abstraction gets more interesting, and, you know, there are some, there's starting to be a realisation that there are sort of emergent properties of the very large models, that it's no longer just a, a rehash of what's already been written, or, you know, what's already been drawn or photographed, but actually a genuine recreation of something new, based on that, that input data. In the same way as you can argue that human beings create text and images and so on based on their experience of life.

*Yeah, but, but, as Mandy Rice-Davies said once, [laughs] they would say that, wouldn't they.*

[laughs] There, there is definite evidence emerging that, that these models are generating stuff that doesn't exist in a human sphere. So, you know, if I get an image, trivially, if I get an image generation, [inaud] large model [inaud], and I say, 'Show me a picture of a hamster with a pink party hat, carrying a,' you know, 'a suitcase,' it will generate that. Now there's, there's no way that anyone's ever drawn that particular combination of things. It's kind of, illustrative of where these, these large models are getting to, is that they can genuinely create new things. And more importantly I think, on the large language models, is starting to, to show that there are structures, and, that the sort of architecture of human language, which we as human beings have struggled with for hundreds of years, there is something being created within, within these large language models, that it is understanding the, the structure of human communication, in a way that actually we haven't yet realised how to do. So there's, there's a level of abstraction there that's starting to emerge that's sort of saying, actually there's something serious going on here. And that's with GPT-3 or 4. So, as these models go up in steps of, orders of magnitude, you know, there's already people talking about what's being put into GPT-5, hence the, the letter from the, the Foundation for Life. We don't know quite what's going to happen. So…

[01:13:43]
*Well, I, [laughs] I actually agree with you entirely there. What concerns me is that… Do you think… I'll ask you a question, and, forget about my concern for a moment. Do you think that an artificial superintelligence is going to be created by itself, as a man, a European philosopher you will probably have come across, Bostrom, b-o-s-t-r-o-m, has argued that there is this possible moment of this self-creation of a super-intelligent.*

Yeah. I would sort of… [laughs] I like the Douglas Adams, you know, the, the creation of, that there is a supercomputer to answer the question of life, the universe and everything, that went on to design its successor and so forth. I think that's the, the most likely line, is that, increasingly intelligent AIs will then be used to design subsequently intelligent, or advanced AIs, and at some point that, the capabilities of that AI will become indistinguishable from intelligence as we understand it within human beings. And that's the sort of, the singularity where, where machines then become too complex for us to understand, become, you know, black boxes writ large.

And, one of the fascinating points of that is, is, will we recognise the intelligence, and will that intelligence actually be close to human intelligence, or will it be a different kind of intelligence, that thinks and behaves in slightly different ways, or, you know, very different ways? I don't think we can predict that at this moment.

*You will remember of course the, the classic statement from Star Trek, 'Well Jim, yes, it's life, but not as we know it.'*

[laughs] Indeed. Indeed.

*It might well be that.*

And there have been many writers in the science fiction community that have sort of said, you know, it's, AI is just the, the inevitable natural succession of any intelligent life form, at some point you will design your evolutionary succession.

[01:16:10]
*At the moment, the UK is proposing business rules for AI which, it's been said by many people, are much softer than the ones in Europe. Therefore, the UK is trying to initiate, or, [laughs] or go for, a run to the bottom, basically. This is very dangerous, is it not?*

Yeah, I agree. We've contributed to Government consultations on this, and voicing in public. I think, I think this is misjudged, which has surprised me, because I think they were doing quite a lot of serious thinking about this, but, the recent White Paper published, in fact earlier this week, with their innovation-friendly approach to the AI regulation, I think there's, there's sort of two things wrong with it. I think, one structurally, it's kicking the can down the road, because it's saying that the problem is with the individual regulators in different market sectors to deal with, and the Government may put this on a statutory basis to make sure that the regulators are regulating AI in their individual sectors. So, all the Government has done is, said it's, it's down to the regulators, and we're doing to force the regulators to do it, maybe, in a couple of years' time, based on the government. So that's one problem.
[01:17:35]

But the bigger problem is that… Well, just, just picking up, there's one more aspect to that, and which is that, if you look at the shape of AI as it is at the moment, it doesn't operate within sectors; it operates across multiple sectors. So the idea that you've got one regulator saying that this is how you should do it, and another regulator in a different sector saying, this, you know, healthcare versus finance versus whatever, using the same technology, it's a nonsense to think that you might have different regulatory regimes across these, these different sectors for the same technology. So I think that's problematic. And that was specifically dismissed by the, the work that was done by the EU AI Act. They looked at the more sort of federated approach to regulation, and dismissed it for a variety of reasons, including the sort of sheer impracticality. So… But I think it's out of step with Europe, it's out of step with the US, and it's even out of step with China, who have all taken much stronger, or developing much stronger lines on the control and regulation of AI. And I think while the political instincts may be to, to not regulate things, I think in this case they've kind of misjudged it, and, we actually need guiderails, in industry, we need people in academia advising, to, to really make sure that we, we don't end up with, you know, AI disasters, that we're, we're using this technology for the benefit of human beings, and humanity, and not just allowing a free-for-all, which is entirely profit-driven, at the expense of people.

[01:19:15]
*Let me put a philosophical question to you, because we're… Then I've got a couple of specific questions to round off with, if that's all right, Andrew. One is, why would we trust people, like Microsoft, like Google? I know those type of people, you know those type of people, who brought us what, programmed trading on stock exchanges, which had to be stopped; who brought us what, the Horizon Post Office system in the UK, an absolute scandal; who brought us what, NHS records; and who brought us what, Cambridge Analytica. Why would we ever trust them?*

As a philosophical question. I think there is a, there is a, an unfortunate track record of organisations being, driven by, you know, the realities of making money and profit, being driven by the need to be first to market, to dominate a sector. I, I was asked yesterday whether, whether Google was, was at risk from not being seen to be at the front of AI, in the face of Microsoft and AWS. And I actually think that Microsoft is

probably more at risk because in a way they've, they've so aggressively pushed themselves forward on the market that they may well have over-extended themselves as to the reality of what they can deliver, at a price that people can afford and so on. And, you know, the first time that Copilot or whatever it is that gets rolled out at scale and is used in business, the first time that some corporate inside knowledge gets dumped on the Internet, or, you know, the first of the big sort of, losses in trust, and people start saying, 'How on earth could you have put so much behind this in such an immature state?', you know, that could be really, really critical for, for that company and for companies associated with it. So I, I think there's a lot at stake. I think, I think, you know… Amazon is another player, but they're very quiet, they're not in this sort of, race between Microsoft Open AI and Google, and maybe very sensibly so, that they need a more, a quieter presence in the world of AI. So why should we trust them? You know, they've done a lot of good, they've helped a lot of organisations, productivity and all the rest of it, but there are many examples of where it hasn't worked as, as originally intended, and disasters that, you know, have affected people's lives. And that accountability I think is one of the critical issues that's missing from the development of AI as we create these abstract systems where it becomes, you know, the black box problem, the transparency problem, makes it hard to hold individuals accountable for taking shortcuts, for negligence and so on. And I think that's one thing we have to get right, is, there need to people, you know, who are responsible and held accountable for mistakes, in order that we take a more considered approach to these very powerful technologies.

[01:22:42]
*There is also, I think, another issue I would put to you. Even on more traditional IT systems. The impact of more traditional IT systems in banking has been that there are a lower proportion, and a lower absolute number, of women in banking now than there used to be. Because the men are the traders, and a lot of the back office work has been automated. Is that the effect we want to have? That's the type of consequences that IT people, I'm not accusing you of this directly, but IT people hardly ever look at.*

So, you know, that, that's a topic that is, very frequently talked about nowadays, diversity in tech. One of the pieces of work that we are doing with a group of

companies and local government and so on in Surrey is to look at what influences, particularly young girls, and I do mean young girls, you know, sort of, pre-teens, to, to not pursue careers in digital technologies, and more broadly in STEM subjects. We know that when you look in, you know, certainly my experience, and it still seems to be the case, that if you look in companies, the male to female ratio is, you know, fifteen per cent women is, is not untypical. And that's, that is such a, a huge waste of talent, potential talent. But what is it that turns young women and young girls away from careers in, you know, in tech, in computing and so on? And it does seem to go back very early, decision-making. So Government have, UK Government has made a, you know, a number of interventions to try and encourage people to, to study STEM subjects, because, shortage of STEM talent is a UK problem, has been for many years, is actually an international problem, no country is doing it right. You know, you think that countries like France and Germany, the value of science and engineering, would have STEM graduates coming out of their ears. They have politicians who are STEM qualified. No. They suffer from the same shortages, the same downturns. So what is it that's driving people away, not to follow those, those careers? And it does seem that, you know, some of the sort of, the life stereotypes that permeate, you know, at very early ages, in primary school, in, you know, that is influencing people, is influencing people, you know, of all shapes and sizes and colours, away from STEM, but particularly making it unattractive for women to be represented. And I do think that that's, that has been damaging, and will continue to be damaging, and that we don't get that, not just that representation, but that contribution from, you know, all sectors of society into these important technologies.

*It also, it also goes for race, doesn't it?*

Absolutely.

*Not just gender.*

No, absolutely. I am concentrating on gender because actually, racial diversity, certainly at the university, and anecdotally in companies, it is better. Gender is probably the, the single characteristic that is, is most out of kilter. You know, we see

huge numbers of, Indian, Chinese, Asian students who want to come and study tech in the UK, want to do AI and so on, but the gender ratios are still very poor.

*Yes.*

You know. You are right, it's a diversity question overall, and we are very interested in actually how we, how we design AI to be inclusive, not just about, you know, race and ethnic, you know, ethnicity and, and gender, but also, people with different needs, so neurodiversity, people with accessibility problems, and so on, how do we design in, how do we bake in new approaches to developing these technologies that, you know, that represent the entirety of humanity so that we can use these technologies to ensure that they benefit the entirety of humanity?

*I was giving a lecture at the university I used to teach at, and this woman came up to me and said, 'Why are you using red on the board?' You know, the whiteboard. I said, 'Well, it's the only colour I've got I'm afraid that works.' She said, 'I can't read it. I can't read red. And that's why I've got this screen.' And she showed me this screen, and, [laughs], I never knew. Absolutely never knew. It's those things as well that we need to tackle.*
[01:27:31]
*Now, big question. Last one, really. What's the biggest mistake you've made in your career?*

[laughs] Oh how long have we got? I… It's interesting. There's a couple of points where I think, you know, I ran into problems, and it's because I tried to do the right thing for the people who were working with me, for me, rather than take a hardnosed business decision. So, you know, you asked, can you wield the axe? That kind of question. I, I sort of have the view that, I have failed if need to, to wield the axe, because I haven't got the best out of people, I haven't understood where the company is going, I haven't directed it in the way… So, you know, I haven't built the right team. So I think, you know, the, the biggest, my biggest regret as it were, is, is, not my biggest regret, but the thing that hurts the most, is, is when trying to be decent and run organisations in a decent way doesn't align with the corporate realities, and you end up diverging those. Those are probably… I'm not sure I've explained that

terribly well, but I think, having a humane approach to building businesses, having a, an ethical approach where you, you value the people, you value what they do, and you understand that they are, you know, they have their friends and families and so on, you only need to, to get the best out of them, to get the company to perform the best. And I think putting profit before those people is, is a very corrosive thing to do, and I don't like doing it. I wish in a way I could, because I would have been more successful I think on the corporate front, but in a way I'm glad that I can't, because, I can sleep at night.

[01:29:35]
*But isn't it true… I'm glad you can. But isn't it true, Andrew, that, academia is having to put profit before that process of learning, and that all of this, we are developing a group, not of students who are here to learn, to experience, and to grow, but we are getting them ready for the job market. That's what we are doing. Isn't that really, changing, that relationship? They become customers.*

It is, and I find it fascinating, having spent 30 years in industry, to go back to academia and, and view it as a business, which many of my colleagues don't, because they've never had to, and realise that, you know, most of our income comes from student fees, it comes from accommodation and so on. We are a business. And, you can see the huge disruption that is going to occur to the education system ongoing, the impact of the pandemic, and then, the future impact of online provision. You know, the pandemic has, has enabled online teaching in a way that was probably going to be put off for a few years, maybe a few decades. In a way it's, it's really starting to grow. To see the impact of international university teaching, so the fact that we may not just be competing with universities down the road, we'll be competing with universities in China, India, the US and so on, who will be providing very good degree courses. Having to adapt to corporates who increasingly want their workforce to be trained, you know, to capture workforce at an earlier age, and not necessarily to value graduates for that wider experience, and who want to train them with micro degrees, micro credentials, just enough for them to do their job, for, you know, for this day. You know, a few changes there. And that's before you start looking at the impact of AI on the education system. So, what automated systems may be able to do to supplement education, to, to assist, but also, you know, drive education direction.

There's a huge change coming in the world of university, tertiary education, advanced education.

*And we shall watch it with great interest and hopefully contribute to that shaping, and you certainly are contributing to that shaping. Thank you very much for your contribution, wide-ranging, thoughtful. I expected it was going to be, and it did. Thank you very much Andrew Rogoyski.*

It's been a pleasure. Thank you.

[End of Interview]