



Yorick Wilks

Interviewed by

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5th September 2019

At the

The Reform Club

London, UK

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Archives of IT

(Registered Charity 1164198)

Welcome to the Archives of Information Technology. It's the 5th of September 2019, and we are in London at the Reform Club. I am Elisabetta Mori, an interviewer with Archives of IT. Today I'll be talking to Professor Yorick Wilks. Yorick Alexander Wilks is a British computer scientist who has contributed to a wide range of academic fields, including philosophy, artificial intelligence, computational linguistics, natural language processing, and machine translation. He is Emeritus Professor of Artificial Intelligence at the University of Sheffield, and Visiting Professor of Artificial Intelligence at Gresham College in London, a position created for him. He is a Research Associate at the Oxford Internet Institute, Senior Scientist at the Florida Institute of Human and Machine Cognition, and a member of the Epiphany Philosophers. He is a Fellow of the British Computer Society, and of the Association for Computing Machinery. He is a Fellow of the European Association for Artificial Intelligence, and of the American Association for Artificial Intelligence. In 1997 he led the team that won the Loebner Prize for machine dialogue; in 2008 he got the Zampolli Prize of the European Languages Research Association; and the Lifetime Achievement Award of the Association for Computational Linguistics. In 2009 he got the Lovelace Medal of the British Computer Society for contributions to meaning-based understanding of natural language.

[01:35]

Welcome Yorick. So, we can start with, when and where were you born?

I was born in 1939 in Buckinghamshire. My parents had... My mother had gone out of London because the war was about to start, but we basically lived in London at the time.

Can you describe your father?

Yeah. My father was a, hm, working-class man, a builder and furniture maker. He had spent many years in the Army, in the Guards, but he had managed to be in the Army between the wars, so he didn't have to fight in either World War, which was probably a good idea. And through most, my children, he died when I was young, but throughout the war he built bombers. He worked on wooden planes in north London.

And what about your siblings?

I have a brother, six years younger, who is an accountant, but, now retired.

Can you describe your grandparents?

No, not really. I only knew one of my four grandparents. She was a rather middle-class grandmother, who was a war widow from the First World War. She didn't like me and I didn't like her. So, after my father died she didn't really want me living with her. So, my grandparents really weren't a part of my life.

[02:51]

What was your family life like? Any early memory maybe?

Yes, I mean my early memories are of the Second World War. I'm very much a war baby. I'm careful with leftover food, and put it in the fridge. We were very much a working-class household in north London. My mother was rather middle class, but, the family took its, took its nature from my father who was very much working class, as I said, worked in furniture factories, during the war making bombers, and after the war. And so, yes, it was a classic English working-class childhood of the time.

[03:27]

Did you have any important influences on you in your early life?

Well my father. He, although he was a man who had left school at thirteen or fourteen, and been educated in the Army, he knew the value of education, and, curiously enough, before he died, he died when I was only eleven, but he said to me quite firmly, 'You are going to go to Cambridge.' Now why he said that, and what he thought going to Cambridge meant, I don't know. He was a very intelligent man, but uneducated. But he, he was right, I did as he said.

[03:55]

So what schools did you attend?

Oh, I went to some awful little primary school in north London, which is still there, and, a part of London utterly changed. None of the people, none of the kind of people who lived there then live there now, it's utterly unrecognisable. But after that, I was the only boy from that school who went... We had an exam then called the Eleven Plus, which, if you were intelligent and passed it, you went to a grammar school. And I was the only boy from the school who did. So I went to a grammar school, and that sort of, moved me out of the kind of background I came from and towards a proper education.

And what was your favourite or most successful subject at school?

Oh they were all much the same I think really. I remember, looking back, I got, I asked for prizes like Aristotle's *Metaphysics* and Plato's *Republic*. Which looking back looks the most extraordinary snobbery, the idea of a boy at school wanting Aristotle's *Metaphysics* as a prize, but I did. I don't think I ever read it, you can't really read Aristotle's *Metaphysics*, it's not very readable. I thought it was a very good thing to have.

[04:56]

So which colleges and university did you attend, and what subjects did you study?

Well after, after my father died, my family, my mother and my brother and I, we moved to the West Country, away from London, to Devon. So I went to Torquay Boys' Grammar School. It's still there, there's still a grammar school that survived the attempt to abolish them. And from there I got a scholarship to Cambridge. So I went to Pembroke College, Cambridge, and, I went there to do physics, but on arrival I didn't think, I didn't want to do physics, so I changed to mathematics. And after a year or two of mathematics, I changed to philosophy. So... And after, of course my career has been in artificial intelligence, so in some sense my life has been going down from more difficult subjects to easier ones, all the way, physics, mathematics, philosophy, artificial intelligence. It's been steadily downhill.

And what was your life like in Cambridge?

I was in a college that was almost entirely boys, or men then, from private schools. I was one of the few state school boys. But, that wasn't embarrassing, everybody was very nice to you at Cambridge. I spent much of my time doing theatre and politics. I didn't work very hard as a student. I also wasn't taught very much by anybody. So I was really sort of self-taught. The idea, still surviving, is that you get personal tuition in Oxford and Cambridge colleges, but I assure you in those days it probably wasn't true. There was a woman who was our philosophy tutor for my college, and, she, I'll talk about her again later, because she's important in my life, but she certainly didn't teach me any philosophy. So I didn't work very hard as a student. As I say, I, I became an amateur actor, and I worked a lot in left-wing politics.

[06:35]

So, at this time of your life, what were the important influences you had, and what was your relationship like with your teachers and tutors?

Well, I suppose my influences were largely literary at the time. I mean people like Bertrand Russell and George Bernard Shaw were huge influences. There were, there were intellectual giants in those days. They've gone now. I wasn't that influenced by teachers locally, because as I said, Margaret Masterman, who was the philosophy tutor for my college, she became the most important influence in my life intellectually, and I think we'll talk more about her in a moment, but as a teacher she was terrible. I mean she wasn't all that interested in philosophy, and she didn't know all that much. So for example, I mean, in my last year at Cambridge, the author was Kant, the German philosopher. Margaret didn't know anything about Kant. So, there wasn't actually, she couldn't teach me anything. So really, I was entirely self-taught. I mean, there's nothing wrong with that of course. I mean, you could say all teaching is being self-taught. But, I didn't have those advantages in Cambridge that people think you get, of personal teaching. I did get a lot of other advantages. It's a, it's a great place to start.

[07:41]

What about your PhD?

Well, Margaret Masterman, who as I said was my philosophy tutor as an undergraduate, although she couldn't teach philosophy, she was a highly eccentric person, and the most important influence on me, she ran a small research unit called the Cambridge Language Research Unit, which did research in machine translation, information retrieval, and language and machines. And she ran this. And she was an utterly inspiring person with enormously strong views, on, language machines, religion. She was a charismatic character. She was a, a kind of person who founds religions, she was that kind of force. So she had an enormous effect on me. So, when I graduated, I both registered for a PhD, and I went to work for her. So I had a job working at her research unit, and I registered for a PhD. Because, she made me believe that metaphysics was very important. I already believed that I think, because I had had a prize of [laughs] Aristotle's *Metaphysics*, but, she... Margaret believed that metaphysics was tied up with the nature of language, and she got that from Wittgenstein. She had been a pupil of Wittgenstein's, the great philosopher, and what she had carried away from him was this idea that, metaphysics as strange and bizarre, but whatever it was, it was, a) important, and b) tied up with language and how language works. So she, unlike Wittgenstein, had become a more practical person, and thought that work with computers on language would show you how language worked, and therefore could show you how metaphysics functioned. And that's what I wanted to do my PhD on.

What computers did you use in Cambridge?

Well, I started work on things not connected to my thesis, so, although my thesis was called 'Argument and Metaphysics', I didn't get to working on that for some years. It took me five or six years to do that thesis. And I had to go to America for the computing, and we'll come to that. So the computers that she, Margaret had in this unit were absurdly primitive. Initially all we had was a Hollerith card sorting machine. This is a machine you can't imagine. It looks like a horse on four legs, with a range of slots. It was built by the Americans to sort punch cards for elections. It sorted on the holes in the cards. But a very very ingenious man at this unit called Fred Parker-Rhodes worked out how you could use repeated sortings of cards to do any computing at all. And for people who know what a Turing machine is, that shouldn't be surprising. Very primitive devices can be computers. And Fred Parker-Rhodes

proved that a card sorting machine could be a computer. So I used it to do the syntactic analysis of some sentences using a theory of syntax we believed in the time there, which, nobody believes in any more. But, it was quite extraordinary to use punch cards in that way by repeated sorts, and where they fell in the slots gave you your results.

And who was your PhD supervisor?

Well, it was all very incestuous. Initially I had a New Zealand philosopher called Jonathan Benn, the famous specialist in Kant. But he didn't like me and I didn't like him, so that didn't work. So in the end Margaret, who we've just heard of, who was the director of this unit, she persuaded her husband to take me as a student. Her husband was one of the two philosophy professors at Cambridge. He was the Professor of Moral Philosophy, but he wasn't a moral philosopher, he had just taken that chair. There were only two chairs. He was really a philosopher of science, and a logician. And as a favour to his wife, he took me on as a student. He wasn't interested in my thesis at all, but he became a sort of adviser and protector of me. And, he was a nice man, he just, wasn't interested in what I was doing.

[11:19]

What are the key lessons you learnt from this moment of your life, that maybe you can also attribute to your later success?

Well, in those days, a PhD was something where, you were meant to have an obsessive idea that you wanted to work out. It was thought to be a very solitary thing where you worked out an original idea, and then it could become a book. I did that. It was original. I mean, nobody else I think had done computing of... I did... My thesis, I did computing over metaphysical arguments in America where I went to later as we'll see. No one had done that before. But, that's not what a PhD means now. It's become an industry where, you need a PhD to be in the academic business. You don't expect it to be very original, because you can't be. There's hundreds of thousands of PhD students. So, the very nature of what a PhD is has changed. I was lucky in the sense I was on the end of the old regime where you were expected to be original, and, possibly no one could teach you anything; you had to do it yourself.

[12:21]

What brought you to move to California in 1966?

Well, it's all to do with machines. We had this very primitive machine. Eventually we got a very small real computer called an ICL 1202, which had a revolving drum with 24 tracks and had 1,000 registers on. Well, 1,000 registers now of course is nothing, it's not a, it's not a microscopic fraction of my mobile phone. It's... We could do nothing on that. There was a big, a so-called big machine at the Cambridge Mathematical Laboratory, which became the Computer Laboratory, called Atlas. A big old valve machine. But, a) it wasn't all that big, by today's standards it was ridiculous, but b) you couldn't get at it. I had no entitlement as a student to go and use this machine. So really, in Cambridge in 1963, '64. '65, I had no right to get near any computer of any size. However, the institute where I worked was supported almost entirely on American money, and Margaret, among other extraordinary features of her personality, was her ability to charm American defence contractors into giving, and science contractors, into giving her lots of money. So we ran on these large American grants. So when Rowena Swanson turned up, who was one of the directors of American Air Force research, and she heard that I needed a machine, Rowena Swanson said, 'Oh, come to America,' she said, 'I'll give you a machine. I'll give you a contract.' So, she promptly gave me an Air Force contract for a year. I moved to Los Angeles, and was able to use the IBM 360 machines at Systems Development Corporation. I didn't work for Systems Development Corporation. Rowena Swanson had given me a one-man contract, essentially to myself, nominally to an Institute for Formal Studies, but that meant nothing. The Institute for Formal Studies was a phone answering service, run by a man... Well, it was a phone answering service, it was women, all women in those days, answering phones. But the Institute for Formal Studies was a, a notepaper of E Mark Gold, who was the son of the great Gold Gyms inventor in America, which some of your people may have heard have. But, Gold was a mathematical genius who had set up his own company, got money from the Air Force, and he agreed to take me on as somebody who he would funnel money to.

And then you moved back to the UK, after one year?

Yah. Well I... No, not after one year. I stayed on. This was the era of Los Angeles being the centre of sex, drugs and rock 'n' roll, so, I had no urge to leave. Things, people were wearing wonderful clothes, sitting in parks, carrying flowers, taking drugs. I mean, I was doing all those things, because I was also working and writing books, but they didn't know what. They thought I was just sitting in parks wearing military clothes and, and singing. But it was such a wonderful time. I had no urge to leave. So even when the Air Force money ran out, I didn't leave. I went and worked in television, and, got onto a TV show as a small part comedian. Because I had done a lot of acting in college. So I got on a TV show as a small part comedian. So I supported myself on television for another two years while I wrote my... I finished my thesis really, and turned it into a book.

[15:34]

And then you moved back to Cambridge?

Then I moved back. Yes, moved back, put in my thesis in '68.

And so you were still at the Cambridge Language Research Unit at the time?

Yes. I was attached there, although I wasn't really working there any more, I was, frankly I was preparing to go back to America, because, America seemed more fun at that time than... California certainly seemed more fun than being in Cambridge.

So, about the Cambridge Lab. Do you remember Roger Needham and Karen Spärck Jones?

Oh very much so. They were key people there. Roger became a professor in the computing lab in Cambridge, and Pro-Vice-Chancellor of the university. He became essentially the senior computer scientist in Britain with political influence, and he was a very impressive man. His wife, Karen Spärck Jones, who was a PhD student about the same time as me, she did some of the most original work. She, for various personal reasons, moved also to the Computer Lab, but the man who ran it, called

Wilkes, no relation of mine, he hated artificial intelligence. So, she had to disguise her work as something else. She was actually doing very original work. She was doing some of the first work in the world on statistical clumping of semantic terms to make semantic groupings empirically. Some of the most original work. That's a common thing to do now, but when she did that in the early Sixties, mid-Sixties, utterly original. And, she had to disguise it as information retrieval. So she became very famous in the world of information retrieval. She invented the key measure of information retrieval significance, which is really her, one, she's one of two or three people who created it. So she, like Roger, moved into the university from this little lab, but they certainly started in Margaret's lab, and were much influenced by her. Then they both became very influential figures in computing, and Karen in artificial intelligence, and information retrieval.

[17:32]

And, what about Epiphany Philosophers?

Well, Margaret was not only a sort of intellectual genius. She wasn't at all a formal, a formal person. She loved mathematics, which her husband was very good at, he was a logician. Margaret believed in mathematics, but didn't know any. And... But she firmly believed that there were mathematical structures to be discovered. So it's quite extraordinary, looking back, that she had such influence, because, she had no formal powers; she just had enormous intuition as to how things should be. But as well as being that kind of, I would say genius, Margaret was in some sense a genius, she was also a religious genius. She believed that science and religion were intimately connected, and it was a complex relationship that probably isn't relevant here, but scientific insight she believed was a, a form of religious, or spiritual, or mental insight. There's various things in the history of science that support this. I mean, people in science who had visions, visions of scientific structures. So she founded, with lots of other scientists, and her husband, a thing called the Epiphany Philosophers, which were to have very high-level intellectual discussions, dialogues. They were on the radio quite a bit in those days. In those days we had intellectual radio where you could have dialogues between people on philosophy and religion, and they published things. And I got sucked into that. And the interesting thing was that, half the Cambridge Language Research Unit were in the Epiphany Philosophers and

half weren't. And Needham and Spärck Jones who we talked about very much weren't. One of the reasons they wanted to go to the university was that, they didn't like the science and religion aspects of Margaret. And Margaret's personality was, fairly overpowering. So, some people wanted to escape from it.

[19:15]

And so, it's the end of the Sixties, and you moved back to the US, and you went to Stanford.

Yup. I moved back to the US, and, by sheer chance I ended up in the Stanford Artificial Intelligence Laboratory run by John McCarthy, which was exactly the place to be at the time. If you couldn't be in MIT, you should be in the Stanford AI Lab, if you wanted to be in AI. I mean AI was a very small thing then. I mean, in London, all the people in Britain working in artificial intelligence could get into one room. I mean I had been in that room with them in the Sixties. I know how small it was. Some of them are still alive. But in California, in America it was bigger of course, bigger country, but also, more people doing it. And so Stanford AI Lab was one of the centres, and, at that time, we're talking the end of the Sixties, so many of the things we now take for granted were actually going on in the Stanford AI Lab under this man called John McCarthy, who was another genius I feel I've been close to.

Can you describe him?

John? He was slightly autistic. I, I use that word loosely, in the sense, he didn't like talking to people much. Nothing wrong with that. So people who were near him thought he was ignoring them, or, blanking them out, but he wasn't, he just didn't want to talk to people. Half Jewish, half Irish. He invented the great programming language called Lisp, which drove artificial intelligence for decades. He made logic as acceptable as a basis for reasoning and thought as anybody ever has. And he ran this amazing lab on American defence money, which, where people did anything they wanted. And, there at the time there was the, the people doing robotic arms, which, that robotic arm, the Scheinman arm, became the source of all car companies in the world now, which make cars with robots, you know. Extraordinary things going on. And, I was there, trying to develop my thesis, away from the metaphysics, into what

had been the core of it, which was semantic representation of language, I was trying to turn that into a machine translation project.

Can you describe a little bit more what you did in Stanford?

Well, the idea behind my thesis, which in the thesis was developed into an idea of what metaphysical argument was about, I thought metaphysical argument, it wasn't my idea, I got it from a man called Bosanquet in English philosophy, that metaphysical argument is not about logic; it's about the meanings of words, and how the metaphysician persuades you that words have changed their meanings. Spinoza famously persuaded a generation that God could mean nature. Things like that. So they use words and turn their meaning. So, for me, metaphysics was a kind of, gigantic metaphorical exercise. And so I wanted a computer program that would analyse the meanings of texts, philosophy texts, and would grasp the senses of words and see how they shifted. So, when I went to Stanford, I dropped the metaphysics as it were, dropped the philosophy, and used it as a, as a program to analyse texts and get a meaning structure from them, which once you had got it, you could then translate into another language. So the actual published work at Stanford was mostly an English-French machine translation system, working through semantic structures. Nowadays that's not thought to be the way to do machine translation. But in those days it did look like one way you could do it.

[22:37]

Another personal question now. Are you married?

Yup.

Can you tell us about...

I'm married to a Pittsburger called Roberta. We have two daughters, of, 30, who's an emergency room doctor; 24, Zoe, who's a, becoming a psychologist. We live in Oxford. I was married for 20 years before that to a, a Cuban American, born in Havana, and we had two children, a son who's now 43, a daughter who's 31. And, before that I was married to a contemporary of mine from Cambridge, who became a

doctor also, and went out to Africa I'm afraid and caught a disease through a patient and died when she was 30. That was awful at the time, but it's 50 years ago now, so... You can't think of the past as sad, because, if it hadn't happened you wouldn't have married the other people and had the children. So, you can't regret the past.

[23:29]

In 1974 you moved back to Europe, and you became a research associate at the Institute for Semantic and Cognitive Studies in Lugano in Switzerland. What are the memories of the time?

Oh wonderful time. Wonderful. We, we lived in a... That institute was in a villa which had belonged to a ballerina on the shores of Lake Lugano. Lugano is the Italian-speaking province of Switzerland where, as it were, you have all the advantages of being in Italy and all the advantages of being in Switzerland, you know. In those days, that was serious, because Swiss money was more serious than Italian money, not, not so much now. But... So it was a fascinating time to be in Lugano. Lugano had 30 banks, in a small town. And... But living in a villa on the edge of a lake with gates that opened so that our director's boat could go out of the villa into the middle of the lake, this was splendid. I had an office with its own bathroom looking out over the lake. It'll never be as good again, it was perfect. And we had a good team of, mostly Americans and Brits. Very few, very few other Europeans, very few Swiss. It was basically an American-British... It was funded by an Italian, I can't say millionaire because it was lira then, so, millions meant nothing, he was called Dalle Molle. He invented Cynar, the drink, out of burned artichokes, in his mother's kitchen. And with this money he founded a whole range of institutes, which still survive. He's long dead. He lived in Stra, and gave banquets on gold plates. And, he founded three institutes in Switzerland, three institutes in Italy, and, he was wonderful. He didn't interfere in what you did. But the institute in Switzerland, the *Istituto per gli Studi Semantici e Cognitivi*, the point of it was to invent the universal language, which he believed in. He believed there could be a universal language of reasoning. An old dream going back to Leibnitz and the great philosophers. And our director, who was a Swiss German, he kept the rich man happy by claiming to invent this language. But he wasn't really. He was directing an institute that was doing artificial intelligence. And we were having a good time, and I

developed some of my ideas there, away from meaning representation, and more towards, belief structures. I became interested in belief, and, what it is to believe, and what human belief models are, and how we detect what other people believe, and things like that.

[25:52]

So, in 1975 you went back to the UK, first to Edinburgh, and then to Colchester. What can you tell us about...?

I left Switzerland. I mean, many people didn't leave. The institute moved from Lugano to Geneva, for reasons we didn't understand. It was all to do with the politics of Ticino, and should there be an Italian university in Ticino or not? There is now. But then, it wasn't clear, and he wanted his institute to be, Dolle Molle, wanted his institute to be the core of the Italian University of Ticino, and it was all political struggles inside the Italian-Swiss community. So in the end Dalle Molle said, 'Forget it,' and moved to Geneva. So he moved his institute. It became the *Institut des Études Sémantiques et Cognitives*, of course. In French. And he moved to Geneva. And I didn't want to go to Geneva. I didn't want to go. I left. Because, Geneva was a city against which I had prejudices. It was the city of Calvin, the city of extreme parasitism. Not true now. But I just had this deep prejudice against Geneva. One of my daughters was born in Geneva later, so we came back. But... So I left and went to Edinburgh, on a sort of fellowship for a year, which was good. I did some good work there on, I think good work on developing belief models, and with a Polish scholar in Warsaw. And...

[27:10]

But I wanted to stay in Britain after that, and wanted a real job. And, I'd never had a proper university job. I had always had research jobs. And I was already, bop-bop-bop, I don't know, I was getting on by then, I was, 35, 36, 37. I thought it was time to have a real job. So I took a readership in language and linguistics in the University of Essex, became Professor the year later. So I became Professor of Linguistics there. You may say linguistics, what did you know about linguistics? Well the answer is, not much. I read a book on introduction to linguistics on the train on the way to the job interview. But, there wasn't a very big gap between what I was doing and computation-, and linguistics. So I had got my first university job, readership and

then chair of linguistics, Chair of Theoretical Linguistics I think it was called, at Essex. And Essex was a very interesting university in those days. It was a very small university. It's still small. It was one of the... Very few faculties. Had been quite revolutionary in the sort of political days of universities, revolutionary architecture, based on, I think it was based on, Lord, Lukau, San Gimignano. It had these towers, and *piazze*. Piazza storre. They had this idea of an Italian, sort of hill town, or something. So... I liked it. I mean, Essex is a very good university, still is. And the language and linguistics department was huge, it encompassed all kinds of stuff. We taught languages, we taught applied linguistics to people who wanted to be language teachers. But we had a good core of people doing theoretical linguistics, which is very close to artificial intelligence.

How many languages do you speak?

Oh. I... Speak several European languages badly, French, German, Italian, Spanish. I used to speak Swahili and Japanese, but I can't any more, because, I've forgotten. [laughs] Facebook is very good for languages. Every day I have to read Italian, French, Spanish and German, and, people complain about Facebook, but, if I didn't have Facebook I wouldn't be reading these languages every day.

[29:09]

So, can you tell us about the Eurotra machine translation system?

Yes. This was a European project funded by the Commission. The discussions to found Eurotra started about '77. It was called the Leibnitz Group. It was a group of academics and researchers in the major European, well, many European countries, I think about, eight countries, because the Commission needed a machine translation system. And they were using the big American system called SYSTRAN, which was the only big available machine translation system in the world. And, they needed it because the volume of translations inside the Commission is so great, it was greater really than they could find humans for, particularly to translate between the major languages of French, German and English. And they were using SYSTRAN, which they didn't like. Well they didn't like it largely because it was America. And it wasn't all that good. It wasn't bad. SYSTRAN wasn't bad actually, looking back. It

had been going for years. It was an old system invented by American defence, patched up for... It was done originally for Russian. It was so as to read Russian scientific theses in the Cold War, so American scientists could read Russian science without reading Russian. And it was very good at that, it was very good at Russian. And the American scientists could read a Russian thesis, translated by machine. It wasn't perfect, but they could understand it. So then SYSTRAN was adapted to be more commercial and moved to French, and then eventually other European languages. And the Commission bought it. And they weren't happy with it, as I say, because it was foreign. So they said, 'Let's put lots of money into a European system. Surely we can do better. We're Europeans, we know languages, we can beat the Americans.' It was a pure dream, let me tell you. But they spent 70 million, dollars or euros, whatever you want to call them, on it, and it was a complete failure, but it was very interesting. And, the good thing about Eurotra was, it served to create a very large group of trained people in the European countries on computational linguistics. As a technical device, it was absurd. For 70 million, euros, they were called EUCs then, they got about 26 sentences translated. That was absurd. But we had a wonderful time. The British had control of the software, but the French had control of the theory. They wanted *pilotage*, as they always do. And, they had the wrong theory. They had, simply had the wrong theory. And we couldn't change it. And it was badly run, and, the man who was the Commission officer in charge of it all was an extraordinary character called Serge Perschke. Serge Perschke was a German-speaking Russian, who had come from the Soviet Union, lived in Italy with an Italian wife. Spoke no languages, spoke ten languages but none of them perfectly. And Serge was a wonderful man, but he was a very bad manager. And, the system was organised by a committee in Geneva. It was organised back at the old institute. I had... Because a woman called Maggie King, who should come into the story somewhere, Maggie King came out to Lugano from Manchester to be my research assistant. When we all left, Maggie] became a director of the institute. So when it was in Geneva she was the rector. And she became the chair of the committee running Eurotra. Serge Perschke was the Commission officer, the, the man who sort of controlled the money and the direction. Maggie chaired the scientific committee. But it was a complete failure, but we all had a wonderful time. It ran on for years. I think I can safely say it was complete waste of 70 million euros, except that, as I say,

it did train a lot of personnel, and created a community in Europe of computational linguistics, people who could talk to each other.

Can you name some of your colleagues?

Lordy. Yes. Well, Christane Wati in France was one of the principals. The most senior Frenchman was called Bernard Vauquois, professor in Grenoble. Bernard's dead now. Christiane isn't. Bernard had an interesting theory of syntax and semantics, which he managed to make us all accept, but... So his influence in that sense was bad, but he was a very interesting man, and, highly intellectual. The model for the whole thing was quite good. It was like a sort of European rocket with different stages where the rocket drops off. So we had different sort of, software phases, which were independent. I mean, in that sense it had a good modular design; it's just, the theory was wrong and didn't do much translation. Other people? Lord. I mean... Dieter Maas was one of the most senior Germans. He helped to found a big unit in Germany which still survives. Zonderfortunsbereikundert, which in Saarbrücken, is still, was until recently at least, a major force in German computational linguistics. In Italy, there was a major figure called Antonio Zampolli, in Pisa. And Antonio, over the years, through his association with the Commission, became essentially the, the leader of European computational linguistics. He was the *capo dei tutti capi*. He was an amazing man. He's now dead, he died in a tragic fire when his collection of jazz records caught fire, and burnt him to death in a room. His wife opened the door, saw the room was burning, closed the door again, which was intelligent, because otherwise it would have destroyed the house, but it meant that Antonio, who had become slightly demented by then, was closed in the room with hundreds of burning vinyl records. The newspapers described him as '*completamente carbonizado*', which, I mean our newspapers wouldn't say that, but he was. And, it was a tragic, tragic death. He was an extraordinarily influential man. He in some ways controlled the flow of – not control, it's too strong. He was the biggest influence on the flow of funds from the Commission to computational linguistics throughout Europe. So you had to be Antonio's friend, which was OK, I mean we, we got on very well. He was a great man, and I'm sorry, you know, it's awful it's dead. Nicoletta Calzolari still runs the Pisa institute, who was his second professor, and she is still, she is still a major figure in Italian computational linguistics.

[35:23]

So, yes, there are still Eurotra people around. And, when we get together we all agree Eurotra was a failure, but it was a sort of grand failure in a way. What it showed was that, I'm afraid, that the American method of doing things was simply better. I mean, one of the deep mysteries in Europe is, you know this story, everyone knows this who hears this, why Europe has no big software companies that can rival Apple, Facebook, Amazon, Microsoft. Why is that? Why is that? Why can we not create one? Every time we create one, the Americans buy it. But we can't do it, there's nothing in Europe as influential, and, powerful, and... The Chinese have got them, in Baidu. But we can't do it. And Eurotra in a way is a, is almost a microcosm of that. It's a failure in design execution. Although it had so much expertise, and yet the big American machine translation companies went on and took over the world. It's a... It's a great mystery.

[36:19]

After Eurotra, in 1985 you moved back to the US. So what brought you to New Mexico?

Yes. I had... In Essex, I moved from the linguistics department to the computer science department, because... Eurotra of course wouldn't go on forever, and I could see it was going to fail. I think, and if I'm honest, one of the reasons I moved back to America was, I didn't want to be part of a crash when it crashed. I didn't feel responsible. We had fought hard against the French design and we had lost. I don't mean we would have done better necessarily, but, we would have it differently. We would have used more American techniques. It's like a model of Brexit now I'm afraid, we were, again, siding with American techniques against the French. I didn't want to be caught there when it came down. Also, I found that being in the linguistics department was not good for getting government grants into artificial intelligence. So I moved to the computer science department. But after that, my then wife, the Cuban, she was getting a bit bored with the English climate, and we saw this amazing job ad for the director of an artificial intelligence laboratory in New Mexico, a new laboratory, founded with state funding, in a city in the south of New Mexico called Las Cruces, and, we moved to southern New Mexico, yah, with a child and dog. And, it was a curious town. Because, New Mexico is the size of France, almost exactly,

almost exactly, but has one million people, as opposed to 65 million people. So it's pretty empty. But all the action is in the north of the state, in Albuquerque and Santa Fe, Taos, these are the places that people have heard of. But we were in the south of the state, right down near the Mexican border, so there was less action down there. But they founded this... They gave these five million dollars to found an artificial intelligence lab. So, that's what I did.

What was your life like then?

It was great. I mean, it's... New Mexico is a wonderful place. Were I ever to move back to the States, I would go there. The climate is, 300 days a year of laser-like sun, one day of snow a year, vast cacti, huge spaces, mountains, desert. So you build your house, you build your house on an acre of desert. And the laboratory was really quite successful. I mean we had got a, some good people, we got some good grants, we did some really good work. It, it's died now. After I left a friend of mine took it over but it died, because, due to various changes in American funding, which are complicated. [38:57]

But while I was the director for, oh, eight years, we got an enormous amount of money from the Government, and some from industry, and I think we did some good work. We helped to found a new technology, which is now commonplace, called information extraction, which is interesting in itself. I've been the proponent, through my thesis and my research life, of deep analysis of language by computer, but suddenly the wind changed, and, we realised that that wasn't producing the results we hoped for, and that maybe there was more to be got by a more superficial skimming of language, skimming stuff off the surface, just lifting things from the surface of language, for certain limited purposes. And that was a technology which DARPA, the American funding agency, helped to fund. We got one of the earliest grants in New Mexico. And we produced one of the first successful information extraction programs. And it works. I'm afraid, for limited purposes, you can get a great deal off language with a machine, without deep analysis. And that went against all I had believed. So, as always, like politics, you have to sort of, adjust your beliefs to what is actually happening. And you realise, although you need deep analysis for some things, a lot of our understanding is quite superficial. If you stand in a cocktail party, listening to people, you don't usually need deep analysis to know what they're saying.

You sort of, know what they're saying anyway, because, they usually say the same thing. You know what this person's going to say. You're only half listening in the cocktail party because of the noise. You can get almost all you need from quite simple, listening while you're looking for the next person to talk to.

[40:39]

In 1993 you moved back to the UK. Why?

Why did we do that? I had a messy divorce, and... Yes. And, I didn't want to stay in a town where I had had a messy divorce. And... So my son and I moved back. I had also fallen in love with somebody else, with whom I had another child. And, so, yes, I thought going back to Britain was probably the right thing to do. Which is what I... So I moved back with my son, and... Yes.

And you went to the University of Sheffield.

Yes. And I was then in Sheffield for, nearly ten years. And founded a, a new group. There again, the same old stuff. You get into a rut. We always do the same thing. Well we don't always do the same thing. It is the same area. All academics really work in the same area, unless they're very remarkable. I moved into other things. I... The main thing I did in Sheffield... And it's, the Sheffield group, I have to say, which I left of course some years ago now, I wanted to go to Oxford, but, the Sheffield group is still the biggest and most influential group in language processing in Britain. And they're all my colleagues and students, my students are all professors now. You know, we had like, I think, I was the Professor of Computational Linguistics, but I think now there are six professors of computational linguistics, all of them my students or colleagues. And, what we did was, we set up a software platform which anybody could download, and do their own language understanding. That was called GATE, and the Government here funded it, and with Rob Gaizauskas and Hamish Cunningham we three set up GATE. And that has been amazingly successful. It now has its own tutorials, it's been downloaded thousands and thousands of times. It's quite complex, but it enables any laboratory, any person if they have the time, to do computational linguistics on texts, and it embodies all kinds of functionalities, and, different modules. I mean, modularity in a platform, it's the

classic model, but, we are, we were one of the first to do a, a modular platform that anybody could use for nothing. And that was... I know... But the core of it was information extraction, which I had started in New Mexico. So we sort of, honed and honed information extraction, and that still remains at the core of it, yes.

[42:59]

Can you name some of your students you are particularly proud of?

Oh gosh. Well I... The... My student who has now risen to eminence there is Kalina Bontcheva, who is a Bulgarian. She, she arrived in this country from communist Bulgaria speaking and writing perfect English, [laughs] much better English than most of my English students. And she's now a research professor there, and she, she has become a great name in language understanding and language processing generally. She did a wonderful thesis on a museum guide that talked to you, and adjusted what it said to how much it thought you knew about the museum. So if you knew lots of stuff, it wouldn't tell you all the boring things; if it didn't think you knew anything, it would tell you some of the boring things. So, that, but that's long ago now and she's been there for, woo, I guess she's been there, more than 20 years, and has children and a husband. And so, yes Kalina was extraordinary. I mean, a whole range of people. It's unfair to name people, because there are so many of them. I mean... I can't always remember at this stage if they were my students or my colleagues, because, those two categories blur in my mind, but, there's a solid core team of about ten people there. The academics are Rob Gaizauskas, Mark Hepple, Mark Stevenson, Diana Maynard. These have all become very eminent people in language processing.

[44:18]

When you were at the University of Sheffield, in 1997 you led the team that got the Loebner Prize for machine dialogue.

Yes. This was another thing I was doing in parallel with what I just talked about. I had spent quite a number of years working on belief systems and how humans in order to communicate have to have a model of the beliefs of the other person. Which led to a theory of dialogue, but again, quite deep, complex theory, which was very

hard to implement in computers because it required so much complexity and power. So just as I mentioned before, I shifted from a deep theory of senses to a more superficial theory, I then did the same move for dialogue, and realised that you could probably model human dialogue with more superficial methods than these belief models. Although, I still know that, for deep understanding of other people, you need to have a model of them. To understand somebody well, what they're saying, I have to have a model of what they believe. But for a lot of superficial dialogue, that's not necessary. The cocktail party theory again. So, it's important that out there, I knew this, was a competition run every year in New York, the Loebner competition. Loebner was an American millionaire who had given a lot of money... He became interested in the Turing test, the so-called test of whether a machine's intelligent, whether it's, not conscious, but whether it can think, and... This is a complicated, semi-philosophical issue to do with Turing. But, what that's come to mean is, a test as to whether you can have a dialogue with something and know and guess, decide, whether it's a machine or a person. And so Loebner helped with others to design the Loebner test essentially, which is where journalists talk to a range of laptops, machines, and decide, behind each one, is there a person or a machine? And every year this competition went on, and the machines got better. They never actually beat the people, but they got closer to them. Very occasionally one machine program was better than the stupidest person, so, you know, getting better. And the prize wasn't big, it was a few thousand dollars.

[46:32]

And, an English chess master called David Levy, he has become a significant person in my life, and a very good friend, David Levy was a chess Master, a Grandmaster, Scottish Grandmaster in chess. He spent his life making chess machines. He wrote 30 chess books. Suddenly in middle age he became interested in dialogue, and he wanted to win the Loebner Prize. So he came to Sheffield and said, 'If I gave you guys money, from a grant, could you pull a team together and win the Loebner Prize, a dialogue system?' And we said, 'Yes, sure, we'll do that.' So we did. And in New York, in '98 I think, I hope it was '98, or '97...

'97.

Thank you. Thank you. Because it's bad when you can't remember. We created this system called Catherine. Catherine was an English journalist. We made her female, because that's fashionable. We made her British because, if she made any mistakes in New York, they might think it's because she was British. And, the Catherine program won, and, as always with these dialogue systems, it's not a cheat, I wouldn't say the word cheat, but there are tricks. For example, you make sure that the machine puts up the typing slowly. It doesn't suddenly appear. If it all suddenly appeared, people would know it's a machine, ka-boom! There's 1,000 words, boom! So, no no, it... And it makes spelling mistakes, like people do, you know, oh! And, we did all those tricks. And the other trick we did, which was convincing for the jury, the journalists, was that we programmed it the night before with what had been on the news, and what had been on the news was, that Bill Clinton, the President, had met Ellen DeGeneres, the lesbian actress, and talked to her, and it was a, a first, because here's a president talking to a lesbian actress, you know. Well, if that's your idea of news, you know. So we got that in. We got that into the dialogue. So we thought this was convincing, because, the journalists probably, testing us, probably wouldn't think we could have last night's news in discussion that morning. We had to move very quickly. Which is a bit of a cheat. But it worked. And she was a pretty good conversationalist, Catherine. And it wasn't just super- I, I was not quite right, what I said earlier. I said it was all superficial. It wasn't. There were some... It was the biggest Loebner program they'd ever loaded. It was full of dictionaries, and thesauri, and it had a lot of knowledge of things. So it wasn't superficial really. I mean, Catherine knew a lot of things, and she remembered what you had said. And if you, you know, you went back, or changed your mind, or said something, she spotted this. So, Catherine was really quite a good conversationalist. And Levy won the prize. So it was good.

[49:15]

In 2003 you moved to the Oxford Internet Institute, where you managed another large-scale EU project called Companions. So can you tell the audience more about Companions and your role in the project?

Yah. Companions has been my last big project really. What I've been doing since then I think has been much less significant. Companions I think was a very good

project. It was a very very big EU project that I had got, European Commission project that I got when I was at Sheffield. It involved about twelve sites, it... Oh, it cost about, fifteen million euros. It was a big project. A lot of money to spend. And, whether or not we delivered enough for that, it's not for me to judge. It came out of the Loebner work. I got interested in dialogue from the Loebner project, and I wanted to go on with machine dialogue. But I, I wanted more than dialogue. I had... I... It sounds obvious now, because, what I'm about to say is now in a sense common sense, because we live in the world of Siri and Alexa and Cortana, which are commercial projects, products which listen to you in your house, in your bedroom, in your hotel. We know that. But 20 years ago, in the late Nineties, this was not common talk. And, so I began to write about the idea that, what we needed were computer companions that had dialogue, but it was more than dialogue. They, they would know about us and be our personal companion. So the motivation of the original EU project was to be company for old people. Lonely old people, living alone, no one to talk to. They'd rather have a computer to talk to than nothing. And that's true. The standards are very low. If people are lonely enough they will talk to anything. The Tamagotchi eggs proved that, they'll play with little stupid things, you know. So, anything that talked at all. And experiments have shown this. So the standards are low. And we wanted a good conversationalist in Companions that would talk to people, know about them, be their companion. It's personal. It wouldn't be owned by the State or a company. Your data will be safe with it. It wouldn't just give you company, but ideally of course it would do all the things they do now, call the restaurant, order food, call the taxi. It would, in a dream world it would deal with forms for you. You know, people aren't very good at dealing at the Internet, they can't manage their tax forms. If you had the right companion, it could manage your tax forms for you, you know. I, I'm, I'm obsessed with this idea that, the Government is driving us all to use the Internet, but the bottom ten per cent of the population can't use the Internet. They're either not literate, or they just can't do it. Or they don't want to. If they had the right companion they could talk to, that person could fill in their forms for them, fill in their welfare forms, whatever they need. And so that was the Companions project .

[52:03]

The trouble was, and this was my downfall with the Commission, the whole project became riven with politics, in some way I don't now understand, and, it's probably not appropriate to talk about, I crossed somebody in the Commission, a senior person,

and, they took the project off me. And, that was one of the reasons I moved to Oxford, to start again. Not because... Well, yes, literally, I mean, the trouble was, having crossed this person at the Commission, the Commission insisted that I be removed from the Sheffield project, and really, that meant I had to be removed from Sheffield. And, it was a very ugly business. I mean it was extraordinary actually, looking back, extraordinary. I mean, the Commission began to make accusations that I was employing someone in Malta who had another job, and... It was all nonsense. I mean we've documents showing that, he, he was a perfectly appropriate person. He then became the mayor of the capital of Malta, so you know, he was a perfectly respectable person. He was a programmer for us and so on. But I had crossed someone on the Commission, he was an Italian actually, but that's irrelevant. And he fell out with quite a lot of people, but he sure fell out with me. And, he fell out with the head of the German AI lab as well, but that man was able to get enough backing from the German government that they couldn't get rid of him. But I didn't have the backing. Because, the Commission official threatened the university. He threatened the university that, if they didn't get rid of me, he would audit the project, where audit meant a kind of punishing audit, to try and find mistakes and things. There are mistakes of course, but you can't cheat on Commission money, you can't... Universities handle the money. And he threatened the university. So, the university, like all our universities, are cowards, they were frightened. They were frightened. And I can remember the Australian dean, we had an Australian dean in Sheffield, he said, 'I don't want some bloody Commission official telling *me* what to do.' But he did, he did as he was told. It's very like the Brexit debate now. I mean, he was told what to do by the Commission, and he did it. And, I, I didn't lose personally. I mean the university paid me lots of money. But, I lost the project. And, I still feel cross about it. It's actually, it's probably the source of my political views on Brexit actually, that I don't trust the Commission, and I think they're corrupt, and, dangerous. But anyway, that's another story. Not part of this.

[54:26]

But... So I moved to Oxford. And they gave me a... I went to Oxford on sabbatical, but it tied up with losing Companions, and it was convenient. So there... I then began to think, when I was there... The Internet Institute's an interesting outfit. They're not a computer outfit. They're basically a sociology, law, politics outfit. But they've become more and more technical, more and more computing. So, I helped, I

was still active enough in those days, to help their transition from a sort of, social science outfit, into something with more computer backbone. I was still a, sort of, officially a computer scientist then. And, so I began to write lots of, I wrote lots of fun papers, with titles like ‘Death and the Internet’, and, the idea that, you know, properly understood, your companion could become your substitute after death. If it knew all about you and you died, your relatives, if your relatives could talk to your companion, they’d find out more about you than talking to you. I mean after all, maybe you never... Maybe I never asked my mother where she met my father. I didn’t. I don’t know. But, had my mother had a computer companion in old age, she might have talked to it and told it. So if I could talk to my mother’s companion after she was dead, I might have found out all kinds of things about her. So, I, I had in my mind the things you see on Italian gravestones, which we don’t have here. You know you have those pictures on gravestones? And some of them I’ve even seen on little videos driven by solar panels. I’ve seen a gravestone in Italy with a tiny solar panel where you can press a button, and the person talks to you on the gravestone. And I thought... And they’re called Vidstones now, in English. I thought, what a brilliant idea. I thought, your companion, if it survived your death, which it would, computers don’t die, you could talk to the companion afterwards, and you would have the person back. And now, with fake, fake video, of course you can talk to dead people. Talking to dead people’s going to become normal. And if they were programmed with sufficient dialogue and sufficient knowledge of your life, you could go on talking to your relatives forever. I mean this is, I think this is quite fun. Some people think this is terrible, terrible, terrible. Anyway, so that’s the kind of thing I began to write about at the institute.

[56:38]

And do you think that artificial companions have also issues?

Well of course. I mean, this has become clear, because history has rolled forward like a great wave, and now Alexa, Siri, I laughed at them when they came out, because when they came out... Alexa came out in – no, Siri, came out I think in 2010, 2011. It was significant for me, because, I had moved to Florida by then, and, I couldn’t work in Oxford after 70, Oxford’s very strong about 70, bang, you’re finished, so I took this job in Florida. And, we had almost got this contract with a gigantic car

software company in Indiana. They... We said, 'You could have a companion in a car.' That sounds obvious now, but in 2010 that was a good thing to say. 'You could have this companion in the car you could talk to. You could talk to your car.' So I've got a car where I, even now, it's so complex, I'm not sure sometimes how to open the doors. If I could talk to the car, and say, 'How the hell do I open the doors?' it would tell me. Or, 'Open the doors.' You know. It's got a key thing I can't use properly. And we almost clinched the deal, and that was the month that Siri came out. And these people in the car thing said, 'Oh well we don't need you any more. We can have Siri now.' Now, that was absurd then. Siri was very primitive. Siri came out of a DARPA grant in California. But Siri has come a long way in nine years, and you probably know now that, in America hotel chains, I'm answering your point about problems, hotel chains are installing Alexa and Siri in hotel rooms, that guests can talk to instead of talking to a concierge. So for room service, luggage. But, we know now that Alexa is listening to their conversations. So they're having conversations in bed, and Alexa is listening. And they're using these conversations. They are. And, well, we all know now from reading the papers, it really is, we're on the edge of a form of 1984. I don't mean that in a frightening way, because it's not very frightening, but it's not nice. And I think we're going to have to have more serious laws. I mean Germany I think is in the front of laws for this, because, for good reason Germany is more sensitive to state danger than most of us. In this country we don't care about state danger. We don't really think the State's dangerous here. Americans do and Germans do, but we don't. But we may have to, because, if the State controlled Alexa, and had access to Alexa... And we know what's happening in China. China is the test case of where the Government is going to control Alexas in rooms, and the Chinese state will know what everyone's saying. Weeeee! So, to answer your question, yes there are problems.

[59:20]

In 2010 you founded a new AI group, to research on metaphor, cybersecurity and belief, and emotional propagation in groups, in Florida, at the Institute for Human Machine Cognition. Would you like to discuss more about this?

Yes. I, I moved to Florida at 70, which is a bit old to start, but, Oxford wouldn't employ me after 70. They have a very... Oxford and Cambridge have stood out from

all other universities in this country by not employing people after the retirement age. Other universities will. Oxford won't; even if you raise your own money, they won't. So I looked for a job in America. And I, I was reduced to writing round to my friends saying, 'Can you give me a job?' And at 70, that's a difficult thing to do. But fortunately, I found this amazing... Well, I had a number of offers, one of which was a sort of, secret job with the NSA, which I didn't want. But... I didn't want a secret job. I'm not an American citizen anyway. Although they said that wouldn't be a problem. But I found this job with the Florida Institute, which is in fact the best institute in America for robotics. Not what I do, but that's how they get lots and lots of money in to Florida for robotics. And it's run by a man called Ken Ford, who is a most remarkable man. He's one of the characters late in life I've discovered, younger than me of course, who's a remarkable influential man. He's on the, he was the chair of the NASA board, and, spends a day a week in Washington. He's managed to survive all the President's, still in this senior position of, scientific advice, not the Trump business scientific advice, but... Ken is an amazing man. And Kenneth founded this institute in Florida, which has managed to attract some of the best artificial intelligence talent. I mean, Pat Hayes, who is possibly, the most interesting older person in British AI works there. And so on. And it's in a boring part of Florida. Florida's a boring place, and it's in a boring part of Florida. But, that doesn't matter, but, at a certain point you don't care how boring things are. And Ken bought the public library, put a million dollars into the public library and made it into a beautiful place, with, you know, put little sort of, Tuscan huts into this space, in this great open public library, and, every office has its own air-conditioning, and... And he offered me the job here in the Reform Club where we're sitting. We had lunch here, and offered me this job. And I was so pleased to be offered a job at 70, I took it. And I never regretted it. And, his main group is in Pensacola, which is in the Florida Panhandle, over towards Alabama. But, he thinks that's far too far out from the centre of things. So he wanted another group in the centre of Florida, near the universities, near the Government. So, I was hired to go into this new institute, branch institute shall we say, a daughter house of the main house, and to set up, help set up a, a new group. And we did, and we managed, amazingly, at this advanced stage I pulled all my strings and my old contacts in American funding and government who I hadn't seen for many years. But we got grants, we got a good lot of grants.

[1:02:11]

And, indeed what we moved into was, a reconstituted work I referred to earlier on, belief. Somebody in navy research had read my papers on belief, and liked them. So I managed to raise some substantial grants on models of belief in others, and how individuals communicate. And this was lucky, because, your listeners may know that at the moment the trend in AI is entirely towards statistical work and deep learning, so the people who are still trapped in what you might call cognitive symbolic work, which is what I do, I've done statistical work but nobody thinks I'm a statistician, so most of my work has been in cognitive, symbolic AI, but there are still people who will support that, and there's people in the Navy. I mean DARPA, who will still support... They're not... They don't... We'll come to this perhaps, but they don't completely trust deep learning and statistics yet. Looking at dialogues between, in among groups of people, and their models of each other, and what they believe and how they influence each other, and who is the leader, and who is influencing the others and causing their beliefs to change, you could probably imagine why American defence might want to support that. And we did some work on that. We amazingly had a big grant on metaphor. Again, metaphor sounds like an artsy, literary subject, but the American funders, who are much more open-minded than Europeans in some ways, have realised that since most language is metaphorical, and they want to understand language, how do they understand metaphor? Because especially in other languages, when they are trying to understand, Farsi, Farsi, they like Farsi, they're keen on Farsi, and languages like that, how do they understand people when they use metaphors? So they set up this enormous grant. This wasn't DARPA, this was IARPA, the intelligence part of ARPA. They set up this enormous programme on understanding metaphor. And we got a good piece of that. That was fun, because I had worked on metaphor all my life. I mean, I started life with metaphysics as metaphor, and I've kept up publications on metaphor. So we did some interesting work on that. So, these were interesting things, and we hired some interesting people.

[1:04:07]

The problems were that Florida is not a place where Americans want to move to. So we were reliant largely on hiring Europeans, which turned out to be difficult at the time for various political and immigration reasons. So, I don't think recruitment was totally successful. But we ended up doing this work, and I don't think it was, world-shattering; I wouldn't think it was my best work.

[1:04:30]

The other interesting we came up with I think, which won't surprise anybody probably listening to this, is the role of emotion. I've come to realise in the last decade a thing I hadn't seen before, how important emotion is in artificial intelligence. Once upon a time there was one man in this country called Aaron Sloman, in Brighton, who said emotion was important in AI. And everybody thought he was mad. Emotion? Artificial intelligence? Are you crazy? But he's won, he's right. Everyone now agrees, emotion is crucial to the understanding of language and understanding of people. I mean had people read their philosophy, they'd know that one of the most famous quotations in British philosophy is from Hume. Hume says somewhere, 'Reason is the slave of the passions.' And it's a key to all his work, that reason, unlike what great rationalists like Leibnitz said, reason is the slave of our desires and what we want, and emotions, broad sense, emotion, desire, et cetera. And, people in the street know this. Philosophers didn't know this. And Hume said it. And increasingly AI has come to see it, that, I mean, the whole of economics, as you probably know, has been completely revamped into non, as it were, non-rational economics where economists now recognise that people are not rational choosers; they're driven by all kinds of irrational drives, voting, consumer choice. We know it's not a rational business. Politicians know this now: well they always did. And AI knows this now, and therefore, theories of sentiment and emotion have grown in AI, from lonely people in the Eighties and, Seventies, to now it's big business. And, one of the things I think I can say we established in this project I just talked about in Florida is that, when you detect changes in belief in people, computationally, it's often preceded by changes in their emotional level in the language they use. So, emotion can become a signal, if not a trigger, for belief change. And I thought that was interesting, interesting, because, it's much cheaper computationally to detect emotional change in language than change in belief. Change in belief is very complex and difficult. To find out that someone's belief has shifted is a very big computational task. If they contradict themselves, it's easy. If I say, 'X,' and I say 'Not X,' great. But they don't do that. They make subtle shifts. But if emotion is a trigger, if... Sorry. If change in emotion is a trigger or a clue to change in belief, that will make it much easier to detect. So I think that was an interesting finding.

[1:07:04]

What activities have you pursued recently?

Well, since winding down work in Florida as my 80th birthday is just about here, I, I put myself in the last year into writing this popular book on AI. And, I enjoyed doing that. I've never written a popular book before. I wrote it much quicker than I thought. I gave myself four months and wrote it in two months. And, I thoroughly enjoyed that. I enjoyed that so much, I want to write another one. And... So my, my... I'm now looking for funding again in Europe, and... Or... Sorry. Not necessarily funding in Europe, but, funding to stay in Europe, I mean Britain. Not wanting to travel so much any more. And, I've moved now towards being interested in artificial intelligence and religion, and, there's a gigantic American foundation called the Templeton Foundation, which actually funds science with metaphysical, spiritual, religious overtones. So, they often find it difficult to find any to fund. So they end up funding regular science. So, I'm in now with a group of people in Cambridge who want to do some interesting and different things on AI and religion. So I think I might write a book on that.

[1:08:07]

Quoting the title of your recent book, is artificial intelligence modern magic, or dangerous future?

Well the title... The publishers suggested a title like that because they wanted to catch people's attention, but, I know why they wanted it, because, I think the public are very double-minded about artificial intelligence, whatever that means, I mean they use that to cover, I use it too to cover the Internet, media. And of course, with things like political adverts, Facebook, Google misusing our data, all these books with titles like, *Surveillance Capitalism*, I think the educated public, and even the uneducated public, are quite suspicious of AI now. Although they love it of course, they love Facebook, they, they're going to love self-driving cars. I think self-driving cars, which are here already, people don't realise, our roads have self-driving cars on, when there are self-driving cars, people will really see the benefit of AI. I mean, they know it already, but... So, they're double-minded. They see the benefits, they can't imagine living without intelligent phones. People are aware that there are dangers and there are positives, and, this is always true of science. I mean atomic energy has

brought enormous benefits; it's also brought enormous dangers. There's nothing new here. Lots of science is both frightening and enormously beneficial. And, AI is just like that. And... But as always with these things, the science, the AI, the engineering, has given us the tools that are dangerous, but it, it will also, I believe, I'm an optimist, it will give us the tools to correct it. So however dangerous we think Facebook and political advertising are, it will also give us the tools to correct it. So, my old group in Sheffield, who I still keep in touch with, although I'm not part of it, they've done excellent work, as have others, on, can we use automatic processes and computing to detect fake news? Could we, by algorithm, detect what news is true and what news isn't? On the face of it, no you can't. But actually, yes, usually you can. And there's all kinds of – not all kinds, there are several clever ways of doing it. So again, I, being an optimist, I think that, AI will give us the tools to correct things, as well as giving us the problem.

[1:10:24]

If you look at your career, is there anything you would do differently if you had the chance, and why?

Yeah, well two things I'd say. I always say... I don't say it because I don't go around giving advice, usually, but... or I think, that when I look at young academics... It's much harder to be an academic now. There's far more people with PhDs chasing jobs than there were. I mean it was, it wasn't easy when I was young, but it's worse now. And, like everything, like every other company, like every other enterprise, universities are trying to cut down on their commitments, so there's some amazing figure that shows that, whereas nearly all American university teachers were tenured professors, now only about a third of, or a half of them, are; the rest are casual adjunct professors who have no security and low wages. So, this is bad. So, the world is worse for the aspiring academic. So, what I did wrong, and I advise against, is, can be summed up in a simple slogan. If you are in a very good university, stay in it, and, I have been in a very good university several times, Stanford, Cambridge, but I always moved. I, I've been peripatetic, I've moved around for all kinds of personal and crazy reasons. That wasn't a good idea. You should... When I look at friends who have done really well, and come right to the top, even though I don't think their talents are amazing, it's because they got in a very good place and stayed there. So

that's one thing I'd always advise young people, and I think I did wrong. The other thing I did wrong is similar, it's that, I lacked the stamina that some of my friends have had to stick with a theory, or a claim, or a piece of research idea, and stick to it, and develop it thoroughly for your life. I got bored with it.

Mm.

So if I look at my career, I've done like, probably four different kinds of thing. Related, and I, in my mind they're related, but, on the outside they look like four different kinds of thing. And I think that's bad, because, it means you give up things before you've tested them to the end. And one should, as a scientist, as an academic, have the stamina to stick with it to the end, and be completely associated with it, and I didn't.

[1:12:35]

So what are the proudest achievements of your career?

Well because I've moved around both physically and intellectually, I mean, that takes away some of the pride. I've been lucky. I mean... I was lucky in the beginning, because I was part of that... In this country, I'm speaking about Britain now. I mean, there was a period when I was young when, because of state education and the change of policy in Oxford and Cambridge, bright young working-class people were taken up and sucked up into the middle class. Middle-class jobs expanded, Oxford and Cambridge would take them where they always used to take better-off, privately-educated people. So I got sucked up in that. It's harder... I think it's harder now. I'm not certain about that. There are figures both ways. But, so I was lucky and I got picked up and put into the very place, like Cambridge, where I had every chance to do well. I'm not sure I've fulfilled it at all, so I don't know I'm proud. I mean, I think this thing I call preference semantics is a bright idea, and I, I don't think I own it, I think other people had parts of it before me, but, I, I pushed that for some distance. And, I think the stuff on belief models is still a pretty good idea. And I think the idea of companion, although, companions are now everywhere, and, I don't own the word, and it's everywhere now, but, I was one of the first people to use it. And I think... So

I think there were three reasonably good ideas. But as I said, I don't think I had the stamina to see them through to the end.

[1:14:00]

What do you think are the biggest challenges and opportunities for AI in MPL in the next ten years?

Oh. Well, there's only one big elephant in the room now, which is deep learning. And, the best people in deep learning, I think, can already see what the limitations are. [pause] They know that much of the success of deep learning is because of very careful choice of what are called priors. They choose very carefully which features to probe the data with. You get some more naïve deep learning people who say, 'Well, give me lots of data, more data. Data will do everything for us.' This is nonsense. Data tells you nothing. Dear old Chomsky, in my view now totally discredited, he always was, I never liked Chomsky, but Chomsky was always right about that. Data tells you nothing. And one thing we know is, human beings do not learn in the way deep learning systems do. Human beings learn intuitively and immediately, and we don't know how

[1:15:03]

If you can stand it, I just want to tell you one thing Rodney Brooks said at a lecture here – no, in Oxford, a year ago, and it was brilliant. Brooks is an old hand at AI, an Australian who, he's the man who sort to, helped commercialise the robot vacuum cleaner. But, he was also the man who said that we needed to learn from creatures like ants, that things like ants have a level of intelligence that's very important. But here he's giving this lecture in Oxford about the limitations of deep learning. He turned to the audience and said, 'Do you know what steampunk is?' Well I know what steampunk is, but most of them didn't. Sort of Gothic, Victorian dress-up, attractive clothes on women at least. They didn't. So what he showed them was, he showed them six pictures of steampunk people, and six pictures of non-steampunk people. 'Now,' he said, now he showed them six more pictures, and said, 'pick out which ones are steampunk.' They did it instantly. In other words, from twelve pictures, they learnt what steampunk was. As he said, to teach a deep learning system steampunk, you would have to give it a million pictures, or ten million pictures. No, no. People can do it instantly. And we don't know how they do it.

[1:16:11]

So you could say, to answer your question, that's the challenge for AI. Why can a learning system not do that? Just learn from six pictures. It's amazing. There are some real advances. I mean you know, one of those experiments on getting the Web to go out and find pictures of jaguars and learn what a jaguar is, are quite good, I'm quite impressed by that. You say the word jaguar, it looks up jaguars, it looks up pictures of jaguars, and then sometimes it can spot jaguars. Woo, great. Completely un-, un-stimulated by priors or anything, just the word. But basically, no. Basically deep learning systems I think have been very narrow, good at go, not very good at face recognition. The public now think face recognition's solved, but it isn't. Facebook recognition isn't very good. The police who are using it are making a mistake. So, to answer, deep learning has had some great advances, but it's narrow and it's fragile. And we're still going to have to go back at some stage to other methods that try to mimic how it is we do things.

[1:17:14]

What about AI and war?

AI and war. Yes. This is a really big one. I mean, I'm giving a lecture on this in London in a, a couple of months. I disagree with several of my closest friends on this. There's a colleague of mine from Sheffield called Noel Sharkey, who is very big in the anti-robot weapon world. He's got a new career as a sort of, he lectures at the Pentagon and the UN on why robot weapons are terrible. I disagree with him. I think, I'm afraid, I think robots weapons are the answer, not only because they protect your personnel and you don't lose people. But he argues that they're dangerous because they won't be able to tell combatants from non-combatants, and they'll kill the wrong people; to which my answer is, well, people always killed the wrong people. Soldiers were always massacring women and children. I don't believe that robot soldiers will be any worse than machines. I think with a little more research they'll be better. And I don't think we'll have to go around killing people. I think automated war, in the hands of the goodies, which of course always tends to mean people like us, that's another story, but robot and automated war will be so devastating that we may not, states may not need to kill people at all. I mean basically the cyber strike, the great cyber strike, that, you can bring down a country in, five

minutes, one minute perhaps, it's what Russia did to Estonia over that war memorial, it's what we're afraid China might do to do us, but they're equally afraid that America might do it to them, but at least it won't kill lots of people. I mean, it's really bad to have hospitals and sewage works shut down, but it won't kill them in the same way as dropping an atomic bomb on them. So I still think that the threat of automated war, is possibly going to stop war. I think it may actually stop war. If you know who Steven Pinker is, I'm a Pinkerist, in spite of what the newspapers say, I think the world is getting better, and the numbers of deaths from murder and war are going steadily down. So I think, automated war is part of that. It will be so devastating. I would like our Government to stop building aircraft carriers and build lots and lots of automated drones and ships and, small frightening things, you know, small... Volkswagen cars with a big gun in, of which you don't have one, you have 10,000. And nobody, nobody's going to invade you if you can turn 10,000 armed Volkswagens loose on them. No. [laughs] Sorry, that's not what you wanted is it, but there it is. [laughing]

[1:19:58]

Can you close generally about how you think AI will impact society in the next ten years?

There's so many good things and so many bad things going on. I mean I'm stunned by the rise of the Alexas and the Siris, and the fact they're having an influence on things and... I'm stunned... Stunned is the wrong word. Nothing's stunning. But, the inf- I've been much influenced by the Israeli philosopher called Yuval Harari, and, I've been much influenced by his... I don't agree with him. But I've been much influenced by his line that, the statistical algorithms behind Facebook and companies like that are destroying our notion of self. He's interested in this idea that, people are coming to believe that machines will know them better than they know themselves. I mean in a sense, he's right. I mean, half of me agrees. We don't know ourselves very well. We don't know other people very well. We don't know why people do the things they do. We have explanations, folk explanations, but we don't actually know. And that's what machine learning's like. You know, one of problems with machine learning is, we don't know why algorithms do what they do. DARPA has this huge programme called XAI, explainable AI. The big drive now is to explain why AI does

it. Just like psychiatry was to explain, why people do it. We don't know enough... So people and machines are in the same position: we don't know why they do what they do. And one of my answers is that, we can have the kind of devices that will explain both to us. I think we're going to have moral advisers. This is the good side of the Facebook statistics. Harari's worried about the bad side, that, we don't know that... We will ask machines what we should do. If we don't know whether to have a mastectomy, or a colon operation, we'll ask a machine. Yeah, sure, that's sensible. It knows more about our genetics. But at the moment we don't want to think we'll ask a machine to make a moral choice for us. But I think we may. So I've, in a recent paper I've used this phrase of Ken Ford, my former employer, he used the word orthosis. Orthosis to mean, not like a false leg, which is a prosthesis. An orthosis is a kind of, clamp on thing you carry around with you, like a, you know, I don't know, a watch. And I coined this, I've used this phrase, moral orthoses. We might have with us advisers who, will be companions of course, companions come back, but they'll be moral advisers who know us very well, and might advise us what to do. And that I think is a very interesting idea, and not a bad idea. We've always had advisers. We had priests, we had spiritual directors, blah blah blah. Your mother. You know, we had people who advised us. Maybe in the future we will have companions who are moral advisers who explain our behaviour to us. And I don't think that will necessarily be a bad thing. Harari's right, we may have machines that understand us better than we do, and that may be OK.

[1:23:10]

OK. So, to conclude, really this time. You probably already answered a little bit to this question. What advice would you give to someone who would wish to pursue your career today?

I think it's still important to go and live in American for a bit. I did that. I spent half my life there. But, the trouble is, Europe, although... An old professor said to me once in Australia, a famous linguist, he said, Britain was a better place to live than America, and America was a better place to work than Britain. So he lived in Australia, which was meant to be a halfway, which isn't true, he was wrong, but I know what he means. I think Britain is a better place to live than America, but I still think America is a better place to work. And I think in artificial intelligence, America

is still, for now, for now, so far ahead of Europe, at least in the applications of AI, and still so far ahead of Japan, and I think China. We build China up in our minds but China isn't there yet. America is still supreme. So I think for a young person going to America for some time, it's one of the best places, and there are so many labs now, is important. It's important. It's how they... It's the best way to... They have the best way to do things, and the best way to think about things. And, we should do better than we do. I'm not being here an American patriot, on the contrary, I don't want to live in America. I don't like living in America. I don't approve of their, much of their political system. It's that I think they have the right way to do AI and to think about it, and, in Europe we're just too inflexible, and we need to loosen up a bit. And, so a young person should spend some time in America. Twenty years ago I would have said, spend some time in Japan. But now, I'd, go back to America, yah.

Thank you Yorick, it's been a real pleasure talking to you.

Thank you, very much.

[End of Interview]