PhD Pioneers:
The Living Experiences of The Open University's First PhD Graduates

Oral History interview transcript

Name of Interviewee: **Professor Max Bramer**
Interviewed by: **Elizabeth Currie**
Date of interview: **29/04/2021**

Important

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This is Liz Currie, researcher for The Open University, interviewing for the Looking Back, the first OU PhD project on the 29th of April 2021 and Max, if you'd like to introduce yourself.

I'm Max Bramer. I'm a graduate of The Open University. I had a part time PhD, which I obtained while working as a full time member of staff. I'm now retired. I'm retired, but they're called Emeritus Professor of information technology at the University of Portsmouth.

And do you remember the title of your PhD?

Yes, how could I forget? It was Representation of Knowledge for Chess End Games.

Thank you very much. So I'm going to ask you the first question and then let you loose. So the first question is can you tell me a bit about where you were born and whether your family were familiar with higher education?

Well I was born in June 1948, so it's just shortly after, more than three years after the Second World War had ended and I was born in North London. London was a complete mess at that time. When I went to primary school when I was five, I had to walk past three bomb sites to get to my primary school. There were outdoor toilets, I mean London was just bad. The country had been devastated by winning the Second World War, let alone losing, the way the Germans were, it was terrible. But things were moving forward, but it was difficult. My parents had no background in higher or further education. I was the first person in my family who went to a grammar school. Grammar schools had been created in their modern form in 1944 via the Education Act, part of the Education Act and I was the first person in my family then to go to a grammar school and none of them had been to university.

Professor Max Bramer Interview

My parents really didn't have any great idea of what to do to help me, but they were extremely keen and supportive that my brother and I both went to grammar school and both went on to university. They wanted that to happen and it did. I was lucky to take advantage of the Education Act in 1944 and also the expansion of universities in the '60s, which took place after the Robbins Report in 1963. It was really those two things together that gave me the opportunity to get into university, but that was a standard experience. Probably just about all the other students on my degree course would have said, or the vast majority would have said the same thing. They were the first generation ever in their family to get a university education. And we were expecting to do great things, or I think everybody else wanted us to do great things.

It was a very exciting time, a time of really I suppose a great deal of social mobility. People who would normally have had no chance of higher education or selective education suddenly got it and if you were able to you could seize that and move on. I graduated in 1970 from the University of Southampton with a degree, a BSc in mathematics and went to work for the CEGB, Central Electricity Generating Board in London, in what I regarded at the time as quite a well paid job, certainly very secure job in a leading computer centre. May not be famous now, at the time we were famous for having the biggest computer in the country and the computer had a whole one megabyte of memory, which we could, all the people using it would have to share, all using it at the same time, so you couldn't use more than about a fifth or a sixth of that.

I remember I was in trouble one time because I wrote a programme that was more than 200k bytes and until I managed to get rid of those 2k bytes they couldn't give me any kind of pay increment, it was that sensitive, this giant machine. But that was regarded as a really big thing in those days. So that was my position in May 1972, less than two years after graduating. So I'd already moved onto computing from maths, it really was obvious I think to just about everybody that computing was the coming field. That was the place to be, especially for mathematicians, well especially for everybody really, but especially if you'd got the technical skills in mathematics, because so much more of it in those days was scientific than it is now. So that was the position. I

was really quite comfortably placed, I had a job I enjoyed, secure and quite well paid.

So then this question, I've been introspecting about this, why on earth would anybody in that position become a part time PhD student, part time anything, PhD student in of all things computer chess, which was a sub-field of artificial intelligence, which was a barely known field mostly derided by those who had heard of it, while working as a member of staff at a university that no one had heard of, that hadn't actually got even one graduate at the time. Obviously I mean The Open University, zero graduates anywhere, that was under threat of being closed any moment by the Heath government and was based in a field in the middle of Buckinghamshire. So I think that deserves a certain amount of comment as to why that might have happened and I thought I'd start to unpick it if I possibly can, I've had to think it through myself as to how that could possibly have happened.

Why artificial intelligence and why computer chess? Well when I was an undergraduate I'd become very interested in the idea of intelligent machines. I've managed to find this, I've actually kept this for about 50 years, if you can see it. This is the October 1968 issue of Science Journal, it talks about machines like men. These ideas were very much around, not just in comics, but in quite serious reputable publications. Of course it never occurred to me I'd be able to do anything about it, but I must have bought that shortly after I started the second year as maths student and that had appealed to me. Now computer chess? Well first of all, no actually something else I could say was in my undergraduate days the head of department, the computing department in the faculty, he used to go round with a book.

I remember this book, because on the cover it said Machine Intelligence II and I was quite amazing there could even be a topic called machine intelligence II and I was really impressed that he'd got this, I might have even read it, I don't know, but he'd got this book. And it never occurred to me that later on I was going to meet the editor of that book and become very friendly with him and start working with him. So that was really something. So I was really keen on

this, but it never occurred to me I'd be able to do anything about it. Now computer chess, well I was a very keen chess player and at the time I used to play regularly in county matches, whatever county I happened to be in at the time. So I mean in the case of Southampton University it would be Hampshire, when I was at home it would be Hertfordshire and so on and I was a very regular keen player.

And computer chess in those days was regarded as a touchstone area of artificial intelligence. I probably couldn't have used that phrase, but it was clear this was regarded as a major area to work in. There's a famous paper, I didn't know this then, but a famous paper published I think it was 1963, which talked about building something like an expert level chess machine, if you could do that you would seem to have penetrated the core of human intellectual endeavour. That's a remarkable thing to say. Penetrated the core of human intellectual endeavour. I don't think anybody would say that now, but maybe because it's been done long ago, so we now move the goalposts and it's going to be something else that when that's done we can move the goalposts again. But that was something that really appealed to me and I didn't have to know that that had been written to get the idea that to do this would be a huge intellectual achievement.

So big, you couldn't possibly do all of it, but you might be able to do a little bit of it, make a small impact on it. But again never occurred to me that I might actually be able to do anything about this, it hadn't crossed my mind really. So next thing is why work in university? Well I think what can I say, I hadn't been graduated very long, it was less than two years after I graduated, it was about 18 months after I'd graduated I applied to the OU. But I had very much enjoyed the university ethos, again I probably didn't know that word either, but I enjoyed, university seemed like a good place to be. The things that were good about universities, you could discuss, you could think, you could say things that were stupid, heretical and the values of the university, I wouldn't say this is necessarily true today, but at the time it seemed were really very good values and something I'd like to be associated with.

Again something I didn't know at the time, but I thought about it later, there's a very well known novel where the author uses the description, he says a university is a church of reason, remember that, a church of reason. A very nice phrase, I hadn't read that until later, but I acquired this idea, this really is the place to go if you want to reason and think. And of course I still hadn't gone anywhere, hadn't done anything about it. So then I'm going to have to come clean, why did I go to The Open University? Well not an inconsiderable factor was that my fiancé, whose name was Dawn, who is now my wife, she was there. That does tend to be a bit of an attraction, but she had actually joined in 1969 just a few weeks after the university had opened. She was a research-, at the time a research assistant in educational studies faculty and she'd told me a lot about it, far more than I would have known otherwise.

I mean the idea of distance learning, whatever that was, the term university of the air was used and I think that was a Harold Wilson phrase I think possibly originally. The idea of students with no or certainly not regular academic qualifications, preferably with none of them, it's a heretical ridiculous idea, but they were good people who believed it could work. They hadn't actually made it work, but they were good people putting their careers on the line, very strong academics who wanted to make this work. And I was interested and quite enthused by this through regularly talking to her about it. She was working, well partly on a building site in the middle of nowhere like everybody else, but also sometimes the university used a lot of converted huts in the local areas, local villages, Simpson village for example and people were actually building these buildings on this building site, mud covered building site.

And so of course a weakness in my position was I was working in London and living in Hertfordshire, she was working in Milton Keynes and living in Northamptonshire and I thought it really would be quite a good idea if we could live a bit closer together, preferably in the same place would be more helpful. And so it's going to be a great deal cheaper for me to move north towards the Midlands, not that far north, than for her to move down to London. So it all sort of fitted together. When a job came up it was very tempting to apply and I was quite surprised to get it. Maybe my enthusiasm came across and maybe I was

one of the few people who applied that actually knew what The Open University was and still applied. So I gave up a job, I think a very good job, I took quite a big pay cut by the standards of those days and I got a one year post basically as an assistant, very junior post working in a team of two developing one of the first computing courses.

There were no computing courses when I joined in May '72. The first one, well there were two being developed in parallel, the one I was in was starting January 1973 and almost nothing was ready as you might have guessed, it being The Open University. So I went into this one year temporary post, absolutely no guarantee it was going to be renewed. I was working in a wooden hut, one of the Wimpey huts on the ring road of this bomb, well it's not a bomb site sorry, a building site, situated near a tiny village. Milton Keynes was a small village with about four or five houses and a tiny shop there and that was Milton Keynes and the rest of it was just a field. But I enjoyed it. The nice thing was instead of commuting into London I could just look out the window and right next to the window, right touching the wood would be my car.

If I wanted to go home I just had to walk, it took me about 10 seconds to get in the car and drive home. And a few months later my fiancé Dawn and I, we bought a small bungalow by the Grand Union Canal in Northamptonshire, a place called Blisworth. We got married and we never looked back. So that was how I got there. And looking back I think I was crazy really, there must have been some other way of doing this. But on the other hand if you can't gamble and take a chance when you're 23, when is it going to be a convenient time? When will it be easier than when you're not married, no children and you're 23 and probably very employable? So it probably wasn't that big a risk. At the time it felt like it and certainly when I got there it seemed like it was an absolute roller coaster, well a combination of a roller coaster and a rapidly sinking ship really.

I mean it was a very dangerous place to work. The government might close us down, more than likely the courses would never get written and anything could happen. There were no graduates. Now I don't suppose most people remember this, but one of the priorities the OU had was to get some graduates, but they

were three year degrees. So a trick was done, I think trick is exactly the word, of allowing teachers, qualified teachers to have a year's exemption so they could get degrees in two years. Now quite honestly I don't think and no one's going to sue me for saying this, it's absolutely true. The reason was that at the end of the second year, the end of 1972 they would get the first graduates. Alternatively it would have been the end of 1973 normally, by which time the university could have been closed.

But once the first graduates came out at the end of '72 the whole situation changed, and it became practically impossible I'd have thought to close it down. So there was great relief about that. So I went into The Open University in '72, and I registered for a PhD. It seemed to be something that people were expecting and I thought well what can I do it in? Oh I'm interested in computer chess, why not do that? And my supervisor, the head of computing, Professor Mike Pengelly, I later discovered, I didn't know for a long time, was actually quite enthusiastic about artificial intelligence and he probably jumped at that as much as I did at the opportunity to do it and of course I could do it for nothing. And I had this mildly imaginary one day a week when I could work on research, probably more like one minute a week would have been more accurate and I would say probably for the first two years I didn't do anything except for one thing.

At the start of the two years and I'm talking about '72 to maybe the end of '74, I really had none of the skills to do a PhD. By the end of '74 I hadn't got a project, but I'd probably developed most the skills I was ever going to develop, or certainly many of them and I was much better placed to do it. So it may just be by sheer luck, but this was a great, or maybe not, but this was a great training experience for me, especially because I was still alive at the end, which I really wasn't too sure about quite a bit of the time. So it was an exciting period I think we could say. At the beginning I really, I'd done a little bit of technical writing with the CEGB, but I wasn't much good at it. I had really no investigative skills, the only thing that was really going for me I suppose, well brain I suppose, quite good at analysing things like a mathematician does and I was pretty good at writing software and analysing situations as a way a computer scientist or

systems analyst does, but that wouldn't have been anywhere near enough for a PhD.

So what happened though was that I was suddenly thrown into this situation where whether you are the most junior person, which I was, or the most senior person, you're bailing out this ship that's rapidly sinking, but you're trying to get somewhere like America. So you have got to take responsibility, you have got to work hard and you've got to become very self-reliant or the ship will sink. And I was given a lot more responsibility than I would ever have got in a university like Oxford or Cambridge. They probably would just park me somewhere for a few years, and I would never have done anything. But in the OU you had to learn how to do things or you'd be gone and the course would be gone with you. So we were developing a course, so one of the first computing courses and it had the usual large number of course units, printed documents, supplementary material.

We had to write software for the course. The Open University computer system didn't have useful software, we had to write a complete operating system, and then document it, write manuals, write tutor marked assignments and so on and of course all the television and radio programmes. So I ended up I think de facto really responsible for getting all the printed material out. Certainly I was at the far end of the process. The final versions that went to the printer for final publication were those that I had prepared, I got the final cut on every single document, which isn't necessarily a great thing when you're 24 and don't really know what to do, but we survived and just learned to do a lot of things. And one thing I realised was I got to meet and talk to some really good computer scientists, I mean professors, people who are obviously very knowledgeable.

But I rapidly realised that many of them can't write at all and many of them have no idea how to explain anything to anybody that isn't basically in the next office or preferably working on their project. And no offence, but I stand by that today and I'm sure my friends say that about me as well. But nevertheless I discovered that that was the case. And although we had a lot of consultants writing material, we wrote some of it ourselves, but the material you wrote just

basically couldn't be used. I'm sure this is still true, it's just not written in the right way. You've got to think we are writing this, we are sending this to somebody in a submarine under the Arctic, under the North Pole, or somebody in Pentonville Prison doing it in his spare time and they're not going to phone you up and ask you what this word means, or have you made a mistake about this? You have got to explain this, and once you've got that idea in your head, this is really for that person, the guy in the submarine under the North Pole, it makes a lot of difference to the way that you do it.

And in The Open University we got into, well the way of working was repeated refinement of documents, repeatedly making things clearer and clearer and clearer. The term I'd use for it would be ego free writing, so you write something and you're expecting it to be torn to pieces by six critical readers and then you put it back together again and then they tear it to pieces again. Now the trick is when I did that to something written by my professor he didn't mind, he really didn't appear to mind at all. So when he did it to me it would be rather churlish if I minded, so after a while you get into this style of writing, this collaborative style that has served me enormously well ever since. When you think of the kind of ego free writing, it doesn't matter if people say I don't understand it. You actually want that, because you don't want the reader to think that, you want the person helping you to say that and that helped a lot.

So I was trying to list some of the things I think I learned at that period. On the face of it nothing to do with research, but a lot of skills. I learned to write technical material. I'd done a bit of it but I was far better at the end of that period. And I'd written, rewritten and rewritten again and rewritten and I learned to punctuate, I learned good grammar. You've got to get this right if you're going to communicate with people. It's not negotiable whether you can communicate, although you wouldn't know that if you read a lot of maths textbooks, they're written for people who obviously are just professors of maths and nobody else. I learned to critique other people's work. That's not the same as criticise, but analyse and come up, identify the flaws, the areas, the weak lines of reasoning, that kind of thing in other people's work, which is of course what you really need for research.

And I learned how to edit other people's work to make it better and better and better and of course once you've learned how to do that you can apply it to your own work. You can write quite a poor version of your thesis, but you can edit it yourself because you know how to do it now. And of course obviously bringing other people to help, but I'd do this with my own papers. I apply the same standards to my own writing as I do to my students' or to my friends' writing and it makes a lot of difference once you get the idea of doing it. I learned to refine documents over and over again until they're "perfect", they're the best they could possibly be with that content and that was a tremendous thing to be able to do. I learned to work with academics who some people think are not the easiest people in the world to work with, and I think it's a rather shattering experience but I learned how to do that and I learned how to get things done in a university.

And these were the days, there were no word processors. The high tech, we all had secretaries because we couldn't type, we hadn't got anything to type on and all they had was electric typewriters with no memory. So if you wanted to change a few words on a page, you either painted it out with something called Snopake, like white paint and typed over it, or you had to retype the whole thing and the continual typing and retyping of exactly the same documents. And when we sent documents to printers, most of it they were typesetting in hot metal, they really were. Now even at the time I thought this is ridiculously antiquated, nevertheless that's what they were doing. And that process introduces numerous errors, so you can send this really perfect document, you get something back with 300 errors in it. So then you correct those, send it back out and you get something back with maybe only 25 errors in it and you send that back.

And eventually one day the printer's managed to get it right and there was something to be said for inventing word processors, it does rather help, but that was 10 years or more afterwards. What else did I learn to do? I learned how to do things like use the library, how to get documents. How to get things from the British Library by using inter-library loans. I learned how to assemble

information and to use information and I learned really how to be self-reliant. I became much more confident, because I'd actually done something that hadn't collapsed around me, it makes a lot of difference. At that point I felt I was becoming an academic, I was turning into an academic. I was learning, I'd learn a lot of things you needed to know how to do, but I still didn't really have a project, just general ideas. I'd read a few papers, but I didn't really know what to do.

So then the next period would be from there up to actually getting the degree. So that was '74 to '77. And well the first thing I'd say is you couldn't really have found a much worse time to be a research student in artificial intelligence, because that was the time in 1973 the publication of this, I'll show you this. This is a really infamous document. This is the Lighthill Report for Science Research Council it's called on artificial intelligence. Most copies have been collected up and burned since, but I've kept mine as a horrible reminder. Sir James Lighthill was a very distinguished applied mathematician FRS and should never have been asked to comment on AI, he knew nothing whatever about it and the report was awful. Just to paraphrase it, I mean he doesn't use these words, but basically this field is rubbish and everybody in it is a charlatan would be I think a reasonable paraphrase of what he said.

And it more or less killed the field certainly in this country and it became just impossible to get research grants for it, or you wouldn't even want to say it. But luckily for me my research supervisor, who was the head of computing, but by that time was actually the Dean of the faculty of mathematics, which was maths and computing, but it was then called just mathematics. He was very keen on AI and didn't care at all about what Lighthill had said, he thought it was rubbish just the same as anybody who actually knew anything about the subject would have thought, so we just carried on. I didn't need any external funding, we just carried on. But the big thing that changed was the term artificial intelligence went dramatically out of fashion and I've called this, at lectures occasionally I've talked about this and the field that dare not say its name. That's how I think of AI.

And until the last few years, recent years, you just couldn't use the term in a grant application, in a lecture, title of a course or anything without expecting to be laughed at or attacked. It really was that bad and we traded under other names like computer science, information systems, knowledge engineering, but we were really doing AI all the time, but you didn't want anyone to know that because they'd probably shut you down if they did. Well who was right? I'll just leave it to you to decide whether AI was a pool full of charlatans or not, I don't know, I'll let you work that out. But it was an appalling time to do it, but I did start to get some time to work on research and I was able occasionally some weeks to get a whole day to work on. This thing I'd been promised, but I didn't really believe the promise.

But what I'd do is I studied everything I could find on computer chess, I mean there weren't that many papers, maybe 100 or so and I read everything I could possibly find from every angle and what you tried to do is to find a niche area you can work in. Now if you're in a field where there's 20 other people in the same room or same department doing it, it's much easier. What you need on your own is to find something that someone in America isn't going to do while you're doing your PhD, and publish six months earlier. You really want a niche area that no one's going to think of and chess end games seemed to be that area. Hardly anybody in the field, but because of that, quite attractive. And I kept going and eventually managed it. My first publication, if you'd call it that, very flimsy little publication, very low quality event, external event was 1975, and by 1977 I'd graduated. I wanted to say something about supervision though.

The critical thing for anybody who's listening to this who hasn't done a PhD, the really critical thing is supervision. It's really the difference between passing and failing and you've just got to get this right. And it was crucial to me, but it was also a major problem. I mentioned my director of studies, Professor Mike Pengelly, who by that time was Dean for the first couple of years, he was very supportive. He really helped me, he was a great guy. The one weakness was he had no time to do research and as soon as he got promoted to Dean it became worse and worse, he just had no time for it. And I used to, I got to the

point where I was spending quite a lot of time with him talking about courses, course development, course maintenance, faculty policy, future of education, computer science, but then you get one and a half minutes talking about research at the end of a meeting and it was like that.

But what he was, he was very well connected, as well as being very supportive and he put me in touch with an external supervisor who was at the Institute of Computer Science at Gordon Square, which was where all the academic computer scientists in London were based at the time, but they later spread out. And he put me in touch with somebody called Mike Clark who shortly after went to Queen Mary College in the Mile End Road. And on reflection, retrospect now I would say he was almost the best possible person in the country to supervise a project on computer chess. So I really found an extremely good person. Well I would say he'd probably be the second best person in the country, the best would have been a professor in Edinburgh called Donald Mickey, who'd been at Bletchley Park and he ended up as my PhD examiner.

So I was into a network with these people, very good people, but Mike Clark also had very little time, but what he did do was bring me into his network. He got me into meetings I would otherwise never have gone to, so low level work. I say low level workshops, that's what you want. Big international conferences with 1,000 people are not the place to be. The place you want to be is a workshop with 10 people, but they're all working on the thing, and you can get lots of information and ideas from them, and give them your ideas, and he got me into that world. And he introduced me to his own research student, Don Beall, who later on became a leading figure in British research in computer chess. So I was really building up a network at that point, but Mike Clark also had great problems with finding time to supervise and I learned from that. But at least I had two very strong people, what you've got to do is get the most benefit from them, rather than complaining they haven't got more time.

The problem with good people is they don't have lots of free time and that's called the bad people, they've got plenty of time, they can spend four days a week with you. The good people can spend five minutes with you if you're lucky

and you've got to work around that. But just a little anecdote about this, just to show how difficult it was, I mean this was getting towards the end of my project. Mike Pengelly and I, both working together a few doors apart in Milton Keynes, he decided he just could not possibly spend time with me, but what he would do is he had a friend at University College in London and he managed to book, just use his office for an hour or so on a Friday afternoon for a few weeks. And so we got into this incredible situation that we would just go together to University College, so that we'd go in one of our cars to the train station, get a train from Milton Keynes to Euston. Then we'd get the underground across to, I forget which station it was for University College. Then we'd go and sit in this guy's office for an hour and chat, and then we'd do the whole thing and come back.

So probably the whole business must have taken three or four hours and yet there was no way Mike could have spent 20 minutes if he'd actually been in Milton Keynes. That was the problem he got into, and the answer if you're a student is don't complain about this, think you're lucky that you see him at all. I just saw it as an experience though, who would imagine that you could ever get to a job where that's what you had to do to talk to your students, but that was the reality. So what I did was I developed, I think now a kind of survival strategy. What you need to do to get your PhD. The thing about PhDs is I think everybody complaints about their supervisors, I think that would be number one cardinal principle. You could go to every PhD student, what's the worst thing that happened? Supervisor, he was useless. They all would say that.

So what you've got to do is win despite that. Now these people haven't been made your supervisor because they're stupid, mostly they're extremely talented, they just don't have any time. And what you have to do is work around them. You could say manage your supervisor if you like. If they can only manage 20 minutes, an hour at University College after a train journey, go with them or go some other way and get there and meet them there. It would be very easy to say I failed my PhD because the supervisor did XYZ, didn't do ABC, but who cares, you don't get any credit for that. You could sue the university, why have they given me this terrible supervisor? Because he's an expert on the

subject that's why. What you have to do is manage that process and this idea of managing your supervisor, once you've got that idea it's a lot easier. Where is the supervisor going to be, that's where I'm going to be. You the student have to make the running.

Now if you can get the supervisor interested in your project, because it's one he'd rather like to do himself, or she would, then of course that's so much better. Now in the case of Mike Clark he was doing projects and alongside my PhD I actually did some work relating to other things he was doing. He got interested in working with me, I was interested in working with him. So of course you're going to get much more receptive atmosphere than if you're confrontational and say well why aren't you available every Tuesday afternoon? You've got to just learn how to handle this and if you do that it makes a big difference. Now something I've done really from very early on was to create my own network. I mean I would say an invisible college is the term I like for it, but a network and it wasn't that hard. At the time there was only one, as far as I know, one organisation in Britain devoted to artificial intelligence called AISB, it's still around.

And they used to publish a regular newsletter and in there, there would be a list over every paper and every research report, even flimsy tiny little things that they knew about published in English in the world. And some of those, but it wouldn't be that many, I mean it might be just a list, like a page long, there weren't many. But some of those would be about computer chess, I contacted just about all of those authors and I asked them for copies of their other papers, I sent them copies of things I had done when I'd got somewhere and I made contact with them. And I started to go to these very esoteric artificial intelligence conferences, not many people there, but I got to know a high proportion of all the people in AI in Britain. Now I mean to say that now would be crazy, there would be hundreds of thousands, but when you've got maybe 50 people, the fact that you might meet 20 or 30 of them is entirely realistic.

And I got to know a lot of them, and I got to know many of them when they were at much the same level as me, they were research students. So when they

became famous professors I still knew them. So I always wondered how my professor knew all the other professors, well it's because they knew them when they were making the coffee kind of thing and they worked their way up together and that's how you do it. But I got to know those people and when people are working in any area remotely similar to mine published something they sent me a copy. So by the time the papers came out in journals they were three years old news, I didn't want to read them, I'd read them three years earlier, because I'd been sent a personal copy. That's the situation you want to be in and that was the invisible college. Now we had no internet, it was all done by post, letter to Australia, that kind of thing, but that was the winning thing to be able to do.

I knew the players and I knew what the players were doing and they knew what I was doing. A couple of other things. I kept reading, I mean I dug out every paper I could find and papers refer to other papers. And of course after a while you see that some papers are referred to endlessly over and over again. But one secret there is don't assume that what people are saying about them is true, get those papers, read them yourself. And what I found, I found it many times since, is that the received wisdom about what some classic paper says is not actually correct at all. If you look through it, it says something rather different and yet the mistakes once quoted then get quoted by other people and it's almost as if they were in the original paper, but they weren't. Now sometimes of course the original did it properly, sometimes it actually has mistakes.

I found papers where there's just obvious errors like logged to the wrong base, that kind of thing, they've just gone completely unnoticed. I got hold of papers where people published their algorithms, their programmes, retyped the programmes in to a computer using paper table whatever it was and very often when you do that it don't really work, but if you change them you can get them to work. You've really got to do this kind of thing, don't take everything on trust. And bear in mind that the people who are regarded as stars, they don't think they're gods, they think they're just fallible people who make mistakes like everybody else. It's only the rest of us who think they're the gods, their colleagues don't think that, their children don't think that and they do make

mistakes. So I got into the habit of reading, but critiquing what I'd read and of course I can critique myself.

And one thing I needed to do and I did it as much as I could, we present work orally whenever you can, just on your feet. Get on your feet and say things, because if you do that you will spot that you're making mistakes and your friends will spot it. But start off in a friendly environment like the people in your department or your wife, a husband, friend. Somebody who can actually tell you it's no good and you don't kill yourself. You don't want the first person to tell you your work's no good is the PhD examiner and it's entirely possible that can happen. You want it to be, it's going to be attacked, get it attacked now. That's why it's also a good thing to send in papers to conferences more than journals I'd say, because you get very rapid feedback. Sometimes the feedback is this person's rubbish, why does he think this way at all.

And I had things like that and you learn from that. But the examiner will never say that, because you've already picked up that problem and fixed it, so that's what you do. But something else I did and I think this is very important, is write and keep writing. One thing I did, I'd recommend this to other people, is to write something regularly. I used to, I said that Mike Pengelly was a great guy, he really was a great guy, but he had no time to do this. But I used to write him a report every single week once I got going and some of it was a minutely detailed account of some experiment I'd done, where there's every number you could possibly find. Other times I hadn't done much, but I'd write down my thoughts I'd had or something, anything I could think of about that. But there would be something every single week. Now I was very aware I was really writing for me, because I imagine he wasn't reading them, but I'd got this enormous collection.

In fact a year or so ago I came across, I still kept it amazingly in a big ring binder, I'd got all these weekly reports that I'd sent to him and this is kind of treasure trove of ideas I had at that time. I could probably do several PhDs if I could only have the time to just take those points out, things I didn't follow up. But the important thing is to keep writing, don't worry about the reader, you're writing for yourself more than anybody. It's very hard to write gibberish down,

well some people have managed it, but usually if you try and write things down or explain them to people, you realise that your ideas aren't that good, you can actually critique yourself. But that's fine, that's the route to improvement. So that's one thing I did. Well what happened? Well eventually I got to my Viva and I had this potentially terrifying ordeal of having I would say the top artificial intelligence researcher in the country, this Professor Donald Mickey as the external examiner.

Well apart from being friendly with my external supervisor, he was basically a killer of intellectually very tough character, I couldn't expect any quarter just because he was friendly, I mean nothing like it. Afterwards I saw him crucify one of how own students in a Viva, it was amazing. If he thought you were wrong he would just fail you, it was as simple as that. And this man, you probably don't know him, but he was at Bletchley Park. He went there when he was 18 at the start of the Second World War, he worked closely with Turing, got very friendly with Turing and obviously picked up a lot of the ideas about AI that Turing was coming out with. And then after time had elapsed he set up the first artificial intelligence group in the country in Edinburgh University, the Machine Intelligence Research Unit, and it was really an open secret that this scurrilous document, the Lighthill report, more than anything designed to wipe him and his research group out.

But he wasn't an easy person to wipe out and they certainly did their best, but he carried on and went onto greater fame even but this was a dangerous person. But the trick there is to be very well prepared. I've read, he also had written a lot of popular articles in the computer press, places like Computer Weekly. He was the first person who wrote articles about Turing and I had no idea who Turing was when Donald started writing about him, became famous a long time afterwards, but he'd worked with him. And he wasn't leaking secret information, he was just talking about somebody he knew, it could have been anybody, some crazy guy who counts bicycle spokes and things like that, chains his cup to railings, could have been anybody. But I knew his opinions on quite a number of topics, because he'd told the world many times.

So I was very careful to not tread on any toes and the critical thing with Donald was to not try and define the term artificial intelligence, because he would kill you. And basically what I said was, he asked me this, I said I think it would be better if I didn't, I think it's almost impossible to define this in a completely satisfactory way, or something like that. He said oh that's all right, OK, just let me get on. Almost anything I've said I would have been destroyed. So I think that was probably the turning point in my Viva, was just to duck this lethal question, but I was expecting it and somehow I passed, I just had two or three trivial changes. One of them was actually taking a perfectly correct grammatical sentence near the end and changing it to put in a grammatical error, but I didn't bother to argue about that, I just let it go. So it's in the thesis now, if we get it out you'll spot this mistake.

But after that I felt absolutely great, I mean I remember saying, well I can do anything now. I've done this, I can do anything. And somebody else I said, I think to my wife, anything I do after this, after getting this PhD is going to be a lot easier than I've done to get this PhD and that's how it turned out. Nothing was ever as difficult as that again. A PhD is a rite of passage. In another society what they do is you'd swim across a river, raging torrent, you would kill a lion, you'd climb a mountain and you'd swathe through a swamp, kill a couple of alligators, but in our culture they get you to do a part time PhD at The Open University. And if you've done that, basically you can do absolutely anything, it's never going to be any harder, they can't throw any more at you, especially trying to do it without word processors, without the internet etc. It's absolute hell, but if you survive you have certainly learned.

I won't tell you how many dead bodies there were along the way, there were probably quite a few, but if you're one of the people still standing at the end you've made it. And the reward for that I remember now was in, so this must have been shortly after I was actually awarded, not the graduation ceremony but the actual award in '77, my nice head of department, Professor Pengelly, paid for me to go to Toronto in 1977 to attend the Second World Computer Chess Championship, which is a legendary event really, where computers were playing each other. And I got to meet really the top people in the world in that

field who were all there in Toronto typing moves in. A move comes up on the teletype or something and they type it in. Some of them had these new fangled monitors, but a lot of them were just teletypes. And that was a great event, a very formative event, one I'm very pleased to have gone to.

So that brings me onto graduation day. I hope I can be forgiven for being a bit self-indulgent about this, because this really means quite a lot to me. First of all it was a wonderful day, it couldn't really have been better. The sun was shining, it was a great day, but graduation was Alexandra Palace, and it was the 3rd June 1998 [sic], which was three days before my 30th birthday, which seemed to be quite significant in a way that I just got in just before my 30th birthday. And amazingly I've actually still got a copy of the graduation programme. I wondered whether my mother might have kept this and she did, amazingly enough she did. I've searched her piles of papers, she wouldn't throw something like that away and indeed she's got it. It was at Alexandra Palace, now to me that was a very important place, because first of all for several reasons. One is The Open University had, or maybe has a production centre there with the BBC.

That was where the programmes, television and radio programmes were all made and certainly I'm sure not only broadcast from there, but they were broadcast from. I'd been there a few times to do TV and radio programmes, but in the main I was working on the print production, which was bad enough, hard enough. But also the student computing service, which I had been involved with a lot when developing the course and after that had three sites in Britain where everything, the software was being developed, they were networked together the three places. There was the OU in Milton Keynes, there was one in Newcastle and the third one was at Alexandra Palace. So I was also in contact with the people there, knew them quite well. So that was a big place for The Open University, it was just any old place, it was the place for The Open University graduation.

The other thing was and I've only really thought about this recently, that when I was young we were in North London until I left primary school, but when I was very young, I think quite possibly before I went to primary school, we used to

live not very far from there. And I remember going there several times to Alexandra Park with my mother, quite possibly in a pushchair and so that's a place that means something to me. But of course think what it means to them, my parents must have lived. I don't know what the address was, I wish I knew, but it couldn't have been very far away. And so for them coming to my graduation would have been like coming to a place that they were very familiar with. And my favourite uncle, he used to, he still at the time was alive and he still lived near Alexandra Palace, so he came to graduation as well. So somehow I managed to get four people in. I think the official limit was two, but I didn't' really care about that and they wouldn't know how to enforce that, don't worry about it.

So I got them in and my wife. For my father, mother and uncle this was a nostalgic place to visit, but the really great thing about this was it was broadcast live on BBC2, which not many people can say about their graduations, and I was the very first person presented. If you look in this booklet you can see that actually I was the second one listed under PhD, but the first one didn't come luckily, managed to stop him coming, so I was the first one presented, which is great. I was actually I believe the first person who'd ever got an internal, first internal person who'd ever got a part time PhD with The Open University and that was mentioned in the broadcast, I was quite proud about that. I think all the others had died or given up long ago and left or something, but nevertheless I actually was the last person standing, I got that distinction.

And it was broadcast live on BBC2 and there I was resplendent in my Open University PhD gown, beautiful blue gown. And quite honestly, this is arrogant to say this, but those gowns put to shame those boring Cambridge PhD, BA sorry IMA or MA gowns, the Oxbridge gowns on the stage. Those are terrible, rubbish, compared with the beautiful Open University PhD, so that felt really great. And I had my wife there in the audience taking photographs, recording it. And the people I was presented to, of all the people it could have been, one was Professor Mike Pengelly who I've mentioned before, my internal supervisor and the Dean of my faculty. I was also presented to the pro vice chancellor, who was Professor Don Swift, pro vice chancellor staff, who by sheer chance

was the boss of my wife who's still working at The Open University and that was just a coincidence, but of course a really nice coincidence and I was also presented to Walter Perry, the first Vice Chancellor, who I must say I thought, I still think was a legend really.

He did an absolutely brilliant job, and it was a great honour really to be presented to him, I really mean that. He deserves all the praise he's had, he was a very good man indeed. And as I say the sun shone and I felt really good. And that was probably about as good at it got. Now what happened after that, nearly finished what I want to say, but what effect did this have on my life? Well I know the supervisor sometimes since then, sometimes people do PhDs and it doesn't have the slightest effect. They just carry on with the job they were doing as if they've collected it like a hobby. But for me it totally transformed my life. So I was now an academic. I started off as a lowly assistant, but by now I was an established academic, I could do independent research. I could supervise projects, I could apply for grants, I could referee papers, I could referee grant applications, I was an academic and 10 years later I was a professor, so a professor at just over 40.

Now there is no way I would ever have got to be a professor if I didn't have a PhD, certainly not in computer science. But it was more than that. This field that I talked about, although the field for my research was Representation of Knowledge for Chess End Games, this area of the clarity of representations of knowledge, which seemed incredibly esoteric at the time, it was really just me and Donald Mickey, the examiner and Mike Clark, about three of us in the country who were remotely interested in this, had any idea. What I'm talking about is the idea, instead of having computer programmes that run sequences of instructions, which they still do and inside internally of course they're running instruction, instruction, instruction. What you don't do that, what you do is you make a description about the world and you let the computer loose to work out what it can from you description.

So your description stands on its own regardless of any programming language, regardless of anything else, regardless of whether you've got a computer or

not, these are just statements about the world. So this isn't what I did for my PhD, but supposing it was something like all Greeks are mortal, Fred is a Greek, you can conclude from that Fred is mortal. So it's that kind of reasoning. The things themselves stand completely independent of any software. Now the idea you could actually write this into computer programmes and use it to solve problems was completely crazy. Nobody had thought of that until in 1980 the Japanese government and consortium of universities launched what was called the fifth generation computer systems project, where they put that way of working right in the centre, absolutely in the centre.

And because other countries were really definitely scared of what the Japanese were about to do, like take over the world computer industry, there was a massive attention focused on that way of working right throughout the world, but very much in Britain and America. And the field was just given a name, expert systems. Expert systems meaning systems that use rules and reasoned with rules, rather than sequences of instructions. And the few people who knew anything about this like me, suddenly found ourselves in massive demand as speakers. We were going to meetings with government bodies frequently, because suddenly this thing is very important, but nobody knows anything about it. And so I found myself in great demand as a speaker and this helped me to rise up the ranks. And I became head of department a few years later in one university and then head of department and professor in another.

And now I ended up as emeritus professor in Portsmouth and also but other things. Also I became chair of the British Computer Society's specialist group on expert systems, which later became specialist group on artificial intelligence. And well probably that was part of the platform which led me to become vice president of a body called IFIP, the International Federation of Information Processing for six years. That's the body that represents about 45 national information technology societies. Now none of that was going to happen. If I'd stayed where I was in London I'd have had a different career, possibly had more money, possibly had a less stressful time, but I had a lot more fun with what I've done and I'd recommend it. But I just wanted to end by saying what I think about The Open University now.

I think The Open University, much the same as I thought at the time, The Open University was a brilliant innovation, it was a great innovation. Whatever happened afterwards, whatever faults it may have it was doing the right thing and it did it at the right time and I'm really very proud to have been involved with it. It was horrific working there the first couple of years, but horrific because you're doing something that's worth doing, and you really believe in doing. And I enjoyed doing it and I'm very grateful and I think my wife feels the same. And other people I know who've had that experience, they've felt the same way. This was an inspirational place to be and so I'm very proud to have been there and it's interesting how all these years later the significance of using distance learning methods in education has become right central right throughout education, because of the pandemic.

It's taken all that to get people to understand what some people understood right back in the 1960s and '70s and I'm very glad for that experience. It was tough at the time, but I'm really glad I did it and that's all I wanted to say.

END OF INTERVIEW