Christopher Curry

Interviewed by

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26th April. 2016

At the

WCIT Hall,

32a Bartholomew Close, London, EC1A 7JN

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Archives of IT

It's April 26 2016 here in London, England. I am Alan Cane and this morning I'm talking to Christopher Curry, one of the pioneers of the UK's home-grown microcomputer industry. This interview will come in two parts, the first a discussion of Christopher's career, and second, his background influences and views on the information technology business.

Christopher, you started your career I think in Pye, the electronics company. What drove you to take a job there?

Well actually I had to get a job somewhere. I decided not to go to university, because I thought, the Diploma of Technology, which, with its sandwich courses, appealed more to me. So I had to get a job somewhere. Pye was *the* most important electronics company in the area, so I started what was called a student apprenticeship there. And that was a quite extraordinary experience.

What kind of work were you doing?

Well, as a student apprentice, the first thing you have to do is learn to solder, and work on a production line. A production line was about 500 women, with very bouffant hair in those days, and about four chaps, like me, doing these courses. So, we were very well outnumbered, and it was a quite extraordinary experience.

So this was education as well as work?

I learnt how to solder very well indeed, and I wrapped the wires… I mean this is before printed circuit boards existed. You had tags, and you wrapped the wire round, through the hole, snipped it off at exactly the right point, and put a blob of solder over it, and that's how Pye of Cambridge radio sets were made, like that.

So this was for radio?

Yes, what they did at Pye Telecom was, they made car radio systems for the police forces of the world. I mean they were probably the principle supplier in the world.

[02:04]

Mm. But, you weren't there very long, you left after a few months to join the Royal Radar Establishment. Why was that?

Well, after my, after I learnt to solder, I was put on electrical testing, which meant, a vast sack of relays would arrive on one side of you and you would plonk 'em in a slot, click a button and read the resistance, and put it in there. And after a few months of this I thought, I don't think I can go on doing this. So I saw a job advertised at the Royal Radar Establishment as a lab assistant, lab technician, and I can do my Dip Tech course at the Royal College of Radar. So off I went, from Bedford [Cambridge Bedford South] station to, when it existed, to Malvern. A lovely place. And started living in the Geraldine Staff Club, which was the place where everybody lived. It was like a boarding school, it was an extraordinary establishment. And everywhere you looked were radar dishes going up and down and around and round, and, and in that place they did everything, absolute… It was an Aladdin's cave of wonderful scientific things. Beautiful place. Marvellous.

At this time were you using integrated circuits in any of this work?

No. No.

So that was yet to come.

Yes, it was yet to come. Things like, the nose cone of TSR-2 sat in the lab next to me. And you know, those, just wonderful, the radar which TSR-2 had, and it was of course the most advanced radar in the world. I was working on superconductivity actually. We made superconducting junctions. I used to sputter bits of aluminium on to glass, put a milliamp down one bit and stop ten amps travelling the other way, which was magic.

Indeed. Indeed.

And great fun. A marvellous place.

[04:05]

Again, you stayed there a comparatively short time.

Yes.

And then moved on to the ITT laboratories of WG Grace.

Oh yes.

Yes. What was that all about?

Well, I had a bit of a, a bit of a dust-up at… I had a warning at the Royal Radar Establishment. I had been skiving my college afternoons, and filling in the register as if I had been there, which a lot of us did by the way. But this was a serious offence. And when they also found that, to travel to the Cavern Club once from Malvern in a, only-just working Morris 8, we had used a winchester bottle of ethanol absolute to put in the petrol tank, which had come from stores. And I mean, and, this is again something that a lot of people did there. The stores, you could get anything, and if you worked there and you had signed the Official Secrets Act, they expected absolute decorum. I'm afraid I wasn't very, very good. They found that I had had a winchester bottle and got, got to Liverpool on it. Missed the Beatles, but we went to the Cavern. So I had a warning that says, if you stay, you will face disciplinary procedure. You have a chance to leave and you will not have a stain on your record. So I chose to leave. Had to get a job. WR Grace. What did we do there? They, they blew bubbles to make cling film. And I, I really didn't do very much except I used to take part in taste testing. I was a lab technician, you do what lab technicians do. But taste testing was the best bit, because they were replacing cork seals in bottles, so, you had a tonic water to try and see which one tasted nice or closest to the reference. And then, weekly competitions to see who got it right. But that's the only thing I really remember about it. Because, that was pretty tedious too. So when I saw an advertisement, and I'm probably jumping your gun here, from Sinclair Radionics, I went to…

[06:22]

Mm. That was in 1966 you joined Sinclair.

Oh. Oh.

What was Sinclair advertising for?

Engineers. He had just moved to Cambridge, and he wanted engineers. It was a very loose term, it didn't say with any particular experience. I had had, my experience was building things with valves. And I had actually bought one of Clive Sinclair's early products, an X-10 PWM amplifier, which never worked very well. But, anyway, so I knew his products, and I liked building electronic things, so, that's where I went. And that's when the fun started.

Wow. What did Sinclair put you on when you joined?

Little radios, amplifiers. The matchbox radio Micromatic, I, I developed that. He used to come in and say, 'Try this, try this, try this,' and, and disappear, and you would have to build it, and, fiddle with resistor values and capacitor values, and, look at ways of making it work a bit better. Wind the, wind the coils on the ferrite rods. And then lay the thing out and squeeze it in a box, with a battery.

What was it like working for Sinclair?

Well it was… It was fairly hectic. It was very hectic. Clive was a very irascible person, who was always charging up and down shouting and throwing his slide rule around. But it was great fun. And we worked, we worked till late at night every night. Then usually, I'd go off to the pub at about eight o'clock with him, and he'd go home afterwards and I'd go home afterwards. But, there was always a new project, a new product to be developed, and you'd take it from the idea that usually Clive came up with that he wanted to do this, and, you'd take it right the way through, lay the printed circuit board out, test the components, put it all together in a kit suitable for selling mail order, and, you know, everything from the packaging… He always did the advertising.

He did the advertising?

He always did the advertising.

[08:40]
Uh-huh. Uh-huh. Mm. But you were involved I think in the development of the Sinclair Executive calculator.

One New Year's Eve party, which was one of Clive's annual events, the New Year's Eve party, which were usually awful, drunken scenes and fights and things like that, not with Clive I should say, perish the thought, I had done my share of drinking and socialising, and I knew that I had to get on a plane early that next morning to America, to Texas in fact, to go and collect the first samples of a chip called the TMS 1802, which was the first single-chip calculator that TI had developed. Clive had arranged this and I was sent off to get it, with the worst hangover on God's earth, and, in a most terrible condition. I got there. We got three chips, and a chip was more or less a new thing in those days, but three chips, and two others went to Japan. So we got three out of the five samples that they originally sent out of TI. And my job when I got back was to, was to build a prototype around this chip. We didn't have keyboards or anything to work with, so we had to build bits of wire with flexible bits of tin on them to make a keyboard. And eventually… And a clock. And eventually, after a couple of days, the most amazing moment was, it had an LED display, and seeing, because we got the clock at the wrong speed, seeing, putting, pressing a key, and a whole lot of flutterings went across the screen, and then a number appeared eventually in seven-segment form, times button, a lot of fluttering, and then another number. And the result. We always did 22 over 7, was the test. Pi, and, I'm sorry, oh you know.

Yes indeed. Yes.

And when the figure came up on the screen, I think everybody gathered round and cheered. It was magic. This was magic.

How many decimal points? [laughs]

22 divided by 7 = 3.2428571, I think that was eight digits on the display.

Eight digits. OK. So how, I mean, how revolutionary was a pocket calculator at that time?

There were no others. That was the only one. I think there was one called Rapidman 800 from the States, but it was a great big lumpy green thing. And what Clive always did was to try and make things look really sleek. So, the case was designed to be very much a pocket, almost a, you know, a fashion accoutrement or something that the wealthier businessman could show off with. And in fact we, we did supply, one of the very early ones we supplied to Lord Rothschild in Cambridge, and, it was quite a story, I don't know whether it's appropriate for this, but the story was that…

Oh let's hear it.

We had squeezed every last bit of power out of these three little button cells, too much in fact, because if you put too much, take too much drain out of them, they de-gas. He was in a board meeting, Lord Rothschild in a board meeting, and one of the batteries exploded in his pocket. And he thought he'd had a heart attack, and they called ambulances and things like that. He hadn't had a heart attack, it was the bloody Executive going off bang in his pocket. He didn't, he was very reasonable about it. And I took him round a replacement a few days later. But that's, I think we changed the circuit after that, so we didn't have this tendency for the other batteries to charge the one that went flat first. But it's, it was £79, it cost us £11 to make, and we sold them, we couldn't make them fast enough.

[12:56]
Mm. Mm. Yes. Yes. And you were still at this stage doing the engineering as opposed to managing, or…?

There were no managers Clive, Clive ran everybody, and, but everybody had responsibility from ordering the components right through to getting the production

made. So, each project was somebody's end-to-end task. Which was nice, because you learnt every part of it. And you could watch Clive to learn about how the advertising and the marketing was done.

That was his particular skill, advertising and marketing?

Well his… Yes. He… Well it's the bit that he…

I think, concept, advertising and marketing.

That's right, yes.

Yes.

Yes. Oh but he was also, I mean, he started off doing circuit design. He published a little book called Bernard's Radio Books, if you remember those. [

Mm. Yes I remember those.

Which were, *22 Tested Circuits*, and, you know, two or three transistors doing something or other. So, he was a circuit designer. Transistors were quite new things then.

[14:03]
Mm. Indeed. But by 1976 the National Enterprise Board, which was a, agency of the Labour Government, set up to encourage investment in British business, took a share in Sinclair. What was all that about?

Ah, I think it was, it was a cash flow problem, and there had been a grant which had horrible strings with it. So when it didn't achieve… I mean this was I think to do, more to do with the television, the Microvision, which was costing money and, and had, after the launch had to undergo a complete redesign, different kind of tube. And that was one of the things I worked on, I mean I went, we worked five days before the radio show where we had to show this, building the damn things. And, I remember

winding frame coils, 400 turns of 40 SWG wire, had to be done in a, in a very short space of time to get the things working. We got them working, stood beside them, correcting the frame mould every two minutes. But, they worked. But the design was never going to be a mass-production one, so, it moved to another one, moved to an electrostatic display screen. But gradually the time went by, and the costs went up, and I think that was when the NEB, it was a slightly less friendly organisation than it could have been, they definitely had a view to nationalising things if it had a chance. And, Clive, Sinclair Radionics was getting to the stage where the NEB was taking too many decisions. Clive didn't like it at all, and, then he was told that he'd got to reduce staff costs. And, so he, I talked to him, we agreed to set up a, a little outfit on the side that would use up some of the surplus chips that we had for the calculators.

[16:11]
Yes. Yes, we'll come to this in a second. But, the Executive calculator was very successful.

Yes.

The Black Watch and the television had problems.

The television… Yes, the television never really got to volume production. The Black Watch did but it had terrible reliability problems. It was very smart, but it, it didn't work very well.

What sort of lessons do you think there were to be learnt from that experience?

I don't think… I think the Black Watch gave Sinclair Radionics a rather bad name. It didn't stop people buying the product, as we well know from what happened later, but, it was an expensive error, and, it was often because Clive had a tremendous tendency to go for the lowest possible cost of assembly. So if he could save a transistor that was only 5p, he would, even if it meant that something might not work quite as well.

Mm.

Yah, I suppose, warning ships and things like that comes to mind, but, that's the only lesson I'd say. I mean, the Black Watch looked good. I personally never liked digital watches, so I never really wore one. I had a, I had a Hamilton for a while, but, I didn't, didn't like the look of them. Didn't like having to press them to see what the time was.

Mm. Yes, I mean just for the record, the Black Watch was a, a black plastic watch with, which you pressed a button to see the time, which came up on a red, a red LED display.

Yes. Which was under a dark, a darkened filter so that the whole of the surface of the watch looked completely black, until you pressed it and then it lit through. Oh, it was impressive, but, [laughs] sometimes you had to actually press very hard as well.

And you could build it as a kit?

I don't know. You couldn't. The thing that, the thing you could build as a kit was a thing that was rather like it, which was the first product that we built in what was briefly called Sinclair Instrument. That was a… I'm glad I've got the ring off [inaud]. [laughs]. That was a wrist calculator.

Ah yes.

Based on the C550 from General Instrument, and, a load of buttons. It was roughly the same size as the Black Watch. A bit bulkier. Had eight little mercury cells as they were then. And we sold lots of kits in America. I don't know whether I'm leaping ahead, but, the, the American part of Sinclair Radionics was not subject to the NEB's constraints. So we tried to build up as much sales in the US, and certainly sold something like 100,000 of those little watches over there.

Mm. Mm.

I don't know how many came back. [laughter] People were very, very forgiving with the kits. We had kits that people built with solder paste instead of soldering irons. And most of the time we would repair them for them. But, kits were a good way of, mm, concealing what could have been perhaps a slightly more professional design in the first place.

[laughs] OK.

Beta testing in the field.

Which the computer industry has specialised in…

I'm afraid so. But then…

…from year zero.

But then it has to, because of the software side of things I suppose.

Indeed. Mm. I mean software presumably wasn't much in evidence in Sinclair at this time.

Software had started. Yes it had started, because the programmable calculator, one of the Cambridge programmable, wasn't software, it was programmable in a, in a crude way, but to make it programmable with straightforward software had been done for it by one of our number called Nigel Searle who was our specialist in doing it.

[20:41]
Ah yes. Mhm. Mhm. Anyway, tell me about the spin-off, the birth of Science of Cambridge.

Well, it was, first the watch was done under the name Sinclair Instrument, and it was part-owned by Clive and me. He had the majority. And, the watch was based on surplus stock, the watch calculator was based on surplus stock. But, later on we were

trying to use one of the programmable calculator chips to make something like a programmable microcomputer. And…

Whose idea would that have been, you know, to build a microcomputer?

I wanted to do it.

You wanted to do it?

It was… I had been, I had been out to the States a couple of times, picked up a magazine called, I think it might have been *Wired* or something like that. And there was somebody advertising, I think they were called something like Altair, a computer in a book. And they were selling a computer in a folder, which had a printed circuit board and some packets of components and some instructions. A bit like the MK14. But in a book. Because they didn't pay Purchase Tax on it if it was a book. Oh it was a good way of keeping the price down a bit. I looked into it here, but I thought, well, that looks like an interesting thing for our kind of hobbyist market. So, I'll do one. And, I was helped by, oh I've forgotten his name, a chap from Cambridge Consultants, Ian…

Ian Williamson.

Ian Williamson. That's right. And he knocked something up, based on the, on the calculator chip. While I was looking at that, I was approached by a sales engineer from National Semiconductors, who said ,'Why don't you use our 4040 chip, SC/MP as it was known.

Mm.

And he offered to virtually design it. There was an application note that came with it. So, I went with that. And, I laid out the board, and, I had, a friend of mine, David Johnson-Davies, did some, a set of programs to go with it, simple programs. They had no storage, we had 256 bytes of memory. So you couldn't do an awful lot. And you had a hex keyboard, which sometimes worked well, and sometimes, if the

conductive rubber that we used as the contacting mechanism was high resistance, it didn't work well. So we had some interesting customer observations on the keyboard and what we might do. It changed eventually, but…

But this was the MK14.

MK14. An MK14, it's not mark 14, it stands for microprocessor kit, with fourteen components. That's how inventive we were with names. [laughter] But, everybody thought it was mark 14.

Yes. Yes, I don't know if you remember, but you gave me one of the early MK14 kits. The keyboard never worked. [laughs]

No. Well there you are. You've got one of the high resistance sheets of rubber.

Mm.

Sorry about that.

But how successful was the MK14?

Oh it was brilliant. Absolutely brilliant. We sold 90,000 of them, which was, seriously high. It was the… And what did we get? Sold for £39… I can't remember if it was nineteen and six or 95p, I don't know whether it was pre-decimal or not by then, but… And that was the one that kept me in, kept me in the office over Christmas. Because sometimes we were late delivering, and Christmas presents when they don't arrive, that's pretty serious. And I'm afraid, they were often late. And… But lots of people, they built it, and something didn't work, and they wanted to know why. It's Christmas Day in the afternoon, they'd assembled it, and wanted to know. I sat in the office answering these questions, all through the Christmas holiday, I think, two years running actually. And you get to know your customers. And actually, really rather nice. There were some savage ones, there were some very understanding ones. But what happened was that, most of them started sending me back things they

had done with it, ideas they'd got, little programs. And if you can use your, use your customer base to build the product…

[25:40]
I understand you were marketing chiefly to hobbyists I suppose.

Yes. Yes.

I mean, had the idea that the microcomputer as a personal computer would become so important occurred to any of you at that time?

Well in a way, no, because you will see what happened much later. We hadn't really spotted the, the business computing aspect of it for some years. We saw it as a, as a thing to learn to program with, and clearly, programming machine code was a jolly useful starting block, but, without BASIC or some higher level language it wasn't really going to get to a wider, non-mathematical audience. No, we, it was just the next step for the hobbyist that liked soldering things together. They'd been buying amplifiers from us to start with; now they bought MK14s.

Mm.

It wasn't really a computing market, it was a, exploration market, electronics market.

Mm. And you were very much in the, if you like in the hands of the semiconductor manufacturers.

Mm. Well, the problems with that really came a bit later. You always… Memory, memory chips were always hard to get, and, when we got into, beyond Science of Cambridge, the ordering of memory, which became a national, a globally scarce commodity, went up and down like that, you had to order a year ahead, and, you'd have to guess your requirements and order a year ahead, which was a tricky thing to do. Chips of all sorts, there were… I mean, there is a section that I, before I start to talk about the, about the problems that we faced in the early Acorn days of chips. We didn't have a lot of problems with the MK14. The numbers were well within the

supply of bits and pieces that were available at reasonably short delivery time. We had to make many more than we expected to make, because of demand. But within a short space of time, the customers that had bought things from us and had come back with ideas and suggestions, had also created a demand by people that had applications that needed microprocessors built in them. And this led to an approach from a company that made fruit machines, one-arm bandits, coming to us and saying, 'We want to leapfrog the competition and build a microprocessor controlled fruit machine. This is a fairly hairy industry, the fruit machine industry. The turf wars and some savage attitudes. So we were on…

That was pretty advanced thinking for that industry I would have thought.

It is. It is. But, somebody had done it in America, and they were all worried that this American company might come over and, you know, flatten them all. So we started doing that. And in order to do that, Science of Cambridge kept on its normal business of selling products, and we set up a little consultancy on the side called Cambridge Processor Unit, which handled special builds for people. And that's when, and that's the time when Hermann appeared on the scene.

Hermann Hauser.

Yes. And we, we had a collection of part-time employees, mostly from the computer lab, but not all, that helped develop these custom builds. And the first custom build that actually earned the money that started up Cambridge Processor Unit was this twin processor Heart for a gaming machine. One processor switched all the lights and flashing bits and buttons and things, and the other one did the calculations and controlled the, and this sounds disgraceful, but it controlled the wheel where it stopped. All the original wheels whizzed round until it ran out of momentum and clicked to a halt, fairly random. But what we were doing is actually putting a thing in and stopping them, using a random period generator to stop them, but it, it could be stopped wherever you want it to. [laughter] So you could absolutely fix it. This was very good, because, in the old days they used to test the machines by having teams of women testing them for, seven or eight days on one machine, 24 hours a day, to discover what the likelihoods were. And then writing that machine down as being

good on this, bad on that. And they would have to adjust off by changing the number of nudges you were allowed.

Oh yes.

But with the new one, the nudges didn't matter, you could set it and it would do what you wanted. [laughter] It, it was still done within the rules, because of the so-called random number generator in it. As we all know, there is no such thing.

[laughs] Indeed.

That was, that was good fun, and it was good fun because, for the chap that did most of the design, Steve Furber, it involved joining two separate microprocessors at bus level, which was quite, relatively unusual anyway then.

[31:52]
Mm. How did you meet Hermann Hauser?

Hermann. Herman, in, occasionally in bars. I mean we, we would… I spent quite a lot of time in bars; Hermann spent a bit less time. But one, we got talking, and, he was interested in what I did, so he came up to Science of Cambridge, we were right opposite King's College, and King's Parade. And, and he was instrumental in making the links with the, some of the people at the computer lab, and the engineering lab, who acted as our part-time employees.

Mm So at this time there was Cambridge Processor Unit, which was your company with Hermann.

Yah.

Did Science of Cambridge still exist at that time?

Science of Cambridge still existed, but at the time when we… And CPU was there just to do external developments projects, it wasn't really anything to do with Science

of Cambridge. But Science of Cambridge, by this time Clive had, had seen that, that a microprocessor, or a microcomputer, definitely had consumer appeal. He was by no means keen on it when I first did it by the way.

Mm.

But then he saw it had, and so he started development of his own. He had started development of it, but it got taken away as an unnecessary expense by the NEB.

This would have been around 1978, or '76, '78.

Yes. It got taken away to Newbury Electronics, and became, what he had started became the NewBrain.

How did that work? I mean…

Newbury was already owned by the NEB.

Yes. Right.

So, when the BBC… Oh hang on. Maybe I'm getting, getting timings a little bit out here. But when the BBC started looking for something, they decided this is, this is something, this is educational and something that we should be doing, they asked the DTI what they should about it, and the DTI said, 'Oh well let's see, the NEB's got a company in Oxford, Newbury rather, go and see them.' So the original BBC platform was going to be based on the NewBrain.

Mhm.

Which was also very galling for Clive, because it had started out life in Sinclair.

So the NewBrain was originally a Sinclair design?

It wasn't fully, by any means fully designed. It developed quite a lot more at Newbury. But it was, it was a project that was taken out by the NEB. But, Clive had started anyway doing something with, with Nine Tiles to build the original, the first ZX product as well.

Right. Mm.

But the NewBrain was, had its origins in Sinclair. But that was developed as a result of the success of the MK14.

[35:10]

Right. OK. So, tell me the story of the BBC and the development of the BBC Micro.

At Cambridge Processor Unit we had a, we had a policy of building to order and really aiming at the industrial market. So we were building things to control Skinner boxes in places, and, and our customers were mostly engineering companies that needed things, not consumers. And I felt a bit sorry that, well I felt that we were missing out, and that we needed to have a brand suitable for the consumer market. And so, after CPU had been running for about a year, and Science of Cambridge had more or less been shut down by Clive, Acorn was formed as a company, and the product that was largely developed in my house sinking into the Fens was called the Atom. Which used the basic designs of the modular card system that we did for the industrial market, in a single board computer. But we built into it a local area network as well. We had to, because it was the way things were developed in our offices, with the thing that we called the Econet, which was developed for internal purposes, but actually became enormously important, and a big consideration when we came to meeting the BBC. So the Atom was designed in two ways. One, Steve Furber, because he was a specialist on twin processor systems, designed the… The Atom was designed so that it could plug into a second processor, if you wanted to go 16 bit.

The main processor on the Atom was 8 bit think.

Yes, it was the 6502, same as the Apple.

Yes, the 6502.

Mm. But, the version that could take twin processors was called the PROton. Had to be, didn't it. And, we were really only toying with the idea of the PROton when I saw this advertisement or news item, might have been something you had written, I don't know, but, about the BBC planning a computer program. And I got, I got in touch… First of all I rang Clive. Remember, at this time we were, we had sort of, gone apart a bit, but I thought it was worth ringing him, and said, 'Are you doing something with the BBC?' 'No. What are you talking about?' We realised that neither of us knew anything about it. I wasn't quite sure whether he was telling me the truth. But he was. And, I investigated and I, I went, I went to see them. And, went to see them with a rough outline of what we were doing, and we could tell them that we had, we had a, if you wanted to work with a 16-bit processor, then we had the option to plug one in; if you wanted to run a properly-structured BASIC, it was there, but it also had, as the BBC Micro did have, so did the Atom, had BASIC and machine code, which you could mix. So you… And, so, the BBC sort of, faltered. We made a bit of a complaint to the DTI I think it was at the time that, the BBC shouldn't be doing this sort of thing. [laughs] It's not fair, and anti-competitive, you know. Well it didn't suit us. [laughter] And after two or three meetings, and they came to see the prototype of the PROton, which worked at the very last minute, and I think Hermann has got one of his well-rehearsed stories about snipping a wire that was causing an earth loop…

Mm, so I believe. [laughs] Yes.

…it worked. And we explained how the Econet worked, how they can be linked up. We showed them the Atoms linked in a classroom. And this is quite unusual. You could have a teacher, and you could put it into, you could switch remote, and the number of the pupil's machine, you could take over the keyboard, and you can write to the screen. This is something you can't do with, with modern local area networks. But it was especially impressive to the BBC. Anyway, they, they said, 'Right, we'll think about this. We'll probably work with this, with you, if you can build this in time.'

[40:22]

Mm. What was the US competition like at this time, in this area?

Well there was only Apple, really. I mean, there was Atari and Apple, but Atari was really sold as a games machine. It didn't suit the BBC's image at all. It wouldn't have worked. Apple was a clean-cut kid of a product, and it was very similar in design to the BBC machine, but it didn't have, it didn't have the things that the BBC wanted. We built in, because the BBC was promoting this thing called Teletext, we built Teletext into it. So, it had a Teletext graphics generator specially to appeal to them. We didn't really use it as much as we should, but, it was there. So it, it ticked every box they could think of.

[41:12]

Mm. How did you go about… I mean, to develop and market this machine, you had to move into software in a big way. How did you do that?

Do you know, the extraordinary thing is at that time, we had, we had sort of, full-time about, six software people, coders, but, you know, one of them was a man that was nocturnal, worked all night and all day and, da-da-da, and wrote code that worked first time, and wrote code at three times the rate of anybody else. Huge, he was the most hugely important generator of product in the software side. Very very important. At that time and still is of course, even now he's at ARM or something. But, because of that, we got a lot done. But, we didn't, that wouldn't have stopped us, because by that time, a lot of our market was amongst the Cambridge people, so we had the engineering labs and the computer lab and the maths lab, they all had people that wanted to do things for us. And they were all students or postgrads that liked a bit of, a few quid on the side to do something. We had a, a version for the Atom of VisiCalc, which we called AtomCalc, knocked up by Jack Lang of now Raspberry Pi. He knocked it up in about a fortnight, and, to have VisiCalc, or AtomCalc as we called it, on the Atom, was, was quite a, you know, feather in the cap. So…

Mm.

But we still didn't really think for business machines, of machines for business. And that's one of our serious failings.

[43:13]
What did the BBC think it was doing with personal computers, or microcomputers?

It was teaching programming.

Teaching programming?

Programming, and, rather than teaching use of computers.

Mhm. Mhm.

And I think we all felt that, we thought, well one thing will lead to another, but, it didn't. IT was a separate business from learning how to program. And, I suppose that's where, that's where our nemesis in the shape of IBM appeared. I mean the first, the first problem that awakened us to it was the frightful Amstrad machine with its built-in printer, that we had no answer for. You know, it was just a word processor.

Mm.

But suddenly the market, woofed off into, yes, I can get that for my wife, she runs a shop. She'd like a word processor. And…

[44:14]
But, let's just step back a bit. There was this quite well-publicised spat between yourselves and Sinclair over the BBC Micro. Can you tell us about that?

Well Clive resented very strongly, and I don't blame him, I would have been just as cross, when the BBC announced that they were going with us. And when the DTI added their support to it, they were obliged to add, you could either, you could get fifty per cent off with a DTI grant if you were a school, if you bought a BBC computer, or, a Sinclair one. Well the Sinclair one cost less than half as much, so the

schools all said, 'Oh we get 300 quid with this one, and only 120 quid that. So we'll buy the other one.' So it didn't work very well for Clive, the Micros in schools scheme. So he was pretty cross about it. But, but we had the disadvantage that for the new people coming in, they were still buying the cheapest model and the one with the flashiest advertising, which Clive was very good at. And, so we were missing out badly on the low-cost market. And, I, I was determined that we should have a cut-down BBC computer, that ran all the software but didn't have some of the features, and that was called the Electron.

Mhm.

The Electron we were going to make as cheaply as we possibly could so we could sell it at the same sort of price as a Sinclair product. And in order to make it cheap, we needed to put a colossal ULA in it, to use all, take up nearly all the, the general logic componentry, reduce the printed circuit board size, and… So this was…

Sorry, ULA?

Uncommitted logic array. This was Ferranti. Ferranti was a connection that I had had from the Sinclair days, because they made a radio chip for us.

Yes.

And, we knew the people at Gem Mill that did all the chip development, and they came up with the idea of having uncommitted logic arrays, before anybody else. But, their technology was based on ECL, high current, rather high, higher… Things got hot.

Mm.

There was no CMOS equivalent in those days. So, anyway, we worked with them, there was a ULA in the BBC computer, and then there was a much bigger one in the Electron. And the Electron ULA, Ferranti had so many problems that it, we lost a year and a half, and we missed a vital market place. And while we were in the

middle, missing the vital market place, Sinclair was getting all the business that people like WH Smith had booked with us, we couldn't deliver, and so we were doing anything we could to keep the pressure up. And I must admit, I am slightly shamefaced, I agreed… We never did knocking copy normally, but we agreed to publish an ad that listed the failure rates of the popular machines.

Oh yes.

It was from *Which?* magazine. It was only just a little bit in it that said, these are the *Which?* figures. And it had failure rates of the BBC computer at, 1.1 or something, some others, and then the Sinclair at 26 per cent. It was a shabby trick I suppose, but, we had to do it. We had, we were… This is, this is what really killed us you know, the Electron not coming out on time, because something else happened after that. So, I agreed to run this ad, and Clive saw it. And, he was very cross. So he bumped into me and a little scuffle occurred, but, that was, a minor thing. It was made a lot of, but, it wasn't much.

Mm. Well because this is, this interview is for history, I mean, people may well have watched the BBC Micro drama Micro Men.

Micro Men, yes.

What did you think of that?

I found it very embarrassing, and, uncomfortable. It set out really to make a fool of Clive, and partly a fool of me, as being the two buffoons that ruined the British computer industry, you know. [laughter] Both, both are unfair, but, I had some say in modifying it. Clive refused to have anything to do with it. I had it modified a bit to get some of the really unfair stuff about Clive taken out. But it, I'm afraid it, it exists. I don't like it, but, you know, I didn't have… We deserve it I suppose.

I don't know. I thought it was a bit like a, like a comic. [laughs]

Yes. Well… Well…

The, Alexander Armstrong was the dreadful bald wig representing Sinclair. [laughs]

The domed head. Yes, I know. He got some of the shouts right. I mean we told him, the rantings off stage were quite good, they sounded just like Clive in fact. [laughter] But I mean we, the little scuffle that happened was, we were both fairly pissed, it was Christmas Eve or something like that, and… It was a, a minor fracas. We were great friends; although we were sort of, rivals in business by then, we still remained great friends.

Mm.

[50:25]
Yeah. But if the Electron had come out that Christmas on time, then, a half a million Electrons would have been sold, and the world would have been a different place, because it was that that gave time for the Amstrad business machine if you like to appear on the scene and skew the market completely. And that gave time for the IBM juggernaut to roll inexorably on. But, the ULA delay was, was terrible. Kenneth Baker carpeted us both, because it was part of the, again part of the Micros in schools scheme. But there was no way round it by then, we had, we were totally dependent upon that, on that whacking great ULA being done. So, eventually it…

[51:18]
What was the problem with the ULA?

It overheated.

Ah.

They'd never built such a big one, and it over-heated, and it had some, it had some other… When it overheats, it gets leakages and things like that, and, parts of the circuit wouldn't work properly.

So was Electron ever a successful machine, I mean in terms of working, as opposed to selling?

Oh yes. Eventually the, the ULA worked, but it was only, it only worked by being chosen, picked, tested. So it became very expensive for Ferranti, because they got about 40 per cent yield, which was terrible.

Terrible.

And the Electron had lost its opportunity. A great pity, because…. And we had a whole series of modules that stuck on the back that did all sorts of things, more than the, more than the Beeb would ever have done, but… So, it didn't happen.

[52:20]
Mm. And the BBC Micro was launched around 1980, and by 1981 you had shipped 12,000, and '82 you had shipped 25,000. So it must have been hugely successful for the company.

I thought it was more than that, because I thought we, we certainly did a million by, I thought in three years, so, we must have gone up fairly quickly than that. But, your figures are probably…

I'm just looking at some of the published figures.

Yeah. That's right. But we were doing higher volumes than that. We, we started off building in Hong Kong, Wongs [BBC Micro Chima factory Wongs – Kong King], and with… But we wanted to give, we wanted to say, and I had this big thing about made in England, we had them being built in Wales, and in ICL's factory in the Midlands somewhere.

Oh yes. Mm.

I can't remember where it was. So we had three different plants building them. And then the problems came with DRAM shortages, which, suddenly when the demand

appeared that the chip makers weren't expecting, DRAM became the problem. And, our sales people were on… We… BBC originally was going to be sold mail order only, but, we got so much pressure from the retailers to stock it, that we had to find a way of putting a margin in for retail, and the margin in for the BBC. So it got a bit less profitable. But the volumes that went through retailers became dominant. And, when we didn't deliver on time, not only did they cancel orders, but they demanded price, price compensation if they had surplus stocks and had to sell them off in a sale. And they demanded price compensation anyway.

[54:25]

So one day, we had a, we had, as in the film, we had a stock, we had a huge number of Electrons in our warehouse, and one of the sales people came to me and said, 'We've got an interesting enquiry from Russia, for, they want to buy 100,000 Electrons.' This is, we're still Cold War-ish now. And, I said, 'Yes? How are they going to pay?' you know. Roubles? Anyway, we had a meeting with these people that claimed to represent the Russian or, state organisation. And they said, 'Well, we will buy 60,000 over the next three months, and we'll buy the first 1,000 now and we'll put… But we want to pay just…' We were selling them at 70 quid to retail, I think it was 70, might have been 80, and they wanted to buy them for 40. I think they cost us about 38 to build. And, oh dear. Then we thought, look at the stock we'll get rid of. We sort of said, yes, well perhaps we will. 'They were only going to be sold in the Soviet Union.' 'All right, if they're only going to be sold in the Soviet Union, or supplied through the State, so it doesn't have a visible, going into schools, that's something we can do. We'll have to think about it. We'll think about it and get back to you.' And they said, 'Well look, this is to show our determination,' and they put a half a million pound bank draft on the table. Now, if we'd have been a bit wiser, we'd have known how dangerous that was. But we weren't. We were very trusting.

Mm.

So, I said, 'Well you don't have to do that, we don't want it. We're not going to put it in the bank.' 'Well, it's there anyway. Leave it there, and we'll see, we'll wait to hear what you have to say tomorrow or the next day.' And they walked away. Then, the next morning all hell broke loose. All of our, all of our customers had been contacted by them to buy Electrons at 65 quid each, instead of the 79 to 99 that they

were paying, by these people. Who weren't Russians at all. They were specialists in, you know, stretched and over-stocked organisations. Mostly, they did carpets and jeans.

Oh yes, mm.

But they'd turned their, they'd gone technical, and they did it to us. And we said, 'Right, we're not… Forget it, we're not dealing with you.' They said, 'Oh yes, you've accepted our bank draft. You have legally accepted it.' We said, 'We didn't.' And then we said, 'We have… I mean, our internal lawyer was sitting at the table, and he will confirm that we didn't accept it.' And when they heard that, they were clever people, they were experienced, 'Right, so you had a lawyer present and he didn't explain that he was a lawyer. That's a…' That's apparently an absolutely wicked thing to do and you get expelled from the Law Society if you don't explain who you are.

Really? Mm.

Anyway. When he heard that, that threat, he said, 'Well I'm resigning.' So he resigned, we didn't have any legal witness, and we had to come to terms and pay these people their loss of profits. This was happening at the same time as we were dealing with, we were dealing with Olivetti, the first discussion with Olivetti for Olivetti to sell the product outside, into Europe, or where, you know, they sold their typewriters in those days.

Yes. Mm.

So the Olivetti deal and this were going on at the same time, we were dealing in, phone coming in from these Russian solicitors and… It was a, it was one of the most hairy moments of, of all time. And they threatened us, they said, 'If you… We know where your directors live,' and they reeled off the addresses. 'If you don't…' Then, 20 articulated lorries arrived at our storage depot at Corby, demanding to be let in, all on piece work, 20 angry lorry drivers, and our poor little man that ran the depot was under threat. We had to try and get the police to get them to go away. And it was all

happening while we were trying to close this deal with Olivetti. We ended up having to pay them £120,000, which we really didn't have at the time.

Mm.

It doesn't sound a lot in today's money, but, it was then. So…

That's an extraordinary story.

That was, I went to bed with a shotgun by my bed. Others went on holiday, left home. It was, the threats were taken very seriously.

These were threats of physical violence?

Yes.

Gracious.

Mm.

Mm.

Anyway. That was a little high point, or low point. It was high anxiety.

[1:00:07]
Yes. Well, returning to sort of, more mundane things like an eleven million loss in 1984. [laughs]

Yes.

This was presumably part of that. What… I mean, could you enumerate the factors which led to the, to problems? You've talked about IBM coming in, Amstrad coming in.

Yes. Sales were going down, and deliveries weren't being made. I mean the loss of the Electron deliveries at that time were key factors. Because we were, we had, again, a sign of our naivety, even by that time, was that, we had… We placed orders with subcontractors, which made us absolutely liable to take them. And we accepted orders from retailers, like WH Smith, Boots, Currys, Dixons, that they retain the ability to cancel without any come-back. So, everything was coming at us and we couldn't, we couldn't push it through. So, the loss, I mean, the loss was largely that, the value of the stock was devalued as unsellable.

[1:01:32]

And we were running at the same time an operation in the States to convert, to sell BBC computers. We had a, we thought was a really good idea. Apple used to sell via reps, agents that travelled across the place selling, and Apple had just got rid of all their reps, closed the repping operating down, and we thought, oh well, why don't we use them. They'll know all the places to go, they have got no constraints on them selling a different product. They'll be very eager to do it, they'll be… So we did a deal with the Apple reps. Only trouble is, after their experience with Apple, they all wanted retainers. And we had to agree to them, some retainers. So we had about 300 Apple reps with retainers, which cost money. And then found that FCC, the Americans' main mechanism for stopping imports when they want to, said that we failed emissions, RFI emissions tests. I don't think we did any… I mean, our circuits were very similar to Apple's, the contents were the same as Apple. Apple didn't have any… We had to rebuild the entire internals in a steal case, to pass FCC. And that stopped us from selling in the States for almost a year.

Do you think that was deliberate?

What, the FCC's…?

Yes.

Oh yes. I mean, it's well known. I mean… And, just look around the States for the, at the corpses of British companies that have tried to get in there. But, no, FCC is a way of… But, it wasn't just that that caused the problems in the States. We had, we had our… No. Let me backtrack on that a bit. With the delay in rebuilding it… Oh

yes. We, we had also, in order to launch it in the States, we had done a deal with PSB, Public Service Broadcasting, to run the BBC series.

Oh yes.

Now that cost us $200,000. The numbers seem so puny today, but they were a hell of a lot then.

Mm. Mm.

So we, we were spending money, and we had a development team in California, building a Windows-like interface for the next generation. They were all ex-Xerox Park people. So that. We had our sales people in Boston. The sales reps. There was a lot of money going out into America. And I think that combined with the build-up of stock in the UK and it not getting out on time. I don't know what we could have actually done. We should have had proper contracts, sales agreements with people like WH Smith and Boots. They all cancelled. They said, 'We don't want any,' you know.

Mm. I mean it sounds like your legal people should have been doing a better job.

I think so. Well, we didn't ask them. You know what legal people are like. They only do something if you ask them to do something, and, we didn't, we were so… Up until then, the demand had been so much the dominant thing, that we didn't worry about what happened the other way round.

Mm.

And that's, you know, there's a big, serious lesson to be learnt there, always go… It was largely caused by the long-term delivery of key components like DRAM, but, you know, if you didn't order them two years in advance, you didn't get them when you wanted them.

Would you also say that you were in general in the firm technologists who were inexperienced in business?

Yes. Mm. Absolutely. Although, some of our sales force were ex-ICL and things like that. But, they would have been just, sales people, they wouldn't have been strategists. We didn't, we didn't do enough on that.

[1:06:00]
And what was your board like at that time?

There were no ex… Well, there was only one… There were two ex… One chap, a Nedo (non-executive directors organisation] person who really had very little influence at all, and one, one chap called Christopher Ward, who was a journalist, and he was there because he had good journalistic connections, we hoped. But we didn't have, you know, the kind of people that you, you get onto boards nowadays to, to provide you with a bit of old-fashioned experience and connections.

Mm. Remind me of the structure. Who was chairman, who managing director?

Hermann and I were Joint Managing Directors. We didn't have a chairman until we appointed Alex Reid, during the Olivetti deal, we brought…

Well of course he was a very experienced businessman.

Well he was an architect by training, a helicopter pilot by, by hobby, and, he would have been, he had been working for British Telecom in Prestel.

Prestel. Mm.

So, in a funny sort of way, very analytic, a very impressive chap, Alex, but experienced in the kind of thing that actually hit us, he didn't have either.

OK.

But Olivetti, that was a disastrous relationship. Olivetti was run by De Benedetti, as a, almost like a dictator at the top.

Just remind us of the way that worked. Olivetti first took a share in the company to help with refinancing, was that right?

Yup. What happened… First of all, after the loss, and, actually quite shortly after the flotation, a year after the flotation, our bankers, who were Lazards, sold all their shares. And this was the largest single block of shares on the market. We only put ten per cent on the market remember. That's one of the messages.

[1:08:30]
Sorry, I think we'll have to go back yet another step, and, I apologise for that. But the flotation.

Mm.

When was that and why was that?

I was hoping you would tell me when it was. I think it was, '83 wasn't it? Or '84.

Well '84 was the year of the, the big loss, the £11 million loss. Presumably… It must have been at the height of the…

It must have been '82 or something like that. But, we were approached by one bank after another wanting to float us. We had never thought about it. And they said, if you really want to, you know, grow to a huge company, you've got to, you know, raise capital and raise your profile and so on. So we were sort of, flattered by the attention that we were getting.

Yes.

And, eventually it came down to some beauty contest, and we chose the two bluest-bloodied top outfits there were. We chose them out of a number of suitors, and that

was Lazards and… Oh dear. The stockbrokers. Oh. I can't remember the stockbrokers' names. They were the, they were the, the top old stockbroking firm. I can't think of the name at the moment. But, but it was true that, after the first year of the flotation they sold all their shares at double, the price went to double, and they sold. And that sell knocked the share price down colossally, as you would expect.

As you would, yes.

And we complained bitterly about this, and, they sort of, took no notice. Other people said, that's not what your advisers should ever do. In the end we told them we, we were no longer retaining them. So we fired Lazards and the other one. And we went to Close Brothers, rather smaller, less known.

Yes.

And Close Brothers were, their advice to, to get back on an even keel was to find, a) an investment from outside, and b) a sales force. And Olivetti represented both.

Ah.

Olivetti had just sold a big chunk of its equity to AT&T, and, so they had a cash, little cash mountain, so, putting a bit of money into Acorn didn't hurt them. And they undertook to put the BBC computer through all their sales regions, which were considerable, worldwide. However, a year after that they hadn't sold one. And I went to, to Benedetti, I think Hermann as well came, and we said, 'What's going on? You know, we've still got a huge big stock of BBC computers that we're [inaud] expecting you to have sold.' And he said, 'Why haven't we sold it? I shall call a meeting.' And had a big meeting, a whole room full of people. De Benedetti stood at the top, with me and Hermann, and said, 'These are our friends from England, we have promised to sell this, their computer. Why haven't you done it?' And, with a sort of, thump on the table. 'Why haven't we done it? Why have we let our friends down?' Very Mussolini-esque I thought, but, you know. [laughter] And, there was a long quiet, and then, 'I want to know.' And eventually somebody said, 'Well sir, we, if you recall, when we did the deal with AT&T, the deal was that we would manufacture

the IBM PC in Ivrea, and that we would sell the IBM PC, and that we would only sell product that was based on MS-DOS. And the BBC computer isn't based on MS-DOS. So we haven't sold any.' So they should never have done the deal with us in the first place. But that, that was Olivetti's fault, and that was getting towards the last straw as far as our cash flow was concerned.

Mm.

And indeed, indeed Olivetti, from then on said, all right, so that really the end of the relationship. They had an option to take a further, major chunk of the equity, to take control, if, if necessary. They could go up to eighty per cent, which, for, for another £100,000 or something silly. Which, they didn't want to do, because they didn't want to spend any more money on something that wasn't going to be any use to them. And at that point, the BBC computer supply system looked as if it might come into question. And Kenneth Baker, who I got on very well with, I went to talk to him about it, and he said, 'Well, Olivetti, I think I can help you here. Olivetti have been applying for a licence to sell the big AT&T exchange, telephone exchange.' It wasn't System X, it was competition to System X. 'But they haven't got the licence yet. I'm going to tell them, unless they go ahead with the deal with Acorn, they won't get the licence.' And, that's, that's a nice sort of way that politicians can, can help. Anyway, they did go ahead. They provided a letter to our bank, and they paid a little bit more money across. But they didn't like doing it. And so they sent in their insolvency practitioners to try and find a way of valuing the last percentage that they were allowed to get, and they looked at everything and valued it at nothing, their insolvency practitioners. At this stage there were all sorts of fallings-out. I mean, Alex Reid fell out very badly with the main man from Olivetti. I did. They were, they were just trying to destroy everything we stood for. And then they started shutting down projects, and, that's when I decided, enough was enough.

Mm. Just for the record, Kenneth Baker was Secretary of State for Trade and Industry at that time in the Conservative Government.

Yes. Yes. Or, IT Minister as he… Yes.

[1:15:33]

IT Minister. Indeed. So, what did you do at that point?

Well I… We had a, we, we'd set up an outfit that was called, we put in for planning consent for quite a lot of land at the back of where the building was in Cherry Hinton, to build what we called a hatchery. It's like an innovation park, fairly small one, but nevertheless, where we could send people who wanted to be part of their own businesses, from the company, to go and set up… They put a project together, propose it, we provide them seed funding, and they'd go and do it, a small team, separately, in this, in this hatchery.

Mm. Mm.

And the only one that had actually started by then, because we hadn't built the hatchery, we'd got the planning consent but we hadn't built it, was one called the Communicator, the Acorn Communicator, which was a network computer based on, it was a, it was based on the BBC's hardware, but it had the best modem chip in it you could get at the time, and it was plug-in to the phone, it did phone, it had a phone built into it. A small screen like that, or a big screen. And it was meant to be a, like the One Per Desk only rather better. And it had the ability to download big lumps of data via Teletext, because, actually, the bandwidth available from the Teletext system was huge and pervasive. It was an un, very much a wasted asset. So it was doing all this. And Olivetti was going to cancel it.

Mm.

So I bought it out of the company, and I put it in a business called GIS.

Yes.

And that, I think that paid the salaries for the company for a couple of months or something, the amount I paid. And we started to wonder how to build the network computer into something viable, because at the time it was a useful machine without the services that go with it. We'd already set up Redwood Publishing, which was

meant to be an electronic publisher, a database acquirer, and then, used to supply data from databases to, to these network computers. And, the trouble is, it was a, it was a bit before its time. There wasn't an Internet at that time.

No.

And that made a huge difference. We had, we had done a deal with Kingston Communication, a Hull telephone company, that was one of the forward-looking alternatives to BT, to give us trunk wires.

Yes.

And we'd done a deal with Energis, to give us trunk wires on the Energis, what's it, optical cables that are slinging under the pylons. And all we had to do was get, use the local loop, which gradually, which BT still own, which was gradually becoming accessible under legislation to get that. It wasn't Internet Protocol, it was based on ICL's Tradanet. You must remember that.

Oh yes. Mhm. Yup.

It was a packet switch network, without the IP. And, so, it seemed that, how quickly can we build up databases, and we decided it's going to be too long to do that. What we need is to take this down to the consumer level. And so we shrank the communicator down to something which we called the… What the hell did we call it? [pause] Keyline terminal. And we set up a team to build the customer base of Keyline and we got all the banks except Barclays, we had all the mail order companies, a lot of food retailers, and a few other big retailers, all joined to start letting people… They have a terminal at home, they put in it natural language, I want to go on holiday, or I want to buy my grandmother a present, or, who sells, thing, or where can I acquire the services of a butler for my party? That was all natural language input. And it would come up with a list from its internal database, and say, 'Do you want to talk to them?' And then you'd go online to talk to them. Not quite the Internet as it is today, it didn't have the, it didn't have Google and things like that to back it up, but it was partway there.

So you would say that was the forerunner of the Internet in many ways?

It wasn't… It was something that would have worked before anybody else was doing it if, if the Internet had been there. But you know, everything happened when the Internet appeared, and I suppose we might have been swept aside by a big organisation. My, my great sorrow, and this is the biggest regret of all, is that, I didn't, I was unable to maintain the cost of that operation. Because, my other big fault is that I tended to try and finance everything myself, out of not a lot of money that I got from Acorn in the first place.

Mhm.

Hermann was much better at knowing how to use other people's money, which is why he set up the venture capital fund that has been very successful. He could use a little bit of his own money, and then, a lot of other people's, and it works. Because you share the responsibility, you share, everything. But, I didn't tend to do that. I just thought, oh I can't be bothered, let's… I can pay for this and I'll get it earning money quickly and…

[1:22:13]
Were you completely under Acorn at this time, at the formation of GIS?

I was still, I was still a director, but a non-exec, and a shareholder.

When did you actually leave Acorn?

It was one of those sort of, gradual drifting out processes. I don't think there was ever a specific day. But I mean, the day that I bought the Communicator was probably the day that I, that I left. And I'm afraid I don't know the date that I left.

[1:22:44]

OK. Well we've been talking about Christopher Curry's business activities and now we're going to talk a little about his early life, his education, and his views on the industry. Christopher, when and where were you born?

I was born in Cambridge in 1946.

You've been a Cambridge man all your life really.

Indeed. Yes. Not many of us.

What did your parents do?

My father worked in farming; my mother didn't do anything, she was a housewife, but, most women were in those days.

Right.

Yes, so there was no, there was no technical background at all. And my grandfather was an architect. So, again, no reason why I moved in this direction.

Right. But, at school, you did well in science and technology?

Well I, I started off well. [laughs] Used to have the green button and then, and then came first, first, first until I met the boys that joined the school from, on scholarships. And I couldn't understand why I suddenly started coming ninth instead of first. I had to come to terms with the fact [laughs] that they were clever.

So, you were at Cedar House School as your primary, kindergarten.

Kindergarten and transition it was called at Cedar House. It was a girls' school, and, it had mixed kindergarten and transition. And, the last two years there I was the only boy in a class full of girls, which was, I think I was too young to take any benefit from that. [laughter]

So you were at Kimbolton School, and then, again Kimbolton School where you did your O Levels and A Levels.

Yes, Kimbtolton, went into the prep department at Kimbolton. And then, and then did three years in the upper sixth because I had to do a retake on my A Levels because I didn't do very well the first time. Ended up with maths, physics and further maths. And was going to go to Southampton University.

Mhm. Yes.

But, changed my mind. And, other people were recommending things where you could actually start working earlier instead of being poverty-stricken for the next three years at university, or two. So, elected to go on a, what was called a Dip Tech course. But, apart from giving up on the Southampton University to read Maths, I, I had always been fascinated by the computing and, and the word automation. On the way to London there was a big blue sign that said 'Elliott Automation'.

Yes.

And every time I went past that sign, it sort of, there was a flash of excitement. I didn't know what it meant, but I always wanted to do something to do with automation. Irrational but that, that's, that's a fact, I'll never forget it.

Because this would have been at a time when, well, computers would have existed but only as mainframes.

Yes. Yes indeed. Yes indeed. The only thing I was doing in those days was, as sort of, in electronics, was, we used to build amplifiers and radios out of old valves that we took out of televisions at the dump. Used to go to the dump, and there were always a few televisions there, and if you got a nice big K66 you could build a guitar amplifier. And there were lots of people with skiffle groups around in those days, and we built them amplifiers out of bits out of televisions. That was good, good fun. A bit dangerous, had some big shocks from the high voltages on them, but…

But you survived to tell the tale.

Yes, survived. But, that, that was sort of where I started taking a more practical interest in electronics, crude though it was.

Mm.

So… At the same time I used to buy things from places like Henry's Radio and build kits, radio kits.

Yes.

[1:27:22]
But then, in order to proceed in my so-called career, I went to work at Pye, got a job at Pye, to do a student apprenticeship, which, which was interesting because it simply, you had to start at the very bottom.

Mm.

And so, we started off in the solder school, and in, where you learnt to solder. So, Pye was a very impressive place in those days, building radio communication, mobile radio communication, for the world, and I worked in the factory there doing my student apprenticeship, learning to solder, and then learning to do electrical testing. But it wasn't a very intellectually stimulating experience. So I applied for another job, and ended up moving to the Royal Radar Establishment in Malvern, where I was a lab technician, and learnt to do all sorts of things, there, because, we had to build high-vacuum equipment, so I had to raise pipes, I had to build power supplies to, to test circuits, build circuits. We did everything. And it was a hugely valuable practical learning experience there. And, what's more, we were in the middle of the most concentrated collection of brilliant people you could find in the country. There were so many original inventor-designers at the Royal Radar Establishment then. They were like gods,. You would occasionally pass them in the, in the corridors and things. But, but as far as the, as far as the work there was concerned, I was working in superconductivity, which was a fairly exciting thing to do. And we were building

very very simple junctions, where, you put two bits of aluminium with an insulating layer across each other, took it down to minus 270-something degrees, and you could use a little aluminium track, a few angstrom units thick, to switch off the current in, a ten-amp current in the other track going across it at right-angles. Which seemed pretty impressive to me. I had to polish the glass to make it shiny enough to evaporate the aluminium, polish that, and, make the connections, build all the kit. Somebody else was telling me what they wanted to be done. But, you got everything you wanted from the stores. They had everything in the stores there. In the lab next door they had - building next door, K Block, they had nose cones from TSR-2, which, wonderful, sleek, pointed things, choc-a-bloc with the best radar systems the world had ever done, ready to do Cold War missions across, under the radar and drop stand-off bombs on Moscow, and they never did luckily. But, the plane, the most fabulous looking plane I've ever seen, even made Concorde look lumpy, was, was cancelled, unfortunately, by a certain group of political activists. But, there they were, before my very eyes, these wonderful nose cones.

[1:31:15]
Looking back over your career, are there people you can point to who have been a particular influence, particular mentors?

Well, if I just look at the people at Malvern. There was a man called Baxandall, who created the classic tone control circuits that every system until signal processors came along still use. There was a man called Dinsdale, who invented push-pull transistor amplifiers, and… They were, they were people, important to me, because, I built those things, and I built them before I worked at Malvern, and when I got to Malvern and found them there, it was a very odd experience to be amongst the people that, whose names were still applied to the technologies. But, I got a bit more used to it later, because, my time at Malvern was a bit, cut short by a few indiscretions on my part, and, I left, I left… And I left, and a brief spell working in a place in St Neots, called WR Grace, before I saw an advertisement for Sinclair Radionics, which I applied for, and, he offered us the job on, on the spot, joining Clive Sinclair in his new premises in Cambridge.

[1:32:53]

Mm. What sort of influence did Clive Sinclair have on you, do you think?

Interest in me?

No…

What was Clive doing?

No. I mean, how did he influence you, and was he a mentor, was…?

Ah. Absolutely. I mean, Clive, Clive was a can-do person with, as so many articles used to put it, no formal education. Well really rather insulting. I mean, like me, he hadn't been to university. But, he was an inventor. He had an amazing determination to get things done, and he would use first principles. Because he wasn't, he wasn't a professionally trained electronics engineer, he just worked from first principles. So he built televisions with circuits that didn't, weren't based on existing circuits at all. Anything that he wanted to do, he thought, well, let's try doing this. And, nine times out of ten they'd work, to a degree. So, a) he was a can-do person; b) he sort of, invented crowd funding, in a funny sort of way. And this was important to me, I mean, it's all called crowd funding now, but, in those days, mail order was crowd funding. You stretched the limits a bit, you got your suppliers to give you 30 days, which you always stretched to 60 or 90 days. You sent off… You booked the advertising, which you got 30 or 90 days on. And, the cheques came in, and you cashed them. You could in those days. You cashed them, put them in the bank, and then, you might deliver some on time, but you had, 'Please allow 28 days for delivery.' I know nowadays it doesn't look, it's very uncommon, that sort of thing. But in those days 28 days was quite normal. And it was legal to cash the cheques in advance. Things have changed. But that was crowd funding. And only if you had got customers, from your, from the community, that was crowd funding. And actually, some of the modern crowd funding techniques are no different, really. So he taught me how to do that, and how to get the timing right to, to get your product built, probably the design completed and built within the, within the, 28 or, 54, 56 days that it might take to deliver. And, and at the same time, learn how to handle the customers that weren't happy. But…

Mm.

So, the can-do bit about Clive was terribly important, the determination and the way he drove us, like a, like a slave-driver. But, we didn't mind, we worked often till eight o'clock every night, and, didn't mind at all. It was such fun. There was always a new product, and always a new challenge. So, it was a really good twelve years of my life. And in that time, you know, I, I got more and more like Clive's friend than his, than his employee, but, the relationship didn't change. And, I suppose watched him go up to the stratosphere and, and then down again. The huge success of the first calculator.

Yes.

And, it was all… I mean we created, more or less created the whole concept of hi-fi systems as well. Sinclair hi-fi was the dominant sound system. There were higher quality, higher cost, people like Quad, and others, but, we did, we did the snazzy stuff. He loved sharp design. And his name, in that famous sort of, zigzaggy thing, was on everything. So he was a very very strong influence. I might have learnt some of the bad habits as well as the good ones, but…

[1:37:33]
What in your career have you been most proud of?

Well I was very proud of the, of the Sinclair Executive, because that was my, my project from beginning to end, from picking the chips up in the States to, to fitting everything inside the ludicrously small case that we had to fit it into. Laying out the printed circuit board, the lot. So when it came out, it looked good, it even worked reasonably well. And, that was very pleasing indeed.

Mhm.

But I think, after that, the next project, the next product I was very proud of, and I, I use the word proud carefully, because I'm, I don't think I'm often proud of anything,

but, maybe I haven't done anything worth being proud of, but, the MK14 was on its own out in, the first, the first of its kind.

Yes.

And it was very pleasing to see it sell so many so quickly. And, that was what I realise, there's a, there's an existing market. If you can give them, give that existing market something which takes it into a slightly different area, then you've created another market. And it's about finding the inherent enthusiasms and interests and catering for them. So computing, or microprocessing as we called it in those days, was, was really, as far as I'm concerned, built out of the soldering iron enthusiast market who built amplifiers and things before that.

[1:39:32]
Mm. Surely you're proud of the BBC Micro.

Well of course. The BBC Micro was a hugely team-based project. And it was an accumulation of, important features that came from a lot of different areas. The BBC had seen its predecessor, the Atom, and had decided that it really wasn't going to do the job that they wanted. But, because of the other things that we had in train, you know, like, the twin processor system, like the, the networking, like the structure, that we were able to adapt the BASIC interpreter to exactly what they wanted, like the fact that it had Assembly code programming built into it, it did so many of the things that the BBC wanted, they had no, they had no real choice to make. What they had in their sights originally, being the NewBrain, was a) untested, un, incomplete, and b) had a lot of the shortcomings that the Atom had. It was also Z80-based. And we were in the 6502 camp, so… Yes, I'm proud of that, but, I, I would say that… I'm more proud of the fact that I made the effort to have a go at the BBC and try and stop them from going ahead with the NewBrain. The rest of it, the rest of the, the design, was a team, team thing. There were some very important players in that.

[1:41:24]
Mm. What do you think your biggest mistakes have been, what do you most regret?

Well I think I've sort of said this before. What I regretted since then, I've regretted not, not having more orthodox management controls over the processes of ordering and, and taking bookings from people. Because that really did hurt Acorn, the fact that we were caught between suppliers that wouldn't shut of the supply, and buyers that could just shut off their demand. And the result on cash flow was, a critical factor for us. So that could have been avoided, we should have been more careful about that. I am mostly upset about some of the other projects that I should have kept going with, but, for financial pressure reasons I was obliged to, to abandon them. In particular the, the teleshopping project, which really would have been the most important presage of the teleshopping that exists now with the Internet. It was pre-Internet, but it was, it was used in exactly the same way. It had a series of suppliers that were very keen to supply via a keyboard. The keyboard, the model for the, for Keyline, was that, people would buy a terminal at a reduced price of £50, a deposit in fact, which they could have back if they wanted to give it back. And, and then they paid, we got a commission on every sale that the retailers made. So, it was a model that hadn't really existed before as well. It was the mobile phone model to some degree. I'm really, really very disappointed that I didn't continue with that, because, we'd have been there very early, and it's important to be there early in some of these big growth markets.

[1:43:40]
Mm. And the reason this failed was, at least to do with the ERM, and Britain's involvement in the ERM.

Ah. Yes. Well, the point was that, again, I had been a little bit silly in trying to finance it myself for a long time. And, my, my own funds were limited, as Acorn shares had diminished in, almost a penny a share value at one time. I should have got more people involved. And I did have a, a venture capital company involved, which was in the process of raising about a million pounds. Not a lot in those, even in those days, but, they, there was delay after delay after delay. And the reason for the delay was, John Major's attempts to keep Britain in the European Exchange Rate Mechanism, keep our, the value of the pound within the currency snake. And some certain nasty people over the other side of the Atlantic who were determined to make money out of forcing it by buying and selling and so on, the currency. So, the result

was that every time the pound slipped to the bottom of the snake, John Major decided to put the interest rates up to lift it off the bottom. And within a period of about a year, interest rates had gone up to, officially, to fifteen, sixteen per cent, banks, which meant a lot of people were being charged 20 to 25 per cent, which under any circumstances is unsustainable. And as a result of that, venture capital, which used to work on a ten per cent, you know, expectation of increase in value, could earn much more than ten per cent just putting it in the bank. And most of their investment companies that had a combination of venture capital and bank loans, were being crucified by the interest on the bank loans. It was very bad news for venture capital at the time. It was a much newer market then, younger market then, venture capital. But they all closed down, one after another they closed down. Our venture capital company gave up just before Black Wednesday, and when that happened, as you know, it took about three months for things to get back to normal.

Right.

But it was too late for me. That, that meant that I had to take up, I became responsible for the debts with the company, and, it more or less took me… Well it took me very largely into personal bankruptcy.

Mm. Mm.

And I wasn't alone during that ERM fiasco, that people should be thinking about now, with the referendum coming up. There were more suicides, bankruptcies, divorces, and insolvencies in that period than any other equivalent period in recorded history. So, he's got a lot to answer for, Mr Major, in my book.

[1:47:02]
Mm. Do you think if you had had better business advice, you know, in terms of finding money, borrowing money, rather than using your own money, you would have been better off?

I would, I should, I should have, at all times… The trouble is, some of the things I was trying to do were not really tested ideas. And, it's quite difficult, there's quite a

long process of convincing people. The world is different now. There is a lot, there is a lot more open attitude to, and a lot more choices for venture capital supply. I mean I think…

Mm. Certainly.

I think I would have rather liked the official form of crowd funding today for some of these things. But, yes, I needed to have more people alongside me with the same interest of making their investment work, rather than mostly depending on my own efforts. So, more business advice, more, you know, sharing of responsibilities, would have been helpful.

[1:48:15]
So, am I right in thinking that, at this point, you are, as you say yourself, personally bankrupt?

I… I had to enter what's called an IVA, personal IVA, which isn't supposed to limit you in any way, but it, but it sort of makes an undertaking that you will pay this, pay this amount of money over a period of time. And this was after I had already lost my house. The house, I used the house, which was a beautiful Georgian house, a ridiculous extravagance when I, when I first, when we first floated I bought it, and, and enjoyed it for ten years. But, foolishly, used it as collateral for the E2S venture, thinking it was a bridging loan, which it was meant to be. But when the venture capital disappeared, it became my responsibility.

Oh course, mm.

And they took the property from me, for actually, far less than I originally paid for it ten years earlier. Which, I don't know how they did it. I always expected to fight back and recover it, but I never did. Actually, what happened after that was almost equivalent to bankruptcy. Because, there comes a time when you, you, most of your options are closed off. And, it was a pretty, a pretty painful time.

[1:49:52]

So, what have you been doing since then? I mean, you formed GIS.

GIS was formed right when, when we first saw that Acorn was being subsumed by…

Olivetti.

…by Olivetti. And they were cancelling all the projects that we were doing there.
So… GIS did two things early on. One was a, we were very interested in digital
money. After the banks, I thought, treated us abominably, I thought, why on earth do
we have banks just to pass money around? We should be doing it ourselves. What's
the matter with cash? Or if you can't do it with cash, do it electronically. And we, we
created a thing called the Transactor, which had a smart card there, and you
transferred value off the smart card. That was in, that was very early days. And, then
that was developed as the payment makers and for the Keyline terminal as well, and
in due course, because we had got all the banks involved in it, the banks thought, this
is really our business, and an organisation called Mondex] was crated at NetWest
Bank, which Midland, Midland Bank, all the banks except Barclays joined it. And
Mondex was cash stored on a card, which was transferred to another card, offline.
This is the big difference between most of the digital cash now, and then, it was
offline, so exactly like paying with a coin or a, or a note. And we got very heavily
involved in this, because it was really based on our original concept, and we became
the second biggest supplier to Mondex. We had offices in South Africa, Hong Kong,
Australia, Canada, everywhere where there was a Mondex operation. And it was all
looking very very exciting. We built most of the bank head-end systems for the
Modex kit, for all of the banks. But, in order to expand, Mondex decided that, what
do we need to do to get real global coverage? We need to do a deal with somebody
who's got real global coverage. And they went to MasterCard. And MasterCard said,
'Yeah, all right. We'll buy 51 per cent,' and then, you know, you've got the whole of
the MasterCard coverage all over the world. They bought 51 per cent, and they closed
it down completely three months later.

Hm.

We all thought that Hitachi, who lost 400 million on this, and a few of the others, would sue MasterCard. But the Japanese didn't. And, that was the second terrible destruction of my dreams and, and my business technical empire, because, we had built all sorts of devices, for hand-held consumers, point-of-sale stuff, everything to go with Mondex. And suddenly it was all dead and buried, in, just like that. One MasterCard bit of chicanery. Because MasterCard makes its money out of every time you send something across a wire. It was against their business model.

Mm.

We should never have let them invest.

Right.

They lied. They did. So, there's another regret. But I, nothing I could do about it.

[1:53:40]
No. What have you been doing since then, in business terms?

Well I keep, I keep going with electronic currencies, and every now and again one comes back from one place or another that looks like an appropriate one. I keep going with smart cards. And what I've been trying to do recently is generate a market from the retired, in, the retired population. We all have a certain, all except[this chap opposite me [laughs], has a certain interest in this, but, we all know that the economy of the country is in a bit of a mess. We're, we're a one-time manufacturing economy, no longer. And we can't afford the expense that we're finding the ageing population is, is creating. The National Health is always saying it's broke. My view is that, the ageing population, just because you've reached retirement age, doesn't mean to say you're no bloody use. And most people are infuriated when they get accused of being, oh he's retired, doesn't count any longer. So there's a huge latent set of skills, and a huge latent amount of enthusiasm for doing things for themselves and doing things for the community. When you get to a certain age, you start to be a lot more kind to your fellow people [laughs]. I mean, everyone we've met, and talked to, on this, we've had a trial project, it's called Bluefish, as soon as people get to 65, 70,

they have a nicer attitude, and they really do want to help each other. So I think there's a huge economic entity in the retired population. There are twelve and a half million people that carry bus passes around. A bus pass in London is wonderful. But what it is, it's an ID card with a purse on it. So we did a version of that which had a complete medical history on it, and a complete set of logging of visits and, doing good deeds and so on. I want to build… If you can get people to take more interest in their health and the health of other pol around them, while, and many of them are very fit and well, I mean I'm 70, and I, I'm quite capable of doing things still, they want to do it. People want to do it. There is an economic community just sitting there waiting to be… You don't want to work full-time, and you don't want to do something that messes up your pension arrangements. So, I have the idea that there is a pseudo currency outside the tax thing which is used to incentivise people to do good things for each other. And the whole thing makes people aware of health issues. I'm also developing test, test and measurement systems for health that you can wear at home. So I'm very interested in wearable interne of things, sensors. And I think if you can get people to look after themselves, that's how you save money. The problem with this country is, having had a National Health Service as the sort of, you know, the wonderful thing that was created in 1948 or whatever it was, and being used to it for so long, we have a dependency culture which isn't actually healthy. There has to be some sort of backstop there, and some of the other countries show that the alternatives are not so good. But the National Health Service is too big, too powerful, too immune to change, and it needs modifying a lot. And the only way to modify it is by people like us, start to play an active role. So, that's what I spend a lot of my time doing at the moment. It's hard work.

[1:57:58]
And is that just you personally, or a company, or…?

It's called Bluefish, and at the moment it's, it's me and a group of other people that are, that are of the same, feel the same way. But it's not… We've done a trial of using the bus pass as the sort of, membership card key, and at the moment I'm trying to set it up, funded by a social impact bond. I don't know whether social…

Can you explain that?

Yes. Well, there's this thing called social impact investment. Social impact investment says that you can, you can make an investment in something that might not give you a profit back in the form of a dividend, but, but it will, if it can be shown to have a good, a beneficial effect down the line, you will get full tax relief on that investment. And, the way it mostly works nowadays is, people buy, people invest in a building which gets used to house a charity. And that's a typical, very poor example of a social impact investment. You've got a charity which is doing good works, it sits in a building built for them, with money coming from tax-paying people. But I think that there's, that social impact investment should be a little bit more exciting than that. And, social impact, they've got a Cabinet Office man supposed to be looking after this, it's a, it's a quiet but important plank of Government policy, and it's cross-party agreement.

Mm.

So, it's all about investing in, mostly not-for-profits. But, my idea is that it's not a not-for-profit; it's what's called a community interest company, which is something which is halfway between a charity and a limited company. And that's called Bluefish, and that's what I'm working on, and, as I say, it's a fairly informal grouping at the moment, but, it's got everything built into it. It's got eCash, it's got the latest kinds of health monitoring systems. Yes, it's got everything. It's got… Yeah.

[1:00:35]
OK. Again, looking back over your career, what advice would you give to young people wanting to make their, make their career in the electronics business, the IT business?

Do you know, I really think that, probably, my, the only advice I can give would be, iffy. I think I can say what I would do. But the world has changed so much, you know, the opportunities for fundraising are extraordinary now. The different varieties of, of crowd funding. You can really get businesses started in the most unlikely ways. I think, the businesses need to have a fundamental, there has to be a fundamental need or a fundamental appetite for it. It's not just a good idea to, to build around something

that you particular like yourself. But, second guessing what next year's fashion or next year's must-have. It's partly luck, and… I would say that, as a piece of advice, try and do it with, either do it with other people's money, and that means you get tested fairly carefully before you get it, but don't risk everything on something that might, you hope is going to make you rich, because it might make you very poor. I think that's rather feeble advice, but it's… I'd love to have some real insights into where the future big money, start-ups are going to be. Clearly there's lots of things happening in health management, and I think that, the merging of, of electronics and, and biology, biotech, is becoming more and more of a reality.

Yes.

So there's some really exciting things happening there, and if you happen to be in genetics, and, big data, big data's another important subject, because you're going to develop inferences from big data that will be better than, better than test results from an individual. I really do think that, huge amounts of data will produce very very important results when they're analysed properly. And, if you can… I still worry, again, about the National Health being a block to developments. I do think that, mobile phones, the ubiquitous mechanism for, for things like health, fitness management, may be more powerful instruments for change in personal health than any kind of government advice or, you know, diktats coming from the NHS via CCGs, via the GBs. People want to make their own decisions, and they've got to have a, an active consumer market to do it. So, consumer markets in health have got to be a very interesting area to be in.

Mm. Fine. I think, we've covered the ground pretty well. Christopher Curry, thank you very much.

Thank you.

[End of Interview]