Charles Ross

Interviewed by

Richard Sharpe

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It's the 24ᵗʰ of May 2016. We're in the Worshipful Company of Information Technologists. I'm Richard Sharpe. And the subject today is Charles, Charlie, Ross. He's been described as a serial entrepreneur, a risk-taker, and a man of great enthusiasm.

Charlie. You started employment in Coutts bank.

Correct.

And your family has had a banking background.

Correct.

And you were a clerk there, and you proposed, in 1957, that they have a computer. Where did you get this idea from?

Well I did the examinations of the Institute of Bankers evening classes, and they organised a conference round about that time, and someone came over from California to say that the Bank of America was using a thing called an electronic digital computer to keep the balances of their customers. I had never heard of an electronic digital computer, and it sounded a lot more sensible than what we did every day in the bank. Because having just come into the bank, a little bit disorientated after National Service, as the cheques came through to be credited, so they were collected here and sorted and added up, and collected and sorted and added up, and collected and sorted and added up. And it went round in circles. And surely there was a better way of doing it than that. And as I'm sure you know, Coutts & Co is a rather unusual bank, well, it still is, even more so in those days. And, so as a 22-year-old clerk I wrote off to all sorts of people saying I wanted to find out what an electronic digital computer was. And had I been in one of the, if I could put it this way, the ordinary banks, I'm sure no one would take the slightest notice, but when it's Coutts & Co, people always answer because they don't quite know who you might be. And so I wrote off to all sorts of people. And I started finding out about computers, and put together a paper. I've still got a copy of it. It's quite fun. Actually, it's not all that bad. I got most of it right, would you believe. The bit that I got wrong, which is very

funny, is that I suggested one tape recorder for each customer, [laughs] 20,000 tape recorders. The best bit was that, nobody noticed. And, the…

And did the bank say yes?

Oh no, of course not. I got a very nice letter from the chairman, saying, very impressed that, taking this trouble, that, there was a committee of the banks who is looking into automation, and he'd pass it to them. It turned out that Coutts & Co had their own representative on this. And nobody seemed to know about that. Anyway. And I went and gave a presentation, and everyone looked suitably surprised, because, the automation committee was actually looking after accounting machines, and people had heard of computers, but, nobody really knew much. And nobody was very interested really. Because computers seemed to be a very long way away from banking. But the chief general manager of Barclays Bank was interested, and two or three years later they bought an EMIDEC 1100 and put it into an office near Euston somewhere. And I kept in touch with him, and, we did talk a number of times about it. I'm not arguing I influenced him or anything. But that was the only other interest in the entire banking community in London.

[04:14]
You then did your National Service.

I had done National Service by this stage.

You had done your National Service. And you applied for your first job directly in the computer industry in 1958.

Correct. Well, having read, having now started taking an interest in these curious things, because, I didn't do any physics at school, because in those days you weren't allowed to do humanities and science, you had to give or the other up, and, it seemed more sense to stay in banking, I knew a bit more about that. So I saw an advertisement for a computer programmer. And I quite genuinely had no idea what a computer programmer was. So I went along to find out. There were two vacancies and one other applicant, so I got offered the job. Whereupon all hell let loose,

because the chairman of the bank of course now wanted to know why I was leaving the bank. And, so he said, had I discussed this with my father? So I said, 'Yes.' 'And what does he think?' you see. And I've always actually been very grateful to my father, because, given that the family had been through two world wars and a massive recession, and banking had looked after the family very well, I would have quite expected him to say, 'Are you sure? I mean you know absolutely nothing about all this.' But he didn't, he said, 'Oh, jolly good idea. Give it a, give it a go.'

So you had not training?

None whatsoever.

You had a manual, did you?

No.

No manual.

No. The… Well, there were no courses in those days. And when I arrived at Colgate-Palmolive as a programmer I was given a, I suppose manual probably is the right word, it didn't look like a manual. But, in those days everything was written in mathematical formulations. Because it was all mathematicians as it developed, computers. And, you know, I had some difficulty understanding the contents page. But, why should one let a little thing like that put one off? The very first program I wrote was a little Turing thing, you know, you input a character, change it by a formula, and output it. And, I managed to get a mistake into that. And, we used to go up to this vast computer in the, somewhere up near Marylebone, the National Cash Register Company, and there was this rather attractive young lady who was about five years older than me who was extremely efficient, and you used to put a program in on keys, and she would go, 'Oh, yes, no problem at all.' [vocal electronic sounds] 'See? Right, there you are, there's the answer.' I was none the wiser. [laughs] That was my first experience of programming.

[07:18]

And what good was that program for Colgate-Palmolive?

None whatsoever.

OK.

Colgate-Palmolive had been sold the idea by the National Cash Register Company that if they put all their order, order processing, put all their orders through a central computer, what was very important to them was that, a chemist shop was never, didn't have stock of their products, because, if somebody came in and they hadn't got their favourite Colgate-Palmolive whatever it was, they'd have another product, then they'd probably get hooked and, get lost. So the idea was that all the orders would be put through the central computer, and the orders would go out to the warehouses, and the stock would be kept in the warehouses. If the stock was too low, it would be coming in parallel from the central headquarters. And, Colgate-Palmolive had been sold on the fact that this program would take about two hours per evening. And our first run of half a program took 36 hours. And it did occur to us that if it took 36 hours per day, we had a problem. So I thought it was time to leave and become a systems analyst.

And where was that?

[laughs] British European Airways.

Doing what?

Well, [laughs] it's quite funny, because, so much of all these early days, everybody used to make all the mistakes that everybody's been making. Because instead of picking something easy, and learning how to use computers doing something relatively easy, they picked the job that was the most difficult, which gave all the staff the most difficulty, thinking that, gosh, this computer will help them. [laughs] And of course, the problem was, the computer couldn't do it either. These were the days of travel agents, and if you booked a ticket, you had to go to a travel agent, and then when you wanted to change it, you had to go back. And there was an immensely

complicated charging system. And so every travel agent had an immensely complicated form to fill up for everyone to know who had got which ticket to go where, and more importantly, who was going to get what sum of money. And, I think it, in the end it was about 20 years before they got that sort of thing properly sorted out, when they were actually doing the, all the actual ticketing over those systems. And the airlines were by far the furthest forward in technology in those days, long before anybody else, and they tackled all the problems and fought their way through. So it was a disaster.

Did BEA have their own computer, or did they, again, use a bureau?

No no no. They… [laughs] Well, British European Airways bought UNIVAC, on the basis that BOAC bought IBM.

Ah.

So, on purpose so that they were different. [laughs]

[10:43]
Then you moved to NCR, the National Cash Register, computer division.

Yes. I lasted for about a year in British European Airways. And so, went to NCR. And, they had a service bureau in Marylebone, in NCR's accounting machine business headquarters, and I suggested to them that they set up a service bureau in the City. Because I knew a little bit about stockbroking and banking and that sort of thing. And, they said yes. So we had a national Elliott 803 computer, which was the first transistor computer, from Elliott Brothers, that, NCR had the marketing rights for that. And, the first program we did was to calculate the *Financial Times* indices for the Stock Exchange every night. Because up till then it was done with paper and pencil and one of those accounting machine things. And there were only 35 shares in the Index, because between the time the market closed and the time they had to go to press there was only time to get 35 indices in – 35 shares into the Index. And I think we got, I think we were looking at, something over 1,000 shares in. And also that meant that we could have subdivisions, so that you could have a section index for

construction, miners, oil companies, banks, and then the overall index. And the Institute of Actuaries worked out the mathematics, and we did the programming. And, my contribution… By this time I was getting a little bit better at programming. And I was, did quite a lot of the work of actually getting the share prices into the computer and then one of our mathematician friends actually did the mathematics. And that was interesting, because, of course shares can be a penny or £1,000, and so, [laughs] we had all sorts of problems of scaling, which nobody had ever thought of before. But that ran from about 1960 I think. Long before that, the *Wall Street Journal*.

What was the programming language?

Machine code.

Straight machine code?

Yes.

Not even assembly?

They hadn't got that far. No, assembly in… If they existed, we didn't know about them, but I don't think they did. We were just beginning to hear about assembly languages, three or four years later.

OK.

And people were beginning to talk about FORTRAN. And I think I may be a little bit wrong about this, but, my memory is that FORTRAN didn't start entering our world, also, if you like, the commercial world, until quite early in the, into the Sixties.

Yes, I would have thought so.

I think it was around, but it was very much used by the mathematicians.

[13:56]

And you left in '63.

Well, an important thing to add here, because of the FT Index we had 1,000 share prices going through the computer every night. So we started doing portfolio valuations. Now that, as you well know today, it's free every, and you can get a valuation every ten seconds if you want it. But in those days, this was a great move forward. Because, if a merchant bank was going to advise some trustees on a portfolio, they had to do a valuation. So had to get that, type it all out on things called typewriters. Then they had to get calculators to work out so many shares at so much, and income and all this sort of stuff. Then it had to be typed out to look nice. But of course the typist made mistakes. So it had to be retyped. So it used to take a merchant banker, as much as a week to do a portfolio valuation. We could do it for them in an hour. So I started going round the merchant banks in the City and all the other bankers, who my family knew anyway, or if we didn't know them, at least we knew who to get to. And started building up this business. And as a result, left NCR, started our own business.

[15:18]

And your own business was what?

Well it was called International Investment Computers, as one who's never ever been shy of nice, big important titles. And there were two of us to start with, Intinco Ltd. And, so we started writing programs for stockbrokers. Because all stockbrokers then, and now, have their pet theories, about, you know, of how to make money on the Stock Exchange. So we were very happy to write programs for them, you know, to… I mean none of them worked of course, but you know, that didn't worry anybody. And quite a lot of stockbrokers were boasting that they were using computers you see, and therefore they could offer a better service, et cetera. Market research, public relations, and, fun, lots of fun. We did quite a lot of work which is, had another side effect. There was a lot of arbitrage in Government bonds in those days. War Loan was the largest individual bond on the market. Thanks to inflation of course it's now trivial. And, brokers actually arbitraged, just in ten Government bonds. And they wanted to calculate the gross redemption yield. Not just the yield of the money you

put in now and the dividend, but the effect to redemption. Which is a bit more complicated. It's easy for a computer of course, but a bit difficult for human beings. But, what the brokers wanted was to publish this to their clients, because the actual publication of it was part of their marketing. So we invented computer typesetting.

And that was your second entrepreneurial venture.

Well, that was all mixed up with the first one.

Right.

All the people that we talked to, did various things, but, we kept running out of money, and people didn't buy the things we expected, et cetera et cetera. And we used bits of computer time from people. And, so, we came up with the idea of actually having a central computer with terminals which were teleprinters in those days, no screens. And, we thought we'd have a go at doing that. Because, if a small project wouldn't work, let's try a big one. And, we got some finance from a Manchester stockbroker, who liked the idea of coming down to London every now and again, and particularly liked the idea that Manchester would be producing some technological project miles ahead of those boring old people in London. And he put a consortium of Northern Stockbrokers together to provide some £250,000 capital (about £5m in today's money)/ And, so we got that going.
[18:49]
In parallel, I got quite friendly with some people in the International Publishing Corporation to do with computer typesetting, and using some machines that they, very quaint in today's world, machines that would print type. You could always use a linotype hot lead line casting machine from paper tape. That had been, I think, in existence for perhaps, since the middle of the Twenties perhaps. And of course we could produce paper tape. We did on one occasion for the *Financial Times*, did a demonstration of printing the whole back page, you know, of the statistics, and they were absolutely terrified, because the union said, 'We'll stop you if you dare do anything like that.' So that was a bit of a problem. But, the World Airways Guide, back in the, I'm sure you remember, back in the Sixties, if you wanted to go to New York you had to go to Shannon and Canada and all this sort of thing. And so you had

to book segments. And the timetables. It was so complicated. And so, the International Publishing Corporation, who published the *Daily Mirror* and, was it three or four hundred other publications, wanted to produce something, a world airways guide. They were doing it with hot lead and tweezers. And, it took them two months to set each monthly edition. So it was always out of date. And we had been following up some of this computer typesetting technology in the States, and suggested to them that we could typeset the World Airways Guide in two days. So we had a joint company, IPC bought the typesetting kit, and bought half the capacity of our computer, which paid for the computer for the Stock Exchange. So we had the two companies.

When you said we, who was we?

I always use the word we. It annoys my wife intensely. Because, I used to work with a chap called Michael Gassman, who had been a financial journalist, and we set up the original company together. And he always said to me, 'Always say we, Charlie, it gives everyone the impression you're part of a huge corporation,' and it stuck. [laughs] So we were, International Investment Computers and Computaprint Ltd, .and in due course we set up a branch in Philadelphia.   We structured the group so that Michael Gassman and I always had voting control and were joint Managing Directors. Because we were actually ahead of the Americans both in the technology for the Stock Exchange and for the typesetting. And then, the chap who gave me the job at Colgate-Palmolive and I set up a sort of consultancy firm. So there were three little companies in our little set-up.

All making money.

Well, no, no no no no, none of them made any money, but we kept raising enough money to stay afloat.

[22:17]
Right. You sold the group of companies…

Yes.

...in 1967.

That's correct. We were very friendly with the IPC people, the technical people, not with the, the board of directors or anything. And, some people remember a maverick, Professor Stafford Beer, who actually was, came up with some very clever ideas about computing. And he had been employed by IPC, by the main board, the Chairman was Cecil King, who ruled IPC like royalty. He had his own personal lift in the building. And, they had employed Stafford Beer saying, 'We've got the world's biggest publishing company; what can we do?' And he came up with the idea of International Data Highways, which bears a strong resemblance to a thing called the World Wide Web. This is 1960s. And he had been all over America trying to find the technology. Lo and behold he found, there were we, running the Stock Market Computer Answering Network. Anyway, long, long and, lots of fun stories, they said, 'We want to buy you.' And we said, 'You can't buy our technological company. No.' 'What? Oh. Er… Well, I'll tell you what, we'll give you a very great deal of money to develop all sorts of things.' And in the end we said yes, partly because we had run out of money again. So we, I sold my soul to the devil.

So these types of companies were really burning cash very quickly?

[hesitates] The answer to that must be yes. [pause] I mean with the benefit of hindsight, as I knew absolutely nothing about running businesses, and I, I'm very well aware that I think I probably made every mistake you possibly could make at one time or another in my life, I took it for granted with the typesetting company that if we had this typesetting capability it wouldn't be too difficult to sell typesetting to the British printing industry. You know, which of course was hilarious, laughter, because they weren't the slightest bit interested. They were only interested in having strikes with their, over the unions. So, what I should have done was to have charged the World Airways Guide people effectively enough to make a profit, even though we were only using a quarter of the capacity of the machine. Because I couldn't sell the other three-quarters of the capacity. So that's why we set up a company in America. So we used to do, we had a computer in Philadelphia, and we used to do all the processing out

there. And this you will find difficult to believe, we then put a tape onto an aeroplane, fly it to London, typeset it, send back the typeset stuff to America.

What was the machine in America?

The Photronic I think. Believe it or not, it was, you had a large glass plate, etched on it were all the characters, and lights behind each, and a series of, whatever, to focus each character in place onto a film.

Very good. Very good.

Mm.

[25:56]
So you sold the companies.

We did.

And you then moved to…

Oh I lasted… Well I had to stay.

You had to stay.

Yes. That was part of the deal.

They wanted you?

Mm… [laughs] I think they persuaded themselves that they did. Well, we were talking about technology in the land of the blind, the one-eyed man is king. And that's quite a good word for the chairman of the company. No that was, the whole thing was that we were saying, 'Look, there's so many things we could do.' And they said, 'Well look, we will give you the resources to do the job properly.' So, the whole idea was to do a whole lot of things. The only snag was that, about nine months after

we had sold the companies to IPC, IPC went bankrupt, which was a bit of a shame really. And they were all broken up. And the *Daily Mirror* went off one way, Reed paper went another way. Reed now, ended up being bigger than… And, you may remember Cecil King published a thing in the *Daily Mirror* saying, 'Enough is enough,' and, tried to organise a coup d'état against Harold Wilson. That's another story. Because unfortunately they hadn't got any money.

Aha. Did you get paid?

Oh Lord yes. Oh yes yes, it wasn't like that. But, I mean it was, it was a very large company, it wasn't that sort of problem. They promised us ten million [about £200m in today's money], which is quite a lot of money in the Sixties. Clearly they weren't going to go ahead with that. And so… Perfectly in a friendly way. We sold the computing stuff. We tried to buy the Exchange Telegraph Company, which, I mean in those days had all the records of the Stock Exchange but in paper form. And we tried to do a merger with them and they wouldn't play. If IPC had still been gung-ho, as it had been, they'd have just bought them, but that didn't happen. And so, we were going to buy a very big computer, and they said, 'Well, I think we'd better not.' So, we decided, well, OK, well, let's call it a day. We sold SCAN to Reuters, and then they completely turned it upside-down and inside-out of course. And that was the basis of the whole of the Reuters information and dealing systems. And of course, Michael Blomberg in the States followed on from that.

[28:52]
Yes. Then you moved to Miles Roman.

Ah. Yes. Well, based upon the success of SCAN, we had become quite friendly with Kleinwort Benson, a merchant bank in those days. I forget who bought them. And, we had been in… Well, we had been in touch of course with a lot of banks, because we did a lot of processing for them and all that sort of stuff. And, we argued that we could do for general business applications what we had done for the Stock Exchange, and we could create a sort of programming language, and you could have your terminals linked to your central computer. I mean it's all, it's so obvious now isn't it. And, so the National Research Development Corporation, there was a very good

leader of that in the Government, it was the time that Modular One, oh, I'll think of his name in a minute, who had set that up, and that was, you know, a very…

Barron wasn't it?

Iann Barron, well done. Who was getting that going. Which was far ahead technically than anything the Americans had got. And so the idea was to use Modular Ones with support from the NRDC, and Kleinwort Benson, to set up cloud computing, more or less, which is more or less what cloud computing is now. Ferranti got in on the act, because they had come up with a way of using very early screens, that they could get a coloured image. And, between us we worked out how you could put, fix a character in a particular place on the screen. So you could put up a form and fill the form in, and get the data that way. And it was very successful. Unfortunately we hit the financial crisis that Ted Heath and co engineered, and the Stock Exchange hit150, the Index. And it's 6000 today. And everything collapsed, if you recall. Kleinwort Benson had all sorts of financial problems. The NRDC had their budget halved and the chairman left. We had bought a company in the United States, and because that hadn't been in the original business plan we agreed a contract with the IRC, the Industrial Reorganisation Corporation, that if we needed some money, because we had used money for something else, we could call on them. And, Ferranti wanted, needed more money to finalise the details of their new screens. And we also made lots of mistakes, as I said before, you know, I have a habit of making lots of mistakes. [laughs] And we, actually still had quite a lot of cash in the till. But, Ferranti wanted more. And the particular director at Kleinwort Benson had retired, and there was a rather different crew in place. They financially were in, suddenly, a very difficult place, because of the financial crash. So they closed the company down. So we went to the IRC and said, 'We need some money.' And they said, 'Well, the Government's decided to close down the IRC, so, we won't give it to you.' So we said, 'We have a contract.' And they said, 'Oh yes.' And I well recall the meeting in the Treasury. He said, 'Yes, well, absolutely undoubtedly you would win, but it'll take you three years.' Never trust a politician. And never trust a bureaucrat. So, we sold Miles Roman to Slater Walker, as a tax avoidance scheme. Sad, but there we are.

[33:55]

So you were often working, it seems to me, in this early period, not only with applications in finance, but also the interface between technology and the financing of it.

Yes.

And the financing of it allows you to have these particular systems and develop these particular systems. And sometimes it runs out and you stop, and sometimes the technology itself is not able to really do what you want it to do.

Yes. It, it's fairly rare that the technology is wrong, it's that it takes longer. Everything always takes longer. We got the whole of this programming language, plus cloud, whatnot, all working, and we got some customers. But difficult to find people who will take risks in the United Kingdom. The United Kingdom, very, very conservative. I should have learned from the typesetting industry. Do something different? You must be joking. As an example, our own auditors, a very well-known firm in the City of London, gone bankrupt I think now, they had a meeting to discuss whether they would install one of these systems. And they said, 'Well, you know, don't you think it would be best if we let other people use it first?' To, you know, sort of, deal with any of the problems. That's been a huge problem in the United Kingdom. Because, of course if you don't use the first bit of, whatever it is, first bit of technology, then you can't cope with the second bit of technology. And, you may recall the Stock Exchange some years later tried to go all the way from quill pens to the leading edge of technology in one step. And they fell flat on their faces and the Bank of England had to bail them out. So, if our own auditors wouldn't back the company, it doesn't help. But anyway, not grumbling in any way, quite understand; we should have sold it to them better, shouldn't we.

[36:04]
You moved to Software Sciences.

No, Software Sciences was part of Miles Roman.

Oh I see.

And, I bought Software Sciences. When Miles Roman had some problems, all the other banks we were involved in turned off their overdrafts. Although I had been in Coutts & Co, and knew the people, we had our account with Software Sciences with Coutts & Co, and they asked me if I would drop in to have a chat. They said they were worried. Now, we had done a business plan for Software Sciences. I had known the managing director, a very excellent chap, became a director of the Bank of England in due course, and been going however long. And we had just got to that point in the business plan. So, everything was actually going right, but we were just there. We had bought a company in the United States. And, so, he said, 'We're worried.' So we said, 'Well it's exactly what we forecast, this is happening, and it's going very well. We think it'll perform,' et cetera. 'We'd like you to repay the overdraft.' So I said, 'Well, we can certainly deal with that. How long have we got?' And they said, 'Till three o'clock.' So I bought the overdraft. [I had to find about £100,000 (£2m in today's money) in four hours – quite a stretch!]

Right.

So I owned Software Sciences. When we ran out of money, some years beforehand, Michael Gassman had known quite a number of people on the Continent, and we received some financial support from the Dutch. A simply splendid banker called Jonkeer Quarles van Ufford, Chairman of Pierson, Heldring & Pearson was the sort of, Rothschilds of Amsterdam, and they put some money up. And they were very pleased when we sold to IPC, because they made a reasonable sum of money. So I went over to see Quarles and he said… We gave him the business plan [he smiled, did not even open it and said], 'How much do you want?' So we said, 'Well we think…' 'Fine,' he said, 'yes, we'll go ahead. Anybody else in London?' So we said, 'Well, Technical Development Capital are quite interested,' part of, one of the English banks that had been set up by the politicians, because there isn't any venture capital in London. And, so, they said, 'Ah, well if, if Pierson's will go ahead, we'll go ahead.' Great. Then they said, 'Actually, we quite like this, so, we really don't want Piersons anymore.' So we said, 'Well we're not going ahead without them.' Anyway, all sorts of fun and games. And that proved to be very successful. Colin

Southgate was the Managing Director. It was sold through, et cetera, and eventually, it's ended up in IBM, Software Sciences. And I think, I think was sold to IBM for something like 150 million.

[39:35]
We're now in the early Eighties, are we?

I should think it's probably about then, yes.

Right. What have you learnt so far in this part of your career?

[laughs]

You're in the early Eighties. What have you learnt so far?

Oh… Oh, Richard, you do ask devilishly difficult questions. I'm almost tempted to say humorously, 'Bloody little.' I'm still making all the same mistakes. [pause] We did, my wife and I, Louise and I, very nearly wondered, in the Sixties and early Seventies, if we'd go and live in America. Because, Americans then, interestingly not so much now, they, it wasn't that money was freely available to start new projects, I mean, it was fairly easy to raise money. Because, there are no laws in the United States to stop people raising money, as of course there are laws in this country to stop people raising money. It's a criminal offence to solicit venture capital, as you probably know. And… But, that's only half the problem. There are lots of people in America who will try new products. There aren't in England. You always get one or two people who will be, lead the pack. But it's not enough to give you the critical mass to get off the ground. That's not to suggest that, the computing industry makes lots of mistakes. The British Government has set its hand against the computing industry from the beginning. In the Sixties the argument was that, we put all our spare money into atomic power, and there wasn't any money there for, for these mathematical gadgets. Then when it began to be used, the official policy in Whitehall was to buy foreign computers to encourage those companies to build factories in England. And, so the British Government put more money up for research for IBM than for International Computers and Tabulators. It was a policy, I mean, at least it

was a policy. One might argue whether it was good, bad or indifferent. At least it was a policy. Then when micros came along, Mrs Thatcher actually sent a message to the managing director of the Research Council, a very good friend of mine, and I've seen the documentation, that no Government research money was to be put into any research for any of the universities using one of these toys. And we had to wait until IBM came up with a professional machine. If you remember, the Government of the Eighties thought that the way to finance technology in schools was to buy computers using stamps from Tesco's as a way of financing it. That was the level of knowledge in Whitehall.

[43:16]

What was your response to the microcomputer?

Well, probably I was lucky. Because, my wife had always wanted to run a business, and my careers [my career has either been vertically up or vertically down], I have been doing that, all that, so when it goes in one of those phases, she said she'd love to start an antiquarian book business. So we decided, let's do that. And so I became a househusband, which didn't work very well. And, this is the sort of, late Seventies. And, just coming onto the market were the bits for micros. You bought a processor and you bought a printer and you bought a memory and you bought a keyboard and you wired it together. And, so, Louise would want to write up a book, you know, an antiquarian book, and all the rest of it. Then, having typed it all out, one would then want to send it to somebody, so you'd have to type it all out as a letter. Then of course you'd have to type it all out to put it in the catalogue. And she'd say, "couldn't you program all these gadgets to sort these out?" And so, I bought all the bits, also an automatic typewriter, which is very similar to the sort we'd been using in…. So I knew a little bit about that world, you know. So, I wrote a program, and…

In what language?

Well, we used C+ [to start with, then C++]. But it was, it was, we compiled the program, but it was based upon interpreting codes in the text. It's worth a moment, because, it's all so obvious nowadays you know, everybody takes it all for granted, but, up till then all printers, all the characters, were the same size. So an m took up

the same space as a full stop, or of course an n. And, because, almost all printing, in those days, was accounts. And, if you put any text in, it was usually just a description of an item or something very short. Now, if you are going to write a program to manage a lot of information about books, you say to your bookseller, 'How big a field shall I allocate for the description?' And they'd say, 'Well, of course it varies.' So you'd say, 'Well, would 50 characters be enough?' 'Oh, I wouldn't think so. No, no.' '100?' 'Most of the time.' And you can't [laughs] have the database with huge fields because a small number… So, it struck me, the obvious thing to do was to, instead of have fixed fields, which had been the standard procedure, we wrote a programming language that allowed you to have floating fields. So in fact you just, you invented a code that said, 'This is the author,' until you finish the author. 'This is the description,' until you finish the description, and if it's that long or that long, it doesn't matter. And so on and so forth. So we devised a database with floating fields. I mean, it's all so obvious nowadays, but nobody had ever done that. And of course we could work typesetting machines. So, Louise could type in her book, incorporate bits into letters, and then we could do a file, send it off to a typesetter, get the catalogue done. Big plus. And then of course laser printers turned up. And, so, we of course could work laser printers, because laser printers were the first, in effect, dot matrix printers, that you could have wide 'm' and narrow 'n', characters, proportional spacing. If you can do proportional spacing, then you can justify the columns, which everybody reads in every newspaper every day without thinking about. And of course on the screen now. And if you want to have a different typeface, you just go click and, whoop, you've got a different typeface. And of course in those days you had to take out the typeface, put in a new typeface. And you had to know for each typeface the exact width of every character. So, every time you put a character in place, you had to do some maths to work out where it was.
[48:15]
So, we built this, and all the booksellers we knew said, 'Hey, we'd like one of those.' Now you asked me what lessons I had learnt. Well one lesson I learnt was that, if you write a program for yourself, you can work it yourself very easily, and if you press the wrong key you know what you've done and you can retrieve it. Of course if you sell it to someone who hasn't the faintest idea what they're doing, nine-tenths of the programme is defensive programming for when they switch the machine off at the wrong time, et cetera. But we, we actually built a programming language, Commands

and Layouts for the User made Easy. CLUE. And all sorts of people bought it and used it. The Criminal Intelligence Service, the Regional Crime Squads, wanted to have a system. They weren't interested in typesetting, but they wanted a system where, if there was a crime and they set up a crime unit, and they worked out what information they wanted for a database, they always found that the endpoint is something else. And our system allowed them to add fields whenever they wanted to, and you just carried on. Then if you had got some data in that field, great, and if you hadn't it didn't matter. So the Home Office used it quite extensively. And, we designed our own typeface, and I discovered how difficult that is. Then we were invited to write a program for the Hermitage Museum in St Petersburg, to do all their cataloguing, and that involved designing a Cyrillic typeface. So I designed a Cyrillic typeface. And then we did an Arabic typeface. And, if you justify type in Arab, you don't have wide and narrow characters, you don't insert extra spaces, you elongate the shape of a character, which is a bit more complicated. And that was fun. And so I did a lot of work with Hewlett-Packard, because Hewlett-Packard had produced these laser printers but sold them 99 per cent of the time to accounting machine systems and… And so we helped to expand that business in typesetting. And of course then there's, now it's all taken for granted and everything I've just been saying, everyone will say, well, every computer does that.

[50:50]]
Mm. And this was called CLUE Computing Company Ltd?

Yep. Yep.

What happened to it?

Oh we sold it, in due course.

To who?

To a company in Bristol. And they carried on and developed it. Then, Microsoft came up with Windows. And we had a decision to make, whether we wanted to rewrite it for Windows. And, one group wanted to do that, and I didn't feel I was all

that interested in doing that. I thoroughly enjoyed myself installing systems for
booksellers, because we knew the booksellers, they were all friends, and, that was a
lot of fun. I didn't sort of feel like getting back involved in managing things. And so,
that maybe is one thing I have learnt to do: don't manage things; invent things but
don't get stuck with managing them.

[51:52]
You were already a member of the British Computer Society.

Ever since 1961.

Why did you join?

It didn't occur to me not to.

You are a joiner, are you?

N… No. Well, mm. Mm, how can I put this tactfully? If I join something, I want to
run it. If I can't be involved in running it, I don't bother to join it. But it does run in
the family. My grandfather did set up, or helped set up, the Institute of Bankers, and
I've got the manuscript copies of the first examinations for the Institute of Bankers
that he wrote out. So it's sort of in the family. I got involved in the British Computer
Society quite a lot. You and I met in the British Computer Society.

And you helped launch Computing…

Correct.

…in 1973.

Sounds right. Yah. If I've written it down, that's when it was.

You have. And it was, it was going to be a rival to Computer Weekly.

Correct. And everyone said, not a chance. They've got 99 per cent of the market; how can you possibly compete in the market? I can hear you saying that all those… But they, very cleverly, Heseltine was very, as you know, ran the company, because they had realised that the money wasn't in telling people about technology; the money was in classified ads. And, they managed it very well. It shook poor old *Computer Weekly* to the core. And they both did very well for a number of years. But we put into the, one little bit of entrepreneurialism, we did put in the clause with Haymarket that they got our membership list, which was great for them, because it gave them 30,000 people immediately. None of this boring business about selling things to people. And, they gave us a full page. I can remember you being furious at the fact that *Computing* had a full page that you had to give to the BCS.

Indeed.

And, I put in a little clause – oh no, not necessarily I, a clause had gone in, that produced a sort of… We got, the British Computer Society got an element of the profits in a sort of, it wasn't shares but it was a formula. And nobody took the slightest notice of this because obviously it was going to fail. It did, of course, do extremely well. And a few years later *Computing* really wanted to finish with that, because they really didn't want the auditors crawling all over their accounts and stuff. And so, the BCS, Haymarket bought out the BCS interest, and that was enough for us to fund the headquarters in the centre of London. So the next time BCS had a financial crisis, it would have an asset.

[55:23]
If we roll the cameras back, if we may, because in 1967 you were a founder member of the Real Time Club.

Yes.

What was the idea behind the Real Time Club?

Oh. It wasn't a matter of joining or anything like that. Well, we had launched SCAN for the Stock Exchange in 1966. If… We sold the stockbroker the concept; he had to

get a telephone circuit, or in fact a teleprinter circuit, from what was then the GPO. And they had to wait six months. And that doesn't half bugger up cash flows. And so, an American who was wanting to get a business started wanted to meet what he thought were the sort of movers and shakers in London in computing, and he invited about ten people to a dinner. And it happened to be in the Institute of Directors, the old one in Belgrave Square. And, rather posher than the present one. And we all met, and most of us hadn't known each other that well. And we all had the same problem: we couldn't get circuits out of the bloody Government. And, so, I was now in IPC, and so we said, 'That's a very good… Why don't we all get together and see if we can do something about this?' And in those early days, one of the party funded the dinner. I think I funded the next one. Because it wasn't actually a significant sum of money. And, Philip Hughes and, you know, you know all the names. So we decided that we'd do, we'd bang on every door in town and make as much noise as we possibly could. And it was the days when you used to pay MPs to ask questions, and…

And legal then.

Oh yes, totally legal. And, Eric Lubbock, who sadly died about, in the last year I think, was on the Select Committee of Science and Technology. And so we used to give presentations to the Select Committee you see and all the rest of it. And it dawned upon us, the thing to do was to get together all the online, in real time, systems, and do a demonstration to the minister and to the Select Committee. Wedgwood Benn by the way, who in those days was very helpful. And, Stan Gill, sadly not with us, a long time ago, was the President of the British Computer Society I think at the time, and was very helpful. And we knew that the chap who ran the telecoms side of the Post Office, a chap called Merriman, was a load of trouble. And, so we employed a Major General to organise this. And, I sort of felt more comfortable with that. And we organised this with military precision, in other words, it worked, at the South Bank. And all sorts of people turned up, GCHQ and, all sorts of places that nobody had ever heard of, as well as the commercial systems that were being set up. I think we had about twelve, thirteen, fourteen systems working. And, along came all the MPs and everybody else. And at a crucial moment, the whole system collapsed. Because, the telephone system had been organised for short

messages, because, people making telephone calls. In those days they were usually quite short, because it was quite expensive. And so, the exchanges worked on the basis of short messages. Now, we turned on our computers for the day, and it collapsed, the exchanges. We didn't do it on purpose, but of course we collapsed all the telephone exchanges in that bit of South London. So Mr Merriman, being the boss, went round you see, saying to all the people, giving them the telephone numbers of how they could get through the system. And I had a very bright secretary who followed him round and wrote the numbers down too. So, very useful to us. And, that actually kick-started the Real Time Club. And, the ministers asked us to produce a paper, on that subject that we were talking about earlier, the evidence we gave to the Select Committee and all the rest of it. And we argued that we should set up what we would now call the Internet. Bolt, Beranek and Newman in the United States had been doing some work for ARPA, because, as you know, the American Government actually liked technology, and therefore funded it. And, so, we argued for that.

And you argued for packet switching, did you?

Yes. Partly because Donald Davies, who invented it, was a member of the Real Time Club, when he was at…

Imperial.

Yes.

The National Physical Laboratory.

Yes, yes, NPL.

Yes.

So… And we've got the… And we've kept those submissions. In due course, about ten years later, the Government did set up the Joint Academic Net, or JANET, which was much the same. It was the beginning the Internet.   But on condition that no

commercial company would gain any benefit. Which I think sums up the attitude of Whitehall, to sit on technology as long as it possibly can.

[1:01:51]

Now, I remember, you got very excited about quantum computing.

Correct. Well, yes. Two reasons. I suppose, round about the time I was 60 or so I was beginning to think, what was I going to do now? And so I got involved in two things. Brian Oakley, which is a name I'm sure you will remember but I doubt very many people will remember him now, was an exceptionally nice man who was the, who ran the Research Council, he was the Chief Executive of the Research Councils. And at the Real Time Club we had, we were having dinner, and Brian was saying that, this business, we… The British Computer Society set up the Cybernetic Machine Specialist Group. Peter Marcer led that. And it was based upon some of the stuff coming out of Oxford, the idea that you could use the curious effects of quantum, instead of being a problem you could use them to our advantage as a means of processing. David Deutsch. And so we got him down to speak, which was quite an achievement because he generally didn't, still won't, talk to people much. He's a very shy man. And, so Brian said he was thinking of going over to Brussels to see a mate of his, and suggested that they ought to, Europe ought to take an interest. And so we duly went over, saw the people that ran the long-range research department [Directorate Brussels], and they said they were very keen to do this. Because, people were beginning to talk about quantum things. And we found, I think about, nine, ten universities in Europe that were beginning to think about things. And so we set up the Quantum Computing in Europe Pathfinder Project. And, put up a paper trying to say what quantum computing could be. That led to an international conference in Helsinki to peer review what we had done, by bringing in some Americans. I don't think anybody else was involved at the time. And it led to the European Commission putting up, from memory, 30 million, called ECUs in those days, in Framework 5 of the research projects.

Are you surprised at how long it has taken to come to fruition? Because it's only this year that IBM…

[laughs] IBM actually made it work.

...made it work, and the Thomas J Watson Research Center.

Absolutely correct. Frustrating. [laughs] Actually, I remember going to a conference, must be about five or six years ago, perhaps more, where someone would say, 'We've actually manged to get data into quantum state. We've processed it. Hooray!' But can't get the answer out. [laughs] And, everybody was going, oh, you see. And this chap actually said, 'You're never bloody satisfied. We're two-thirds of the way there.' That's been the problem. It's a bit, a bit more complicated. I've kept in touch to a certain extent with some of the, some of the technology, because it, it has a direct effect upon cognitive neuroscience, [laughs] which is another interest. [pause] I don't think we entirely understand the mechanics of that. We did look into quantum cryptography, and, the Department of Trade and Industry put some money up for a project with, whatever the people in Ludlow, in…

Whoever they were.

They keep changing their name and I don't always keep up. The Radar Establishment. I don't mean Ludlow do I? I mean… Malvern.

Malvern.

National Physical Laboratory. And, everybody decided it was, it was too soon. I'm not sure that the kit that IBM has produced yet is quite what we hoped it was. Something tells me that there's something we don't know.

[pause in recording]

[1:06:55]
We're back with Charles, Charlie Ross, at the Archives of IT.

Charlie, you come from a banking family.

Yes.

Where were you born?

Highgate in North London.

When?

Oh 1936, on the 8th of February. It was a Saturday, and the weather was dreadful.

And did your parents encourage you, were they close to you?

Oh very close.

What relationship did you have with them?

Oh a wonderful relationship. I was extremely fortunate. I think, talking about learning things, they were much better parents to me I think than probably I was to my children. The best bit about being a grandparent is watching one's children try and be parents, and discovering it's a bit more difficult than they thought. I was very fortunate. I was very close to my mother, I was very close to my father. My father comes from the Scottish side of the family and my mother comes from a farming family. [pause] I was born I think with a great deal of self-confidence, and I think that was partly nurtured, but I am tempted to think that it must be a bit in the genes, because they were… Both of them were very keen on education. My mother had been a teacher in Birmingham; she had been a suffragette. My father's family were bankers. And, I never heard them say anything nasty about anybody. I never heard them fall out ever. They gave me the most wonderful support.

So you come from this very stable background.

And quite a big extended family in London, Scotland, Shropshire and Conneticut USA.

Right. Were you an only child?

Half and half. My sister was seven years older than me. So, although I'm not an only child, I think, up till sort of, about ten or so, I was effectively an only child if you know what I mean.

Your formal education, where was that?

I went to Highgate School in North London at the age of nine.

That was your first education?

No. I went to… My mother taught me to read and write and all that sort of stuff, until was about six, and so I went to a dame school round the corner for a couple of years. And, then went to Highgate junior school and then on to the senior school. I had, like, actually, nearly all my family, I find maths just easy. And I've often joked that if you were doing maths, you learnt something on Monday, applied it on Tuesday, and you were top of the class on Wednesday. Now English, you learnt something on Monday, applied it on Tuesday, and found yourself in detention, because they'd changed the rules. And, my grandfather, my father, my son and my grandson, just seem to find maths isn't a problem. It just seems easy.

Right.

And we don't seem to feel we have to try, if you know what I mean. So I sailed up the junior school on the back of maths. I had been in the, I was in the choir at Highgate, so I knew the senior school therefore, and the building and that quite well. And I actually was quite excited at the thought of going to the senior school. And the first year went really, really rather well. And then, it got rather boring, mainly because not much went on in class. And, sort of, partly with the benefit of hindsight, I, I sort of, did enough to stay out of trouble, and I…

[1:11:15]
Do you get bored easily?

No.

OK.

I mean I don't… I can't remember being bored exactly, but I can't think of any other expression. Nothing was exciting.

You fill your life very, very purposefully don't you.

Well, I spent most of the time in the senior school in the library, designing gardens. I should have been an architect actually. I'd love to have been an architect. I think I'm a frustrated architect. I designed a monorail system from London to Edinburgh, and things like that, which was fun. Then, we used to have to recite poetry, and you used to have learn it for prep. So I started thinking, how can I do this better? Because it was awfully tedious. If you had to write an essay, you write the essay and forget it. If you had to recite poetry, you keep remembering the damn stuff. And so I started experimenting in the summer when I was at school in finding different ways of, of remembering. That was a disaster. Anyway. But…

And you left with A Levels in English literature, politics, economics and philosophy.

Correct. The best bit about going to Highgate School…

I'm sorry?

The best bit about… Well it was worth going to Highgate School for eight years to read John Stuart Mill's essay *On Liberty*.

What struck you about that?

I couldn't make head nor tail of all the stuff to do with religion. Because in the choir, you had to listen to people, you know, and that sort of thing, and none of it makes sense, because, you know, it just, doesn't make sense, to a sort of, a very simple mind.

And I was trying to work out why it didn't make sense. And of course John Stuart Mill, the first half of the essay *On Liberty* of course describes exactly that. It gave me the means to think. It gave me the structure to think. And I would say genuinely to quite a lot of people, if you want to start thinking about programming, it's a good place to start. Everything should be open to question, et cetera et cetera. I actually committed to memory chunks of it, especially the bit about general state education, which I have before now, to everyone's embarrassment, stood up and repeated at dinner parties et cetera.

[1:13:51]
You went on to a polytechnic.

Yes. It was the Regent Street Polytechnic, which is…

You chose not to go to university?

[laughs] Yah, quite firmly. My sister was seven years older than me, and, when I was about thirteen or so she was 20. She had got strings of First Class Honours degrees from London University, and she worked incredibly hard, and so I wasn't going to have anything to do with that. And I discovered that you had to pass Latin at O Level to go to a university. So I espied the solution. I announced I was giving up Latin. Oh, needless to say, the world fell in. And I gave up Latin.

And your parents supported you?

My parents have always supported me. I can remember them sitting in front of the headmaster at Highgate looking worried. It's the only time I can remember them looking worried. But I, I… You were asking me about learning things. In a negotiation, there comes a point where both sides have put their cases, and there is a silence. The first person to speak loses. And I well remember going, I can tell you exactly the room in Highgate School, and the weather and where we stood. Because I stood up; everybody else sat down. And the headmaster actually asked me, why I want to give up. Well of course I wasn't going to tell him. But at least he had asked me, which was more than anybody else did. And, so he… There was a pause. And

my parents looked worried, and I was on the point of thinking, if my parents are worried, perhaps I'm wrong. But he spoke first, and he said, would I… And he said please. Now, very rarely did the headmasters at public schools say please to thirteen-year-old boys. And, he said, would I take Latin for one more year, and if I came in the top three he would consider me giving it up. Well perfect. Because there was no problem about learning the bloody stuff. So I agreed, of course. Took Latin for a year. Came third. And gave it up. I have, to my embarrassment, discovered later that that only applied to Oxford and Cambridge. Now, actually in my family we only knew that there were Oxford and Cambridge.

Would you have gone if you had known?

No.

You wouldn't have gone to university?

No. I, I had made my mind up to go into banking about this time, because, it seemed, it had looked after my family, and lots of my family, very well. And it seemed quite fun. And, well what's the point in going to university? I mean, in the Fifties, roughly ten per cent of the population went to universities.

Mhm.

Half went to university because they were going into the business of education, and half for social reasons. Well I had spent two years in the Army in an upmarket artillery regiment, I had no need to spend any further time socialising. And I wanted to get out in the world. I was not going to waste my time sitting in a university. And if you've commanded a field gun troop in the British Army, you don't really want to sit down at a desk. But I went to evening classes for three years and did economics, law, commercial law and banking law, and accounting, which would have been quite useless in banks, but hugely useful when I got out to start running my own businesses. Because, I wasn't an accountant, and I wasn't a lawyer, but I could brief a lawyer, I could brief an accountant, and I knew when, what they told me, I could understand

what they told me. And I could judge… Hugely helpful. If you're going to try and be an entrepreneur, you must know the rules of the game.

[1:18:07]
What would be your advice to the young entrepreneurs in the IT sector in this country today?

Oh. Gosh. Well actually, my great-nephew is running a business doing websites, and, he's very much of a bright spark. And he actually asked me the same question. And I said, well, go to evening classes and learn about accounting, learn about law, and economics.

And did he?

[clears throat] Can we move on? [laughs]

We can move on indeed. We can move on.

And I actually mean that, because, I knew, I realise now I knew so little about running a business in my twenties when we were trying to get things done. And, one just had to, have a go.

Mm.

It does help to know a little bit of the theory of, of business, and marketing. And I think it's a lot more complicated now. I mean it's relatively easy. I mean it's extremely easy to start a business. Do bear in mind that it is a criminal offence in the United Kingdom to solicit funds unless you are an authorised person. I happen to know the clause of the 2000 Financial Services and Markets Act, it's Clause 21. And we campaigned in the Real Time Club saying, this means that only bankers can raise money, or, if you wanted to do a prospectus you had to get an authorised person to prepare the prospectus. So everyone reads the bankers' view; no one looks at the technology. So that upsets everything. And it makes the financial community the gatekeepers to funding. And so we managed to get into the Finance Act a way out:

the Sophisticated Investor clause. If you sign a document saying you are a Sophisticated Investor, then, it bypasses the law. And quite fun in the last few years is, crowd funding has come up. Crowd funding would not be possible without the Sophisticated Investor clause. So, the Real Time Club scored a point.

[1:20:41]
If you had your time over again, what would you do differently?

You ask… Cor blimey! more difficult questions. [pause] Funnily enough, I have mildly thoughts, because I'm very lucky because I'm in touch with quite a number of young people in their early twenties. [pause] I don't think I'd get into computing now. I don't think I'd have the patience to learn it all. And it's so much more complicated. So I quite honestly don't know. The only way in which I might be mildly, very very mildly envious of my grandson who's 22, is what he will see in the next 30 or 40 years, which will be fun to be around. But I don't know what I would do.   And so I, I'm not very helpful.

[1:21:36]
No that's fine. What's your biggest mistake that you made?

[laughs] How long have we got?   Oh Richard. There are only two things about which I am vain. [One is that] I've made more mistakes than anyone else I ever met. [The other is that I can still get into the uniforms that were made for me at 18] Shall we move on?

Fine. What's your proudest achievement?

Well, I'm extremely fortunate to have a very happy relationship with Louise, and with our children and grandchildren. I've just had lunch today with my son, and I have lunch with him, he's an underwriter in the Lloyds market, and, we've had lunch together more or less once a month for the last, since he was, well we won't go into how long, but…

So it's personal, it's private, your greatest achievement?

I'd like to think that I, I contributed to the computing world a bit.

There, in the computing world, greatest achievement there?

Well, we did produce the first online system, commercial online system, and ahead of Wall Street, and I'm quite pleased about that. The… I suppose… I think I can claim to have contributed a bit towards the development of computer typesetting, and therefore the use of computers in place of typewriters, and therefore the means of communication which made the Internet and the World Wide Web possible. So I mean, one small straw. Because no one person invented all that, I mean, there were a huge number of people involved.   But I had a finger in that. I quite like the fact that we, we did some work with speech recognition. It's interesting that in the Sixties we pretty well forecast what was going to happen in computing for the next, however many years. But, we got the timing wrong. Some things happened much quicker than we thought, and even now speech recognition is nothing like good enough to do away with keyboards completely. But we're getting there.

[1:23:57]

I think the most exciting thing that's happening at the moment is the way in which, by having the enormous advantage of actually programming computers in machine code, and doing the systems for the first time for quite a lot of applications, one's learnt a great deal about how the brain goes about doing these things. And we've had a lot of fun in the Real Time Club talking to the people in cognitive neuroscience, who all told us to go away please and leave them alone, because computers are nothing like, to do, nothing like our brains. In the last two or three years, two things have happened. We were talking earlier about artificial intelligence, and the steps that have… Artificial intelligence, wherever it's done at the moment, it has taught us a great deal about what we call intelligence in the brain, which is, I think, very helpful. And, if you look at the huge amount of money that's being spent on research, and things like CERN and everything are wonderful, it all depends entirely on people's ability to think and on the brain, and very little work is being done on that. And, the computing world with its usual arrogance, or, at least me, were saying, well, if you look at the systems we use to make a computing system work, a big one, that's very similar to the way the brain must solve the same problem somehow.

You don't think that, do you?

Oh I do. [I spent quite a lot of the early 1990s and 2000's studying Cognitive Neuroscience more seriously – including a course at Bath University. Obviously computer 'hardware' bears no resemblance to brain 'hardware' but the operating systems are remarkably similar. Eventually Shirley Redpath and I published 'Biological Systems of the Brain' in 2008]

You do?

Yes. Very closely. Now, cognitive neuroscience sort of didn't want to know. In the last two or three years they've all been coming back with convergence. We've found the word. Craig Venter is saying he couldn't have done the work he's done on DNA without computers, it wouldn't have been possible. The cognitive neuroscience people are beginning to talk about it. And so, suddenly, about four or five different disciplines are all beginning to talk together, and, it's sparking a huge expansion of ideas and thoughts. And, at least at the level of books, in the last two years, something like twenty books have been written on superintelligence, the master algorithm, et cetera et cetera et cetera et cetera. And that's produced a profusion of new ideas, very exciting. Not the least, tonight I am going to listen to a 22-year-old who is going to give the Real Time Club a lecture on synthetic biology. He is doing a PhD at Oxford in synthetic biology. And I'm lucky enough to have met him when he was fourteen, and arranged for him to spend the summer at the Fermilab in Chicago. And we've known each other since then. He's one of the very rare people, and Richard, you recognise this, not only has he got a brain about ten times bigger than most people, but he can write it, which is very rare. He can actually write down his thoughts in a way that people can understand them.

[1:27:51]
You don't give up, do you, just…

[laughs] What had you in mind to give up?

You just don't give up, looking forward, projecting forward. Putting together things.

But that's what's fun. That's tremendous fun. I mean, what an exciting, what more wonderful career could I have had? Right at the beginning of computing. It's been one long adventure. I just consider myself to be incredibly fortunate to have managed to get into it, quite by chance. And, it is extremely exciting.

Fun is important for you?

[pause] I suppose so. Well, no, well… There you go again, asking me even more difficult questions. I don't know whether it's necessarily fun. I get the most enormous buzz when you see something over here that you don't understand, and something over here you don't quite understand, and it starts coming together, and you suddenly think, ooh, I wonder if that answers both questions. That is a colossal buzz. Then I have to try and write it down, so that I can understand it the next day. So I get other people to write it down; so much better at it than, than I am.
[The Real Time Club started the Brain Mind Forum in 2004 with some people from Oxford University and the New Scientist. www.brainmindforum.org. We invite world leaders in both Cognitive Neuroscience, and more recently Biogenetics to debate the convergence of these three subjects. The theme is all three systems process information in very similar ways.
The most pressing problem is to find some definitions of 'Intelligence' so we are currently setting up a panel to see if we can make a contribution.]

Thank you very much Charlie Ross.

[End of Interview]

Additional Material.

Richard asked a lot of questions about what advice I could offer, What have I learned etc? So I would like to add:

I was at school when 'O' level was introduced. We took this new exam, but were told we were the wrong age so the results did not count. It was obvious that exams were irrelevant!

I found school increasingly dull, sort of claustrophobic. Just one master (they are called teachers now) was great. He introduced me to Aristotle, Plato …the Enlightenment. He did not teach anything. He just asked questions. In the VI form I began to wake up, but my education did not get into top gear till I was conscripted into the Army. I spent 18 months in Germany. All my brother officers and I argued endlessly about everything all the time, and we travelled all over Europe together– luckily there was no war on!

I did not realise till I was well into my 30's that I can learn pretty much anything, if I want to, but I have great difficulty being taught. There are a lot of people in the computing community who are like this. We need to learn our own way. It is some sort of variant brain architecture. Not better, not worse, just different. May be it is an entrepreneurial streak. Entrepreneurs famously rarely prosper in schools!

In 2001 the Real Time Club did a research project with Computer Weekly Worldcom and the BCS for the DTI (as was) into the background skills of some 2,000 computer people. As many as a third think this way.