

Hermann Hauser

Born 1948.

Life story interview by Alan Macfarlane.

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1. Parents



Hermann Hauser at King's College, Cambridge.

I was Born in Vienna in 1948; my great-grandfather was born in Brno, Czechia,. He apparently walked from there to Vienna with all his possessions on his back; on his grave stone described as house proprietor and burgher of Vienna which were obviously the two things he was most proud of; this, my mother's side, has been Viennese ever since; my father's family is Tyrolean and for many generations have been farmers and innkeepers.

During the War my mother's family decamped to the Tyrol because Vienna was being bombed and occupied by the Russians; she stayed at a farm near my father's home and that is how they met; I was the first son; I grew up in the Tyrol in a place called Wörgl near Kufstein; its claim to fame is as a railway junction from Germany to Innsbruck and from Innsbruck to Vienna.



Wörgl in the 1960s.

I grew up in a tiny village, part of Wörgl, with two to three hundred inhabitants; my parents had a very strong influence on me; my mother moved back to Vienna after my father's death as she loves the city. My father was in many ways the exact opposite; he was a country boy and an entrepreneur; he built up a wine wholesale business; I suppose a lot of my own entrepreneurial urges come from the fact that he talked about the business issues; he gave us the feeling that the buck stopped with him and that he was ultimately responsible for the business.

In my own life I have been pretty successful but even so there is a large amount of risk, and on average about 30% of companies never make it and people lose their jobs; fortunately we now have a wonderful environment in Cambridge that Andy Richards described as a low risk environment to do high risk things in; if people fail in a Cambridge company, because there are so many high tech companies the chance of them getting another job is quite high.

My parents were originally religious in the way that all Austrians were and it was part of our social fabric that we go to church on Sundays; later, as was the case in my school, the Gymnasium in Kufstein, there was a dramatic change in ordinary Austrians' attitude to religion which also affected the way my parents lived their religious life. During the eight year period that I was at the Gymnasium there was a change from the dominant position of the Catholic church, where the most important person in the school was the priest, not the Head, but who was an irrelevance by the end of that period; people did not become anti-religious but it just disappeared from their lives; we stopped going to church but no one really talked about this change.



Steve Furber

I recently read both Dawkins 'The God Delusion' and 'The Dawkins Delusion?' which was interesting because it reminded me of my own thoughts in regard to religion; on one hand I found the former quite liberating to say one is an atheist, which I suppose I am, on the other hand I felt he was overdoing it by suggesting one had to fight religion which I could not identify with; I suppose I became a little

disillusioned with religion in Austria as it had become social habit rather than something that was thought through.

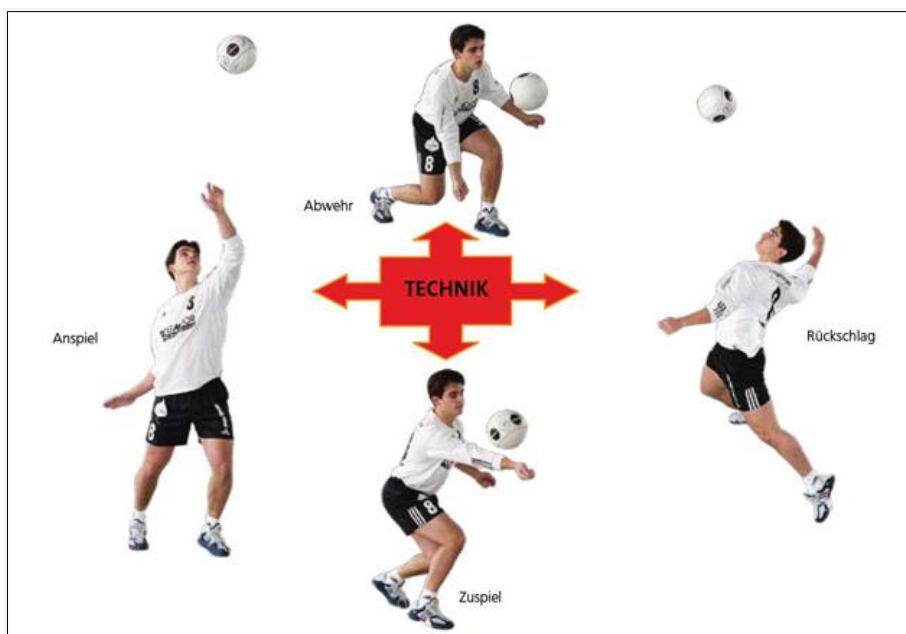
I remember meeting Steve Furber, one of the brightest people who ever worked for me, one of the inventors of the ARM, now Professor at Manchester; he is religious, he is clearly a lot smarter than I am, so if somebody as smart as him believe then it must be valuable to him and I have to respect that.

2. School

My first school was the primary school in Bruckhäusl, a wonderful village school; we had up to three years in one class; my mother forgot to tell them that she wanted me to go to the Gymnasium which was academically a highbrow thing to do; when she finally told them they were all excited as they hadn't prepared me for the entrance exam.

I got private tuition and just made it into the Gymnasium; primary school is from six to ten and Gymnasium from eleven to eighteen; Frau Edelstrasser was a wonderful first teacher; she was beautiful, kind and knowledgeable; I can remember her sitting beside me showing me how to form letters.

I developed a love for physics because of my uncle who had studied both physics and maths at university; there few jobs for mathematicians after the War so he became the local jeweller and watch repairer in Wörgl; when we went on mountain walks together he would tell me about physics and maths, that you could turn lead into gold but that no sane person would do it as you needed an atomic reaction; he talked about atomic physics in particular and the discoveries of quantum mechanics.



The technique of Faustball.

At about fifteen-sixteen I bought myself a book by Zimmer about quantum physics and relativity which we were not taught at school; I was good at both physics and maths; I always participated in games, particularly faustball (fistball) which we played in the courtyard of the Gymnasium; I took up squash here but learnt tennis in Austria. I have skied since I was four; I run once or twice a week around Granchester.

Music is important; we had a wonderful music teacher called Kurt Neuhauser who was quite a famous organist who was widely broadcast on Austrian radio; he was totally absorbed in music who became exasperated if his pupil could not understand him. Mozart was taught, so was Haydn; I developed a taste for Bruckner and

Mahler, then Stravinsky; having lived here for a while, discovered Vaughan Williams. Chris Curry with whom I started Acorn Computers is very patriotic and said that Vaughan Williams did not write music for foreigners. People point out that he is in business with a foreigner but he describes me as an honorary Brit.

3. University

We have our thirtieth anniversary of Acorn Computers on 13th September, and while looking for some pictures, I discovered that I must have come here first in 1964 when I was only fifteen; I came to the Studio School in Cambridge on a language course; my father had come back from Innsbruck thinking that I should learn English as it was the most important language in the world; now I tell my children to learn Chinese which they are doing.

I first did my military service which was still compulsory in Austria and did my first physics degree at Vienna University; important person for me there was a man called Roman Sexl, a gravitational expert who also wrote text books for Austrian schools; I specialized in gravitational theory for my first degree; Walter Thirring had just returned from CERN as the head of theoretical physics there; his lectures were wonderful for their clarity; one was on electromagnetism where he generalized Maxwell's equation in a concise manner.

During the summers, because I had been to Studio School I returned to Cambridge because it had impressed me so much at fifteen; looking back I just can't believe that my parents put me on a train at Wörgl to go to Ostend, by ferry to Dover and train to London, then another to Cambridge; I arrived and had found my lodgings then two days later wrote a postcard to my parents to tell them; this would reach them a week later; when my kids arrive in Beijing and don't phone immediately I get very worried.

Apart from one summer in Paris, learning French, I came back to England every summer, always to Studio School; after the third year I asked John Morgan, a teacher there, what I should do and he suggested taking a Russian course at the Sidgwick site, which I did.

During my time at Vienna I became a research assistant during the summer at the Cavendish Laboratory; a wonderful experience as they treated me very well and I could do some interesting experiments; since the results were encouraging, when I finished at Vienna, they suggested that I do a Ph.D. here. I was with John Field's group in physics and chemistry of solids, in David Tabor's department; we were near the Hopkinson Lecture Theatre in the Old Cavendish (where social anthropology is now).

My father had been keen for me to do economics and take over his business but he was always very kind and realized I wanted to do physics; he was not an academic and didn't know how to make the decision for me; he went to see an acquaintance, Klaus Draxler, who was an assistant lecturer in physics at Vienna University; Draxler said that my school results were good enough to do physics but warned me I would never be rich, and that I would be much better off doing economics and going into my father's business; at eighteen I accepted that I would never have any money but I would do physics.

My Ph.D. was on laser induced reactions; we would fire a laser at a surface and see how plasma would form and whether or not this could trigger an explosion; we

were using high speed cameras which were taking picture at the rate of 1,000,000 per second which at that time was by far the most advanced high speed photography possible; I went from quite a theoretical background in gravitational theory, via my research assistant work to something that was applied; I ended up by applying a new computer analysis method for thermal balance and differential scanning calorimetric data that I got for chemical reactions; there is a thing called the 'Hauser Method' which is a lazy way of getting all three reaction parameters out of a single experiment.

My supervisor was John Field who was very helpful, particularly when writing up the thesis, but he was a practical rather than theoretical person; David Tabor was a great linguist and would always stop on the way to his office and speak to me in German; Brian Pippard's lectures were clarity itself, but the person I probably learnt more physics from was a Ph.D. student who finished a few years before me, Jacob Israelachvili, who became a professor at Santa Barbara; he was the first person to measure van der Waal's forces right down to microscopic distances; these are forces that are very important, particularly in biology

Andy Hopper was doing computer science at about that time; we had met socially and played tennis together; I did the Fortran courses that many physicists did at that time, I used the IBM 360 mainframe and before that the old Phoenix system; even used the Titan system before the IBM came with a teletype interface which we had in the lab.

I think I was one of the first people in Cambridge to bind in computer output directly into my thesis as part of the trick of doing the three reaction parameters in one experiment was to do a graphic output and use the graph to find the reaction order.

I knew Maurice Wilkes well and had the pleasure of offering him a position at the Olivetti Research Lab when I had become Vice President of Research at Olivetti after Acorn Computers; Maurice had returned from DEC after five years and was interested in a position in Olivetti which Andy Hopper headed up; he has been seminal for Cambridge computing; he was one of the first computer scientists in the world; his work on microcodes in particular forms the basis for all the microprocessors that Intel produces right now.

It wasn't until the early 1980's that there was a new and different approach to microprocessors, used by ARM, the RISC approach - reduced instruction set computer; until then all microprocessors used microcoding which was his invention; he started the first Diploma in Computing; at that time the computer laboratory was called the maths lab; it changed its name to computer lab under Roger Needham. I had great respect for Needham and really appreciated the way he interacted with local businesses.

4. Acorn



Herman Hauser and Chris Curry at Kings College Cambridge.

At that time we had just started Acorn Computers at 4A Market Hill, about 200 yards from the Computer Lab. One of the best investments I ever made there was Fitzbillies' buns in the afternoon for anybody who wanted to come, which meant that half the computer lab was at Acorn at four o'clock in the afternoon; they normally stayed and one of the traditions at that time was that whenever I got hungry they would get a meal off me if they were still there; a lot of the breakthroughs - and there were lots of them, Acorn was a very innovative company - were made in the Italian Kitchen a few doors down.



Fitzbillies Chelsea Buns.

One of Acorn's innovations was the Econet - one evening we invented networking. We thought that computers should talk to each other and got terribly excited in linking them all up in a local area network and we designed it. Then Andy Hopper walked in and we showed him the design on a serviette; he looked at it and said it would never work and redesigned it; it was this change that led to the most successful area network in Britain at the time; we had 10,000 installed Econets in British schools in 1980-1981.

Although Acorn doesn't exist any more, one of the reasons for the Cambridge phenomenon is the Acorn philosophy; we were really a systems company; we designed our own chips, hardware, computer, operating system, application software; we were the only computer company at the time to have a local area network; Bill Gates saw it and our BBC computer and he wanted to sell us MS Dos; told him that it would be a retrograde step as our operating system was way ahead at the time; one could get files off a server that was far away using the same method as to get files on and off a floppy disc; Bill's response to that was "What's a network?". Manipulating images came later; people often forget that in those days the BBC computer came in two varieties, Model A and Model B; A had 16kb of RAM and B had 32kb. Now just the caches of microprocessors are typically 1mb. We had word processors running; lots of books in Cambridge were written on BBC micros; we had spreadsheets, graphics - typically line graphics - but there was no way you could do video or high resolution pictures. Ethernet is a local area network, invented by Bob Metcalfe, typically 100 metres of cable; internet is global. The World Wide Web was invented by Berners-Lee while working at CERN in order to share results between researchers all over the world. In a way we are witnessing a repeat performance with the Large Hadron Collider where the amount of data is so vast that they have built a much higher speed network called the Grid to get the data out to lots of research groups all over the world.



Acorn BBC Micro computer.

After my Ph.D. I had two serious options, one was to apply for lectureships in physics, the other was to go back into my father's business; although I had done physics he had never given up the hope that I would finally return. My younger brother later did take over the family firm after graduating in economics.

At that time I met Chris Curry socially; he was working for Clive Sinclair at the time and was getting a bit fed up. Clive invented the business model, among other things, that Chris introduced at Acorn, to sell computers through mail order; that was how we could finance Acorn without venture capital or any large sum from the founders.

Acorn was an unusual company in many dimensions; one of them was that the total amount of investment that it had was £200, £100 from Chris and £100 from me; therefore it is the only company that I know of that had a capital gain of a million-fold; when we went public at £200,000,000 every pound we had put in was worth £1,000,000. Andy came in later; he and I had a company called Orbis Computers which we merged with Acorn which is how he became the third director.

After my Ph.D. I had a research fellowship at the Cavendish for a year; I must have absorbed some of my father's business skills because it felt very natural when we set up Acorn Computers; I did not feel apprehensive about starting a company; we started the Cambridge Processor Unit (CPU) first in 1977, and a year later, Acorn Computers. To begin with we were living hand to mouth. CPU was a consultancy and our business plan was that it was all happening in microprocessors; we were very excited by the possibilities as were the Cambridge microprocessor group where we hired the best and brightest.

The true skill which I brought was my ability to find out who the really bright people were that could produce a really good computer and then convince them that they should join Acorn Computers; the excitement at that time was similar to the excitement about the internet twenty years later; I recognised the same sort of people, same attitude to life, and belief that it was going to change the world; we knew that microprocessors would change the world and the idea of bringing microprocessors to the people, of letting them have access to a personal computer - at that time called a home computer and our customers called 'enthusiasts'.

Our first product had a key feature, that it must not work. If the kit they received did not work, then the customer would have the satisfaction of making it work.

Acorn was the first company in Britain to go from zero to £100,000,000 in revenue in just five years so it was a phenomenal success; everybody thought we were walking on water, articles suggested we had the Midas touch, and if this goes on you start to believe it.

None of it was true it was just that the market was exploding at that time; then came 1984, the year that the home computer market collapsed, just at the time we had solved the only problem Acorn Computers had in its whole five year history, which was to produce enough; we finally had them coming in by the lorry load but they were not going out any more; we got into very serious financial trouble and Olivetti finally took us over.



Key Acorn people 30 years on. From top left: Hermann Hauser, Andy Hopper, Christopher Curry, Sophie Wilson, David Allen, Chris Serle, David Kitson, Chris Turner and Steve Furber.

5. Olivetti

Acorn was restructured and they offered me to become their vice president of research, which I did; I moved to Italy, to Ivrea, and had the first boss I have ever had in my life Elserino Piol, the vice chairman of Olivetti, which was a wonderful experience. He taught me about venture capital, business.



Elserino Piol, Vice Chairman of Olivetti.

He was a great strategic thinker; he was the person who turned Olivetti from a seven billion dollar computer company to a zero billion dollar company at the same time that he created Omnitel and made it leap from a zero billion dollar mobile phone company to a twenty billion dollar company. It was the most dramatic change in a corporate strategy of any Italian company. He also had a corporate venture arm which invested in American companies, and I would always travel with him and we would do these deals together, so it was an apprenticeship for becoming a venture capitalist. He was also a very clear thinker, almost at a strategic level; we communicated in English although it took time to realize that he was speaking English.

I first came across the problem of information retrieval when a student in Vienna; read book by Rudolf Carnap, 'The Logical Construction of the World' and what impressed me was that he started with a single concept of the recollection of similarities through which one could build up all the other concepts that we have in our language, basically by set theory.

We now know that Bayesian probabilities is probably a much more elegant way of approaching it. One of the things that I would like to do sometime in the future is to see if we could build a computer that is a probabilistic computer rather than a traditional microprocessor. I hope to put together a group of people to help me think about it including Steve Furber and Steve Young who has been working on speech recognition and that is all probabilistic in Markov chains.

We have a wealth of people who know about Bayesian arithmetic; a most valuable company in Cambridge now, Autonomy, run by Mike Lynch is based on Bayesian principles, and we have a very strong group in the Engineering Lab on that; I really think it such a fundamental problem, possibly the most fundamental problem of

intelligence that I would like to do more work on it

At Olivetti, I had seven research laboratories all over the world; before taking the job I had spoken to Philip Hughes who ran Logica at the time. He advised me to take it and to learn how big companies worked. It was the right advice; those three and a half years were some of the best in my life; Olivetti treated me very well and I had great freedom to do what I wanted.

6. The Cambridge Phenomenon

I set up the Olivetti Research Lab here in Cambridge with Andy Hopper. I had another in Palo Alto and in many other places, but the one in Cambridge was by far the most successful. Alfred Marshall the teacher of Maynard Keynes did an interesting study on clusters in Manchester around the textile industry; he famously said that this knowledge about how to do textiles was in the air because people would be constantly talking about it.

In Cambridge we have had a few seminal companies like Cambridge Instruments, Sinclair Radionics; Acorn, and CCL, that became the companies that set the gene pool; the Judge Institute did some very nice work on the relationship of the companies that have been formed over the last twenty years and the original company that they worked for.

Acorn alumni are responsible for over a hundred companies in the Cambridge area; Acorn plays a similar role in Cambridge to Fairchild's role in Silicon Valley where all the big semi-conductor companies in the Valley are "Fair children"; the overlap between the University and commercial companies is one of the things that really distinguishes Cambridge from other European universities, and sadly, because of the obsession with conflicts of interest, in the United States, too.

Roger Needham was a classic example of somebody who from personal experience was unbelievably helpful to Acorn Computers in the early days; he allowed us to employ people in the Computer Lab on a consultancy basis; some of the chips in the BBC Micro were developed in the Computer Lab by people who were lecturers and they were consulting for us.

He also allowed his students to be fed Fitzbillies' buns and spend a bit of time with us; he would come to me for little bits of financial help in the Lab which we gave him; it was totally informal but both the Computer Lab and Acorn benefited from it; at that time it was informal as people trusted each other; it has become a bit more formalized but it needed to as the stakes are higher and the companies bigger and the contracts need to be more precise, but there is still a willingness on both sides to be supportive of each other; sadly, especially many continental universities, don't do that, and have an aversion to work with business

A few years ago there was a great debate about intellectual property rights; the most important thing was that the University decided on clear rules on how to do this; one of the problems we had before was that you couldn't actually go to the University and ask to pay for intellectual property rights and base a company on it because they would not know who the IPR belonged to. They could neither give a licence for it as they couldn't say they owned it, nor say that they didn't own it so go and do it. All they could say is that they didn't know.

That particular problem was solved so there are now clear rules; this clear rule set is now being implemented by a subsidiary of the University called Cambridge Enterprises; think we have been quite lucky in the person who heads it, Teri Willey, because she had done a similar job for Chicago University and has spun out a group into a venture capital firm that did that for Chicago, and she has a non-

confrontational personality which suits Cambridge; my hope is that this will lead to more spin outs, but there are more rules and it is more regimented than in the past; the IPR arrangements in Cambridge are the most generous in Europe, and more so than both Imperial College, London, and Oxford, and I think that is a good thing; there is movement between Berkeley, Stanford and Silicon Valley, but their IPR arrangements are much tighter than here. However, there are one or two universities in America allow IPR to be used freely rather than assuming that it belongs to the university. I cannot see much difference in spin outs between this type and the rest, so both work.

The early attraction of Cambridge was the girls and punting; I was at King's for my Ph.D.; one of the really nice things about Cambridge was that, as an Austrian with a bit of an accent, you were accepted here - not odd, but interesting; when people ask me which organization I identify with in Cambridge, it is really King's because I lived here, had lots of student friends here, and the exposure during formative years creates the bond.



King's College Cambridge.

I am proud of the University, the Cavendish, but the strongest emotional bond is with the College; Herbert Huppert, as another physicist, I have stayed close to; I had a nice relationship with Alan Bilsborough who was my tutor at the time. At one point I thought I wanted to change from physics to artificial intelligence. He gave me a lot of good advice and introduced people for me to talk to. A lot of artificial intelligence work was being done in the King's Research Centre and he introduced me to people there. In the end I thought it better to finish the Ph.D. and then do something in computing, which I did. Pamela, my wife, like Alan Bilsborough was a physical (now called biological) anthropologist; first met her in the King's bar and we married in the Chapel.

Over the past twenty years the high tech environment in Cambridge has blossomed. People often ask me what I thought about the next five to ten years. I am quite optimistic about it; think that many of the building blocks that made Silicon Valley so successful are finally in place in Cambridge; there has never been a problem with technology but there was a real problem with management, we just didn't have

experienced managers; we now have many second generation serial entrepreneurs. An interesting data set is that in Amadeus I 17% of the deals that we did were with serial entrepreneurs, in Amadeus II this had risen to 40%, and now in Amadeus III it has risen to 70%, all in just ten years.

So we have home grown talent we can now work with and we can also attract some of the best managers from all over the world. Solexa, our latest billion dollar company was grown by a John West who ran a billion dollar operation of ABI, the lead company in sequencing machines; we went to him as a little Cambridge start-up saying we had a machine that was a hundred times better than the one he was selling, and that we wanted him to sell ours. He looked at the machine, and as a physicist understood the technology, and agreed. For Plastic Logic I just hired the most senior person I have ever hired in my life, Rich Archuleta, who ran a ten billion dollar business for HP; this was something that we couldn't do ten years ago. We also have technology based venture capital, like Amadeus, to put syndicates together.

There is also a local culture now of people who are quite willing to engage in start-ups - a low-risk environment to do high-risk things - so people can dare to join a start-up which might have a shaky future as if things don't work out there are enough other start-ups where they can get a job without having to move house. The other criticism that people make is that there are not any more interesting things to do; I have never seen more exciting new projects as I am seeing now.

The belief that China will build what we dream up is a very short-lived phenomenon; they clearly don't just do Nike shoes; one early example of that is a company they called Huawei which produces telecoms equipment and is now one of the largest in the world; a few years ago they had a huge court case that Cisco brought against them because they were copying Cisco kit, Cisco being the largest provider of network equipment in the world; now Cisco hopes to copy what Huawei is doing because it's kit is now ahead of Cisco; they are the innovators now, Cisco the follower.

There were six founders of the Cambridge Network which straddles the business community and the University; the University was one of the founders and it was set up with an objective of bridging the gap between academia and the business community; it now has over a thousand companies as members, all the Departments of the University are members; there are open lectures for both academics and business people as contributors; it has a vibrant web site and newsletter; we didn't expect it to be so successful when we founded it some ten years ago with the help of Alec Broers; it is also concerned with how Cambridge presents itself to the rest of the world so has a close relationship with the Munich Network, Shanghai Network, Stanford Network and one or two others, so is part of a network of networks; it runs the corporate gateway so connects well to big companies; Kodak came here because of it, so did Nokia; an unexpected boon is that the web site has now become the main jobs web site for companies.

7. Amadeus

On spin out companies, I did not set out to have so many links but they just happened over the years; I suppose it is partly because of Acorn Computers and partly because during the 1980's and 1990's when there wasn't a lot of venture capital around I suppose I was about 50% of the angel money; they knew I was a sucker for technology and if they came to me with an interesting project I would try my best to either fund it myself or find them funding.



I am always happy to speak with people even if I don't find funds for them as I am always interested in new projects and new technology. I set up a venture capital fund, Amadeus, in 1997, at a time that people did not believe in technology venture capital, especially not in Europe; all the money we got came from America although now most comes from Europe.

People then did not believe there was enough deal flow but I knew there was as I had too many projects to cope with. Richard Friend and Plastic Logic raised the largest amount ever, \$200,000,000, for the company which I set up with Richard Friend. We had built the world's first plastic electronics factory in Dresden, Germany, which will be opened on 17th September; it is quite an historic event because it will be the first time in fifty years that a new semi-conductor goes into mass production; the last semi-conductor was silicon and here is a new one made out of plastic; it came out of work in the Cavendish Laboratory where Richard did his Ph.D. just one year after me.

We have a new product called an e-reader that I think will change the way that people read; it is a product category between a personal computer and the mobile phone; it is clearly lighter and you can hold it in one hand easily; you will be able to change pages by touch and it is very paper-like; it is a reflective rather than emissive display like a lap top, and because it is reflective display and bistable, it consumes no power at all when you read it but only when you change the page; means that this unit will probably have an endurance of three weeks; there will be two models, one 2gb the other 8gb; the latter will hold 2,000,000 pages, so about 10,000 books.

It has three main uses, e-books, e-newspapers and the paperless printer; people are emotional about books and accuse us of trying to destroy them; I am reading a book on molecular cell biology at the moment in bed, but there are 1000 pages so it is the most awkward thing to read, and weighs 5kg; it would be much better if it were 300g, and easy to hold in one hand.

It has many things in common with paper; one is that it is reflective and therefore you can read it under any lighting conditions; in particular it is very good in sunlight where personal computers are no good; secondly, the contrast ratio between black and white is 10:1, exactly the same contrast ratio to paper and because it is bistable it does not flicker at all, so people have a reading experience which is as close to paper as any display that has ever been invented.

We have over seventy-two patents; it has a Bluetooth and Wi-Fi interface as well as a USB so when you connect it to your computer you will have a shared folder so anything in it will be synced to the e-reader; there is a search function on the e-reader itself and you bring up a keyboard by touch interface and type in the search query; you can type in data but this is not the aim.

The Kindle is a 6" display whereas this is 11"; the former weighs the same although a lot smaller; this is lighter as it is the first implementation of plastic transistors whereas the others have glass as a substrate where we have polyethylene; if you tried to produce a display of this size in glass it would be very much heavier and would break easily.

Richard Friend's group in the Cavendish Lab have been unbelievably productive; they first invented polymer organic light emitting diodes which went into a company called CDT (Cambridge Display Technology) which I was also involved in which was bought by Sumitomo. The second spinout was Plastic Logic with Henning Sirringhaus, one of Richard's brilliant students who is now a professor himself at the Cavendish; Richard has a wonderful new approach to photo-voltaic cells, again based on plastics rather than silicon.

I am very excited about that, and maybe we can produce another company; the energy problem is so big and this is such a neat, long-term solution; all the others, perhaps with the exception of wind, are band-aids; using the sun which had been the provider of energy on earth for the past four and a half billion years. It is a wise thing to use; the main advantage over solar panels, which use silicon, is cost; silicon is about 20% efficient now and plastic solar cells are about 6-7% efficient at present, so we need to get their efficiency up; people like Richard have a wealth of experience in the electronic structure of polymers so I have every confidence that they will be able to increase the efficiency rapidly over the next few years.
