Richard Friend

Born 1953.
Life story interview by Alan Macfarlane.
Available online at www.livesretold.co.uk

Contents

The text of this life story is transcribed, with thanks and acknowledgement, from the collection of Filmed Interviews with Leading Thinkers at the Museum of Archaeology and Anthropology at the University of Cambridge. The interview was carried out by Prof. Alan Macfarlane on 21st May 2008, and was transcribed by Sarah Harrison. The video is here: https://www.sms.cam.ac.uk/media/1116837

1. My Early Life

I was born in 1953 in the Middlesex Hospital in London where my father was a junior doctor. I have recollections of the house in Radlett sitting in a pram looking at paint peeling off the wall. We then moved to Staffordshire where father got a job as a consultant at the Stoke Hospitals. By coincidence my mother's family were from mid-Staffordshire and we spent two years living with her brother, who farmed. A lot of my memories were of the farmyard - pigs, cows, and horses.

When I was five we moved to a large, ugly, rectory where I grew up. Of the grandparent generation, only my father's mother was alive. She was not a scientist so not a strong influence on my future. Father was hardworking but always playful and approachable. I have a brother who is now a professor at Oxford. He was previously a transplant surgeon in Cambridge. Both of us did what our parents wanted us to do which was to work hard and achieve. My primary school was a small Catholic girls' school which took young boys so I was taught by nuns at an early stage.

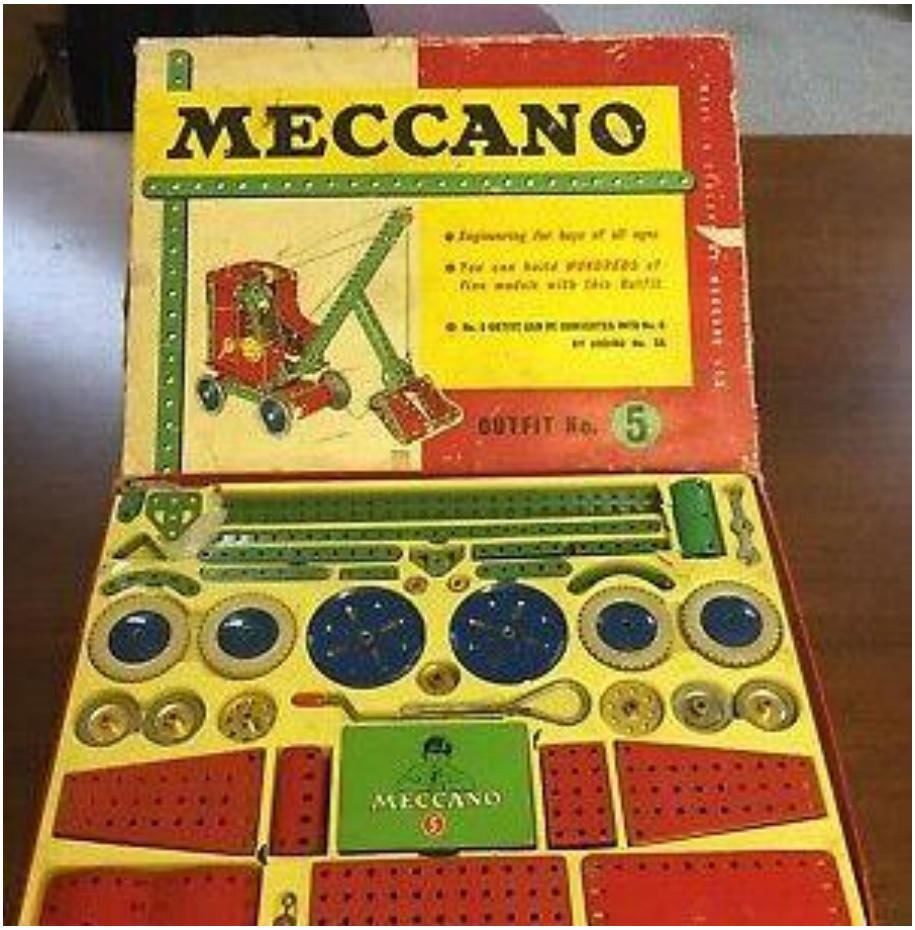
The Old Hall, Wellington.

I was sent aged eight to an absolutely dreadful prep school called The Old Hall at Wellington, Telford. As a peer group we were encouraged not to be very nice to each other. There was a sense of remoteness, dreadful food, freezing to death on sports fields and being prevented from using our brains usefully. It never got any better.

My parents had probably had a harder time. Mother was orphaned at eleven and her happiest times were at boarding school where she found friendship. They did not enjoy us being away but felt it had to happen. To get to a public school one needed Latin so had to go to a prep school where it was taught. My younger brother went a year after me but one of the beastlinesses of boarding schools at that time was that friendship with siblings was not encouraged.

The event that sparked my interest in physics was my first Meccano set aged five. Eventually I assembled a great collection of gears, cogs and pulleys, not bodywork. I worked my way through the sets and beyond set 5 I used to go and buy pieces individually. At about eleven I got my first electronics set. I came in right at the start of transistors. I think science has suffered, too much of it has become black

box of necessity. A lot of electronic measurements are too complex to build your own amplifier and expect it to perform as well as something that comes in a box. I make useful tools at home and am a relatively enthusiastic wood-worker. I spend too much of my time writing grant proposals and not enough time at the lab bench. I am heavily oriented towards experiment where I believe most creativity happens.



Meccano Set 5.

---

2. Rugby School

10:43:18 At thirteen I went to Rugby; I didn't win an entrance scholarship but got into the scholarship form so had a diet of classics and a tiny bit of science. I was so-so at classics and didn't need to be taught the science as I knew it. I don't know how I knew it, but somehow it was common sense. Biology somehow escaped me, but physics, chemistry and the associated mathematics were where I thought I wanted to be. This was the golden age of electronics.

Rugby science in the 1960's was absolutely stunning; it was a paradox that the school rated its science as nothing and that the clever boys were discouraged from taking science 'A' levels. There were some very gifted physics and chemistry teachers; several had Oxbridge Ph.D.s. In every sense excellent scientists whose knowledge was profound, and that came across. Most of the school were completely uninterested but it was wonderful for me.

The Foxcroft Lecture Theatre, Rugby School, named after Geoff Foxcroft.

A famous physics teacher was Geoff Foxcroft; he was a national pioneer of the Nuffield teaching schemes, who knew electronics in a way that no one else did. He was very special. There were one or two chemistry teachers, a wonderful nineteenth-century figure, George Daizley, who went in for pyrotechnics. He thought that chemistry involved making things and if they were dangerous, so much the better.

I had a special fume cupboard to do my own experiments and he decided I needed to do cyanide preparations; he drew a skull and crossbones in chalk on the glass and for weeks we had these lethal concoctions there. Meanwhile other classes used the benches and nothing happened to them; it would lead to instant imprisonment these days. John Allen had just graduated from Cambridge and really gave me an undergraduate education for 'A' level.

I didn't mind games but the imposition of compulsory exercise was something I resisted at all costs. On music, I wish I could play but don't think I am a musician. I enjoy listening to music of all sorts, classical, music of the 1960's, and more

recently, jazz. Music certainly affects me, like an opiate, but I don't associate it with creativity.

At Rugby I did three 'A' levels at sixteen; I stayed on for a year beyond 'A' level to practice for the Cambridge scholarship exam. I had an interesting year being taught in very small groups, doing probably more chemistry than physics. I think there was a discussion between my father and my housemaster and I was told I was applying to Trinity College, Cambridge.

---

3. An Undergraduate at Cambridge

I went to Cambridge to read natural sciences. I wasn't sure whether I wanted to do chemistry or physics but during the first year it emerged that it was physics. Physics was taught in a much more intellectually appealing way; it was structured round ideas rather than facts. In chemistry the ideas were there but they weren't presented so profoundly. I was a pretty unruly undergraduate and thought that I could learn things largely by myself.

I enjoyed the elegant and carefully structured lectures that Gordon Squires (right) gave; he was Director of Studies in physics at Trinity. I was intrigued by Brian Pippard who was not an easy person to learn from as an undergraduate. He gave a very interesting lecture course from which I thought I learnt nothing at the time but, looking back, I learnt a lot. He did give me some supervisions in my final year which felt rather terrifying, but he was very good at stretching me by testing why I believed something I had been told in a lecture, and getting me to think. He was then Cavendish Professor; my brother came and read medicine at Magdalene a year later.

It was a very good undergraduate crop at Trinity - Steve Elliot and Mike Neuberger were exact contemporaries, both fellows of Trinity now. Stephen moved to chemistry and Michael to molecular biology and then to biochemistry.

In my first undergraduate year I did very little work and I knew the whole of first year chemistry from what I had learnt at Rugby. Physics I have always found hard and have had to stretch myself to understand it, and I did find it stretching. You need mathematics to solve problems in physics and some problems require deep and profound mathematics. But those are not the problems I went off to try and solve.

I have never rowed, never saw the point as it seemed such a non-cerebral thing to do. Being an undergraduate in the early 1970's was a time to be fairly left-wing; general buzz of alternative activities; the Vietnam War never seemed to matter very much as it was an American rather than a British problem.

---

4. PhD in Cambridge and Paris

I did a Ph.D. in physics, on the borders of chemistry. I joined a group of Abe Yoffe (right) who was leading a group that actually migrated from Physical Chemistry, the group that Bowden had brought to Cambridge in surface and friction. I think under Neville Mott it had moved across to be an activity in the Cavendish, Superficial Physics.

What was interesting then was that these were some of the materials that were of interest because they made good lubricants. They were appreciated as materials that were interesting as semiconductors. The thought that materials you could make transistors out of might themselves be chemically complex I found intriguing. The thesis was about a rather obscure property of metals. When the electrons of a metal are constrained, rather than travelling around in all three dimensions, in a layer or a chain they are not stable. They naturally distort and do so usually at a low temperature. They reorganize the crystal lattice to put in a distortion which switches them across to be semiconducting.

That sense of coupling between physical structure and electronic structure was interesting. I was looking at that in Cambridge on some two-dimensional metals. I ended up being sent to a wonderful group in Paris in my second year as a research student, specifically to do some experiments whereby we could measure the electrical properties on samples subjected to enormously high hydrostatic pressures. Pressure is a physicist's alternative to chemical variation.

That was very productive and caused me to decide to really finish my Ph.D. in Paris. I ended up spending a post-doc. year even before I had even contemplated writing my Ph.D.. I had been elected to a Research Fellowship at St John's in 1977 and that is when I switched from the world of inorganic materials to working with molecules, carbon-based conductors, because that was the main research line in Paris.

I have continued on that theme in various ways. My Cambridge supervisor was Abe Yoffe and in Paris the professor there was Denis Jérome (right), who has a lot of significant discoveries to his name.

---

5. Cavendish Laboratory, Cambridge

Current Cavendish Laboratory (Cavendish II).

New Cavendish Laboratory (Cavendish III) which is under construction in 2020.

As a graduate student I did supervise to earn a bit of money. I have always been frightened of teaching, particularly undergraduates. I have done my bit of teaching and examining since; I have sort of liked it but I am not a born teacher. I did four years as a College tutor in St John's from 1987-91. I quite enjoy lecturing but am never as organized as I should be. Here in Cambridge, for every two undergraduates we have one graduate student.

We give scant attention to what we give our graduate students. A lot of the time they don't need it, but we have failed to understand that this university has changed. I would say that the business of graduate teaching is very interesting. It is not the same as undergraduate teaching. In experimental science, some aspects of it are like an apprenticeship. It involves teaching how to use some tools but stopping short of telling a student what to do with them. The difficulty with physical sciences are that

the subjects are hierarchical and have to be taught. There is a lot of stuff that has to be known and it is dry. We teach the consolidated understanding of the field rather than the pieces that were used to construct the field in the first instance. The business of how you deal with incomplete information or conflicting models happens right at the end of the undergraduate period.

I don't think we should be allowed to escape all forms of contribution to the University. I think a separation of what seem to be lowlier tasks and those too grand to have to do them would be disastrous. On administration, I am in my fourth year as Head of the School of Physical Sciences. I actually have a very firm view that we should be led by people who take time out from doing the job rather than creating a cadre of professional administrators.

We are a bottom-up organization for that reason. This works if it has been designed from the top-down, which may not be prescriptive but has been skilfully designed to allow bottom-up to flourish. I don't believe that people who are outside research and teaching understand that. Looking back I took for granted that I had freedoms in Cambridge that I wouldn't have had anywhere else.

As an assistant lecturer I had complete autonomy. I was never constrained for space, always had the resources I wanted for my research. I was given access to very bright research students, and as I climbed up the career ladder here I realized that I was just as able to do my work as an assistant lecturer as I am as Cavendish Professor. It is good that Cambridge can do that. Of course I have more to do now so in some ways it is harder, but I hope it is still the case that whatever your rank the freedom to do what you want to is there.

On trust; a lot depends on scale. The Cavendish is a little bit too large and there is some tribalism there. There is considerable loyalty within a research group and some rivalry between groups which doesn't serve us well as we don't necessarily share resources as well as we should. Maybe it is well understood that there is a group size where it is possible to work on the basis of trust, but beyond which it just becomes a bit too remote and fractionates into different pieces.

The research group that I am part of in the Cavendish hovers around fifty which is absolutely the largest it can be. Beyond that it ceases to be a cohesive group, where members would expect to find companionship, friendship, social outlets, as well as work.

Experimental science is a people-centred activity, a lot of sharing of know-how, helping of one another to get an experiment going, passing on techniques, and you have to engineer that that is done well. I have been told by non-Americans who have been to American universities that in their groups everyone is in competition with one another. Someone's success would mean they were more likely to get a job, or a better letter from their supervisor. I taught while on sabbatical at Santa Barbara, California twenty years ago.

I have had lots of offers from America but was never really tempted to go there; hard to say quite why, but they seem to be at work all the time and I don't like to be at my desk all the time. Work is a more complex business. It is taken more seriously there; I do take my work seriously but like to keep an ambivalence. I have been

involved in work which has led to very valuable inventions which we have been protected by filing patents. The view that I've come to is that if you try to avoid putting yourself in a compromised position you switch off opportunities. There is nothing wrong with a conflict of interests so long as you are open about it and make sure that everybody who is in some way associated with that conflict knows what the issues are and what the resolution is. Any structure or set of rules that a university creates to manage away that problem is deluding itself; it should allow things to go the way they are going and then manage it correctly.

Where there is a need to work together collectively people can see the benefit of learning from each other. For research students, most see that when they have got their Ph.D.s their opportunities are very good and they are probably not in competition with anybody else for anything in particular. Behind that there is a sense of there being a zero sum game, certainly if you are after one of the very few academic positions it the UK.

Research groups in Cambridge are very international so the aspirations of the group members will be very different, so they don't need to be in competition. Cambridge physics has always been very international although the international mix has changed with time. We have benefited through our membership of the EU. Before that we benefited from the Commonwealth and before that from the Empire, but it has never been a British only mix.

The College system doesn't help much though I have had very good contacts through my membership of St John's. I think the division between high table and the rest is absolutely outdated and stupid. I would far rather feel that if I turn up for lunch somewhere I would be just as likely to be sitting next to a graduate student as a colleague.

I don't find much time to do things in College now. The New Cavendish building is ghastly and it is already falling down but it does have a good canteen. It suffers from not having the subsidy that College kitchens have with taking money from students for kitchen fixed charges. It is pretty good and far enough away that people will stay there for lunch. I do lunch there and have informal conversations.

The West Cambridge Site. Cavendish II occupies the bottom corner.

There is a need to have that relationship between formal and informal because science is not a military command structure as ideas and observations come from

everybody. There is a need to have a sense of social equality and ease amongst everyone in the group. The canteen is not open in the evening and there is no useful accessible social space. The research students and post docs are good at arranging group evenings elsewhere. We have probably lost something being out in West Cambridge but in other ways we have gained as we do have reason to stick around there for lunch. For the first years it was just us and the vets, but significant parts of engineering, the computer laboratory, and chemistry are now there.

---

6. Creating Companies

I have been involved in forming a couple of companies. No one in the research group has been denied information about the experimental results. We had an extremely important discovery in 1989 when we discovered we could make little diodes made with semiconducting plastics which we could get to light up by putting a voltage across them. It has turned out to be very important and we have a fundamental patent which controls the use of any of those materials for anything that emits light.

There were dozens of people in the Cavendish who knew about it before the patent was filed; we made no effort to keep it under wraps because we trusted people would not tell anybody outside. Science depends on the real world. Technology has been the biggest engine of discovery, being able to make things and measure things which previously were not possible. It keeps throwing up how bizarre and unexpected the world turns out to be. It does take you into the world of industry which is fair game.

Although I took a big risk taking time out, along with others, to get the first company, Cambridge Display Technology, going, and had somehow presumed that the company would head off at right angles to my line of university work, it didn't. It has continued to sustain, to provide an engineering base which has fed back into the university group. So here is the paradox, because we set up a company so we didn't have to do the engineering in the Cavendish, we could just do the science.

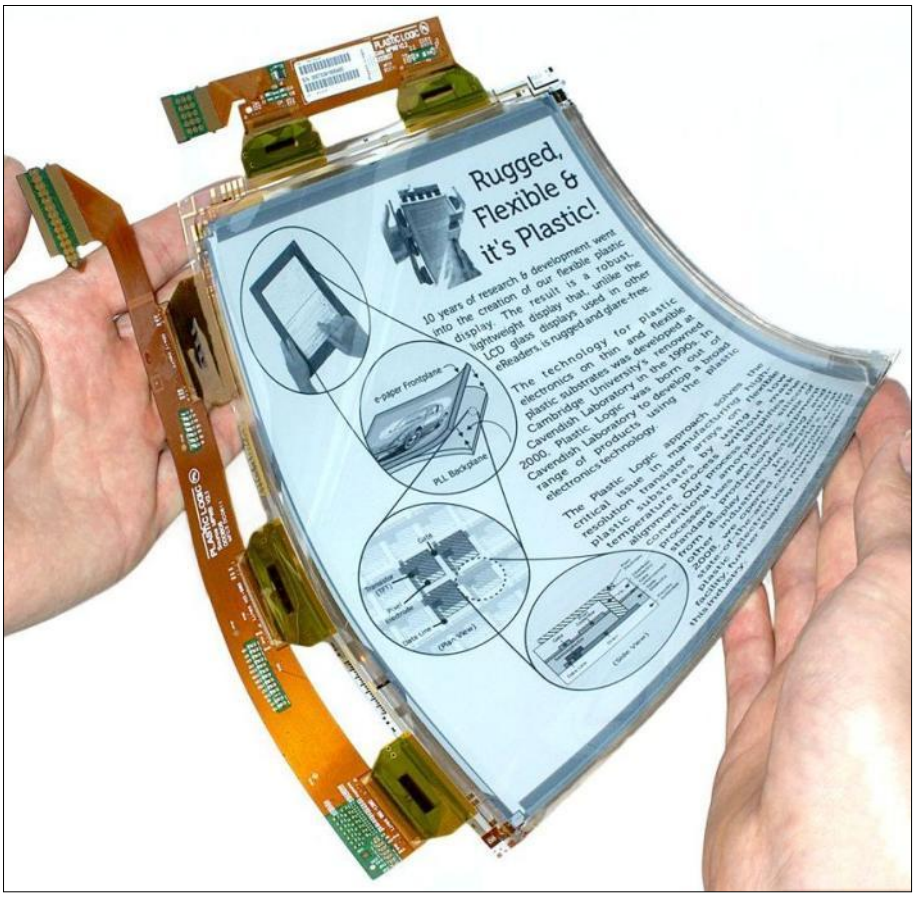
My original interest was that it was becoming possible to get access to synthetic molecular materials, polymers, that were convenient to handle, which were simultaneously molecular but were also semiconducting, One of the best things you can do with a semiconductor if you want to work out what the electrons do when they are pushed around is to put it into a semiconductor device and make a transistor that hopefully works or a diode.

The original interest was actually to borrow ideas about how you could assemble structures from biology, and how you could get those structures to be very functional and borrow from the world of silicon. The original structures we made were actually made purely to explore. The transistor which we first got working in 1988 was a tool to understand what happens when you start moving electrons around. Unlike the case of silicon where they travel just by themselves and the lattice of silicon atoms remains in place, if you do that with a molecular system you disturb the positions of all the carbon atoms and that makes a big difference to how things move.

Our transistors were absolutely useless for any practical application but they showed beautiful characteristics and we managed to get some very clean science out of that. We then were looking for something else but chanced upon this discovery that we could get diode structures to emit light. That was initially green light from the particular semiconducting polymer we were working with. It was obviously important because we could not just make one but lots of them coated over a large area. So we did what I knew one had to do which was to file a patent, which is the start of a process and not the end.

Within a couple of years in various ways we had a lot of support from the Cambridge community outside the University and got a company organised to exploit it. Herman Hauser and I overlapped as research students in the Cavendish; he was not initially involved but later on has come to be a wonderful supporter. Herman has done a lot to change the face of Cambridge and create a lot of opportunity through his vision.

What has turned out over the years is what we had thought originally would be a corner of very interesting science, is that these structures work very much better than we dared hope. There is an interesting check list of things that I was assured by a distinguished colleagues would never work. They were all wrong. It is amazing what you shouldn't believe. It was never planned that it would turn out so useful but it has done so, and you just have to grab the opportunity and do it.



Flexible display from Plastic Logic.

The problem of speaking to camera this afternoon is that next year the answer will be completely different. The current big push is with Plastic Logic which I had a role in founding in 2000. We have a very good technology for being able to put down huge numbers of surprisingly good transistors, which are made out of plastic, onto a sheet of plastic. Those we are using to switch a display on electronic paper which is also flexible so we end up with a display which feels like a laminated card. At the moment the active area is A5 size, so quite substantial with about 1,500,000 transistors in it. That I think is going to be what everyone has wanted say to read on the bus or train. The quality feels like reading black on white and has the weight of a lightweight book and you can bend it. To turn a page you press a button and the

page will change. I don't know what format we will finally use. We are spending a lot of other people's money building a manufacturing plant in Germany. By this time next year we will know whether it had successfully hit the market or not.

A clean room at Cambridge Display Technology.

With Cambridge Display Technology and the light emitting diodes it has been hard but we now have astonishingly good full colour displays. They are not flexible yet but they are better than the crystal displays for TV. That company has ended up being Japanese owned. A lot of that part of the display industry is necessarily going to stay in Asia, but I believe that technology will find its way into top performing displays for computers and mobile phones.

The big area which may turn out to be very important is making low cost solar cells where silicon is fundamentally too expensive and what one needs is a technology that is cheap to make and supply, maybe doesn't last forever but by the time it is worn out it will have many times paid for itself in terms of carbon dioxide not generated. Sunlight is essentially the only truly unlimited energy resource we have. You could meet the entire energy requirements of the U.S.A., which accounts for a quarter of world energy consumption, by coating the state of Kansas with not particularly efficient solar cells; you could look at a map of the world with four such areas dotted around and that is world energy consumption.

There are reality checks; at the moment solar cells are made out of silicon and it is a very expensive technology and requires a lot of energy to make them. I haven't done the calculation myself and it's very hard to check but I am assured that if I were to put a solar panel on my roof and leave it switched on all the time so that every coulomb of electricity that came out of that solar cell avoided some fossil fuel generated electricity it would take five years before it would pay back the carbon used to make it and put it on the roof. You have got to bring that payback time down a lot. We may be able to do it, though not at the moment, but there is a significant chance that this is a route to a low enough cost large area technology to make a big impact on energy.

I don't think that electronic paper will mean the end of books as we know them. Technology always has unintended consequences. The information revolution is good and the way I can now track an out of print book through the Internet that before I would not have bothered. The ridiculous unavailability of the stuff you would like to read is probably going to be a thing of the past.

I don't think we are going to lose our interest in having books but I don't have the same sentiment about newspapers. If I could put them through my mobile phone onto my plastic logic display and then read it on the train, I think I would rather do that than get news print all over my fingers then throw the paper away. You could put a keyboard on these displays but the virtue is with text that we can hold it at the right distance to read and you don't want to have that cluttered up with a keyboard. The problem with reading information is that it has not had the attention it deserves as we have been more concerned with being able to do everything on the same device.

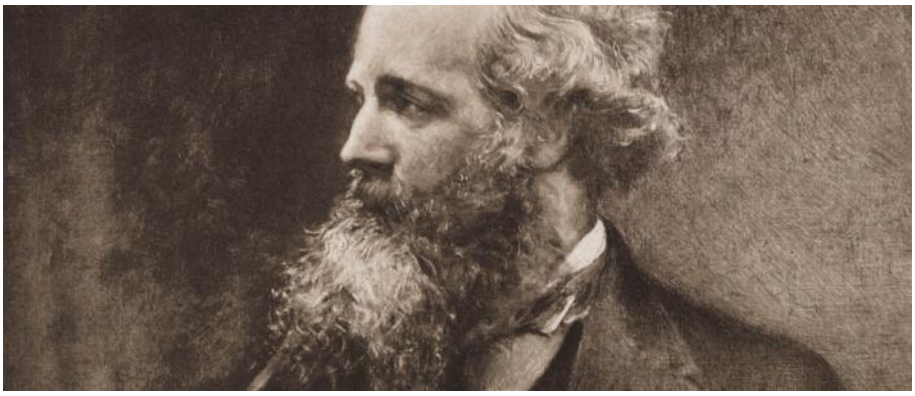
---

7. My Academic Career

On my career, I have had sabbaticals elsewhere but I was always rather proud that I was never thrown out of Cambridge. I have never had another job in the UK in the university system. My excuse is that by getting involved in the two companies was outside the University and was a pretty major diversion at various times. That provided the diversity of experience that I don't think I would have had if I had been just mainstream in the University.

I have been many times to Japan as in my world Japan has been a major player. I have very good links with Singapore, largely because I had an absolutely brilliant research student from Singapore who is now Professor there, and we enjoy working together. I have some limited contact with India and China but I have never really got to grips with them.

I think the problem for me is that I can only do so much and I suppose I am jealous of those opportunities that lead very directly to things that are going to happen in my lab. The rapidly growing Asian economies are very interesting but they are not exactly the same thing as what I think my academic work is. The notion that Western systems are more creative than Eastern systems is last century's view. I don't believe that is true at all. The de-skilling of the West and the up-skilling of the East is absolutely terrifying. I don't see how Western economies will cope. I don't know what we have to offer the East. I do find it terrifying that there is so little appreciation of the virtues of technology and engineering. I think we have been through a very damaging decade where we have seen manufactured goods become absurdly cheap because they have been outsourced to, principally, China. We have failed to appreciate how sophisticated, complex and wonderful they are, and have no idea how to make them now.



James Clerk Maxwell, 1831-1879.

Physicists have been worrying about whether the days of great discoveries are over for a long time. Maxwell, in his inaugural lecture as first Cavendish Professor in 1873 dwelt on this. He said that it was generally put about that physics was essentially complete and that the remaining job was to measure some fundamental constants to higher precision. Of course, he didn't agree with that proposition as he thought it was a subject limited by our imaginations.

He was right as it was just before the great quantum revolution; if one looks back one would have to say that the dawn of quantum mechanics and the probably much underrated role that Maxwell played in the significance of electromagnetic theory is just astonishing. So in the sense that discoveries from physics which will change everyday perception from reality, it is hard to see how that is going to happen in such a profound way as in the first half of the twentieth century. But I don't think that takes away the pleasure or anticipation or sense of discovery. Maybe it is a bit of a diversion. I don't think that we used to imagine that we had to completely change the universe through our discoveries.

A lot of the best science is often low key and small scale, just good, brilliant, observation and there is plenty of that to do. It does, of course, raise the question of what is physics. I don't know whether the people who spotted that we had an ozone hole over the Antarctic were physicists, but they were physical scientists; that may have been one of the most momentous observations in recorded history. The impact that good physics can make on what appear to be huge challenges with a sustainable environment is probably going to be critical. I can't think of a more important time to have the tools that come from the numerate sciences.

---

8. Reflections

Religion

Although I went to a Catholic primary school, my parents were not Catholics. My father's grandparents came from Eastern Europe and were Jewish, but had lapsed. My mother's family were Church of England. I was pushed through the C of E world to the extent that it matches with a humanism approach to the need for a civilized society. I characterize myself as tolerant as I am allergic to anyone telling me what I should think on these matters. I try very hard not to impose my thinking on anyone else.

The best of C of E is its tolerance; in the UK and many parts of Europe one can take a very relaxed view about the role of organized Christian religion and its impact on society. I am shocked every time I go to U.S.A. by the fundamentalism there which I see as usually bad. I do admire Richard Dawkins for his TV program, 'The Root of all Evil', but don't agree with everything he does. I don't think that religious belief or lack of it correlates at all with ability as a physicist. I think they seem to involve different parts of our brains.

Of course you can make the connections, but in general it is hard for a physicist to be as profoundly atheistic as Richard Dawkins appears to be. I have not spoken to him directly and perhaps one needs to know someone well to understand what they really think. He is aware that in physics a lot of what we deal with appears to be certainty. The models work quite astonishingly well; but we are aware that they are not reality. When you stretch a bit beyond that you have no secure foundation.

A lot of the contemplation that takes place in cosmology drifts fairly quickly into theology. The language used is near to religion but I don't think the relationship is that straightforward. Certainly there is a sense that there is a lot we don't understand. The paradox is that the sum of what we have done and make use of works so well. But we are confronted with the fact that it has no particular right to

do that or that we may be confronted with a different description one day. The sense of being both certain and uncertain is probably good.

I have always chosen my science to be in areas where I can keep going back and measuring; in cosmology all you can do is observe, you can't design an experiment and do it. One cannot deny that we seem to feel the need to create something like religion; I don't like feeling that I need to abandon a rationalist approach to understanding what has gone on in the past and what may happen in the future, but I don't know.

Research

I rarely get into the lab given the role I have got in the University. A lot of what I do is within the group, toying with ideas, planning experiments, dissecting observations and working out what didn't fly. I don't really like doing that in formal settings, it is often the chance discussion that happens somewhere round in the Cavendish probably. Also, a lot of my work sits at the boundaries of chemistry and I have benefitted from being able to get access to the materials.

We get people to make materials that I couldn't make where I can see whether we can do something good with it. I have had wonderful working relationships with a great number of chemists, and there the pleasure is being a rank amateur at chemistry but enjoying and it not mattering. We understand that the prize is to make the connections where both sides are fumbling to understand each other's worlds.

That tends to happen outside Cambridge although I have some collaborations with people in the chemistry department. I think what I was alluding to earlier is that it is very easy to go on the grand circuit and be grand. Either you have no visibility or too much. I think one has to be relatively selfish about understanding what you are after. When is a visit somewhere likely to generate the next good idea? Of course, it doesn't happen to order; good ideas can come anywhere, sometimes when I am extremely stressed about something rather mundane but important or when I am relaxed.

The good idea that got the work on transistors going probably arose on a train journey back from BP labs in Sunbury after a desultory meeting. For me half the time it is the solving of the problem that turns up when the experiment is done. That is the way I like science to go but then there is the formulating of what it is one should try and do. This is not quite the same thing as a eureka moment, but you can probably look back and say there is a point when I advanced it beyond the point where everyone else knew what to do.

It is not mechanistic; you have a hunch that there are things that people don't really understand in some preferably large green field that has not been trampled on by everyone else. You don't quite know what you are going to find but you know that you can get to that field as you have worked out things that you can measure that no one else has thought of measuring or thought it would be possible to measure. Probably rather imprecise but not a bad way to go.

In some way I felt distanced from laboratory work as part of everyday life which is part of the lot of the modern research grant holder in a British university. It

somehow feels like a meta-activity that writing a good grant proposal that gets funded is almost the same as discovering some good science/ I sometimes frivolously contemplate rather than producing a biography or collection of essays I shall publish a set of my grant proposals.

You haven't asked me about my hobbies. On home life, we have recently moved and have a large garden, and for the first time I have a large workshop and a rather professional set of woodworking tools. I think the pleasure of doing practical things is very satisfying.
