Piero Migliorato - 80th Birthday Speech

Master, dear Colleagues, thank you for being here to share this rite of passage, from old age to real old age. Sadly, with the good food and wine on offer, I had to restrain myself tonight. So if my speech becomes garbled, confused, blame my accent, not the wine.

On the 5th of June 1944 general Mark Clark, head of the Allied 5th Army, stood in front of cameras, on the steps of Capitol Hill in Rome and announced to the world that Rome had been liberated. This publicity stunt came at great cost. By disobeying orders, in his dash to be the conqueror of the Eternal City, the general enabled the opposing army to withdraw almost unscathed to the North, prolonging the war in Italy and the suffering for another year. But, as far as I am concerned, I can only be grateful because, some ten weeks later, I was born in a free and peaceful city.

My family had a long tradition on the side of liberty and opposing tyranny.

One relative died in the defence of the Roman Republic in 1849, an epic celebrated in the Garibaldi trilogy by Macaulay Trevelyan, former Master of this College. Fifty years before my direct ancestor was an officer in the National Guard of the short lived Neapolitan Republic, based on the revolutionary ideals spread across Europe by Napoleon's victorious armies.

It is not known how my ancestor escaped the brutal retribution unleashed by the returning king. Not so lucky was one of his sons, Antonio. Antonio, a young industrialist, was the secretary of a secret society, the Filadelfi society. The objective was to force the king to grant a constitution. But the king was not too keen on the idea. So, Antonio was arrested, refused to name names and was sentenced to death. Age 27, he was executed on the 4th of April 1829. His name is engraved on the walls of Naples municipal palace, together with other Neapolitans, who gave their lives for the Italian cause.

These memories were kept alive by my paternal grandfather who was living with us. A botanist, he was also a man of wide knowledge and certainly had a considerable influence while I was growing up. My father, an artist, a painter by training and a high school teacher by necessity, was working all hours to support a large family and did not have much time to spend with us children. Actually, he tried to teach me painting and the guitar, but I failed miserably in both.

I started pre-school and primary education at a school run by nuns: an experience hard to forget. Mercifully, my education continued in the state sector, where I found excellent teachers and rigorous academic standards. I was educated in classics, latin and greek, literature, history and the like. The science curriculum was somewhat thinner but nevertheless adequate to access science courses at university.

So I read physics at La Sapienza, the oldest University in Rome. University in Italy is very much sink or swim: sympathetic tutors or dedicated directors of studies are not part of the landscape. And the late 1960s were troubled times, when the student protest erupted all over Europe and the US. One day, I was by then a research student

in the Solid State Physics Laboratory and was in the lab setting up an experiment. At some point the riot police surrounded the building and ordered everyone out. At the door, I was arrested.

Let me reassure my colleagues that they are not harbouring in their ranks a convicted felon, although nowadays this is no bar to high office: I was cleared of any wrongdoings. But a big shock came years later, when I came accidentally across the list of people arrested on that day. There I found my name, next in alphabetic order to the man who had later become the head of the Red Brigades, the infamous Italian terrorist organization.

I graduated in 1969, defending a dissertation on electro-optic effects in thin dielectric films and, soon after, was appointed to the staff of the Institute of Solid State Electronics of the Italian Research Council.

Feeling the need to broaden my horizons, couple of years later, I crossed the ocean to join Bell Laboratories in New Jersey. Optical fibre communications were then at the very beginning and I was investigating new semiconductors as light sources for this application. Meanwhile the Yon Kippur war exploded. The price of petrol shot up, from 35 to 60 cents per gallon, as I recall. Panic ensued among the American public and the emphasis shifted to renewable energy. It so happened that one material I was studying converted sunlight into electricity with high efficiency. So I filed my first patent on a photovoltaic device still being used in present days.

After briefly returning to Italy, I was on the move again, this time to England, at the Royal Radar Establishment, a research laboratory of the Ministry of Defence located in Malvern below the hills of musical fame. There I began to work on infrared devices.

Being the only non-British staff member occasionally created some problems. While the scientific staff was quite relaxed about it, the security officer required that I did not work alone after hours. Understandably, given the trauma of Philby, Burgess and the rest! So I remember the frantic calls, around 4.30 in the afternoon, when I could not stop an experiment, trying to find a colleague prepared to chaperon me. Or when I was not allowed to read a report that I had written, because it had been classified above my security clearance. But workwise it was a vibrant stimulating environment. Among many inventions, the night vision system developed there has been widely used, starting with the Falkland war.

The Malvern connection was eventually to change my life. The Chief Scientist of the Establishment was Cyril Hilsum, later president of the Institute of Physics. If you are unlucky enough to fall foul of a radar speed gun, you can blame him, because one of his many contributions was the Gunn-Hilsum Effect, on which some of those machines are based. Hilsum eventually left his position with the Ministry of Defence to become Director of Research of the General Electric Company in London and offered me a job as group leader at the Hirst Research Centre, to work on new types of computer screens.

I was 39 at the time. I had a permanent position in Italy, actually so permanent that I could not see much in the way of improvements, due to the abysmal state of funding

in Italy at the time. So I mulled over Cyril's proposal for a week or so and then decided to take the chance, leaving Italy for good in 1983. I never regretted it.

People of my generation will remember the old bulky computer screens and TV sets. Few people know that the screens we see now in mobile phones, computers and TVs are a British invention. Original work was done under Ministry of Defence contracts in two Universities: Dundee and Hull. But a lot needed to be done to progress from a proof of concept to a viable technology. It seemed a crazy idea, at the time, to fabricate millions of tiny transistors on a large sheet of glass. That was my job at the General Electric Company: a multidisciplinary type of research, involving areas of material science, device physics and system design. The task was daunting. The competition from overseas, particularly Japan, fearsome. But they were exciting times and when in 1986 I presented our results at the International Display Conference in Tokyo, the reaction was energising.

So we presented to the company a plan for a pilot production and waited anxiously for the response of the Chief Executive, the terrifying Lord Arnold Weinstock. I recalled this instance when, years later, had moved to Cambridge and was visiting the Samsung plant in South Korea. I was impressed how quickly they had become world leaders in a key technology, semiconductor memories. Full of admiration, I asked my host: "How did you do it?" And he replied: "Our president Mr Rhee said: "You 'll do it" and we did it!" "You know, I said, that's almost what happened to us for screen technology. Our president said: "Don't do it" and…. we didn't!"

Meantime, some good science had been produced. I had a concomitant visiting professorship at Liverpool University, so I began to think that a full time academic career would not be a bad option after all. So, when in 1989 a lectureship came up at Cambridge Engineering Department, I applied and was appointed, with the support of Alec Brewers, who also introduced me to this very special community, Trinity. I was then invited to meet the Trinity Engineering team and the then Senior Tutor John Rallison. They were all simply wonderful: very welcoming and later providing the help and advice that I undoubtedly needed, because the system was so new to me. Sadly, a few of them are no longer with us, and I think in particular of my friend Nick Kingsbury, a talented, most generous and selfless person, who left us so prematurely a year ago.

In Cambridge, my work concentrated on the physics of thin film transistors and the development of analytic and simulation tools. Luckily, the General Electric Company retained me as a consultant for a number of years, also providing fabrication facilities and seconding staff to work in my group.

Having been promoted to a readership in 1993, a big boost for my activities came in 1995, when I received the unexpected visit of the research director of the Epson Company, then a leader in the field, who wanted to discuss collaboration. They were to provide over £2 million in funding for my group and set up a laboratory in the Trinity Science Park. In 1999 I was promoted to the Professorship of Physical Electronics.

In 2002 I met Helen, who has shared ever since angsts and joys of my professional and personal life.

As we all know, outstanding collaborators are essential for our work. Two of my former students of that time have been kind enough to rearrange their schedules to be here tonight: Winci Tam, who is a senior scientist at the Toshiba Lab in Cambridge and Michael Quinn, who was elected to a title A fellowship here and, smartly, pursued his career in the City of London.

In the years before my retirement my group's activities came to include semiconductor-based microscopic sensors for biomolecules. For this we had to undergo so to speak some kind of mutation, since the language of biology was quite alien to us. None of this would have happened but for a chance discussion with my colleague Chris Lowe at the high table. This activity was funded by the BBSRC, the Ministry of Defence and also the Newton Trust and the Commonwealth Trust. The work is being continued by two of my postdocs, now full professors, Pedro Estrela in Bath and Feng Yan in Hong Kong.

And it is about time to come to my retirement. There has been a long debate in Cambridge about abolishing the retiring age. I confess I was apprehensive when the time came in 2011, but I was wrong. Having been appointed to a visiting professorship in Kyung Hee University in South Korea, I spent a good five years after my retirement, able finally to concentrate full time on research, in an exciting environment, with laboratory facilities like no other and, what is most important, highly motivated clever students. One of them, Delwar Chowdhury, is now a senior scientist with Pragmatic in Durham, the only microchip manufacturer in Britain. He should have been here tonight, but the weather had other ideas and he is snow bound. Delwar and I worked together in Seoul on one aspect of a technology, OLED television, which is presently in view on the shelves of department stores, as well as in our Card Room.

In 2014 the International Thin Film Transistor Conference celebrated its tenth anniversary in Delft, by awarding a prize to four researchers, who had most contributed to the field in the previous decade: they were Hideo Hosono from Tokyo Institute of Technology, Jin Jang from Kyung Hee University, Sigurd Wagner from Princeton and myself.

People may ask, what am I doing now. I find that I am no short of intellectual challenges, since pushing the boundaries of my ignorance is a never ending endeavour. In this respect I feel very fortunate to be in an environment such as this College, with so many wonderful colleagues and their stimulating conversations.

Many people, colleagues and staff, have provided their help in innumerable circumstances during my many years in Trinity. It would be impossible to list them all. I wish to mention the Catering Department and the high table staff. In many instances they have been simply marvellous, particularly when I was incapacitated following a full knee replacement. Tonight they have laid out a fantastic dinner that I hope we have all enjoyed.

To all of them and to you all in here, thank you. I hope to enjoy your company in good health for many years to come.