Kavli Prize in Astrophysics 2010

Raymond Neil Wilson

Born 23 March 1928, Sutton Coldfield, West Midlands, UK

Affiliation at the time of the award: Retired from European Southern Observatory (ESO), Garching near Munich, Germany, in 1993. Doctorate in "Applied Optics" from Imperial College, University of London, 1953.

Prize Motivation: Contributions to the developments in the optics of large astronomical telescopes enabling modern projects with huge apertures.

Autobiography

I was born in 1928 in Sutton Coldfield, West Midlands, UK, the youngest of four children. My father was a free-lance architect, my mother a housewife with an excellent brain and education. The eldest son started in landscape gardening but later, during and after the Second World War, became a journalist and writer. The second son showed great brilliance at an early age and a passion for Chemistry. He became a professional chemist but his career never gave him the success and recognition that this brilliance had promised. The third child, a girl, was above all interested in Art and its history, but trained as a nurse and combined this career with also being a housewife and mother of two children. I, the fourth child, became a Physicist, but the path to this choice was far from straight – in fact it was more like a random walk until my PhD in 1953. As I hope to convince the readers of this autobiography, I was, from my interests and abilities at school, far more destined to become a professional historian with subsidiary subject Latin.

At the age of nine, in the Preparatory School for the Secondary School, called Grammar School at that time, I was the worst in the class at Arithmetic but excellent in Poetry, Literature, History and Music. Because of my terrible mark in Arithmetic I only just scraped into the Grammar School as one of the last to be accepted. My mental arithmetic is still very weak at the age of 83! However, when we started there with Algebra and Geometry as well as Arithmetic I immediately improved and began to progress in Mathematics in general. But then came a disaster due to my father and the Second World War. I was eleven and a half at the start in 1939. To begin with, nothing happened – it was the so-called "phoney war". Nevertheless, my father, against my will and with no rational need, had me evacuated in March 1940 to Blackpool in the north-West of England where my grandmother lived. A change of school could have been a serious setback at that age but maybe I could have coped. But my father did something almost criminal towards me, and strictly illegal at that time in spite of the war. He did not send me to school at all and I missed (including school holidays) 8 months school until I insisted on returning home in November 1940 and rejoined my old class at my excellent school in Sutton Coldfield.

I could pull back fairly easily what I had missed in all the Humanities subjects, but not in Mathematics. My results in Algebra were always the worst in the class. But to pass the School Certificate with its nine compulsory subjects one had to have over 50% (marks in percent at that time). With a dire warning from the Maths teacher (who was excellent) I worked like a slave the last three months before the exam – and managed by some fluke to get 51% in Mathematics, 1% more than the minimum. I have recounted this in some detail as a number of friends do not believe I had this terrible weakness in mathematics since my two books

"Reflecting Telescope Optics, Vols I and II" are full of mathematics. But it all came, not from talent but sheer, grinding hard work, at school (see above), at my Physics BSc degree course at Birmingham University, and finally at Imperial College, University of London, for my PhD thesis. Only then did I feel I had mastered the necessary mathematics level, and, indeed, preferred the theoretical (mathematical) work for my thesis to the practical side. This opened the way for my real profession in Optical Design, the design of optical systems, above all for astronomical telescopes and instrumentation and for analytical systems in general, although I also have experience (now "stone-age") in Photographic Objectives.

But I must go back to my schooldays to explain why I became a physicist instead of following my natural talents and studying History and Latin. This was entirely due to my mother, an arthritic invalid, to whom I had a wonderfully close emotional attachment. From my School Certificate results in 1943 she realised how deep my interest in History was and how determined I was to study History and Latin. But she pointed out my deep interest also in Astronomy and Optics through my own reflecting telescope-making activities: I had no money to buy one, difficult anyway under wartime conditions. So she maintained that studying Physics was no less logical than History, and that Physics had better career prospects. I think, largely to please her, I let her persuade me and my scientific career was launched in spite of my doubts about mathematics. As I have described above, only through hard work at school, during my degree course at Birmingham University and, finally, at London University in the Applied Optics Course preparatory to my PhD thesis. The external examiner's judgement, that the first (theoretical) part (all mathematics) was very strong and the second (practical) part very weak, convinced me that I had finally achieved a sufficient standard in mathematics to pursue a career in Applied Optics and, furthermore, that I actually preferred theoretical (mathematical) work to the practical work resulting from it! For me an amazing, almost unbelievable transformation!

After the enforced military service (1952-1954), a brief spell (1954-1955) doing exactly the work I liked best, Optical Design (photographic objectives) at the London firm Ross Ltd, which unfortunately went bankrupt through German competition, I got a well-paid job at the National Physical Laboratory (NPL) in South London (1955-1958). Earlier, the NPL had been very strong in Optical Design and Aberration Theory; the new Head of Department, however, was not interested in this and forced me into practical research. I was hopelessly bad, had no real interest and in 1958 was advised to resign my position or be dismissed. This was a blessing in disguise, for it forced me to recognize that there were no career prospects in Optical Design in Great Britain and that I would have to emigrate to the Continent to a country where I could realize my interests. Germany was the obvious choice, but I also investigated France since my fiancée was French. But the French photographic industry was collapsing under German competition, just like the British industry had done. So the decision was taken to try to get a position in the thriving German optical industry. My fiancée was quite happy with this, as she came from Strasbourg in Alsace and spoke perfect German as a result of the wartime occupation. However, it proved difficult to get the offer of a position, since the German firms thought I wished to stay only for a brief period to learn their design methods and technical secrets before returning to Britain to exploit them. This was absolutely not the case. My intentions to stay were completely honest, but I could not prove it. Finally, I had an enthusiastic offer from a German engineer, whom I had met at the firm Ross Ltd in London. When this firm went bankrupt in 1955 he moved back to Germany, where he became Director of a small firm, Karl Foitzik, in Trier, designing and manufacturing photographic objectives and cameras. He offered me the position of Head of the Optics Department, responsible for the design and manufacture of the optics. I accepted this offer with alacrity, naively not thinking of checking the firm's financial standing. Fortunately, as I might

otherwise not have accepted it! In fact, the Japanese competition was already threatening the German photographic industry, just as earlier the German competition demolished the British and French industries. Karl Foitzik had in fact a low quality standard compared with the good German firms and could only sell their cameras abroad because of “Made in Germany”. I soon realized it would take years to raise the standard to that of the Japanese, who had anyway a cost advantage at that time. The inevitable happened: Karl Foitzik went bankrupt in January 1959, only 10 months after my joining them. I was unemployed for 3 months before getting a new position.

The new position was at the famous firm of Carl Zeiss (Zeiss Foundation) in Oberkochen, Wuerttemberg, West Germany. The original seat was in Jena in the GDR. The two companies fought each other finally to the death, while the Japanese took over the photographic industry of the entire world (and still have it!) At Carl Zeiss in 1959 there was no position free in Optical Design, but because I was already established in Germany and had had an excellent education in Optics at London University, they believed I intended to stay in Germany and offered me a position in the Photographic Laboratory, responsible for tests and quality control. This was partly theoretical, which suited me, and partly practical, which did not suit me. But I was happy to be installed in such a prestigious firm.

In September 1960 I had an offer from Imperial College to return to London University as an Assistant Lecturer to do theoretical research on the application of computers to optical design. I stayed until the summer of 1963, but left due to differences with the Head of this Research Group and returned to Germany, again to the firm of Carl Zeiss. Because of the experience gained in London they at last offered me my dream position in the Optical Design Department for Astronomical and Analytical Instruments. After 5 years I was made Head of Department and my career seemed settled and secure for life. But new clouds were forming on the horizon. In 1970, German industry was hit by a massive financial crisis – it marked the end of the German Economic Miracle (Wirtschaftswunder) and the accompanying permanent expansion since 1949. Carl Zeiss was also massively hit by this recession and finally reacted by engaging a new manager who started to apply American “hire and fire” measures, now only “Fire”.

When some of my own staff were due to be fired I told him I couldn’t stand the sacking of innocent staff for failures of the management and “sacked” myself, having first taken up contact for a new position with the European Southern Observatory (ESO) in Geneva. So I left Carl Zeiss in the summer of 1972. During this 9-year period I had developed my concept of “Active Optics” with the collaboration of a brilliant German engineer and mathematician, Gerhard Schwesinger. He believed that Active Optics could never be made to work in practice, but I was determined to get it realised at ESO. Later, I and ESO worked intensively with Schwesinger, who largely designed the support systems for the active ESO telescopes: the New Technology Telescope (NTT) and the Very Large Telescope (VLT).

After serious initial problems regarding my position at ESO, cleared up by the DG Professor Blaauw, I became the Initiator and Head of the newly-formed Optics Group at ESO in 1972. From 1972 to 1976 the entire design of the NTT, financed by the entry of Switzerland into ESO, was laid down. This included the altazimuth mounting and novel building design, which profoundly affects the ventilation and thereby the image quality, which was effectively perfect for the telescope from the Active Optics concept. From 1976 – 1979 I became Head of the Instrumentation Group to broaden my experience in that area too.

To extend my practical experience of working telescopes I joined the Optics Services Group for a year (1979- 1980) at the ESO Observatory La Silla in Chile, a very valuable experience. ESO moved in 1980 from Geneva to Garching near Munich in Germany. From 1980 – 1984 I was formal Head of the Telescope Group, enabling me to concentrate on the active layout of the NTT (3.54 m).

From 1984 until my retirement from ESO in 1993 my position was a Senior Physicist in Optics Development for the NTT and then for the VLT. But my successor, Lothar Noethe, took over the bulk of the Active Optics development for the VLT (4 x 8.0 m) with his specialized team. After 1990, I had the privilege of devoting 50% of my time to the writing of my two books "Reflecting Telescope Optics I and II". These were completed and published after my retirement in 1993, RTO I in 1996, RTO II in 1999. This was a truly monumental task. RTO I is in the second (and final) edition, apart from a small erratum still to be made. RTO II is still in the first edition, but I am working on the second and hope to have it finished in 2012.

Apart from my two books, since my retirement I have pursued my wide interests: history in general, the theory and history of economics, the theory of cosmology and the mathematical laws of botanic growth (Fibonacci theory).

Major Awards

1992 Medal of Geneva University, Switzerland
1993 Karl Schwarzschild Medal of the German Astronomical Society
2003 Chevalier (Knight) of the French Légion d'Honneur
2004 Prix Lallemand of the French Academy of Sciences
2008 Citizen's Medal, Commune of Rohrbach
2010 Kavli Prize of the Norwegian Academy of Science and Letters
2010 Tycho Brahe Prize of the European Astronomical Society
2011 Freedom of the Commune of Rohrbach (Ehrenbürger)

Personal Supplement

The above Autobiography has dealt solely with my professional career leading up to the Kavli and Tycho Brahe prizes in 2010. But there are some personal aspects of my life that I wish to mention briefly here:

Family

Marriage in 1958 to Nicole Grasser, of French nationality from Strasbourg but equally at home in Germany. Mother of our two sons, Geoffrey, born 1961 in London; Peter, born 1964 in Heidenheim, Wuerttemberg, Germany. We were divorced later but remained close friends, linked by our two sons. She died suddenly in 2004. I met Anne Fishburn, born in Scotland, in 1973 at CERN in Geneva. We were married in 1987 and have lived together in the small town of Rohrbach in Bavaria, Germany, since 1982. We see ourselves as totally integrated in the social structures and are grateful for all the friendship and kindness accorded to us.

Medical

My functional life has been profoundly affected by two major illnesses: Poliomyelitis and Bladder Cancer.

1. Poliomyelitis: I contracted this in October 1963 at the age of 35 after my return to Carl Zeiss, in a mini-epidemic in Heidenheim, Wuerttemberg. Because my family was still in Strasbourg (we were waiting for a flat to be available), I drove to Strasbourg for the weekend. This, together with other fortuitous events, saved my life, as I was taken to the excellent civic hospital in Strasbourg where a breathing machine was available. This was not the case in the local hospital in Heidenheim. This illness was a veritable nightmare until the tracheotomy operation was performed and the breathing machine linked up. With rehabilitation in France and Germany, I was away from work for 10 months. Partial recovery then set in and I could walk, or even climb easy mountains, with one stick. But, with age, the Post-Polio Syndrome brings increasing muscle weakness, so that now, aged 83, I can only stand or walk with an underarm crutch and stick. Nevertheless, I can still walk limited distances and drive a car with no problems, so I have been able to lead a more or less normal life in spite of the handicaps.

2. Bladder Cancer: This was diagnosed in 2001 and necessitated the immediate removal of the tumour before secondaries could seriously endanger my survival. But the position and nature of the tumour had certain consequences which now dominate the rest of my life. However, as with the polio, I have learned to live also with these consequences and can be deeply grateful that I have them under control and that my general health is excellent.