Bernard Pagel 1930–2007

Fellow and Gold Medallist of the RAS; innovative observer and modeller in nucleosynthesis and chemical evolution – and enthusiastic musician.

Bernard Pagel, who died on 14 July 2007, will be remembered with both affection and respect. Few other astronomers of recent years would have dared to begin an influential review article with the words, “Like ancient Gaul, abundance data relevant to the study of nucleosynthesis in the course of stellar and galactic evolution can be broadly divided into three parts”, illustrating both his dry wit and the breadth of his scholarship. 

Bernard Ephraim Julius Pagel was born in Berlin on 4 January 1930, but when in 1933 his father was dismissed from his post as Jewish persecution increased, the family moved to Britain. His father, Walter, was a pathologist and a distinguished historian of medicine. Walter, his wife Magda and Bernard – he was an only child – lived initially at Papworth Village Settlement near Cambridge, then moved to London just before the second world war. Bernard was educated at Merchant Taylor’s School and won an open scholarship to read natural sciences at Sidney Sussex College, Cambridge, from 1947. He graduated with first-class honours in physics in 1950, remaining as a research student at the Cambridge Observatories, including study at the University of Michigan, and obtained his PhD in 1953. He was a research fellow at Sidney Sussex from 1953 to 1956, during which time he spent a short period as Radcliffe Student at the Radcliffe Observatory in Pretoria, South Africa. His early research centred on determining the temperature structure of the solar atmosphere and centre-to-limb variations of line strength, together with some interpretation of the spectra of solar eclipses. Inspired by Willy Fowler, a future Noble Prize winner who was visiting Cambridge from California, he started a life-long interest in the relative abundances of the chemical elements. In 1956 he moved to the Royal Greenwich Observatory at Herstmonceux Castle, Sussex, where he spent the major part of his career as a research scientist, progressing to deputy chief scientific officer. A search for more accurate and reliable estimates of chemical abundances led him to develop and refine new methods of analysing the spectra of stars. Although acknowledged as state-of-the-art, his methods were not perhaps as widely known as they should have been due to the restriction at that time on employees to publish in the Royal Observatory’s own Bulletins, instead of international astronomical journals. With advances in computing, the use of full spectral synthesis using model stellar atmospheres became more common, rather overshadowing his differential-curve-of-growth methods.

By 1967 Sussex University had established an MSc programme in astronomy. Bernard became a visiting reader and later visiting professor, lecturing not only on astronomical spectroscopy but also introductory astronomy and galactic dynamics. In the early 1970s he began to develop simple but elegant theoretical models to describe the chemical evolution of galaxies, work that has served as a foundation for the subject. By 1975 the Anglo-Australian 3.9 m telescope had come into use, and Bernard began a long series of collaborations on the analysis of the emission-line spectra of glowing interstellar gas regions. Australian trips allowed him to expand his discriminating appreciation of good red wine. The spectral analyses allowed the determination of chemical element abundances in external galaxies, starting with our nearest neighbours the Magellanic Clouds and later extended to many nearby spiral and irregular galaxies. A particular aspect of this, following a lead from the expatriate astronomer Leonard Searle, was the development in 1979 of a method of estimating a rough value for chemical abundances when observational data were rather sparse and only the strongest lines could be seen. Despite the method’s acknowledged limitations, it had enormous influence in the determination of abundance gradients in external galaxies as modern detectors allowed spectroscopic observation of faint HII regions. Variants of this method are still extensively used today – Pagel’s most recent being a version developed with Max Pettini in 2004. The work broadened out to include the active nuclei of galaxies and fruitful ideas on the origin of the element nitrogen. UK involvement in the opening in 1984 of the Isaac Newton Telescope in La Palma in the Canary Islands created opportunities for Spanish research students to work with him, and two of his students (Pepe Vilchez and Angeles Diaz) are now professors in Spain.

His years at Herstmonceux represented the happiest time professionally, but “retirement” at 60 was compulsory, so he moved in 1990 to a chair at the Nordic Institute for Theoretical Astrophysics in Copenhagen. Here he became very much respected throughout Scandinavian astronomy, aided by his extraordinary facility for languages. A major collaborative programme (particularly involving Roberto Terlevich in Cambridge and Mexico) was completed on the determination of the amount of the element helium that was produced in the Big Bang. Although not definitive due to the unwitting neglect of a subtle systematic bias, the study was very influential in setting a standard of rigour for subsequent investigations to emulate. The modern value determined in this way is crucial in measuring the amount of normal (baryonic) matter in the universe. He enjoyed a new collaboration on the chemical evolution of our own galaxy with Grazia Tauvaiisini in Vilnius. By the time he had “retired” again in 1998, this time from Copenhagen back to Sussex, he had completed his definitive book Nucleosynthesis and the Chemical Evolution of Galaxies for Cambridge University Press, the revisions for the second edition of which he had virtually completed just before his death.

He remained very active, giving a paper at a conference in Tenerife as recently as April 2007. He had been awarded the Gold Medal of the Royal Astronomical Society in 1990 and elected a fellow of the Royal Society in 1992. He had been a fellow of the RAS since 14 January 1955, having become a junior member on 13 April 1951. He served as a member of the MNRAS editorial board from 1970–1984, and was a vice-president of the RAS from 1973 to 1976. He gave freely of his time to those who asked for help and advice. He could be a formidable, but always fair, critic. I was privileged to collaborate with him for more than 30 years, and I cannot recall a single argument or cross word in that time.

He married Annabel Tuby in 1958 and is survived by her and their three children, Celia, David and Jonathan. The Pagel household in Ringmer, Sussex, will be warmly remembered by many visiting astronomers. Bernard loved music, especially Bach, Schubert and Mozart – often playing piano (the Rondo alla Turca was a favourite), both on his own and in duets. He always played with great enthusiasm, if not with quite the accuracy of his abundance determinations! He died stoically after a very rapid onset of cancer, greatly cheered by the many messages of appreciation he had received from his many astronomical friends around the world. He will be remembered with great affection by several generations of colleagues and students, particularly for the beady-eyed look over his pipe and the quick and brilliant Intelligence that would put even one of his heroes, Sherlock Holmes, to shame.

Mike Edmunds
Michael Seaton 1923–2007

Emeritus Professor Michael ("Mike") Seaton, fellow of the Royal Society and a former president of the RAS, died on 29 May 2007, at the age of 84. Mike was one of that rare breed of scientists who are capable of making major contributions to several different fields. Trained under Professors Sir Harrie Massey and Sir David Bates at University College London (UCL) just after the second world war, he quickly saw that the relatively new field of quantum mechanics could be applied to important problems in astronomy and embarked on a series of calculations that paved the way for major advances in both fields.

His academic career was almost stillborn. Having been shocked by Chamberlain’s speech on his return from Munich and by the civil war in Spain, Mike joined the Young Communist League in 1938 and quickly found himself in trouble with the police because of his political activities. Expulsion from school followed, but he was fortunately allowed to sit matriculation exams. The war then intervened, and he volunteered for Air Crew and served as a navigator in Bomber Command until 1945.

After the war, Mike studied physics at UCL, where he obtained both his BSc and his PhD. By 1951 he had published a research paper that established the density of the gas in interstellar space; this was the third of his nearly 300 research papers. The conclusions of this paper were controversial at the time but subsequently proved to be correct. During the 1950s, as a lecturer at UCL and during sabbatical leave at the Institut d’Astrophysique in Paris, he laid the foundations of his later academic work. He began what proved to be a series of seminal papers on quantum defect theory, which enabled reliable values of electron collisional rates, photoionization cross sections and radiative recombination coefficients to be calculated. His first calculations were done on hand-operated mechanical calculators, but Mike began using electronic computers as soon as they became available in the 1960s. In collaboration with observational astronomers, notably Don Osterbrock of Lick Observatory, California, he applied the results of his calculations to interpreting astronomical spectra, providing powerful new tools for measuring temperatures and densities in astronomical objects such as planetary and diffuse nebulae; these techniques remain in use today. The interplay between theoretical atomic physics and astronomy was to remain a central theme of his work.

Foreseeing the crucial role that digital computers were to play in the subsequent progress of science, he oversaw the procurement by UCL of what was, at the time, the most powerful computer in Europe. He formulated ambitious plans to implement on the new computer the quantum mechanical methods that he and others had developed. Many of the computer codes that were written by Mike and his many students and collaborators in the 1960s and 70s are still in use today. He continued to develop computational techniques and write his own code up to the end of his life, handing over more than 60 pages of FORTRAN code to collaborators shortly before his death.

His former students recall with affection his eccentricities. During scientific discussions, he would often fall silent for long periods, head inclined and in deep reflection. Those who knew him would simply wait until, reflection over, he would return to life and frequently be able to give the solution to the problem in hand. It was very rare for a student to leave Mike’s office without a clear idea of how to advance his research project.

In the late 1970s he was drawn further into astronomy by Prof. Sir Robert Wilson, when the International Ultraviolet Explorer satellite was launched. The spectra of astronomical objects such as planetary nebulae and P Cygni stars were measured at ultraviolet wavelengths for the first time, and a host of discoveries resulted. In recognition of his contributions to theoretical physics and astronomy, he was elected a fellow of the Royal Society in 1967, and he became president of the Royal Astronomical Society in 1978.

The project that was to occupy much of the final 25 years of his life – long into formal retirement – began in 1982, during one of his many summer visits to the University of Colorado in Boulder. It had become apparent that there were major flaws in the understanding of the transmission of light through the outer atmospheres of stars. New atomic physics calculations were needed and Mike succeeded in assembling a team of about 25 people, many of whom were former students, working in laboratories around the world. It is a testament to the respect and affection in which he was held that so many were willing to follow his lead in this “Opacity Project”. He continued to work on and publish the results from the project right up to his death: his final paper, completed shortly before his death and currently in press in MNRAS, made use of the results from theOpacity Project to determine the radiative acceleration in stellar interiors. The data produced by theOpacity Project will form the basis for interpreting the spectra of stars for years to come.

In terms of intellectual power and breadth of scientific knowledge, Mike had few peers. His scientific rigour, uncompromising intellectual honesty and unassuming manner were an example and an inspiration to many generations of PhD students.

During his Air Force (RAF) training in Cambridge during the war, Mike met and married Olive Singleton, who died in 1958. Mike’s second wife, Joy Balchin, lives in the Brecon Beacons, a region that they both loved and where they moved after retirement. Jane and Richard are the children of Mike’s first marriage, and Anthony of the second. His students and collaborators are legion, and scattered across the world.

David Flower and Peter Storey

Deaths of Fellows

Donald Alexander MacRae
Born 19 February 1916
Elected 11 April 1969
Died 6 December 2006

Thomas Russell Tannahill
Born 22 January 1909
Elected 9 December 1949
Died 10 March 2006

Charles Kenneth Thornhill
Born 25 November 1917
Elected 14 April 1961
Died 30 June 2007

Bernard E J Pagel FRS
Born 4 January 1930
Elected 14 January 1955
Died 13 July 2007

John Kearlsey Bolton
Born 13 July 1936
Elected 10 March 1991
Died 24 July 2007

RAS Fellow and President, broad and rigorous scientist and driving force behind the Opacity Project.