Editorial

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EDITORIAL

BY MALCOLM LONGAIR* CBE FRS FRSE

Welcome to volume 62 of *Biographical Memoirs of Fellows of the Royal Society*, the 2016 edition. It is a particular honour to take over as Editor-in-Chief of *Biographical Memoirs* since I have long valued the excellent biographies written by our colleagues to celebrate the lives of Fellows of the Society. I have had the experience of writing three memoirs and so fully appreciate the effort needed to create a lasting memorial to those commemorated.

My enthusiasm for *Biographical Memoirs* has been greatly enhanced over the past few years while I was writing my recent book, *Maxwell’s enduring legacy: a scientific history of the Cavendish Laboratory*. I used *Biographical Memoirs* every day as a splendid resource for understanding the achievements and personalities of so many distinguished scientists. There are several features of the essays that make them especially valuable. Most important is the fact that they are written by scientists for scientists and so they concentrate strongly and authoritatively upon the content of the science and the scientific achievement. Furthermore, the recommended length of about 20 printed pages is sufficient to gain a good appreciation of the key contributions of those commemorated. There are references to comprehensive bibliographies for those who wish to delve more deeply. As one of my colleagues put it to me, *Biographical Memoirs* preserves the DNA of the Royal Society. In my dealings with other Fellows of the Society, they all comment upon the fact that *Biographical Memoirs* is particularly enjoyed and appreciated by them. The challenge is to continue and enhance what is already a most valuable and inspiring publication.

My first pleasant duty is to pay fulsome tribute to Trevor Stuart, my predecessor as Editor-in-Chief, for his outstanding editorship over the past few years. The publication has flourished under his editorship, and his advice and help to me, as I have begun to get on top of the job, have been most valuable. Much of the initiative for commissioning the essays in this volume is thanks to Trevor.

One of the first issues that the editorial team and I have tackled has been the size and composition of the Editorial Board: Trevor and I agreed that there would be significant advantages in considerably expanding its membership. The two main reasons were the need to obtain expert advice across the enormous range of disciplines in which Fellows have been engaged and to relieve the amount of work which the (previous) nine members of the Board had to deal with. We are delighted that we received a very positive response to our invitations to join the Editorial Board, with the result that it now comprises the 27 members listed on page iv. We are most grateful to all these colleagues for offering their services in tasks that primarily involve suggesting authors for memoirs and refereeing the draft memoirs.

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The second major task has been catching up with the backlog of memoirs that have yet to be commissioned for deceased Fellows. Our aim is to be as comprehensive as possible and we have embarked upon a campaign to commission memoirs, some of which extend back to Fellows who died in the early 2000s. The Editorial Board has been very supportive of this initiative and we are making progress. We are very appreciative of the suggestions that we receive for potential authors from the families, the Fellowship and other colleagues. Although writing a memoir is a significant task and not to be taken on lightly, in my experience many authors regard it as a duty to honour a deceased Fellow, who will often have been a colleague, supervisor or close friend. We urge any interested readers not to be over-modest in proposing their own names as authors—the committed author is always a joy to work with.

Over the next year or so, we will be developing ideas about how we can enhance the value of the memoirs. Every effort is made to ensure that the science is accessible to the general reader, and behind each of them is a human story revealing the huge diversity of backgrounds, education, family circumstances and so on that fostered the subsequent achievement. These should be more widely known as providing a true picture of the research scientist and the way in which new understandings come about. We will greatly value all thoughts about how this aim can be achieved.

Memoirs are published on the Biographical Memoirs website as they are ready, before collection into the annual printed volume, so please look out for new essays throughout the year.

Biographical Memoirs 2016

There are 27 memoirs in the 2016 print edition of Biographical Memoirs, spanning a huge range of the sciences. The following notes are intended to act as a guide to the different disciplines represented, with a brief summary of the achievement, largely taken from the memoirs’ synopses. These memoirs, and those in previous volumes, can be accessed on the Royal Society’s website (http://rsbm.royalsocietypublishing.org).

Mathematics

John McLeod was a brilliant solver of problems in mathematical analysis, primarily differential equations. He was noted for his contributions to applied analysis, particularly to the theory of partial differential equations with applications to practical problems. He was internationally recognized as the leading British authority on the practical applications of functional analysis, including the analysis of nonlinear equations arising in applications to mechanics, physics and biology.

Physics

Richard Dalitz was a theoretical physicist whose principal contributions were intimately connected to some of the major breakthroughs of twentieth-century particle and nuclear physics. His formulation of the ‘e–θ’ puzzle led to the discovery that parity is not a symmetry of nature—the first of the assumed space-time symmetries to fail. The ‘Dalitz plot’ and ‘Dalitz pairs’ are now part of the vocabulary of particle physics.

Leslie Morley’s research focused on modelling structural behaviour, with particular emphasis on plates and shells. He developed the Morley shell equation, which has been
acknowledged as the simplest equation consistent with first-order shell theory. As the finite element method rose to prominence he developed elements for both plates and shells in both the linear and nonlinear regimes.

Ronald Newman was one of the most versatile semiconductor physicists of his generation and is distinguished for his work in several different areas, most notably epitaxial growth and the behaviour of impurities and dopants in a range of device-related materials, mainly silicon and gallium arsenide. His most significant contributions came from the application of local vibrational-mode spectroscopy to studies of the segregation and diffusion of oxygen and hydrogen in silicon.

Astronomy and meteorology

Sir Bernard Lovell was one of the pioneers of radio astronomy in the UK. Building on his wartime experience in radar, he created the Jodrell Bank Radio Observatory of the University of Manchester. His major achievement was the construction of the 250 ft (Lovell) radio telescope, which was the largest single-dish telescope in the world at the time and which pioneered many aspects of radio astronomy.

Sir John Mason will be remembered for establishing cloud microphysics as a coherent discipline and for building the Meteorological Office into an international centre of excellence on the international stage. His research was notable for carrying out laboratory experiments of direct relevance to the nucleation of ice crystals and the electrification of clouds.

Metallurgy and materials science

Brian Eyre was an outstanding metallurgist who played a leading role in the development of nuclear engineering materials. His experiments on irradiated metals enabled a theoretical understanding of the mechanisms of radiation damage, and in particular the formation of voids and void swelling in structural steels. He was instrumental in transforming the UK Atomic Energy Authority from an organization whose mission was to develop nuclear power generating systems into the privatized AEA Technology.

George Gray was a renowned materials chemist, internationally distinguished for his research into liquid crystals and their applications in flat-panel displays. His seminal invention of the liquid-crystalline cyanobiphenyls underpinned the creation of the modern electronic displays industry, which began with digital watches and has continued through to smart and three-dimensional televisions.

Raymond Smallman was one of Britain’s leading physical metallurgists. Based at the University of Birmingham, he made important contributions, often using electron microscopy, to the understanding of crystal defects and deformation behaviour in metals, alloys, intermetallic compounds and ceramics.

Engineering

Sir John Horlock was one of the outstanding engineers of his generation. His expertise was in the thermodynamics and fluid mechanics of turbines and compressors, as used for jet engines and for power generation. In Cambridge he founded the Whittle Laboratory, which became one of the world’s leading centres for turbomachinery research.

Kenneth Johnson was renowned for the insightful analysis of meticulous experiments in contact mechanics. His major publications included topics in fraction and wear, rheology and lubrication, rolling contact and adhesion. Important applications included the prediction of
corrugations and cracks in railway lines. He was gratified that his ideas in adhesion were used by others to explain the climbing behaviours of insects and other small animals with soft feet.

**Chemistry**

**Alan Carrington** was an outstanding physical chemist who made important contributions to molecular spectroscopy. He pioneered the fields of electron paramagnetic resonance spectroscopy of doped single crystals, solutions of organic radicals, and especially the high-resolution spectroscopy of gaseous free radicals and ions.

**Michael Lappert** was one of the giants of twentieth-century organometallic chemistry. His research, carried out over six decades, had a profound and influential effect on the field, and his contributions covered almost every block of the Periodic Table. He had a lifelong interest in amides, including those of carbon, and especially electron-rich olefins, which remarkably were the ready source of numerous transition-metal carbene complexes.

**Lord Jack Lewis** helped to pioneer the development of modern inorganic chemistry. He was one of the small group of scientists who led the expansion of inorganic chemistry from its renaissance through the syntheses and study of new transition-metal and organometallic complexes. Their characterization was accomplished through the perceptive application of the newly available physical techniques of spectroscopy, magnetism, mass spectrometry and X-ray diffraction. He was created a life peer in 1989.

**Benton Rabinovitch** was one of the pioneers of chemical dynamics. His brilliant experiments performed during his four decades at the University of Washington in Seattle provided most of our early quantitative measurements of the efficiency with which energy is transferred between molecules in gas-phase molecule–molecule collisions and in collisions of molecules with solid surfaces.

**Biochemistry**

**Sir John Cornforth** was a pioneer in the detailed chemistry used by living systems to construct the organic substances that they contain. From his teenage years he was handicapped by profound deafness, yet he overcame this to reach the highest pinnacles of scientific achievement, including the 1975 Nobel Prize in Chemistry.

**Ephraim Katchalski-Katzir** was a leading researcher in the development of polyamino acids, which allowed new insights into the reactions and behaviour of proteins. His work developed pathways into the exploration and investigation of antigenicity. He was President of Israel between 1973 and 1978.

**Robert Williams** was a pioneer in advancing our understanding of the roles of chemical elements, especially the metals, in biology and in biological evolution. He studied the thermodynamic stabilities of transition-metal complexes with organic ligands, their redox properties, magnetism and colour, to understand their biological function. He developed high-field nuclear magnetic resonance to study the mobility and dynamics of many protein structures, leading to a deeper understanding of protein function.

**Ecology and agriculture**

**Michael Elliott** was the leader of work at what is now known as Rothamsted Research that invented and subsequently commercially developed the pyrethroids, a new class of insecticides. He made probably the greatest individual contribution to the control of insect pests that not only constrain global food production but also affect the health of humans and livestock.
Lloyd Evans was a leading plant scientist who published extensively on the regulation of flowering and on crop production. His significant achievements included the identification of a gibberellin plant hormone as a flowering regulator in the grass *Lolium temulentum*, the discovery of a synthetic gibberellin growth retardant that blocked endogenous gibberellin synthesis, and the discovery of a novel biological flowering clock in *Pharbitis nil* with a 12 h period.

John Lund absorbed the different traditions in systematic and physiological ecology from successive contacts with two leading authorities and combined them to good effect in his main work on the ecology of freshwater planktonic algae. With his wife, Hilda, they extended her mycological work to epidemics of chytrid parasitism in planktonic population dynamics.

**Microbiology and genetics**

Sir Howard Dalton was an outstanding microbiologist who devoted himself to the elucidation of the process of methane oxidation by bacteria that use this relatively inert gas as their sole source of carbon and energy. He discovered two completely novel multicomponent monooxygenase enzymes responsible for the initial oxidation of methane to methanol.

Paul Polani is rightly considered one of the most influential founders of modern medical genetics. Contrary to expectations, he showed that sex determination in humans did not follow the *Drosophila*-based model. He also discovered that Down syndrome is sometimes caused by chromosomal translocations that, if inherited from unaffected carriers, may cause familial clustering of the disease.

John Postgate was one of the foremost microbiologists of his generation. He is most famous for his lifelong research on sulfate-reducing bacteria and nitrogen fixation and for his seminal contributions to understanding the survival and death of bacteria. His other great love was jazz: he was an amateur cornet player of note, the leader of several jazz groups and a highly knowledgeable writer, reviewer and author of two books on the subject.

**Neuroscience**

Paul Fatt made discoveries that are fundamental to our understanding of synaptic transmission in the nervous system. His work with Bernard Katz demonstrated for the first time that neurotransmitters are released in small packets, or ‘quanta’. His work with John Eccles and Katz provided an understanding of the mechanism underlying synaptic inhibition, and his work with Bernard Ginsborg identified voltage-gated calcium currents for the first time.

David Hubel was one of the great neuroscientists of the twentieth century. His experiments revolutionized our understanding of the brain mechanisms underlying vision. In collaboration with Torsten Wiesel he revealed the beautifully ordered activity of single neurons in the visual cortex, how innate and learned factors shape its development, and how these neurons might be assembled to ultimately produce vision. He shared the 1981 Nobel Prize in Physiology or Medicine with Wiesel and Roger Sperry.

**Medicine**

Donald Metcalf was one of Australia’s most distinguished medical researchers and is acknowledged internationally as the father of the modern field of haemopoietic growth factors. He defined the hierarchy of haemopoietic progenitor cells, purified and cloned the major molecular regulators of their growth and maturation, determined their mechanisms of action and participated in their development for clinical use in patients with cancer.
Biographical Memoirs

ACKNOWLEDGEMENTS

First and foremost, we are enormously indebted to the authors of the 27 memoirs in this volume for their outstanding work in producing biographies of lasting value. In my opinion they are all well up to the standards of the best biographies in the series and will be widely enjoyed and appreciated.

I am also personally indebted to the publications and editorial team at the Royal Society, whose names and roles are listed on page iv. Their enormous help has made my task of understanding my new role all the easier.

Special thanks are due to Bruce Goatly, who has overseen the copy-editing and typesetting of the memoirs for almost 20 years. He retires from this role after the publication of this volume, and new arrangements will be put in place for the future online and printed versions of Biographical Memoirs. We wish him a long, happy and busy ‘retirement’.

AUTHOR PROFILE

Malcolm Longair

Malcolm Longair CBE FRS FRSE is Jacksonian Professor Emeritus of Natural Philosophy and Director of Development, Cavendish Laboratory, University of Cambridge. He has held many highly respected positions within the fields of physics and astronomy. He was appointed the ninth Astronomer Royal of Scotland in 1980, as well as the Regius Professor of Astronomy, University of Edinburgh, and the director of the Royal Observatory, Edinburgh. He was head of the Cavendish Laboratory from 1997 to 2005. He has served on and chaired many international committees, boards and panels, working with both NASA and the European Space Agency (ESA). He has chaired numerous committees for specific science projects, including the Planck and Euclid missions of ESA.

His main research interests are in high-energy astrophysics, astrophysical cosmology and the history of physics and astrophysics. His book Maxwell’s enduring legacy: a scientific history of the Cavendish Laboratory was published in July 2016.