JOHN (JAKE) MACMILLAN
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Elected FRS 1978

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Jake MacMillan, although by training and personal acclamation ‘first and foremost an organic chemist’, was one of the UK’s most brilliant interdisciplinary scientists. A pioneer in the field of bioorganic chemistry, he was practising what we would now call synthetic biology 40 years before the term was coined. A young PhD student or post-doctoral research associate joining his group would mix with chemists, plant physiologists, fungal geneticists and enzymologists as well as being exposed to internationally leading natural product chemistry, advanced organic synthesis, mechanistic studies and state-of-the-art analytical methods, including emerging techniques such as gas chromatography–mass spectrometry. His multidisciplinary approach to tackling major problems at the chemistry–biology interface was undoubtedly influenced by his early research career working in the famed Butterfield (later Akers) Laboratory set up by ICI as a basic research establishment in the grounds of a Victorian house, The Frythe. There, he isolated and elucidated the structure of the important antifungal agent griseofulvin, before initiating his life-long interest in the gibberellins. These diterpenoid natural products were originally isolated as phytotoxic fungal metabolites, before their role as essential plant-growth regulators present in all higher plants was established. He moved to Bristol in 1963 to commence an academic career as a lecturer at the relatively advanced age of 39. He became the world authority on the chemistry, biosynthesis and biology of the gibberellins, rising through the academic ranks to be awarded a personal chair in 1978.

EARLY LIFE

John MacMillan (always known as Jake) was born in Wishaw, Lanarkshire, and lived there for his first 10 years. His father, like his grandfather, was a railway signalman and his mother

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came from a farming background. His parents, he and his younger brother lived in a two-room tenement, in which the ‘best’ room, as was the custom then, was never used, so the family essentially lived in a single room. He explained his life-long refusal to wear any kind of hat to the scolding he received on returning home from his first day at school without his new school cap, which had undoubtedly cost his parents what was for them a considerable amount. His early and continuing passion was football, consuming all the daylight hours playing in a local quarry with jackets as goal posts.

The family moved to a two-roomed cottage in Lanark in 1934, not a happy move as far as Jake was concerned as he went from being top-dog at Wishaw Primary School to a larger class with a teacher he regarded as something of a tyrant. But she must have been good for him as he gained selection to Lanark Grammar School in the top stream. He used this experience to make one of the many pithy and sagacious points for which he was famed: it is perhaps more important to seek the opinion of ex-students rather than current ones.

Two teachers at Lanark Grammar were his inspiration. While his English teacher did not turn him into a literature scholar, his imaginative and open approach taught Jake how to think. His chemistry teacher was not particularly good in a formal sense but allowed pupils to do experiments on their own, building their independence and creativity. Thereafter, chemistry was the only subject for Jake. However, at the age of 15, his headmaster recommended him to the manager of the local bank for a job as bank clerk. Despite the obvious attraction of extra earnings coming into the family home and the status of a white-collar job, his parents did not press him into accepting the position. By this time, Jake, being well aware of his own abilities and being at least as good as his class-mates from more affluent professional backgrounds, was already aiming to go to university.

The outbreak of World War II saw him continuing his studies, and playing football at school and in the local adult leagues. Despite several offers to become a professional player, he pursued and gained entrance to the University of Glasgow, reckoning that a career as a chemist would be more financially rewarding than that of a professional footballer! He failed to gain a university scholarship, attributing his poor performance in the scholarship competition to his lack of general knowledge. With no grants or loans in those days, during his final years at school and at university he had to rely on his parents and vacation work delivering goods to the railway station on a horse-drawn cart and fruit picking in the raspberry and strawberry fields for which the Clyde valley is still well known.

**University of Glasgow**

Jake commenced his undergraduate degree in 1942, taking chemistry, natural philosophy and mathematics in the first year. He then focused on chemistry, but his subsidiary subject in the second year—by chance, but appropriately for his subsequent career—was botany. He remembered virtually nothing of this course, other than long tedious hours spent looking down microscopes and trying to draw what he was supposed to see. Nonetheless, he was galled about not being awarded an ‘excellent’ grade for this course. He had his revenge many years later when he revisited the botany department as part of a grant assessment panel, taking pleasure in putting the staff (some of whom he remembered) through his hoops.

The final two years at university were stressful as, owing to the War, the final six terms ran successively with no long summer vacation, reducing Jake’s ability to earn much-needed
money. He still found time, however, to play football for a professional team, Third Lanark. As an amateur, reward came in the form of cash in brown envelopes. Time was also taken up with compulsory membership of the university cadet corps.

A final year project involved the synthesis of chiral nitrogen derivatives centred on Tröger’s base. For a literature presentation he chose papers on oxazolines by Cornforth as the structures intrigued him—not knowing anything about their relationship to penicillin, which in 1945 he had never heard of, or of John Cornforth (FRS 1953), whom he subsequently got to know.

Graduation in 1946 with a first class honours degree led to an interview with ICI Dyestuffs Division in Manchester. To Jake’s relief the interview was unsuccessful, allowing him to continue as a PhD student in Glasgow, supported by a Department of Scientific and Industrial Research studentship. He worked on the structure of colchicine (figure 1), supervised by J. D. Loudon, resulting in four publications, his first appearing in *Nature* (1)*.

Loudon was also a master of pithy remarks. His response to this presumptuous young student saying that Windaus (a giant figure of early twentieth-century organic chemistry) had made many mistakes in his early work on colchicine was that when he had made as many mistakes as Windaus he could call himself a chemist. Loudon’s response on being asked what Jake should do eventually in research was that it mattered less what he chose than that he did it well.

### ICI YEARS

After gaining his PhD Jake had no thoughts of post-doctoral research or an academic career, in part thinking himself unsuitable but also because academic salaries were very low and he

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* Numbers in this form refer to the bibliography at the end of the text.
wanted to start earning some real money. So, in 1949, he joined the ICI Akers Laboratory, near Welwyn, as part of a small but high-powered group of organic chemists and microbiologists (figure 2) whose goal was to isolate novel biologically active metabolites from fungi as potential pharmaceuticals.

*Griseofulvin*

An almost immediate fruit of this work was the isolation from *Penicillium griseofulvum* and *Penicillium nigricans* (3) of the potent fungistatic agent griseofulvin (figure 1), still in common use now for treatment of dermatophytic infections. Obviously, this was of great commercial interest to ICI Pharmaceuticals, and in the course of preparing a briefing document for their consultants, Sir Robert Robinson FRS and Lord (Alexander) Todd FRS, Jake deduced what the structure must be. However, being cautious, but perhaps also canny, he kept this structure to himself, waiting to hear the opinions of these great wise men. Robinson proposed that it must be a biphenyl derivative, restricted rotation round the biphenyl linkage accounting for its large optical rotation, and suggested a structure. The young Scot then had the temerity to tell the Nobel Prize winner that his suggestion was wrong as it did not explain some of the chemical properties. On seeing Jake’s proposed structure on the blackboard, Sir Robert immediately jumped up and declared ‘problem solved’, the spiran-based structure also accounted for the optical rotation. Thus, honour was saved and Jake was left to bask in his success.
Jake pioneered what was at that time a new strategy of culturing microorganisms to produce novel natural products when he realized that leaving out potassium chloride from the culture medium or replacing it with potassium bromide should lead to the production of dechlorogriseofulvin or bromogriseofulvin. This indeed happened (2), but neither the dechloro nor bromo analogues was as active. The latter was the first known example of a bromine-containing fungal metabolite and probably the first example of what we would now call precursor-directed biosynthesis.

**Gibberellins**

He then worked on the isolation of a group of compounds that were to become his life-long major interest—the gibberellins. These tetracyclic diterpenoid acids are metabolites of the fungus *Gibberella fujikuroi*, a plant pathogen that causes the ‘foolish seedling’ disease of rice, owing to its property of inducing stem elongation, causing the young seedlings to overgrow and die. They were first isolated in Japan, and only came to the attention of the West in the late 1940s through entries in *Chemical Abstracts*. Their profound effect on plant growth and development indicated an immediate interest to agriculture and motivated ICI to investigate them further. The team’s experience with submerged fungal cultures enabled them to isolate large quantities of the major metabolite gibberellic acid (GA$_3$) and determine its structure, first reported in *Proceedings of the Chemical Society* in 1958 (4). The ability of GA$_3$ to restore growth to dwarf mutants suggested that these compounds may function as endogenous growth regulators in plants, and indeed extracts from several plants were found to have similar biological activity. Jake and his colleagues were thus inspired to provide chemical support for this idea and extracted milligram quantities of a gibberellin from 100 kg of immature seeds harvested from two metric tonnes of the bean plant *Phaeseolus vulgaris*, showing it to be identical to a minor *G. fujikuroi* metabolite GA$_1$ (5). At the time, this was a major technical and scientific achievement, one achieved by chemists and biologists working together—a lesson he was never to forget. Thus, a new research field was established, one he was to play a major role in.

The gibberellin work advanced rapidly with many new GAs being isolated from fungal and plant sources. The work took Jake on the first of many trips to the USA. He recounted his first time: flying first class in a propeller-driven plane that took 19 hours to cross the Atlantic, sitting next to Douglas Fairbanks Jr and sleeping in a hammock unrolled from the roof of the plane. The impoverished young Scot had truly made it. He met many of the luminaries of organic chemistry, such as R. B. Woodward ForMemRS, for the first time, as well as people who were to become life-long collaborators and friends, such as Bernie Phinney (UCLA) and Larry Rappaport (UC Davis).

By the early 1960s the days of the Akers Research Labs were coming to an end, and, indeed, Jake made the point that the natural lifetime of many industrial research labs dedicated to basic research is about one generation. By now the director of the Akers Labs and a senior research manager in ICI Pharmaceuticals Division, he had the responsibility of managing the move of the Akers staff to Pharmaceuticals main site at Alderley Edge in Cheshire and the hand-over of the Frythe site to the new owners, Unilever. This was a stressful time in his life: commuting between Hertfordshire and Cheshire, and, more importantly, spending more and more time behind a big desk in a large office becoming remote from his real love of front-line research. It was a time of rapid expansion of the UK university system, and he applied for and was offered a position at the University of Bristol, despite their disbelief that he was
willing to accept such a large cut in salary. To assuage his guilt at leaving his colleagues behind he made an appointment to see the research director on the ICI main board to explain his predicament. However, the immediate reaction was to have his hand shaken and be told ‘No man is indispensable—good luck in your new job’, and so he headed to academia for a new and lasting phase of his career.

University of Bristol

Jake was appointed as a lecturer in Bristol in 1963 (figure 3). He had decided to cease work on gibberellins and to concentrate on other natural products, many of them emanating from the screening programmes he was familiar with at Alderley Edge, and on studies of fluxional molecules using the emerging techniques of nuclear magnetic resonance (NMR) spectroscopy, the School of Chemistry having just acquired a Varian 60 Hz instrument.

However, his fascination in the gibberellins (GAs) was rekindled by interactions with his colleague Bob Binks, who had become interested in applications of gas–liquid chromatography (GC). Up to that time it was mainly a ‘plaything’ of physical chemists, but it was becoming available in a form amenable to organic chemists. While GC studies of gibberellins in the form of their more volatile methyl esters had been reported by Japanese scientists, the novel approach Binks and MacMillan adopted was to use methyl ester-trimethylsilyl ether (MeTMSi) derivatives, which gave much sharper peaks and allowed separation of all 17 of the GAs known at that time.

Binks was also interested in mass spectrometry, as the School of Chemistry was about to take delivery of a MS9 high-resolution mass spectrometer. Their main objective was to develop combined GC–mass spectrometry (GC-MS), which was in its infancy at the time, and apply it to analysis of gibberellins, which are present in only tiny amounts in plant extracts. Although the MS9 could never be successfully interfaced with a GC, Jake’s then student, R. J. (Bob) Pryce, was able to carry out extensive experiments on instruments in Glasgow and Stockholm and demonstrate the presence of several gibberellins in derivatized crude extracts of immature seeds of runner bean, Phaseolus coccineus (8).

Another landmark at the time came from presentation of these results at the sixth International Conference on Plant Growth Substances in Ottawa in 1967. There, Jake met and initiated his long-life collaboration and personal friendship with Nobutaka Takahashi, leading to many subsequent visits to Japan, and together they formulated what became the internationally accepted protocol (7) for naming gibberellins by allocating GA numbers to naturally occurring gibberellins as they were isolated. This replaced the cumbersome and confusing nomenclature based on whether they were of fungal or plant origin (e.g. ‘bamboo gibberellin’) and was more applicable, as many examples were shown to be of both plant and microbial origin and now number more than 125.

In collaboration with their colleague, John Littler, Binks and Jake developed real-time processing of GC-MS data in 1970, although it was only with acquisition of a new instrument, an AEI MS30, in 1972 that they had their own suitable facility. Up until then they had to use instruments in other labs, often working overnight in the absence of the auto-samplers that are now routine. Their progress was reported at the seventh International Conference on Plant Growth Substances in Canberra in 1970, leading to a long and fruitful collaboration with Jan Graebe (from Göttingen), who had developed a cell-free system from pumpkin seeds that
converted mevalonic acid into kaurenoids. In an interesting project arising from using this system they demonstrated that $^{14}$C-content, and thus specific radioactivity of the metabolites formed from $^{14}$C-mevalonate, could be determined directly by GC-MS (9).

Central to the development of the GC-MS analysis of gibberellins was Jake’s long-time student/research assistant, Paul Gaskin, who provided continuity in addition to unique expertise and ability. Subsequent improvements in sensitivity of the technique came with the use of Surface Coated Open Tubular (SCOT) columns with the MS30, but in 1981 a major leap in both resolution and sensitivity came with the use of capillary columns on a newly acquired VG-7050 mass spectrometer with a dedicated on-line data acquisition system. The extra sensitivity actually posed problems due to the exceedingly small amounts of GAs in plant extracts. One problem was due to trace residues of gibberellins remaining on glassware used for chemical studies. This was solved by carrying out the chemical and isolation work in separate laboratories and banning any exchange of glassware. Another problem came from...
contamination by plasticizers coming from the tubing used in the lab. The suppliers refused to reveal their trade secrets, so Jake simply isolated this ‘novel’ compound and published the structure—acetyl tri-n-butyl citrate. Although normally appearing as very mild-tempered and calm, this illustrated Jake’s underlying determination and ability to live up to the motto of his native Scotland, Nemo me impune lacessit, politely translated to ‘Wha daur meddle wi’ me’.

Other long-standing collaborations were established, notably with the fungal and plant geneticist Bernie Phinney, who spent sabbatical years in Bristol and is well remembered for the sense of fun that he brought to us dull chemists (including TJS, PhD 1969–1973, and CLW, research fellow 1981–1990). Jake made many reciprocal visits to UCLA, continuing until and after his formal retirement from the School of Chemistry. Along with John Bearder, Bernie’s fungal mutants were used to fully establish the biosynthetic pathway to GA3 in fungi (12). An important result was the demonstration of the non-specificity of certain enzymes, so allowing the conversion of analogues of kaurenoic acid to prepare analogues of fungal gibberellins, many of which showed interesting biological activity. Parallel studies allowed the elucidation of the pathway in seeds both in vitro with Jan Graebe (11) and in vivo in Bristol, mainly with Val Sponsel (Frydman) (13). As the enhanced sensitivity described above became available, they were able to extend the metabolic studies to vegetative tissue and, again in collaboration with Bernie Phinney, to carry out the most complete metabolic studies of the GA biosynthetic pathway in shoots of maize and demonstrate that the pathway to GA3 differs in higher plants and fungi (16).

Other highlights of the period included preparation and use of gibberellin epitope-specific monoclonal antibodies (17), work first carried out by Jake’s daughter Frankie (Semenenko) while carrying out a short post-doctoral period in his lab (1990). Work on other plant-growth regulators included abscisic acid (6), so called for its role in the shedding of leaves but also important for many developmental processes such as dormancy and bud formation. In addition, mainly between 1965 and 1980, Jake continued his original aim, after leaving ICI, of working on the chemistry of other natural products, mainly of fungal origin, many of which were originally isolated in screens at Alderley Edge. These included the highly modified steroid wortmannin, the macrodiolide colletodiol, colletetricin of mixed terpenoid polyketide origin, and xanthomegin and related dimeric naphthoquinone pigments. A particularly interesting compound, on which Peter Hedden carried out his PhD studies (1969–1973), was heveadride (figure 1), a representative of the then unusual nonadride class of macrocyclic natural products (10). The biosynthetic origins of these nine-membered ring-containing compounds, generated formally via a formal 4 + 5 electrocyclic dimerization, attracted the interest of Derek Barton FRS, Jack Baldwin (FRS 1978) and Hamish Sutherland (Barton & Sutherland 1965; Baldwin et al. 1999) among others. Interestingly, work on this intriguing class has been recently re-initiated in Bristol, leading to a much better understanding of their biosynthesis (Williams et al. 2016).

Jake always emphasized the importance of interdisciplinary work taking place in a chemistry department. In addition to the metabolic studies dependent on state-of-the-art analytical chemistry, the chemists in his group (especially Mike Beale and Chris Willis) were developing methods of synthesizing the new gibberellins being detected by GC-MS to prove their structures, preparing isotopically labelled kaurenoids and gibberellins for metabolic and enzyme mechanistic studies (15), and designing new gibberellin derivatives for probing their biological function (14). The inherent complexity of these molecules also provided insights
into the mechanisms of basic chemical transformations and molecular gymnastics that these molecules could undergo.

As he increased in seniority, Jake inevitably had major administrative responsibilities imposed on him. He became head of the Department of Organic Chemistry in 1983 (and latterly chair of the School of Chemistry). Although his calm, logical approach suited him to such responsibilities, they inevitably compromised the time he could devote to his research. He was fortunate in that long-term funding, in particular from the Agriculture and Food Research Council (AFRC), allowed him to maintain excellent long-term post-doctoral and technical staff to do much of the day-to-day running of the group. He formally retired in 1990 and took a delight in the timing of his birthday in early September to allow him effectively to continue for nearly 12 months after his sixty-fifth birthday—Bristol regulations at that time stating that one retired at the end of August after you reached the age of 65. He declined the offer of facilities within the School of Chemistry, apart from anything else not wanting to interfere with his successor’s right to do things his own way—for which his successor (TJS) was very grateful. Although appointed six months before Jake’s formal retirement, it was a delight for TJS to be able to share Jake’s views on the School, Bristol and science in general, not to mention (too) many late-night whiskies! His antipathy to being seen to interfere did crack briefly when the first-year organic chemistry laboratory course was revised and the Lassaigne (sodium fusion test) removed—‘excellent for teaching them manipulative skills’ or the ‘outdated bane of first year undergraduates’ lives’, depending on your viewpoint.

LONG ASHTON RESEARCH STATION

With generous AFRC funding and the support of the then director, Ken Treharne, Jake had planned to move with key members of his research group and GC-MS equipment to the AFRC-funded Long Ashton Research Station (LARS). Ken sadly died in 1988, but the agreement was honoured by his successor, Peter Shewry.

Jake already had a long association with LARS through common interests in gibberellins and his membership of the University of Bristol Agricultural Committee, LARS being formally the Department of Agricultural Sciences of the university. Hence, in the 1990s, Jake effectively became a post-doc in his own group, working at the bench and learning new methods in enzymology and molecular biology. For the first three years of this period he spent six months each year in Bernie Phinney’s lab at UCLA. He continued his gibberellin research, particularly concentrating on the enzymes that form GA₃ and GA₇ from their immediate biosynthetic precursors (19), and, of course, writing many more reviews (18) and papers (30 in the period 1990–2004).

This was a happy as well as productive period, and Jake was a very popular and highly respected member of the LARS community. He was an outstanding mentor to younger scientists and enjoyed their company, as the photograph in figure 4 demonstrates; it was taken in 1991 at a meeting of the Royal Society of Chemistry (RSC) Bio-Organic Subject group at Firbush point on Loch Tay.

LARS was closed in 2003, following the Biotechnology and Biological Sciences Research Council decision to merge LARS with Rothamsted Experimental Station, its sister component of the Institute of Arable Crops Research—a decision that Jake firmly believed was wrong because it was taken on political and not scientific grounds.
Thus in 2003, Jake returned to the School of Chemistry, University of Bristol, as Emeritus Professor and Senior Research Fellow. He became a very popular figure and much valued member of the community, and was a source of advice and solid wisdom to the younger members of staff. He was in the School nearly every day, until the last couple of years when his health began to fail and he relied on his wife, Anne, to take him to and from the School.

Family

Jake was first and foremost a family man. He met his wife Anne (née Levy)—whose family were refugees from Germany in the mid 1930s—at the Akers Laboratory, where she was a researcher in plant physiology (figure 5). They have three children: Susan, who is a brain physiologist, now living in Scotland; Frankie, an animal physiologist, currently an associate professor in biomedical science education at the University of Bristol; and Andrew, a school teacher for 25 years and now a property developer in Bristol.

Altogether, they have eight grandchildren (Adam, Mark, Sophie, Henry, Alice, Jake, Anna and Harriet), now all successful young adults. Jake delighted in their company and many of us retain happy memories of Sunday lunches at the MacMillans’ with several small grandchildren fighting to sit on their grandfather’s knee. All of their grandchildren have studied or are studying science at university, and he would be thrilled that Anna (Miller) is following in his footsteps as a chemistry undergraduate at the University of Glasgow. Her first publication, arising from time as a vacation student in Hannover, is aptly on the molecular genetics of the biosynthesis of a fungal terpene (Feng et al. 2020). It is a measure of his immense modesty that several of them only became aware of his great scientific distinction and achievements at his funeral service, where two of his former graduate students, Tom Simpson and Peter Hedden, recounted some of those achievements.
The many fun-filled lab parties generously hosted by Jake and Anne, with games and copious amounts of wonderful food and home-made wine for the hungry young researchers, are among the most treasured memories of his research teams as well as Jake’s family.

**SUMMARY**

Jake was an outstanding scientist, with a keen intellect and enquiring mind, and a pioneer of research at the chemistry–biology interface. Generations of undergraduates benefitted from his traditional ‘chalk-and-talk’ lectures, and his impressive knowledge and enthusiasm inspired many students to continue careers in science.

It was a privilege to be a part of his interdisciplinary research team. He gave researchers in his group the freedom to develop as independent scientists; he was unerringly supportive and could be relied upon to deliver sound and thoughtful advice. While Jake was an unassuming man, ‘still waters run deep’ and below that calm exterior was an ambitious and determined man with strong views.

As mentioned earlier, he was renowned for his many pithy comments, not least the MacMillan formula for success being the product of IQ and AQ, the latter being politely defined as application quotient, both of which he, of course, displayed in abundance. He was a strong advocate of curiosity-driven research, often citing the rich return that the essentially blue skies group at the Akers Labs provided for ICI. He also recognized the importance of the need to inform the public of the benefits of fundamental research, but deplored the trend for ‘accountability’ that becomes an exercise in bureaucracy. He railed against the use of ‘impact factors’ in assessing research and the increasing tendency to cite reviews rather than the original papers. An obvious advocate of collaborative research, he nevertheless argued...
that it should come from the ‘coal-face’, and not, as so often happens, be driven rather than encouraged by funding bodies. As a pioneer and life-long advocate of interdisciplinary science with chemistry at its heart, he would be very pleased with current efforts in Bristol and more widely.

HONOURS AND DISTINCTIONS

1995   The Pergamon Phytochemistry Prize
1991   Elected Foreign Associate of the US National Academy of Sciences
1989   Elected Honorary Member of the Botanical Society of America
1988   Royal Society of Chemistry Hugo Müller Lectureship and Medal
       Royal Society of Chemistry Natural Product Chemistry Award
       American Society of Plant Physiology Charles Reid Barnes Award
1987   Elected Distinguished Foreign Scholar of the Mid-American Association of State Universities
       Elected Honorary Member of the Japanese Society for Chemical Regulation in Plants
1982   International Growth Substance Association Research Medal
1978   Elected Fellow of the Royal Society
       Elected Corresponding Member of the American Society of Plant Physiology
       Royal Society of Chemistry Flintoff Medal
1973–76 President of the International Plant Growth Substance Association

ACKNOWLEDGEMENTS

Much of this material is drawn from a delightful autobiographical article written for Annual Reviews of Plant Physiology and Plant Molecular Biology (1996, 47, 1–21). The interested reader is recommended to this source for many other examples of Jake MacMillan’s sagacity and wit. The portrait photograph is from the Royal Society’s collection and is © Godfrey Argent.

AUTHOR PROFILES

Thomas Simpson

Tom Simpson graduated (BSc) first in his year (Macfarlan–Smith Prize) from the University of Edinburgh in 1969 and (PhD) from the University of Bristol in 1973, where he worked with Jake MacMillan. After post-doctoral work in Liverpool with Stan Holker and in Canberra with Arthur Birch FRS. He was appointed to a lectureship in Edinburgh in 1978, and awarded a DSc degree in 1986. He moved to Leicester as a professor in 1988 (at the time the youngest professor of organic chemistry in the UK) and then to Bristol, where he succeeded Jake MacMillan in 1990.

He has been awarded the Royal Society of Chemistry Corday–Morgan and Natural Product Chemistry medals, the Tilden, Simonsen, Hugo Müller and Robert Robinson lectureships, the Rita and John
Jake MacMillan

In 2013, and the Sir James Black Medal of the Royal Society of Edinburgh in 2017. His research covers all aspects of the chemistry and biosynthesis of biologically important microbial natural products, and his work has led to ca 250 papers. He was elected FRS in 2001, FRSE in 2006 and received an honorary DSc from Edinburgh in 2015. He is currently Emeritus Professor and Senior University Fellow at the University of Bristol and Visiting Professor in the School of Chemistry, University of Edinburgh, and serves as an elected member of RSC Council and Board of Trustees.

Christine Willis

Chris Willis received her undergraduate degree at the University of London (1977), then moved to the University of Sussex for her DPhil (1981) with Jim Hanson and then to the University of Bristol as a research fellow with Professor Jake MacMillan, working as part of an interdisciplinary team to understand the role of gibberellins in plant growth and development. This sowed the seeds for her lifelong interest in natural products. She was appointed to a lectureship in organic chemistry at the University of Bristol in 1990 and promoted to professor in 2000. Since 2013 she has been the Head of Organic and Biological Chemistry in the School of Chemistry. Her research focuses on natural product biosynthesis, including the application of total synthesis, isotopic labelling, pathway engineering and mechanistic studies to produce biocatalysts and new bioactive molecules. She was the recipient of the RSC Flintoff Medal in 2008, the Rita and John Cornforth Award in 2013, the Award for Service in 2018 and the Natural Product Chemistry Award in 2020. In 2019 she was recognized by IUPAC with a Distinguished Women in Chemistry/Chemical Engineering Award. She has made major contributions to the wider community, including the organization of many international conferences, and committees of the International Isotope Society and the Royal Society of Chemistry, and is currently an elected member of RSC Organic Division Council.

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