JOHN FREDERICK NYE
26 February 1923 — 8 January 2019
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Elected FRS 1976

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John Nye was an internationally renowned physicist who made fundamental contributions to the understanding of crystals, ice and light. He explored defects in crystal structures, in particular continuous distributions of dislocations. He explained the mechanics of the flow of glaciers: their advance and retreat, and how this depends on the underlying topography; and how water flows beneath and within them. He was a pioneer in the study of optical singularities on three levels: stable caustics in geometrical optics; phase singularities (wavefront dislocations) in scalar waves; and lines of circular and linear polarization in electromagnetic fields.

EARLY LIFE AND EDUCATION

John Frederick Nye, born on 26 February 1923 in Hove, Sussex, England, was the second child of Haydn Percival Nye and Jessie Mary Nye. John’s elder brother, Peter Hague Nye, became a distinguished soil scientist, and was elected FRS in 1987. Haydn was a chartered surveyor who earned a Military Cross in the First World War for his bravery as an engineer in the trenches. He combined the high principles of the Catholic Apostolic Church, of which he was a devout member, with kindness and generosity. He was a stickler for precision and correctness in the use of words, and John writes: ‘I am sure that my own interest in language comes from that time.’ John’s mother, ‘Mamie’, worshipped at the Church of England, and the boys divided their Sundays between ‘Daddy’s church’ and ‘Mamie’s church’.† According to John, ‘Although not at all intellectual herself, [Mamie] believed firmly in the virtues of a good education and was very ambitious for her two sons.’

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† See the Acknowledgements section for details of the sources for personal reminiscences.
John’s formal education began in 1928 opposite his home, at the Hawthornden’s School kindergarten, where he learned reading, writing and arithmetic. From 1930 to 1932 he attended the Holland House preparatory school, also in Hove. This was run by the sadistic Mr Chubb and the kindly Mr Parks-Davies. That school went bankrupt, but John stayed on when it was taken over by Claremont School, whose headmaster, Bill O’Byrne, ignited and encouraged his interest in science by teaching him ‘about the trade winds and how the barometer works’, and recognizing that mathematics was his forte. In those years he took up photography, a hobby which gave him life-long pleasure.

For his secondary education (1936–41), he was enrolled as a boarder at Stowe School, Buckinghamshire, then recently established in what had been a Georgian estate. His first two years were ‘not really happy ones’ because he was one of ‘certain personalities who attract bullying’. This passed, and John was ‘thrilled’ by practical experiments in physics, advanced mathematics and (to a lesser extent) chemistry. The experiments included seeing waves with a ripple tank, constructed by Mr W. Llowarch, who had written the definitive book about the technique: the mathematics included vectors and projective geometry. These experiences, together with the powerful impact of the natural and architectural beauty of the Stowe estate and his photography, probably contributed to his characteristic visual approach to science, later evident in all his research.

His final years at Stowe were strongly influenced by the build-up to the war and then by the war itself. He helped dig trenches and joined what became the Home Guard, patrolling ‘the local countryside looking for the dropping of enemy parachutists (remembering that they might well be disguised as nuns)’.

In 1941 John won a Foundation Scholarship to enter King’s College Cambridge as an undergraduate. There he studied first mathematics and then physics, graduating with a BA, then an MA and finally ending his student days with a PhD in 1948. In those years, towards the end of the war and after, everything was scarce. Food was rationed and even basic research materials were in short supply. John recalls asking the formidable storekeeper for a piece of connecting wire; he received ‘a copper wire with frayed cotton insulation . . . “Rutherford used that, so bring it back”’. During this period, John embarked on the three great themes of his scientific life: crystals, glaciology and optics. These will be described later.

As well as his science, his interests widened to include literature, amateur dramatics (play-reading) and philosophy. He recalls a memorable evening when the discussion was supposed to be led by Wittgenstein, who, after everyone sat in silence for a long time, burst out ‘Bloody hell; if all your heads are as empty as mine we are not going to get far this evening!’; then someone mentioned a poem, and Wittgenstein was off.

**Academic career**

After receiving his PhD, John applied for jobs outside Cambridge; he was offered several, but was delighted to be invited to stay for a further three years as a demonstrator in the Department of Mineralogy and Petrology. When this employment ended, he travelled to America, largely out of ‘curiosity, to see if it was really like what they showed you in the movies’, taking a one-year position, on the recommendation of the Nobel Prize-winner Sir Lawrence Bragg FRS, at the Bell Telephone Laboratories in New Jersey.
His American friends expected him to remain in the USA. Many did so, preferring the prosperity there to the austerity of post-war Britain. But John had always intended to return, and in 1953 he moved to the physics department at the University of Bristol to work on a topic supported by a grant provided by Nevill Mott FRS. He chose to work on something different and, although Mott provided a desk, he did not give John a salary. However, a lectureship was soon advertised, and John applied successfully. He remained in the Bristol physics department, as lecturer, reader and professor, and after formal retirement, for 66 years. He visited the USA many times, including sabbatical periods in the California Institute of Technology (CalTech), Yale University, the University of California, Los Angeles, and the University of Washington. He was offered several permanent positions in America, but decided that he preferred his life and working conditions in Bristol. He never regretted this decision.

CRYSTALS

The initial topic of John's PhD thesis, supervised by Egon Orowan (FRS 1947), was ‘notch brittleness’. The aim was to explain cracking in the welded steel hulls of ships. When the war ended in 1939, the project stopped without a definite conclusion. He moved on to the theory of plasticity. This refers to materials where an increasing applied stress eventually causes a sudden deformation, in contrast to Newtonian viscosity, where any stress results in an immediate and proportional flow (strain rate). Specifically, John studied the compression of a block of plastic material, with the aim of incorporating strain-hardening, in which deformation is resisted more strongly following the initial yield. The familiarity with plasticity bore fruit in his later studies on the flow of glaciers.

The main topic of his thesis concerned dislocations in crystals. These are defects that disrupt the regular arrangement of their atoms; in the spirit of his Bristol colleague, Charles Frank (FRS 1954): ‘Crystals are like people: it is their imperfections that make them interesting.’ At that time (around 1946) dislocations were theoretical entities. John’s research (2)* established their existence: stresses in silver chloride (‘transparent metal’) were the result ‘not of a single dislocation but of arrays of them’. The technique he used was photoelasticity. This relies on the interference figures produced when the stressed sample is illuminated and viewed between crossed polarizers. The associated mathematics made John familiar with tensor analysis, to which he later made important contributions.

The work on defects led to an invitation from Lawrence Bragg to collaborate on his macroscopic ‘bubble model’ of crystal dislocations (figure 1). Their ‘raft’ of thousands of bubbles on the surface of a soap solution was equivalent to a two-dimensional polycrystal, in which dislocations, grain boundaries and other faults could be clearly seen and studied in detail. Their paper (1), published in 1947, achieved iconic status when Richard Feynman reproduced it in its entirety in volume 2 of The Feynman lectures on physics. John was very proud of this recognition.

During his postdoctoral research, John came to understand that for some purposes a deformed crystal can be regarded as a ‘gas’ of continuously distributed defects. To describe this, he developed (4) the theory of ‘dislocation tensors’ in a curved space, analogous to curved spacetime in Einstein’s general theory of relativity. He realized that for dislocated crystals the

* Numbers in this form refer to the Short Bibliography at the end of the memoir.
tensor is not symmetrical; the space is twisted as well as curved. What later became known as ‘contortion’ was a prescient insight: it played an important role when others developed field theories incorporating torsion into fundamental physics. It can also be regarded as anticipating non-Abelian geometric phases (I thank my colleague John Hannay for this insight).

While a demonstrator in the Department of Mineralogy and Petrology, John was asked to take over W. A. Wooster’s lectures on crystallography during Wooster’s absence abroad. His exposition, employing the then-unfamiliar notation of matrices and tensors, provoked disapproval when Wooster returned unexpectedly. But the lectures were popular, and his notes, refined during his visit to the Bell Laboratory and then in Bristol, culminated in his 1957 text *Physical properties of crystals* (6). This is still in print, and remains a uniquely accessible treatment of a difficult subject. Its publication was the culmination of John’s fundamental research on crystals.

**ICE**

John Nye’s career in glaciology was triggered by hearing a conversation in 1948 between Orowan and Vaughan Lewis, a lecturer in the Cambridge Geography Department. Orowan was explaining how modelling a glacier as a block of perfectly plastic material enabled him to connect its thickness, flow rate, spreading and yield stress. John made the model more realistic (3), enabling crevasses and shear fractures to be understood.

Perfect plasticity and Newtonian linear viscosity are extreme approximations. In laboratory experiments, John Glen arrived at a more accurate intermediate description of ice flow: the strain rate is proportional to the third power of the applied stress. John generalized what is now
called the Glen Flow Law by expressing it in tensor form (5), so that it could be applied to any state of three-dimensional stress. This improved version enabled him to explain experiments in Switzerland by Max Perutz (FRS 1954; Nobel Prize for Chemistry, 1962), in which a metal pole inserted vertically into a glacier deformed as it flowed, indicating the dependence of velocity on depth. Much of his later work was based on the Glen Flow Law (figure 2).

In CalTech, John learned about kinematic wave theory, devised to explain aspects of traffic flow on crowded roads. He realized that this could equally be applied to the flow of glaciers: the shock waves describing sudden build-ups of traffic also described surges in the lengths of glaciers. It was a valuable insight, enabling him ‘to connect the advance and retreat of glaciers with their rates of accumulation and ablation’ (7). An application, increasingly important in recent years, was to show how glaciers and ice sheets respond sensitively to seasonal and climatic change (11). Later, John and Norbert Untersteiner used the theory to advise a company planning to mine for copper at the foot of a glacier in Canada, to predict whether its snout would advance and cover the mine; their advice (13) was that over 20 years it would not—and it did not.

John explained many other features of natural ice. A few examples are: the effect of temperature on the rate of ice flow, showing that much of the shear strain occurring in many glaciers will be concentrated in the lowest layers (8); how transverse waves (ogives, or Forbes bands) on a glacier passing down an ice fall are the result of plastic deformation and ablation, rather than pressure as had been thought (9) (figure 3); and how surface waves on the Antarctic ice sheet are due to mountains under the ice (10).
John supervised an undergraduate project on regelation; the process by which a wire under stress moves through ice by melting beneath it and refreezing above. The theory (12) involves the flow of heat as well as water, and the two are related. There were discordances between theory and experiment, for which he suggested possible explanations.

Later, regelation featured in John’s theory (14) of the sliding of a glacier over its rough rock bed. This employed Newtonian viscosity as an approximation for the flow near the bottom, and a ‘slippery’ boundary condition, unusual in fluid mechanics, resulting from regelation. A remarkably original aspect of this work was his emphasis on the fact that the rock bed contains irregularities on a wide range of scales, so it is impossible to separate roughness from geography. In envisaging a statistically self-similar profile, he anticipated the central idea of what was later to emerge as a major area of applied mathematics: ‘fractal geometry’.

Temperate glaciers consist of grains of ice separated by liquid water. Before 1969 it was thought that the water was concentrated in the small regions where four grains meet, but John noticed that, in addition, the water was concentrated in the veins: lines where three grains meet, forming a connected network in the ice. He discussed the thermodynamical aspects with Sir Charles Frank, who had anticipated some of the ideas in a theory of the Earth’s mantle, and they wrote a joint paper (15). Where four veins meet (at the four-grain region), the water occupies an approximately tetrahedral region, whose detailed shape John computed (23); it depends on temperature. Extensive experiments by his graduate student Heidy Mader
confirmed the theory. Heidy left Bristol, later to return as a volcanologist, eventually becoming Professor Heidy Mader in the School of Earth Sciences.

Some of John’s early research on the motion of glaciers and ice sheets was continued by his graduate student Elizabeth (Liz) Morris. Liz went on to a career making innovative contributions to many aspects of glaciology. She was eventually based at the Scott Polar Research Institute, where she is Professor Elizabeth Morris, OBE; in 2015 she received an honorary doctorate from the University of Bristol.

A new departure, in the 1970s, concerned the motion of Arctic sea ice. This was initiated by an invitation for John to be a consultant for the Arctic Ice Dynamics Joint Experiment (AIDJEX) project. Describing the moving ice as an approximately two-dimensional changing vector field led him, in collaboration with Alan Thorndike, to a fundamentally new way of describing this and other natural fields (e.g. winds) in terms of their singularities when mapped from position into velocity space (18).

From his publications, one might get the impression that John’s glaciology was restricted to his desk and his laboratory, but in fact he enjoyed the outdoors: ‘You don’t need to go there, just to think, but there is something about being there that really concentrates the mind.’ He was a member of many expeditions (25) to carry out fieldwork and investigate the features of the glaciers that he was so successful in understanding: their crevasses, cirques, snouts, ice caves, surface waves and layering. He visited glaciers and ice sheets in Norway, Canada, Alaska, Switzerland, Iceland, the Beaufort Sea and Antarctica (figure 4). In Iceland in 1970, he experienced the aftermath of the recent eruption of the volcano Hekla. Climbing up the new ash-cone almost to its top, a red-hot ‘bomb’ landed half-way between John and the expedition leader, Sigurdur Thorarinsson, who said: ‘I think this is close enough.’

Also in Iceland, John saw the very different aftermath of a jökulhlaup. This is the massive and sudden release, every few years, of pressure that has been building up under the ice
from water trapped there. The water bursts out, causing vast floods. He devised a theory of the phenomenon (17), supported by experimental data from Thorarinson’s student Helgi Björnsson. Much later, John was pleased to learn that similar episodic floods occur under the Antarctic ice sheet.

John’s research on ice brought him much recognition, and he served the world community of glaciologists in many ways, including:

1954–64 member of the Council of the International Glaciological Society
1962–64 member of the Committee on Glacier Variation, International Commission on Snow and Ice
1966–69 vice-president of the International Glaciology Society
1971–75 president of the International Commission of Snow and Ice
1985–89 member of the UK National Committee for Antarctic Research.

**Light**

John Nye had a long-standing interest in the physics of light. *Physical properties of crystals* (6) included a treatment of polarized light in anisotropic media. This was a pedagogical account of standard material, self-contained and with the clarity that characterized all his writing. It was around 1970 that his original and fundamental contributions to our understanding of electromagnetic waves, and light in particular, began, and continued for almost half a century until his death in 2019.

The spark that ignited this change in his scientific direction was measurement of the thickness of ice sheets by radio echo-sounding. In this technique, a quasimonochromatic pulse was reflected from the rock bed, and information about the underlying topography was obtained from the delay between emission and the reception of the first part of the echo, reflected from the rock directly below the source. John realized that the long disorderly tail of the echo was the result of scattering by distant roughness, and contained potential information about it. To investigate this in the laboratory, he devised a student project, in which the radio waves of typical wavelength 5 m were replaced by ultrasound of wavelength 3 mm, and the roughness of the ice–rock interface was modelled by crinkled aluminium kitchen foil. The relatively low frequency (100 kHz) enabled the oscillations in the reflected wave to be studied in detail.

While moving the source–receiver, John noticed something unexpected: occasionally, two oscillations would separate and a new one would be born between them, or, in the time-reversed phenomenon, an oscillation would disappear. His genius was to realize what this implies for the geometry of the wavefronts (constant-phase surfaces) in the reflected wave: the surfaces can have edges, and the birth or death of an oscillation happens when such an edge encounters the detector. He understood the morphological similarity to the dislocations in crystals that he had studied in his earlier research: a wavefront with an edge resembled a half-plane of atoms—a defect disrupting the regularity of the crystal lattice. Therefore, he denoted the edges by the term ‘wavefront dislocations’.

It quickly became clear that wavefront dislocations were a fundamental feature of waves of all kinds, not previously recognized as such. The deepest way to think about them is to model the wave as a complex scalar field. The edges—the dislocations—are moving lines
in space, on which smoothness and single-valuedness imply that the phase of the wave is undefined and the wave amplitude is zero. Therefore, wavefront dislocations are also ‘phase singularities’ and ‘nodal lines’. The trajectories normal to the wavefronts, that is, parallel to the local wavevectors, are the streamlines along which wave energy flows; they circulate around the dislocation lines, so yet another term for them is ‘wave vortices’. They are the most delicate features of waves, representing intricate topological structure on scales much smaller than the wavelength.

Our paper (16) reporting this discovery was initially rejected by the Royal Society’s anonymous referee, on the grounds that the calculations were too simple for the idea to have significance. A second referee, later self-identified as Frank Nabarro FRS 1971, who had been in Bristol in the crystal dislocation years, agreed with our rebuttal that simplicity was a positive, rather than a negative, feature, adding that our paper ‘might have been written by Sir Geoffrey Taylor or even Lord Rayleigh or Lord Kelvin, but seems to have escaped them’. Initially, the paper did not attract much attention, but around 1990 experiments in the Ukraine by the group of Marat Soskin stimulated wide interest in what came to be called ‘singular optics’. This is now a thriving area; optical vortices are described in thousands of papers, review articles and several textbooks. The paper became John’s most cited journal publication; currently it has attracted more than 2000 citations.

John next turned his attention to optics on the coarsest scale, where the wavelength is neglected and a field of light is represented by a family of rays. The singularities are the *caustics*: envelopes of the ray families, on which the light is focused. Caustics are familiar as the cusped curve in an illuminated coffee-cup, as the dancing patterns of sunlight refracted onto the bottoms of swimming-pools, and as the rainbow’s arc. Two new aspects of this ancient branch of optics had led to the study of caustics being reinvigorated in Bristol in the early 1970s. The first was the mathematics of ‘catastrophe theory’, providing a library of the sometimes-unexpected forms that caustics can take when they are stable under perturbation. Our colleague John Hannay called this ‘natural focusing’, to contrast it with the artificial focusing by lenses and telescope mirrors. The second was the discovery that, when wavelength is reinstated, each of the stable caustics is decorated by a characteristic pattern of delicate interference fringes: ‘diffraction catastrophes’, the simplest being the Airy function of 1838, now recognized as describing the first in a hierarchy of patterns.

An early application had been to the study of the caustics in the images of streetlights viewed on rainy nights by people wearing spectacles; the images are distorted by raindrops ‘lenses on the lenses’. John entered this field with several experimental and theoretical studies (19, 21) of lensing by water-drops deformed by gravity. A central aspect was the way in which catastrophe theory explains how the intricate patterns of caustics change as parameters vary.

There is a sense in which caustics are complementary to wavefront dislocations. Observing dislocations requires the scrutiny of waves on the finest scale, where the caustics are obscured because their geometry is blurred by diffraction. Observing caustics requires viewing on large scales, where phase detail, including dislocations, is too small to see distinctly. This complementarity was recognized in the original dislocations paper. Nevertheless, dislocations and caustics are connected, because each diffraction catastrophe, beyond the simplest Airy wave, possesses an intricate pattern of dislocations, constituting a skeleton underlying it. John made a fundamental contribution to this connection across optical scales. With Francis Wright he contributed to the conceptual understanding in our analysis (20) of the ‘elliptic
umbilic diffraction catastrophe (figure 5), and provided experimental confirmation. Later, he elucidated the dislocation structure of other diffraction catastrophes.

Phase, organized by wavefront dislocations, and intensity, dominated by caustics, are two important features of waves. Electromagnetic and other vector waves possess an additional property: polarization—the third in the trilogy of fundamental concepts. Here too John made major contributions, by identifying the singularities of polarization. He started by pointing out the analogy between singularities in the pattern of directions in polarized light and the ‘disclination’ singularities of nematic liquid crystals. This was soon followed by his definitive contribution: recognizing that there are two distinct polarization singularities in general optical fields. First are ‘C lines’, on which the polarization is purely circular; these are singularities because the principal axes of the polarization ellipse are undefined when this is a circle. Second are ‘L lines’, on which the polarization is purely linear; these are singularities because the normal to the polarization ellipse is undefined when this collapses to a line.

John’s seminal paper (22), with his student Jo Hajnal, identified these singularities, and Hajnal investigated them experimentally in microwaves. To distinguish these geometric features in the presence of confusing waves (for example those reflected from boundaries), they developed the modulated scatterer sensing technique (24), for which he and Hajnal were awarded the 1986 Metrology Award by the UK National Physical Laboratory. Since leaving Bristol, Jo Hajnal has had a career in medical imaging; he is now a professor at King’s College London.

In 1999, John summarized his central contributions to the three pillars of singular optics, namely the singularities of phase, caustics and polarization, in his book Natural focusing and fine structure of light (26). He explained the physics of the mathematics and the natural philosophy of the physics, combining theory, computer simulation and beautiful experimental photographs, with a clarity that cannot be improved upon. The underlying organizing principle, emphasized throughout, is ‘structural stability’: the singularities are natural, in the sense that they are preserved under perturbation.

John’s full list of publications reveals many more applications and connections of his three main contributions to singular optics. A few of these scientific treasures are: wave dislocations and phase saddles in the tides (with Jo Hajnal and John Hannay); settling the old problem of specifying an optically black screen (with John Hannay and W. Liang); caustics in seismology;
caustics in rainbows from ellipsoidal raindrops; and a new type of fully electromagnetic singularity (with John Hannay). In his ninety-sixth year, he published a technical paper on an optical aspect of the Riemann–Silberstein electromagnetic vector; and in the days before he died, he speculated on the curious fact that ‘stars are often represented on national flags and depicted in paintings either symbolically or with apparently intended realism, as blunt stellated polyhedra, whereas the human eye sees a very small point source, far below the limit of resolution, rather as a glint surrounded by radial lines and points’.

**PERSONAL LIFE AND PERSONAL QUALITIES**

On 28 December 1953, in the chapel of King’s College Cambridge, John married Georgiana Wiebenson (figure 6). He had met her during his year in the USA at Bell Laboratories. She had graduated from Bryn Mawr College in physics and psychology, and was studying contemporary dance with the Martha Graham company in New York. Several generations of Bristol children have fond memories of Georgiana’s dance classes. John and Georgiana celebrated their sixty-fifth wedding anniversary shortly before his death. They had three children: Hilary Catherine (born 1957), Stephen Christopher (born 1960) and Carolyn Lucy (born 1963).

John Nye was admirable personally as well as scientifically: unfailingly courteous, generous with his time and always ready to help scientists in difficulty. Just one example: in 1981 and 1986, he and John Ziman FRS visited Moscow—at their own expense—to speak at the ‘refusenik’ seminars of senior scientists, mostly Jewish, who had dared to apply for visas to emigrate from the Soviet Union, usually to Israel. The refuseniks were punished by being demoted to low-level positions and denied the most elementary facilities such as access to laboratories and libraries. Their seminars, in cramped private apartments, were their only
source of news about science from the outside world. They were forever grateful to those foreigners who made the effort to visit.

Outside science, John had many interests and enthusiasms. To convert his dilapidated Bristol house into a comfortable family home, he learned to be a plumber, an electrician and a builder. The extensive space around his Bristol house led him to ‘discover a permanent taste for gardening’. The wonderful garden he created included an excavated pond with a statue of Mercury, deep side borders, a huge variety of thematic beds and a carefully designed winding path (figure 7). He loved the physicality of working there, and spending time for quiet reflection, whenever he could. For several years, his garden was opened to the public as part of the National Open Garden Scheme.

The garden reflected the intense visual sensitivity that illuminated much of his science. He was fascinated by the undulations of the sand on the seabed while snorkelling in Corsica, patterns of focused sunlight on the bottoms of swimming-pools in Sardinia and the distorted images of street lights viewed through raindrops on his glasses as he walked home. No detail escaped his keen eye. He became an accomplished artist, painting landscapes in water-colours and oils; perhaps this was the influence of his maternal grandfather, who was a professional painter, mainly of landscapes. Beyond the visual, his aesthetic included poetry (he had an extensive collection of anthologies) and a life-long love of the extraordinary beauty of the Christian choral tradition that he had experienced at King’s College (though he might not have shared the faith underlying it).

John helped explain the complications of theory to less mathematically able colleagues. As John Wettlaufer wrote from Yale:
I learned a great deal, technically and personally, from [John] and Georgiana. I recall a visit to Bristol in 1994 in which I was (unfortunately) in the . . . position of criticizing a piece of work by Charles Frank, and John masterfully saved me from being eaten alive . . . [Such was the variety of his research, that] if someone looks [John Nye] up in a scientific database it would . . . [seem] . . . that there are multiple individuals with the same name and affiliation, . . . John had a herculean influence on so many fields and people, in such a subtle and subdued manner . . . [he was a] jewel of theoretical physics and geophysics.

‘Subtle and subdued’ well describes John Nye. He was the epitome of the English scientific gentleman: wise, engaged, determined yet always polite, with a gentle wit and always giving due credit to others—a quiet man who did not need to shout.

HONOURS AND AWARDS

1961 Kirk Bryan Award of the Geological Society of America
1962 Official naming of Nye Glacier in Palmer Peninsula, Antarctica
1964 Fellow of Branford College, Yale University
1969 Awarded the Seligman Crystal by the International Glaciological Society
   (‘awarded from time to time to one who has made an outstanding scientific contribution to glaciology so that the subject is now enriched’)
1974 Antarctic Service Medal of the USA
1976 Elected Fellow of the Royal Society
1977 Foreign Member of the Royal Swedish Academy
1986 Metrology Award of the National Physical Laboratory (with J. V. Hajnal)
1989 Charles Chree Medal and Prize of the National Physical Laboratory
1996 Meeting of International Glaciological Society celebrating work in Norway 1955–1963
1997 Wheeler Prize for Best Applications Paper in IEEE Transactions on Antennas & Propagation (with W. Liang)
2004 Fellow of Institute of Physics

ACKNOWLEDGEMENTS

In writing this memoir, I found three of John’s resources enormously helpful. The first was the 45-page Reminiscences document that he deposited with the Royal Society. The second was his extended interview with Dr Paul Merchant, for the British Library’s National life stories: an oral history of British science project; this and a transcript (412 pages) are available online at https://sounds.bl.uk/related-content/TRANSCRIPTS/021T-C1379X0022XX-0000A0.pdf. The third is John’s vivid recollections, delivered in Bristol in 2014, Glaciology: 65 years ago, available online at https://www.youtube.com/watch?v=5w38d4GL2O4.

I thank Professor John Glen, whose contribution to the obituary that we wrote jointly for the International Glaciological Society formed the basis of the ‘Ice’ section in this memoir, Professors Heidy Mader and Martin Siegert for helpful suggestions, Hilary and Carolyn Nye, also for helpful suggestions and for generously allowing me access to John’s archive and his photographs, and Professor John Wettlaufer for his tribute to John Nye.

I am personally grateful for the nearly half-century of friendly interaction I enjoyed with John Nye, during which we wrote several papers together and talked frequently and in detail as our ideas on optical singularities developed together and separately. In my slightly unusual intellectual trajectory, John was the first, and remained the only, senior scientist with whom I seriously collaborated. From him I learned much: his simplicity in getting to the heart of
physical phenomena, his visual approach and his demonstration, by example, of the decent and productive scientific life.

The portrait photograph is © Godfrey Argent Studio. All other photographs are from John Nye’s private collection.

**AUTHOR PROFILE**

**Sir Michael Berry FRS**

Sir Michael Berry FRS is Melville Wills Professor of Physics (Emeritus) at the University of Bristol, where he has been since 1965. He is a theoretical physicist whose research centres on the relations between physical theories at different levels of description (classical and quantum physics, ray optics and wave optics, etc.). In addition to these mathematical studies, often involving asymptotics and geometry, he delights in finding familiar phenomena illustrating deep concepts—the arcane in the mundane—including rainbows, the sparkling of the sun on the sea, twinkling starlight, polarized light in the sky, and tidal bores. He has published more than 500 papers, is a member of six foreign academies and has received 14 honorary degrees and 19 medals and prizes. Website: [http://michaelberryphysics.wordpress.com](http://michaelberryphysics.wordpress.com). (Photograph by Chrystal Cherniwchan.)

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