A BAA–RAS pro-am discussion meeting

# Meteorites, meteors and comets

## held at the Open University, Milton Keynes, on 2003 May 10

Around 80 astronomers gathered together on May 10 for a discussion meeting on meteorites, meteors and comets in the Berrill Lecture Theatre of the Open University in Milton Keynes, organised by Jonathan Shanklin of the BAA and Margaret Penston from the Royal Astronomical Society, with local help from Dr Barrie Jones of the Open University. Although advertised as doors opening at 10:30, early arrivals had appeared by 9:30! Several displays were available for inspection during the day, including comet drawings by George Alcock, samples of Libyan desert glass, cuttings from old journals and information on the *Journal* of the International Meteor Organisation. Simon Green and John Zarnecki conducted lunchtime tours around the OU labs and Peter Hudson supervised visits to the newly opened OU observatory.


Dr Monica Grady

The morning session was devoted to meteorites and meteors, with Monica Grady from the Natural History Museum having the unenviable task of setting the scene. She described how the solar system formed in a region similar to the Orion Nebula; asteroids are remnant fragments and meteorites are chips off these. There are three types of meteorites – irons, stones and stony-irons. Heat (from gravitational collapse and radioactive decay) allowed reduction reactions similar to a blast furnace and metal accumulated in the centre of the asteroid. Iron meteorites tell us about core formation. Stony-irons come from the boundary of core and mantle and are the most beautiful meteorites, with intermixed peridotite (olivine) and nickel-iron. Stones form the majority of meteorites. Their main components are chondrules and calcium-aluminium inclusions. The chondrules say something about asteroid formation. The CAIs formed 3 million years before the chondrules, 4.568 billion years ago. Interstellar grains are also present as silicon carbide and diamonds. The silicon carbide has variable isotopic composition and therefore comes from different stars undergoing different reactions. At least 35 stars contributed material.

Meteorites may also come from comets, the Moon and Mars. Deserts such as the Sahara and Antarctica are good places to hunt for meteorites. They come in various sizes – the Arizona meteorite crater was formed by an object 40 metres across which caused a 1km diameter crater. The object that fell in Mexico 65 million years ago had significant effects on life on Earth. On average one meteorite falls over the UK every 11 years. Falls are not predictable and the next one could be over Milton Keynes this afternoon....

Neil Bone, Director of the BAA Meteor Section, introduced the history and work of the Section. Harold Ridley and George Alcock both had long associations with the Section. Alcock in particular worked with Prentice on plotting meteor tracks. Prentice was a solicitor and many of his observation reports have the wills of former clients on the reverse side.

Our next speaker was Iwan Williams of Queen Mary College, London, talking about meteor streams: their formation, evolution and observation. Most meteor showers are associated with comets. The Sun vaporises ice in a comet and the resulting gas ejection speed is around 1km/sec. Comets orbit the Sun at around 30km/sec, so the particles must have a similar orbit to the comet as the difference in velocity is small. The nodal position of a meteor is known very accurately (it is the time when it is seen), so the shift in nodal position between meteor and comet gives a measure of the out of plane ejection velocity. For the Leonids this amounts to around 20 m/s. Radar studies give us problems. They see very small meteors and lots of them – perhaps fragments of asteroids rather than comets. Recent TV results show evidence for hyperbolic orbits implying an interstellar origin if real. A third problem is that the density of meteors is generally quite high compared to that expected from comets, so there is either evolution of meteoroids or some of the theory is wrong.

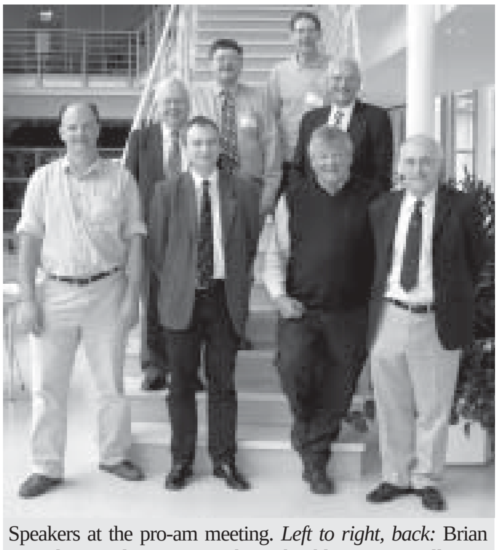
Andrew Elliott concluded the morning session with a talk on video-recording meteors. As well as creating a permanent record, video can yield scientific-quality results. He uses image intensifiers, which can be expensive and not easy to obtain, but the associated equipment – video camera, time inserter and video recorder – is within amateur budgets. A wide angle lens gives a 50° field of view and enables video-recording of the sky down to naked eye magnitude. Two-station work allows 'triangulation' for the computation of accurate meteor orbits, particularly when combined with photography. The driving force behind this work is Steve Evans who carries out astrometric reduction of the photographic negatives and some analysis of video recordings. The equipment is portable and in the last five years, Steve and Andrew have joined expeditions to Portugal, Spain and Arizona to record the recent Leonid 'storms'. More recently, two-station work using intensified video alone had been carried out between Gloucestershire (Evans) and Lancashire (Elliott). Andrew then showed spectacular results from recent expeditions, including the 2001 Leonid storm over Arizona, the 2002 Leonid storm over Spain, and the 2003 Quadrantids and Lyrids in the UK.

Jonathan Shanklin began proceedings after lunch, giving a brief history of the BAA Comet Section and lamenting the fact that early observations had disappeared during World War II. Although George Alcock and Albert Jones had made visual discoveries of comets, amateur visual comet discovery was probably now a thing of the past, thanks to asteroid search programmes such as LINEAR and spacecraft such as SOHO. However at the moment there was still a 'twilight zone' where amateurs stood a chance, particularly in the southern hemisphere.

Amateurs can still make significant contributions by visual magnitude studies, which provide essential continuity with the historic record. Visual drawings of features in the coma and tail can provide splendid illustrations but CCD images are now much more objective. Observations of 153P/Ikeya–Zhang showed variation across the course of the apparition, possibly reflecting the inhomogeneous comet nucleus losing several metres as it rounded the Sun. Comet 2001 A2 (LINEAR) showed significant variation with a period of around a month, which might reflect precession of the nucleus. Comet 46P/Wirtanen had a relatively normal light curve, but by contrast 67P/Churyumov–Gerasimenko, the new *Rosetta* target, might be similar to 1999 K5 (LINEAR), which had a 'pathological' linear light curve, peaking some 73 days after perihelion. Jonathan concluded by posing some questions: should observations be restricted to light pollution free areas (no, as this would eliminate most observations from the UK), do visual observers hallucinate (probably yes, as the brain often lets us see what we expect) and should light curves only be compiled from observations by experts (no, all observations are valuable).

David Hughes (Sheffield University) demonstrated how he used magnitude parameters derived from amateur visual observations. We can measure the size of a comet either directly with the HST or via a light curve as the log of the radius is theoretically proportional to 0.2 $H_{10}$. This absolute magnitude can either be derived by assuming that the comet brightens as 10 log r (=> $H_{10}$) or by fitting to the light curve (=> H). David said that it would be helpful if light curves were plotted as a function of log(r) rather than r or time. Around 2 metres is lost from 1P/Halley each revolution, implying that it will last for around 250,000 years. One might expect that size and perihelion distance are correlated, given that comets with shorter periods will lose more material. The average Jupiter family comet starts with a radius of around 3km and slowly shrinks. The gradient of size versus perihelion distance will give a clue to the average age. There are no bright comets passing close to the Sun. The average comet has a radius of 1.4km and perihelion distance of 1.8 AU. Short period comets are literally disappearing in front of our eyes and after 400 orbits (2,500 years) half will have gone. If we are in a steady state, Jupiter must be deflecting more objects into the inner solar system.

Alan Fitzsimmons (Queen's University, Belfast) told us about some of the interesting things that he is doing at the moment, under the title of 'Recent results in the ground based imaging of distant comets'. He concentrated on three aspects: why we should study nuclei, snapshot surveys and dedicated observations. Spacecraft show that 1P/Halley is quite a large nucleus about 18km long. Sublimation is seen on the surface giving jets of dust and gas. 19P/Borrelly is 8km long, and images show that the nucleus is complex and has real geology, quite different from the theoretical construct of ground based observations. Alan and colleagues had previously run a snapshot survey programme to study bare nuclei, obtaining size limits on 56 objects to get a size distribution. Their most recent observing run was last summer, using the William Herschel Telescope with its prime focus camera, giving 4096×4100 pixels at a scale of 0.25 arcsec per pixel. Some objects are bright enough for amateurs to image, so they could contribute to these studies. His team is now moving on to dedicated observations, looking at size, colour and rotation. A search for comets near the Sun is planned to come on line in a few months with the provisionally titled SuperWASP1 instrument on La Palma, a fully robotic telescope which will have a 247 square degree field and image down to 16th magnitude in 30 seconds. The primary task is to search for planets round other stars at the opposition point, but they hope to try and search for SOHO-like comets at 45°–60° elongation from the Sun.



Speakers at the pro-am meeting. *Left to right, back:* Brian Marsden, Neil Bone, Jonathan Shanklin, Iwan Williams; *front:* Nick James, Alan Fitzsimmons, David Hughes, Andrew Elliott. *Photo courtesy Jonathan Shanklin.*

The session concluded with Nick James describing CCD imaging by amateurs. Automated searches such as LINEAR find practically everything, however amateurs can carry out rapid follow up, observe structure near the nucleus, do photometry and monitor faint objects. CCDs also give pretty pictures. Is astrometry worth doing? Yes, once you have the images, and it is particularly important for objects on the Near Earth Objects confirmation programme. *Astrometrica* software is fast and catalogues are good. Peter Birtwhistle is reaching mag 19.8. Photography didn't have enough dynamic range to show structure in the coma, but CCD processing can be used to bring out details. For example Hale–Bopp had apparently stationary jets prior to perihelion. A rotational gradient filter enhances radial features such as those seen in 153P/Ikeya–Zhang.

Overall, photometry is now seen as the most difficult area for amateurs. Specific targets include the potential *Rosetta* target 67P/Churyumov–Gerasimenko, and comets which have outbursts such as 29P/Schwassmann–Wachmann. Finally the amateur could take pretty pictures and there is nothing wrong with this. In addition wide field images contain lots of structure. New CCD chips such as Kodak KAF1600 at 14×9mm and KAF1000 at 25×25 mm are becoming comparable to film, but remain expensive. Alternatively it is possible to mosaic smaller fields and these show considerable tail structure. Another technique is to use an ordinary camera lens with a CCD. Nick emphasised the need to use the standard naming convention when submitting images.

Alan Fitzsimmons and Paul Murdin briefed the gathering on possible grants to amateurs for scientific projects. The RAS has a small grants programme open to Fellows for peer reviewed proposals. There is a six-month cycle, with £18,000 per year available, distributed in grants ranging from £500 to £5000. They are normally awarded for purposes not funded by PPARC, for example travel, to teachers etc. Pro-am work would come within this remit, but proposals must come from RAS Fellows. Full details are posted on the RAS web pages at http://www.ras.org.uk/html/ras_grants.html. The Faulkes and Liverpool telescopes will hopefully become operational this summer and will welcome proposals from amateurs, which can either be live or via email. The BAA offers the Ridley grants of up to £1000 per project which are open to all astronomers. There is also the Shoemaker grant in the US which has about $35,000 per year to distribute for NEO-related activities.

During the tea break speakers and audience were photographed, which meant that we reassembled to hear Graeme Waddington speak on 'Random Meanderings by Jove' slightly later than planned. He described how non-gravitational forces on comets can perturb their orbits and applied the theory to comet 153P/Ikeya–Zhang. The preliminary orbit was remarkably similar to two historical comets, C/1661 C1 and C/1532 R1. As more astrometric observations came in during 2002 the connection with 1661 was assured and the mooted connection with 1532 became problematic. Using the 1661–2002 linked orbit we expect previous apparitions to have been in 1272/3 and 876/7. There are candidate historical records of likely comets for both periods but their veracity is uncertain. Was there a link to the comet of 1532? Since the descending node of 153P is very close to the descending node of Jupiter, very close approaches of 153P (or fragments of a progenitor) to Jupiter can occur, rendering the long-term orbital evolution well and truly chaotic. Under these circumstances it is relatively easy to engineer a perihelion passage within 0.1 day of the 1532 comet. One possible solution would give rise to the next apparition being 2013 May 1, whilst another should already have been seen, if it exists, in 1901. He concluded that, with a certain amount of ingenuity, anything was possible.

Guy Hurst, BAA President, then introduced John Alcock, brother of George, and Kay Williams, George's biographer, before calling on Dr Brian Marsden to deliver the first George Alcock Memorial Lecture.

## Comets near the Sun

Dr Marsden had first visited George Alcock, with Mike Candy, on 1959 August 31, the day following George's discovery of comet 1959f, though the IAU *Circular* wasn't issued until September 1. This was the first UK comet discovery since Denning had

BAA President Guy Hurst (left) with Dr Brian Marsden of the Smithsonian Astrophysical Observatory. *(Photo: Hazel McGee)*

found 1894 I. It was only observed for a week and was not seen after it passed perihelion at only 0.17 AU from the Sun. George's comet 1983d, first detected by IRAS, did not go near the Sun, but at a distance of only 0.031 AU from the Earth exactly 20 years ago on the day after this conference, it made the closest such passage during the twentieth century. As well as making sketches on drawing card, George often went to the trouble of including pencil copies in letters. An airletter Brian received from George in February 1970 included a sketch of comet 1970a, not a discovery by George but another comet that disappeared a few days before it was due to pass only 0.07 AU from the sun.

In a 1977 letter George depicted a thin pencil-like beam seen low in the sky on 1963 September 12, questioning whether it might have been the comet discovered by Pereyra in Argentina two days later, when this member of the sungrazing Kreutz group was already three weeks past perihelion. In 1965 the fourth of George's five comet discoveries was rather overshadowed by Ikeya–Seki, a more spectacular Kreutz sungrazer under observation at the same time. Soon afterwards Brian demonstrated that Ikeya–Seki and the great September comet of 1882 had rather obviously separated from each other at their previous perihelion passage. He showed that under that circumstance the differences between their orbital elements would have been comparable to the tiny differences between the orbits of the individual components seen when the comets themselves split during the weeks after perihelion in 1965 and 1882. While the precise date of the 1882–1965 separation cannot be established, there was a comet in 1106 that may match. Assuming that it does, Sekanina and Chodas have recently shown that the fragmentation would actually have occurred some 18 days after perihelion. Although they were not so directly related to the 1882–1965 pair, Brian has noted that the Kreutz sungrazers of 1843 and 1880 also probably separated from each other on their previous approach to the Sun. The periods of these comets are not well determined, but assumption of the hypothesis would put them at around 400 years, with the splitting around the second half of the fifteenth century. Since the period of the rather similar Pereyra comet of 1963 was clearly a century more than twice 400 years, it is tempting to speculate that it may have separated from the 1843–1880 parent at the perihelion passage *before* the 1843–1880 split. This speculation would mean that the 1843–1880 parent was at perihelion in 1463 or, more probably, in 1487, but no observational record of such a comet has been found.

Three other Kreutz sungrazers have been observed from the ground during the nineteenth and twentieth centuries, namely, in 1887, 1945 and 1970. In 1981 there came word of what appeared to be a comet on images obtained from the space-based SOLWIND coronagraph two years previously. The object dispersed within a matter of hours as it approached the Sun, and although the orbit could not be 'determined' in any sense of the word, it seems likely that it was also a faint Kreutz sungrazer. By the time of its demise in 1984 SOLWIND had found six likely Kreutz sungrazers. By 1989 the Solar Maximum Mission had added ten more, and since 1996 SOHO has found a startling 465 of these objects.

The arrival of members separated in time by only a matter of hours suggests that splitting also occurs far from the Sun, involving bodies that had already been weakened by tidal interaction with the Sun at the previous perihelion passage. Sekanina has made an extensive study of such evolution, which also leads to more of a spread in the perihelion distance and angular orbital elements of the comets. This mechanism allows a more efficient evolution of members of the different subgroups evident in the ground-based data, and Sekanina and Chodas have recently demonstrated how the 1970 member could have separated in 1749 from a possible third comet spawned with the 1882 and 1965 members in 1106.

Several other groups of near-Sun comets, totally unrelated to the Kreutz comets, have been recognised in the SOHO data during the past three years or so. The first intimation of this was in February 2000 when Brian had remarked on one probable and one possible case of pairs of SOHO comets in essentially the same orbit separated by a matter of hours to days. An even closer non-Kreutz pair appeared in December 2000. No further attention was paid to these until early in 2002, when Brian remarked on the similarity of C/1999 J6 and C/1999 U2, comets with a 27-degree orbital inclination separated by almost six months. German amateur astronomer Maik Meyer noted that C/1997 L2 and C/2001 X8, were also similar, with a 72° orbital inclination separated by four and a half years. The perihelion distances are 0.04–0.05 AU. Further members were soon added, notably the February 2000 probable pair to the Marsden group and the possible pair to the Meyer group, although in each case it so happened that the 2000 orbits had initially been erroneously supposed retrograde, rather than direct. The Meyer group now has at least 34 members. The Marsden group, with at least 13 members, also seems to be related to the Daytime Arietid meteor stream. Intriguingly, the perihelion direction of longitude 102°, latitude +10°, is also closely shared by comet 96P/Machholz and the Quadrantid meteor stream, although the perihelion distances are in excess of 0.1 AU and the orientation of the orbital planes are significantly different. Furthermore, the perihelion direction is also shared by a distinct group of 14 or more additional SOHO comets at perihelion distance 0.05 AU but with inclination only 14°. This additional group is named for Rainer Kracht, another German amateur. Finally, the December 2000 pair of comets may belong to a three-member group containing also a comet observed four months earlier.

The enormous prevalence of groups of comets in the SOHO data (with no group member surviving perihelion passage) becomes even more evident when one considers that there are only 16 SOHO comets with perihelion distances under 0.1 AU that are *not* known to be members of a group. Furthermore, apart from the eight definite Kreutz members, there are just 19 other comets with perihelia less than 0.1 AU that have been observed from the ground over the whole of history, and three of those seen during the seventeenth century have been considered suspect Kreutz comets. Four of the remaining 16, including comet 1970a depicted by George and comet 1953h that Brian recalls searching for in vain, failed to survive perihelion, presumably because, like the SOHO comets, they were tiny objects that completely vaporised near the Sun. Among the better known survivors are the great comet of 1680, the Seki–Lines comet of 1962 and the recent C/2002 V1 (NEAT), the most spectacular comet so far to show on SOHO images.

A more detailed report of the meeting was published in the October 2003 edition of the Comet Section newsletter *The Comet's Tale*, and a further account appeared in the RAS journal *Astronomy & Geophysics*. The former is available on the Section Web page.

**Jonathan Shanklin,** *Director, Comet Section*

*Obituary*

# Michael Gadsden, 1933–2003

Michael Gadsden was born in Harrow, Middlesex, on 1933 December 10, the youngest of three sons of Blanche and William Gadsden, a fire insurance surveyor. He attended Brighton, Hove and Sussex Grammar School and entered The Royal College of Science at Imperial College, London in 1951, the same year he became a member of the BAA. He graduated ARCS and BSc with honours in Physics in 1954 then took the DIC in technical optics and PhD in 1957 with a thesis entitled 'The application of colorimetry to some astronomical and meteorological phenomena', supervised by Professor W. D. Wright. He married Mavis Upton in 1955.

He then became a Scientific Officer in the New Zealand Public Service, at the auroral station of the Dominion Physical Laboratory in Invercargill, during the International Geophysical Year, studying radar phenomena of the aurora australis and spectrophotometry of the twilight and night sky, especially sodium and lithium emissions. This involved two visits to the Scott Base in Antarctica. He was promoted to Senior Scientific Officer in 1960. Michael was a member of a subcommittee set up by the International Association of Geomagnetism and Aeronomy (IAGA) under the chairmanship of James Paton, then Director of the BAA Aurora Section, to re-classify auroral forms after the experience of the IGY and to produce a new Atlas[1] which is still the basis of the Aurora Section's recording method. Mavis and Michael had three children in New Zealand, Andrew, Anne and Jonathan.

In 1963 Michael was invited to work at the Central Radio Propagation Laboratory (CRPL) at Boulder, Colorado, now NOAA, where he stayed for seven years, as Director of the small Fritz Peak Observatory, then of the Aeronomy Laboratory. His work was mainly on airglow and the detection of metals in the upper atmosphere, involving further visits to the South Pole and other Antarctic stations, participation in the 1968 NASA Airborne Auroral Expedition, and visits to the Cook Islands in 1965 and Mexico in 1969 to observe total solar eclipses. In November 1966, while at Boulder, he had the good fortune to witness the immense storm of the Leonid meteors He and some colleagues attempted to count and estimate rates by watching them through a window, but they quickly gave up.

In 1970 Michael accepted a post as Senior Lecturer in the Department of Natural Philosophy (Physics) at Aberdeen University. He was involved in all levels of undergraduate teaching but concentrated his own research on noctilucent clouds, adapting the ancient abandoned observatory on top of the Cromwell Tower at King's College with photometers, spectrographs, polarimeters and an all-sky camera for airglow and NLC. This was where Sir David Gill had begun his observing career in his student days. Michael soon became recognised as a world authority on mesospheric clouds, contributed many papers to several journals and took part in conferences worldwide which earned him lasting friendships and valued colleagues. With Wilfried Schröder he wrote the definitive handbook on NLC.[2] Like James Paton he greatly encouraged amateur involvement in upper atmosphere research, and in the 1980s initiated a simultaneous photography programme with BAA Aurora Section members across Central Scotland to ascertain the heights of the NLC layer. He found that, although the incidence of NLC has definitely increased and it is being seen much further south (demonstrated especially by the remarkable work of Jay Brausch in North Dakota), the cloud height remains fairly constant at about 83km.

Dr Michael Gadsden *(centre)* with Danish observers Holger Andersen *(left)* and Ole Skov Hansen, at the Mesospheric Cloud conference in Perth in 2002. *(Photo: D. Gavine)*

A superb teacher, Michael was also a brilliant lecturer, much in demand by astronomical societies. When he retired to Perth he became a very welcome participant in the activities of the Scottish Astronomers' Group and Dundee Astronomical Society, and continued his own research at home, partly in an old stone-built cottage in the garden which was incongruously filled with computers and remote sensing devices. He gave a great deal of advice and encouragement to the Aurora Section, and was instrumental in having the Section's and James Paton's IGY observations preserved in a special Balfour Stewart archive at Aberdeen University, where they are available to researchers. In August 2002 Michael organised an international conference on Mesospheric Clouds in Perth, at which amateurs were invited to contribute, the proceedings later issued on CD-ROM as BAA *Memoir* Vol. 45. It was a great success, especially as it was the opportunity for everyone to meet the Danish observers whose meticulous aurora and NLC observations are so valuable.

Dr Gadsden became a Fellow of the Royal Astronomical Society in 1958, a member of its Council 1979–80 and 1991–93, Vice-President in 1981 and Harold Jeffreys Lecturer in 1985. He was a member from 1966 of the American Association for the Advancement of Science, and from 1951 a member of the Royal Astronomical Society of Canada. He became a member of the American Geophysical Union in 1964, awarded its Silver Pin in 1989 and made a Life Member from 1990, a Fellow of the Royal Meteorological Society in 1975, serving as Vice-President for Scotland 2000–2002. Much of his extraordinary energy went into running the International Association of Geomagnetism and Aeronomy (IAGA) of which he was Chairman of Commission VII-Airglow in 1966 and 1971–73, member of the Executive Committee 1975–79, Vice-President 1979–83, Secretary-General 1983–95, which involved organising meetings and conferences, and honorary Life Member 1997. He was also awarded the E. R. Cooper Memorial Medal and Prize of the Royal Society of New Zealand (1962), and the US Antarctic Service Medal (1974).

Michael was a big, jolly man, somewhat reminiscent of the late actor Robert Morley, full of boundless energy, with a wicked and sometimes earthy sense of fun which disguised a formidable intellect. He and Mavis ran a happy household which was a delight to visit and to see the latest scientific wonders. Alas, Michael knew for some time that he had terminal cancer; he began to suffer pain early in 2003, and his condition rapidly deteriorated. He died peacefully on 2003 April 10 and his simple burial service at St Ninian's Scottish Episcopal Cathedral in Perth was attended by amateur and professional astronomers alike. We all miss him greatly but none more so than his devoted family, especially his nine grandchildren. Few men have had such a rich, full and happy life.

I am indebted to Mavis Gadsden for much of the above information.

**David Gavine**

1 *The International Auroral Atlas,* International Union for Geodetics and Geophysics, Edinburgh University Press (1963)
2 Gadsden M. & Schröder W., *Noctilucent Clouds*, Physics and Chemistry in Space Planetology, Springer–Verlag, Berlin (1989)

*Obituary*

# Henry Wildey, 1913–2003

It came as a great shock to learn that Henry Wildey died suddenly on Tuesday 2003 October 21, just one day after celebrating his 90th birthday. His sad passing will be felt by astronomers, both amateur and professional alike, who will mourn the loss of a good friend and a truly skilled optical craftsman.

Henry Wildey in 1991. *(John Lewis)*

A considerable number of 'post war' amateur astronomers began their first serious observations with a telescope mirror or object glass made by Henry Wildey, myself included. Many may not have known that they were using a Wildey lens or mirror, because Henry produced telescope optics for several commercial manufacturers. His optical work was revered not only by serious amateurs but equally by professional institutions, for which he produced high quality lenses and mirrors for university apparatus and space research. Henry was one of the last of the 'old school' of home craftsmen brought up on a reading diet of *English Mechanic* and *Amateur Telescope Making*, and carrying on the traditions of the great Victorian semi-professional telescope makers such as Calver, With and Ellison.

I first met Henry way back in the 1950s when as a teenager, I joined the Junior Astronomical Society (JAS) and the BAA. Henry joined the BAA in December 1936, was elected as Vice President in 1956 and served as President of the JAS (now the SPA) from 1959–1961. When I first met him he was Curator of Instruments for the BAA, holding that position from 1951 to 1977. I remember seeking his advice concerning the testing of a Cassegrain secondary which I was making at the time. I subsequently got to know him well when I joined the Hampstead Scientific Society (HSS) in 1965. At that time Henry was Astronomical Secretary, a position which he held from 1946 until he 'retired' in 1988. Having joined that Society in 1934, he was a member for 69 years. Henry was a Vice President of the HSS and one of its oldest surviving members, and on his retirement he was made an Honorary member.

As Astronomical Secretary of the HSS, Henry was responsible for organising the public open nights at the Society's observatory and maintaining the instruments and building. When he acceded to the position in 1946, just after the second World War, both instruments and building were in sore need of attention. At that time the HSS was in financial difficulties and there was a countrywide shortage of materials. Undaunted, Henry applied the 'make do and mend' philosophy and set about re-covering the dome with material salvaged from a barrage balloon. His organisation and building skills were further put to the test in 1963 when the Hampstead Observatory had to be dismantled and removed from its site on top of the reservoir in Lower Terrace to allow the Water Board to reline the reservoir. An appeal fund was launched and just eighteen months later the Observatory was rebuilt and reopened to visitors.

The Wildey family lived for many years in a large old Victorian house in Savernake Road at the foot of Parliament Hill in Hampstead, the back garden of which featured a huge 18-inch (45cm) Newtonian–Cassegrain telescope originally built by John Hindle and improved by Henry. Much of the ground floor of the house was taken over by telescope making paraphernalia, to the consternation of his long suffering but devoted wife Violet.

In the early 1960s, Henry and his cousin William were assisting Henry's father with his building business and I still have some wallpaper in my hall at home, put up by them in 1964, proving that his good workmanship was not confined to optics. Indeed, Henry was a man of many talents, a true polymath. He was a skilled artist who had tried commercial art early in his career. He did not take to the drudgery of churning out artwork to order, so fortunately for the astronomical community he decided to concentrate on the 'art' of producing telescope optics instead.

Wildey at the BAA Exhibition Meeting, 2003 June 18. *(Maurice Gavin)*

His observational and artistic skills are recorded in his notebooks which cover many aspects of observational astronomy. Over the years he contributed observations to many sections of the BAA, from variable stars to observations of novae, comets, solar prominences and planetary detail.

Apart from his passion for astronomy he had many other interests, including opera, being particularly fond of the works of Wagner and Puccini, and Egyptology, a subject on which he could happily discourse for hours. For recreation, Henry loved gliding; he was a solo glider pilot and only gave it up in his 70s after experiencing a 'heavy landing', which he was lucky to limp away from. He was a ferocious croquet player and a demon at billiards and he loved general knowledge quizzes. Outwardly, Henry appeared a quiet, almost shy, individual, but he was always willing to share his considerable knowledge and experience and you soon discovered that he possessed a wicked sense of humour.

After his retirement, Henry and Violet moved away to Broxbourne to be closer to their grown up family. Sadly, Violet died in 1994 but Henry soldiered on and was still grinding lenses and mirrors until a few months before his death.

His deep interest in astronomy and Egyptology was well catered for by the weekend courses held at Wansfell College in Epping Forest. For decades Henry regularly attended these. The astronomy course held each year in the autumn became a sort of unofficial club. It was there that we would all meet up with Patrick Moore and the late Colin Ronan and other distinguished guest lecturers, to discuss the latest developments in astronomy and cosmology and discover new insights into the fascinating histories of those subjects.

Thus it was that Wansfell College was chosen as the venue for a party to celebrate Henry's 90th birthday. Over 40 guests, comprising family members and friends, gathered there to celebrate with him on 19–20 October. We were treated to a splendid dinner and entertained afterwards by his musically talented grandchildren. Henry had also devised a couple of quizzes just in case our wits had become blunted by overindulgence. During the entertainment, I had the pleasure to convey birthday greetings from the Presidents and Committees of the BAA, the SPA and the HSS.

Henry Wildey enjoyed a long and fruitful life and he leaves behind a legacy of fine work and happy memories. Tennyson's Ulysses says 'I am a part of all that I have met.' All those who met and knew Henry Wildey will remember him.

Our thoughts at this sad time are with his son Doug and daughter Gloria, his grandchildren Deborah and Melissa and great grandchildren Jacob and Tom. It must be some comfort to know that Henry thoroughly enjoyed himself at his 90th birthday party, never happier than when engaged in stimulating conversation and surrounded by good friends and a loving family.

**Doug Daniels**

*(Vice-president and Astronomical Secretary, Hampstead Scientific Society)*