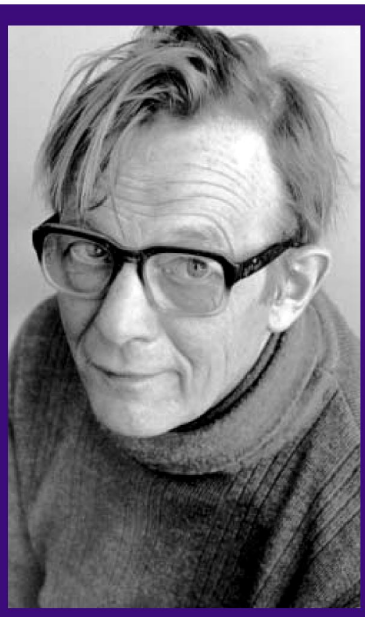
Hendrik Christoffel van de Hulst, 1918–2000

Associate of the RAS; physicist and pioneer radio astronomer; first President of COSPAR and leading light in ESRO, ESA and Dutch space research.



Hendrik van de Hulst

Hendrik van de Hulst died in Leiden on 31 July 2000, at the age of 81. He was one of the greatest Dutch astronomers of the past 150 years. In 1944 he had predicted that the amount of neutral atomic hydrogen in interstellar space would be so great as to produce a measurable signal at the radio wavelength of 21 cm. This prediction led to a breakthrough in astronomical research. It was a strikingly original contribution to the spectacular blossoming of astronomy which began after the Second World War and which continues unabated.

Henk van de Hulst was born in Utrecht, The Netherlands, on 19 November 1918. He was one of the six children born to W G van de Hulst, a well-known writer of children's books in Calvinist religious settings. Henk was not the only one of the children to be highly gifted; one of his brothers became a respected painter. Henk remembered growing up in a happy family atmosphere. The belief in the teachings of the Dutch Reformed Church were followed seriously at home and evidently the younger Henk adhered to them too: in his PhD thesis one finds the pious dedication "to Him who steers everything". Later in his life his religious beliefs loosened, although his knowledge of the Bible became a familiar signature in his discussions. At the most unexpected moments, and to his listeners' general surprise, he could cite an entirely appropriate verse from the Bible in order to put the topic under discussion directly in accurate perspective.

Henk's father was the principal of the elementary school where he received his first education. Henk was in rather poor health as a child, and frequently was confined to his house; this situation is difficult to assimilate with the physically powerful man that he later became. But his health problems did not interfere at all with his educational progress. He completed all of the problems in his high school arithmetic books during the summer vacation of 1930, before he had even entered high school. The aptitudes and interests that were evident before he reached his teens made it obvious that he was well-suited to a university education with a strong mathematical emphasis. He was, however, the first in his family to receive a university education, since universities at that time were still largely citadels for the privileged.

It was not immediately obvious that Henk would specialize in astronomy. During his high-school years astronomy was just one of his numerous hobbies. He considered attending the Institute of Technology in Delft, but was dissuaded from this choice by an engineer who advised Henk that his talents were too strictly theoretical for a purely technical education. Henk followed this advice and remained grateful for it, yet one can question if his talents did not in fact also embrace mechanical matters. Throughout his entire life he enjoyed finding practical solutions to all sorts of technical problems: he improved the sagging foundation of his daughter's house in Amsterdam, he designed and installed the protective barrier on the dike guarding his vacation lake-house in Friesland, and he prepared a good model for the size and shape of the European instrument that was installed in the Hubble Space Telescope.

The decision to become an astronomer was taken in Henk's second year at the University of Utrecht, and was strongly influenced by the lectures given by M Minnaert, well-known for his educational talents. But Henk's studies were interrupted in 1939, when he was drafted into military service following the general mobilization shortly before the invasion of The Netherlands and the beginning of the Second World War. He was not involved in overt military operations while he was in the army, but upon his discharge the University was not effectively functioning: Minnaert, together with many other well-known Dutch, had been jailed as a hostage in St Michielsgestel.

Light scattering

Henk attempted to study on his own and to take examinations under these circumstances, but Minnaert was constrained by the regulations of his detention to answer with a few lines only. Nevertheless, shortly before he had been taken hostage Minnaert had introduced an important direction in Henk's career, by pointing out a prize competition that had been announced by the University of Leiden in 1941. This competition centred on the small particles of dust which had been discovered some 10 years earlier in interstellar space but which were still largely a mystery. Scattering of light by these particles of "interstellar smoke" determines much of the appearance of the Milky Way, which had made a deep impression on Henk during the years of the war, when city lights were extinguished. The subject of the competition challenged Henk, and he submitted his entry in April 1942. The jury, which included among others J H Oort and H A Kramers, did not award the prize but instead offered two honourable mentions, one for Henk van de Hulst (citing "a mature scientific spirit") and one for the entry submitted by D ter Haar.

The competition had two particularly important consequences. Henk became acquainted with Jan Oort, and he became deeply interested in the general problem of light scattering in an astronomical context. This interest was soon reflected in his doctor's thesis, the "Optics of spherical particles". He was awarded the PhD *cum laude*, in June 1946, with Minnaert as his supervisor.

The subject of light scattering remained central to his interests for Henk's entire life. He wrote two monographs on the subject. The first of these, *Light Scattering by Small Particles*, was published in 1957 and was immediately recognized as a classic; it was republished by Dover in 1981. This book illustrates his best scientific talents. He begins with a very simple statement of the problem, and solves this problem in the most general manner. In the following chapters he continually expands the statement of the problem, offering solutions of increasing, but still straightforward, mathematical complexity, until he arrives at the Mie Theory. But the reader is gradually introduced to the general subject and becomes convinced that the constituent problems can be simply stated and simply solved. The presentation is elegant and clear; the illustrations are so efficient as to be almost self-explanatory; the historical background is given all appropriate attention. For these reasons the book was

widely consulted, beyond the confines of its obvious use in an astrophysical context. Henk himself proudly stated that the book "was written to explain the light of the Milky Way, but was in fact also used in dairy factories to measure the size of particles of fat in milk". His scientific interest in light scattering led to the establishment of a laboratory in Leiden in the 1970s, where J M Greenberg replicated interstellar scattering processes with considerable success.

We return to the year 1944. At that time scientific news from the United States had not reached Europe for several years. But news had arrived earlier which was to change astronomy fundamentally. An American engineer and radio amateur, Grote Reber, had proceeded from the discovery made several years earlier by Karl Jansky, in Jansky's investigation of the source of interference which disturbed long-distance communication systems. Reber had himself constructed a steerable antenna and with this instrument had made a map of cosmic radio emission. The emission was particularly strong in the general direction of the centre of the Milky Way. Reber's map, together with the news of an interpretation by two American astronomers that the emission could not be explained in terms of known mechanisms, reached Oort in Leiden. Oort immediately saw the challenge of a new subject of astronomical research, and also realized that radiation at radio wavelengths would penetrate the cloudy Dutch sky.

At a meeting of the Nederlandse Astronomen Club held at the Leiden Observatory on 15 April 1944, the possibilities and prospects of radio astronomy were discussed for the first time. Oort had asked Henk to consider the possibility of observing a spectral line in the radio regime. At the meeting, Henk gave a talk in which he suggested that neutral atomic hydrogen, which in its hyperfine transition radiates and absorbs at a wavelength of 21 cm, might be expected to occur at such high column densities as to provide a spectral line sufficiently strong as to be measurable. Shortly after the end of the war, several groups set about to test this prediction. The 21 cm line of atomic hydrogen was detected in 1951, first at Harvard University followed within a few weeks by Dutch observations made in Kootwijk and by Australian ones made near Sydney.

The discovery demonstrated that astronomical research, which at that time was based on observations of conventional light, could be complemented with observations at other wavelengths, revealing a range of new physical processes. Today, in addition to optical and radio astronomy, observations embrace X-rays, gamma rays, and the infrared and ultraviolet regime. Of these "new astronomies" radio astronomy was the first, and its success following the prediction about the 21 cm spectral line has led to some of the most important astronomical discoveries of the past century.

Henk van de Hulst married Wilhelmina Mengerink in 1946; they had two sons and two daughters. Wil also initially studied astronomy in Utrecht, but after meeting Henk she changed her course to study psychology. Although she and Henk had quite different natures, the marriage was a stable one; Henk always spoke lovingly of his wife and children, confirming the impression that all his acquaintances had of the importance to him of his family.

America and back again

After receiving his doctor's degree, Henk and Wil left The Netherlands for the United States, where Henk had been awarded a postdoctoral fellowship at the Yerkes Observatory of the University of Chicago. At Yerkes he developed deep contacts with S Chandrasekhar, who was later to win the Nobel Prize, and with Gerard Kuiper, one of the numerous American astronomers with a Dutch background and education. Kuiper stimulated Henk's interest in the solar system, which lead to his work on the dust in the zodiacal belt.

Henk certainly had the opportunity to remain in the United States after his postdoctoral period, but Oort convinced him to return to The Netherlands. He was appointed at the University of Leiden, first in 1948 to the rank of Lector, and then to a professorship in 1952. He remained in Leiden throughout his career, becoming Professor Emeritus in 1984. He did return to the United States for several sabbatical leaves, at Harvard, Caltech, and the Institute for Space Studies in New York. He lectured regularly in Leiden, and guided numerous PhD projects.

In 1953, Henk co-authored a book with C A van Peursen about the foundations of the physical sciences. The authors concluded that it is not possible to give a reliable philosophical definition of the sciences. The book was written at about the same time that Henk dissociated himself from his earlier religious beliefs. It is possible that he had become too sceptical for a strongly felt rational belief. Was the emotional basis that he had been given not strong enough? A later development points in this direction.

Henk's career took on a new and unexpected turn during a conversation with Oort at the traditional Leiden Sterrewacht coffee time on 15 November 1958, shortly after the first artificial satellite, Sputnik I, had been launched. "Henk," Oort is reported to have said, "I just had a telephone call from ICSU for a meeting in London, but I cannot possibly comply with the request. Could you go in my stead?" "I'd rather not," Henk replied, "because in doing so I would miss my daughter's fourth birthday. By the way, what does ICSU mean, and is it important?" Oort considered it important and Henk went, to return home one week later as the first president of COSPAR, a new, international organization for the peaceful exploitation of the universe. Later he said of the event: "I was launched into a space career."

The meeting had been called by the ICSU, the International Council of Scientific Unions, which was worried that, in the coming competition between the USA and the Soviet Union, the military aspects of space studies would supersede the scientific ones. That this was eventually not the case (even though the military importance remained great) must have been the result of a variety of reasons, but certainly COSPAR was an important factor. For Henk it was one of the highlights in his career when, at an important congress organized by COSPAR, he presented two astronauts (Glenn from the USA and Titov from the Soviet Union) each with a Dutch wooden shoe, cut from wood of the same tree, a gesture with symbolism that was clear to everybody.

For Henk, organizing space research rationally did not restrict itself to this super-national level. From 1960 to 1975 he was closely involved with the start of ESRO, the first European Space Research Organization, and after that, from 1975 to 1986, with ESA, the European Space Agency, the successor to ESRO. Henk held very important positions on the boards of both ESRO and ESA. He was also one of the pioneers of space research in The Netherlands, supervising much of its prosperous development. In 1959, also at his instigation, a committee for space research was formed within the Royal Academy of Sciences (of which he had become a member before he was 40 years old). He was president of this committee (GROC) until 1984, when it was incorporated into a new Institute, SRON, which now builds major instruments for space research under the auspices of the Dutch national science foundation.

Around 1965, Henk played an essential role in attracting a group of young Delft engineers who were to contribute in the subsequent decades to the spectacular growth of Dutch space research, and to whom Henk was the much admired example of the genuine researcher and accomplished administrator. The important role that SRON has played in space research since its foundation was confirmed recently by an international visiting

committee. Credit for this result is mainly due to Henk van de Hulst, who stated repeatedly that the way one may justify pure research is by providing outstanding quality, a paradigm that is of great importance to his followers.

As an administrator, scientist and teacher, Henk held firm beliefs. He was more open to discussions than many other Dutch celebrities of his generation. He listened to other people's opinions, but he remained resolute and mostly made his own final decisions. He was a strong, physically fit man, level-headed but with a good sense of humour. He was a philosophical person, with an ever-present analytical streak. When talking to him, one always had the feeling that the conversation was simultaneously unravelled and evaluated at a higher and more abstract level. Personal conversations, or discussions in committees, were always characterized by depth and simplicity. The best strategy with him always was the direct approach.

Precise metaphors

Henk had no desk, only a table, which was almost always empty. There were some documents in a corner, mostly loose sheets, under a stone, which clearly had some importance for him. Other than that, just some pencil stubs. Quality was certainly not in the paraphernalia. Often in conversations, precisely targeted metaphors occurred, frequently drawn from other trades and crafts such as carpentry or sailing. He often showed his appreciation of his conversation partner, but sparingly. A graduate student expressed his astonishment at realizing that Henk had taken his draft seriously, and noted how much that had encouraged him.

In a conversation about a university colleague, Henk summarized: "This is someone who hasn't yet found the equilibrium between his hubris and his humility." He applied this judgment on other occasions, which suggests that he recognized this need for balance in himself as well, and that this was more than a casual observation. This problem may be unavoidable for someone who must have been aware at an early age that he had an exceptional talent for rational analysis, and who had been raised in a religious tradition that emphasizes humility. In the search for his own answer to this dilemma he was certainly helped by a strong sense of the relativity of all things. He was a man with great talents, but without a mission. He laboured where he considered himself able to contribute, but had no explicit need to achieve great things. In that respect his personality was different from that of Jan Oort, his immediate colleague and paragon.

Henk was never the most audible voice in company, but those who spoke with him were always impressed by his responses and by the points of view he took. Answers to specific questions were often unexpected and to the point. On one occasion he had been talking to some economists at a reception, and when Henk had left one of them asked another participant who this economist might be.

Naturally, his most powerful aspects were clearest in a setting of rational scientists. Thus it was a surprise to his colleagues and pupils when, around 20 years ago, Henk mentioned that he and his wife Wil had participated in a large European psychotherapy workshop, and that this had made a big impression on him. His wife, who leads psychological group therapies centred on Tibetan meditation, had already been present on several such occasions. Henk and Wil continued to visit these annual workshops and they gave him a satisfaction that he had not known in his younger days and that he now experienced as very meaningful. Surely this new endeavour deepened his domestic ties yet further.

In 1995, the Dutch artist Carla Roodenberg was commissioned to paint three portraits of Henk: one for the van de Hulst family, one for the Sterrewacht, and one for SRON. Each recipient felt that they had obtained the best of the three; the painter and her model developed a mutual respect that must have contributed to this artistic feat. The works show Henk as we knew him best: contemplative but straightforward, and in robust health. But shortly thereafter a downward trend became apparent. He became thinner and occasionally seemed to be less focused. Almost by accident a calcium deficiency was diagnosed, and its treatment spruced him up, even though he did not seem to return to his former health. Suddenly, in the spring of 1999, he lost considerable weight. That autumn, he came to the Sterrewacht with the news that an inoperable lung carcinoma had been found and that his passing was imminent. He mentioned this quite serenely, adding that he had asked the doctor: "So I don't have to worry about the millennium bug?" Whereupon the surgeon sadly responded: "No, you don't."

Henk withstood this final fatal episode with the stoic attitude that fitted him so well: rational and accepting the unavoidable with his head held high. We, bystanders, were assured by him that he had received more from life than most men, and that he was at peace with parting. He was true to himself and to us from beginning to end. He was a most impressive man. ●

H J Habing, on behalf of his colleagues, friends, and students at the Sterrewacht Leiden. Translated by W B Burton.

Donald Robert Barber 1901–2000

Fellow of the RAS, prolific observer and talented photographer.

Donald Barber

Donald Barber was a Fellow of the Royal Astronomical Society for 63 years even though he did not join the Society until he was 36, shortly after he had been appointed as a night assistant at the Norman Lockyer Observatory at Sidmouth, Devon. While at the Observatory he carried out a long-term spectrophotometric programme of observation of the colour-temperatures of early-type stars. He was Superintendent of the Observatory from 1956 until his retirement in 1961. He continued to work on the analysis of the data after his retirement and the resulting monograph received high praise in the foreword by Prof. H H Plaskett of Oxford University, who wrote: "It is a remarkable achievement that Mr Barber, single-handed, has brought to a successful conclusion a piece of work comparable to that of Greaves and his colleagues with at their disposal all the resources of the Royal Observatory, Greenwich." In 1987 he was awarded an honorary degree of Master of Science by the University of Exeter.

Barber was born and educated in Exeter. He won scholarships to Hele's School and to the Royal Albert Memorial College, which became the University College of the South West of England. He was awarded an external degree in physics by the University of London in 1925 and he then carried out research on instrumentation at the College, on which he published a series of papers over the next dozen years. In

1928 he was seconded to the Seale-Hayne Agricultural College at Newton Abbot to organize a department of physics. He was subsequently appointed as a visiting lecturer and he acted as consultant to the Advisory Unit of the Ministry of Agriculture, Fisheries and Food that was based at the College. He was elected a Fellow of the Institute of Physics in 1938.

Barber's interest in astronomy had been stimulated by lectures in astrophysics given at the University College by Sir Norman Lockyer's son, Dr W James S Lockyer, who was then the director of the Norman Lockyer Observatory, and by the annual summer visit by students to the Observatory. In the spring of 1936, James Lockyer invited Barber to become a night assistant, but unfortunately Lockyer died suddenly before Barber took up his appointment. Barber undertook a variety of observational work and he was alert to unusual phenomena such as "sky darkening associated with a severe thunderstorm", which was described in *Nature* in 1938, and the spectacular aurora that occurred on 25/26 January 1938.

Sir Harold Spencer Jones, who visited Sidmouth regularly as a member of the Research Committee of the Observatory, successfully nominated Barber for a Martin Kellogg Fellowship tenable at the University of California. He spent a year at the Lick Observatory in 1940/41 and the results of his pioneering visual photometric research on the light of the night-sky were published as *Lick Observatory Bulletin no. 50* and elsewhere. He spent the next four years on wartime research in the Photographic Physics Division of the Kodak Research Laboratories at Harrow.

On his return to the Norman Lockyer Observatory in September 1945 he was made Chief Assistant and he produced a steady stream of papers from then until 1963 on an even wider range of topics. Some continued the spectroscopic programmes of the Observatory, while others followed up his Lick Observatory and wartime work. He also published several papers on photographic techniques. This work was later recognized by his election as a Fellow of the Royal Meteorological Society and as an Honorary Fellow of the Royal Photographic Society. His early involvement in biophysics and his interest in quasi-cyclic phenomena showed itself in some unusual papers, such as a contribution to *Nature* on the "singing pattern of the common chaffinch".

Barber had an interest in both photography and railways from his youth; his first published photograph was of a train derailment at Exeter when he was a schoolboy and some of his early photographs continued to earn him royalties during his retirement. He gained his Associateship of the Royal Photographic Society in 1938 for a set of lantern slides showing railway subjects in colour.

He had a strict upbringing and was a non-smoker and teetotaller all his life. He was an active member of the Congregational Church in Exeter and then in Sidmouth; he served as deacon, lay preacher, church secretary, director of the London Missionary Society and executive member of the Devon Congregational Union. He married Doris Hale, a gifted musician, in 1946; he lived alone after his wife's death in 1972. He practised drawing in crayon and he maintained his interests in astronomy, meteorology and photography. He continued to walk regularly until a series of falls in 1998 led him to move to a retirement home. He remained mentally active, however, until just before his death on 20 August 2000; this came unexpectedly as it had appeared that he would live to celebrate his 100th birthday in 2001.

George A Wilkins.

Deaths of Fellows

Dr D Scott
Born 10 December 1918
Elected 13 May 1966
Died 2000

Prof. M Waldmeir*
Elected 9 April 1954
Died 26 September 2000
*Associate

Recent gifts and purchases for the Library

The following is a selection of books recently added to the Library. They are listed as briefly as possible with conventional abbreviations and the first author/editor(s) only listed to save space. Before visiting the Library to consult or borrow these Fellows are advised to check that they are available. Grateful thanks are extended to all the donors listed; if no donor's name is given the item was purchased.

Alurkar S K, *Solar and Interplanetary Disturbances*, QB 531, World Scientific, Singapore, 1997, ISBN 981 02 2925 9.
Bertin G, *Dynamics of Galaxies*, QB 855X, Cambridge University Press, 2000, ISBN 0 521 47855 3.
Bishop C, *Astrophysics*, QB 461, John Murray, London, 2000, ISBN 0 7195 8590 2.
Born M and Wolf E, *Principles of Optics* (7th edition), QB 88, Cambridge University Press, 1999, ISBN 0 521 64222 1.
Boston P J (ed), *The Case for Mars V*, QB 641, American Astronautical Society, 2000, ISBN 0 87703 459 1.
Charles J R, *Practical Astrophotography*, QB 121, Springer, London, 2000, ISBN 1 85233 023 6.
Dingus B L *et al.* (eds), *26th International Cosmic Ray Conference*, QB 474, American Institute of Physics, 2000, ISBN 1 56396 939 4.
Dingus B L *et al.* (eds), *GeV–TeV Gamma Ray Astrophysics Workshop*, QB 471, American Institute of Physics, 2000, ISBN 1 56396 938 6.
Dodson S I *et al.*, *Ecology*, QB 632, Oxford University Press, 1998, ISBN 0 19 512079 5.
Eather R H, *Majestic Lights; The Aurora in Science, History and the Arts*, QB 791 X, American Geophysical Union, 1980, ISBN 0 87590 215 4.
Fry I, *The Emergence of Life on Earth*, QB 632, Free Association Books, London, 2000, ISBN 1 85343 481 7.
Holt S S and Zhang W W (eds), *Cosmic Explosions; Tenth Astrophysics Conference, QB 461, American Institute of Physics*, 2000, ISBN 1 56396 943 2.
International Astronomical Union Symposium 177, *The Carbon Star Phenomenon*, QB 816, Kluwer, Dordrecht, 2000, ISBN 0 7923 6346 9.
International Astronomical Union Symposium 186, *Galaxy Interactions at Low and High Redshift*, QB 855 X, Kluwer, Dordrecht, 1999, ISBN 0 7923 5833 3.
Kafatos M and Nadeau R, *The Conscious Universe; Parts and Wholes in Physical Reality*, QB 500, Springer, New York, 2000, ISBN 0 387 98865 3.
Kidger M, *The Star of Bethlehem; an Astronomer's View*, QB 802, Princeton University Press, 1999, ISBN 0 691 05823 7.
Kortvelyessy L, *The Electric Universe*, QB 461, Edition EFO, Budapest, 1998, 963 8243 19 8, Gift of E Crew Esq., FRAS.
Livio M (ed), *Unsolved Problems in Stellar Evolution*, QB 981, Cambridge University Press, 2000, ISBN 0 521 78091 8.
Mannings V *et al.* (eds), *Protostars and Planets IV*, QB 981, University of Arizona Press, 2000, ISBN 0 8165 2059 3.
McConnell M L and Ryan J M (eds), *The Fifth Compton Symposium*, QB 471, American Institute of Physics, 2000, ISBN 1 56396 932 7.
McMillen K R (ed), *The Case for Mars VI; Making Mars an Affordable Destination*, QB 641, American Astronautical Society, 2000, ISBN 0 87703 461 3.
Niemeyer J C and Truran J W (eds), *Type Ia Supernovae; Theory and Cosmology*, QB 842, Cambridge University Press, 2000, ISBN 0 521 78036 5.
Peltier L, *Starlight Nights*, QB 36, Sky Publishing Corporation, 1999, ISBN 0 933346 94 8.
Prantzos N, *Our Cosmic Future; Humanity's fate in the Universe*, QB 632, Cambridge University Press, 2000, ISBN 0 521 77098 X.
Ratledge D, *Software and Data for Practical Astronomers*, QB 142, Springer, London, 1999, ISBN 1 85233 055 4.
Rees M, *Just Six Numbers; the deep forces that shape the Universe*, QB 500, Weidenfeld and Nicolson, London, 1999, ISBN 0 297 84297 8.
Schmadel L D, *Dictionary of Minor Planet Names (4th edition)*, QB 651, Springer, Berlin, 1999, ISBN 3 540 66292 8.
Shapiro R, *Planetary Dreams; the quest to discover life beyond Earth*, QB 54, Wiley, New York, 1999, ISBN 0 471 17936 1.
Tassoul J-L, *Stellar Rotation*, QB 901, Cambridge University Press, 2000, ISBN 0 521 77218 4.
Tyson N de G, *The Sky is not the Limit; Adventures of an Urban Astrophysicist*, QB 36, Doubleday, New York, 2000, ISBN 0 385 48838 6.
Verhees T F, *Waves in Dusty Space Plasmas*, QB 462, Kluwer, Dordrecht, 2000, ISBN 0 7923 6232 2.

Election of Fellows and Junior Members

Fellows

The following were elected as Fellows of the Society on 8 December 2000:

Mr M M Bisi, Blaenau, Gwent.
Ms E M M Boisseau, London.
Mr M P Collins, Nottingham.
Dr D W E Green, Harvard-Smithsonian Center for Astrophysics, Cambridge, USA.
Prof. M J Griffin, Queen Mary & Westfield College, London.
Mr H Kuntschner, University of Durham.
Mr P J Langan, Okehampton.
Alan Lothian, London.
Dr M Marov, Moscow, Russia.
Eur. Ing. R M Newman, East Hendred, Oxon.
Mr D Pullan, University of Leicester.
Mr W Ward, University of Glasgow.

Junior Members

The following were elected as Junior Members of the Society on 8 December 2000:

Mr W I Clarkson, University of Southampton.
Mr T D Thoroughgood, Sheffield.
Ms L J Walsh, Englefield Drive, Surrey.
Ms A L Watts, Southampton.

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Astronomy & Geophysics is the house journal of the Royal Astronomical Society. It is a journal for the publication of serious scientific articles of interest to a broad range of astronomers and geophysicists. Contributions can take the form of Review Articles (up to 6000 words), Articles (up to 3500 words), News and Correspondence (up to 800 words). Articles are subject to peer review; other contributions are reviewed at the Editor's discretion.

Articles and **Review Articles** cover any topic likely to be of interest to members of the RAS. You should introduce material at a level comprehensible to a graduate in the subject, but should not limit discussion to this level. The breadth of subjects necessarily involves a range of levels of complexity in the subjects. Editorial policy is to encourage contributions of accuracy and scientific authority over a wide range of interest, with a topical slant where feasible. The Editor welcomes lively writing and a variety of personal styles, but reserves the right to reject material that is unsuitable.

Electronic submission

It is helpful if articles can be provided in electronic form; we use Word6 on Apple Macintosh. Other word processor formats, Tex and LaTeX are also acceptable; please send rtf files as well or if in any doubt. Submission by e-mail is possible, but please do not send the Editor attachments unless asked. If preferred, use ftp. All submissions should be accompanied by a paper copy of the text and figures.

Whatever submission route is preferred, authors should avoid unneccessary formatting. Manuscripts must include a brief, informative abstract of about 150 words. The body of the text should be divided into sections as appropriate, without numbering. Use SI units where appropriate and explain acronyms as necessary. The edited text is faxed to authors for approval as page proofs; corrections and changes must be returned promptly. Authors who may be away in at the time of production should inform the Editor of their whereabouts or nominate a colleague to check in their absence.

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Illustrations, both images and diagrams, are welcome; we prefer a small number of high-quality illustrations. Suggestions for cover images are always welcome. The Editor has discretion over which illustations to use: the main criteria are content and quality. Illustrations should be sent digitally in a high-resolution file format, preferably tiff. Please do not embed files in the text but send them separately. Authors should also send printed copies of figures. Number figures in sequence and label with the main author's name and the figure number. Give brief but informative captions.

Authors in any doubt about the suitability of illustrations or about the variety of electronic file formats in use should consult the Editor. Good quality prints or transparencies are especially suitable. As a general rule, it is both more efficient and more satisfactory to send *A&G* a good quality print than for authors to spend time producing poor-quality images.

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References should follow the style of *Monthly Notices of the RAS*, giving abbreviated journal title and first and last page numbers. In the text, references should cite authors and date, using *et al.* for three or more authors. References to larger works such as books should include the page number. Authors alone are responsible for ensuring that their references are correct.

Astronomy and Geophysics can provide rapid publication for topical articles: at the Editor's discretion, articles can be published within two months of submission. Such speedy publication depends on efficient repsonse by authors and cannot be guaranteed. If a paper merits fast publication, author and editor depend on the goodwill of referees.

A&G News pieces are shorter items of topical interest, reports on major international meetings, summaries of advances in specialist fields and so on. Suggestions are welcome: please contact the Editor. *A&G* Views publishes letters of general interest and timely scientific correspondence. Letters may be edited for reasons of clarity and space.

Submission implies that the manuscript has not been previously published nor currently submitted for publication elsewhere. On acceptance of a manuscript, authors are required to transfer the copyright to the RAS.

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All contributions should be submitted to Dr Sue Bowler, Editor, *Astronomy and Geophysics*, Dept of Physics and Astronomy, The University of Leeds, Leeds LS2 9JT, Britain. Electronic submission is preferred: send disks or e-mail to "s.bowler@leeds.ac.uk".

