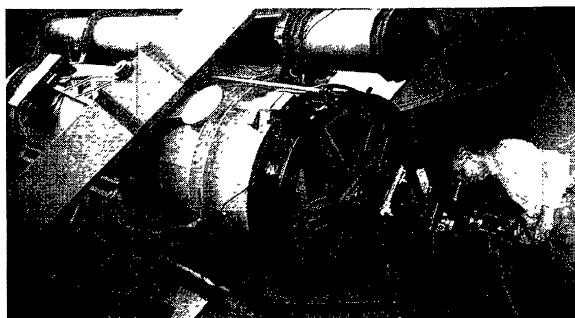


## A TLP in Langrenus crater

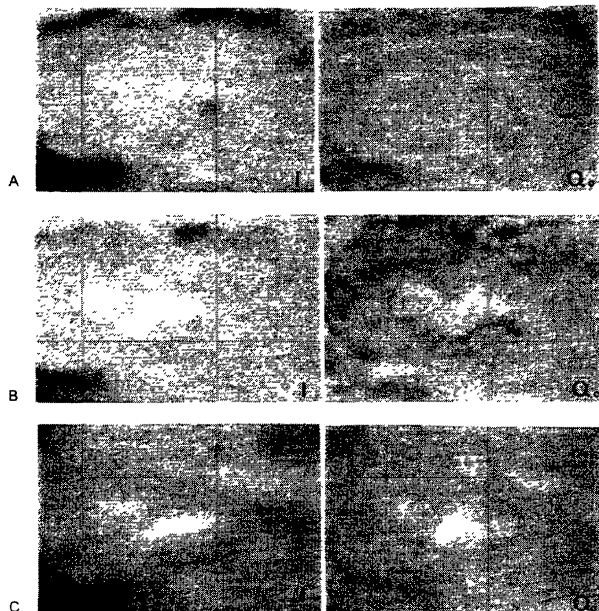
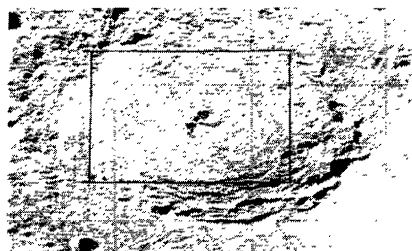
In early June I received a letter from Prof. Audouin Dollfus of the Meudon Observatory concerning a forthcoming paper of his.<sup>1</sup> The careful collection and analysis of polarimetric measurements of the planets has been a major feature of Dollfus' life's work.<sup>2</sup> Back in 1992, Dollfus had been making routine video polarimetric measurements of various lunar features in order to study the texture of the lunar surface. (Measurement of the degree of polarisation of the Moon's reflected light, and its variation with phase angle, can provide much information unobtainable by other ground-based techniques).<sup>3</sup> At that time the Meudon video polarimeter was a virtually new device: it produces simultaneous video images in orange light (centred at 610nm), and images in linearly polarised light. It is therefore a means of making numerous polarisation measures instantly over a certain area;

much easier than pointwise visual work with a fringe polarimeter, the classic technique. Other studies with the instrument showed that it was well suited for use on all Solar System bodies.<sup>4</sup> Dollfus installed the instrument on the 1-metre Cassegrain telescope, as illustrated here. One evening, a supposedly routine set of measurements gave a surprising result.

Langrenus (62°E, 9°S) is a comparatively recent crater, 140km in diameter, possessing a cluster of central peaks.<sup>5</sup> On 1992



The 1-metre Meudon Cassegrain telescope, with A. Dollfus observing with the video polarimeter (1992).



**Top:** Lunar Orbiter IV image of Langrenus, 1967. (NASA)

**Below:** *left*, images of the crater in unpolarised light (I); *right*, images in polarised light (Qo). **A.** Before the brightening, 1992 Dec 29 (angle of illumination 54°, phase angle 116°). **B.** The first brightening, 1992 Dec 30 (angle of illumination 42°, phase angle 104°). **C.** Evolution of the brightening, 1993 Jan 2 (angle of illumination 12°, phase angle 72°). (A. Dollfus).

December 29 (with the last New Moon having occurred on December 24, 00h 43m) the crater interior appears as a relevant process' [i.e., clouds of moon dust were lifted off the ground by the released gas]. Dollfus further notes that the 'TLP' occurred in a lunar region known to be particularly fissured or fractured, lying at the border of a Mare basin. Contrarily, however, the event occurred with the Moon near apogee (which occurred on December 29, 17h), a time of least tidal stress.

There are various historical reports of glows in lunar craters, many reported by members of the Association, and collectively known as Transient Lunar Phenomena (TLP), a term coined by Dr Patrick Moore.<sup>6</sup> Several catalogues have appeared<sup>7</sup> over the years. There can be little doubt that many of the reported brightenings, flashes and obscurations are not objective: Dollfus described how staring at the bright walls of Aristarchus, even under ideal conditions at Pic du Midi, caused illusory flashes to appear. Other reported 'events' may arise from specular reflectance, bad seeing, lack of aperture and (sadly) inexperience coupled with a vivid imagination. But even if many reports have nothing to do with the physics of lunar outgassing, there remain a certain number of well observed phenomena, of which the 1992 report is the latest.

Dollfus has now reported his work in the literature,<sup>8</sup> and interested readers are referred to his full papers for more details. He cites the following as being the best authenticated TLP:

**A. Alter** (Mt Wilson, 1956): obscuration of part of the floor of Alphonsus in blue light.<sup>9</sup>

**B. Kozyrev** (Crimean Observatory, 1958): reddish spot on central peak of Alphon-

## Notes and News

sus. Spectra exhibited the Swan bands of gaseous carbon dioxide.<sup>10</sup>

C. Greenacre & Barr (Lowell Observatory, 1963): red spots in Aristarchus, confirmed by others.<sup>11</sup>

D. Observers in Georgia (Abastumani Observatory, 1952): unusual drift in polarisation measurements over Posidonius.

E. Kolovos (Greece, 1988): flash photographed near Proclus C.<sup>12</sup>

BAA observers will recall other likely events observed by members of our own Lunar Section, reported from time to time in this *Journal* and in the Lunar Section *Circulars*.

This new account by Dollfus, the world's leading expert on Solar System polarimetry, gives credence to some of the past reports, and should serve as an encouragement to the Association's lunar observers. Though the chances of discovering an objective TLP remain very small, there is every reason to continue looking. At the same time only highly objective observations will throw any light upon the current state of the Moon's interior.

Perhaps the Moon is not dead after all!

**Richard McKim**

### Notes and references

- 1 A. Dollfus to R. J. McKim, private communications, 1999 June 1 and 25
- 2 For a full description of the technique of

polarimetry, with many illustrations and a biography of Dollfus, see: A. Dollfus, *50 Ans d'Astronomie*, EDP Sciences, 1998.

- 3 G. A. Steigmann's general reviews are useful here: *J. Brit. Astron. Assoc.*, **98**(2), (3) and (4) (1988)
- 4 Dollfus A., 'Une nouvelle méthode d'analyse polarimétrique des surfaces planétaires', *C. R. Acad. Sci. Paris*, **311**, series II, 1185–1190 (1990)
- 5 See any good lunar atlas; that by Antonin Rükl (Hamlyn) is excellent.
- 6 Patrick Moore gives an historical sketch of TLP in his book *Guide to the Moon*, Lutterworth, 1976. An early summary of obscurations was given by Walter Goodacre in the sixth Report of the Lunar Section, *Mem. Brit. Astron. Assoc.*, **13**(3), 70–72 (1906): the first reference I can find in BAA history.
- 7 A list of TLP from 1540 to 1967 was given by B. M. Middlehurst, J. M. Burley, P. A. Moore & B. L. Welter, *NASA Technical Report R-277* (1968). Moore extended this catalogue up to 1971 in *J. Brit. Astron. Assoc.*, **81**(5), (1971). A further update to 1978 was published by Moore again, in the BAA *Lunar Section Circular*, **13**(7), (1978).
- 8 Dollfus A., 'Lueurs sporadiques sur la lune', *C. R. Acad. Sci. Paris*, **327**, series IIB, 709–714 (1999). A longer paper has been submitted to *Icarus*.
- 9 Kozyrev N. A., *Nature*, **198**, 979–980 (1963). (See also Ref. 10, pp 308–309)
- 10 Alter D., (Ed.), *Lunar Atlas*, Dover, New York, 1968, pp 6, 308–309
- 11 Greenacre J. A. & Barr E., *Sky & Telesc.*, **26**, 316 (1963)
- 12 Kovolos G. et al., *Icarus*, **76**, 525–532 (1988)

### Saturn Section

## A colourful Saturn

Saturn's ring system continues to open its southern face sunward, the Saturncentric latitude of the Earth (B) reaching  $-21^\circ$  in August 1999. Correspondingly, the southern regions of Saturn's globe are better placed for inspection from our Earth-based vantagepoint. A steady flow of CCD images and reports from visual observers has kept the Director well informed of any interesting developments that appeared on Saturn during the current apparition. The power of the Internet means that many of these images and reports have been dispatched by e-mail to the Director only hours, and sometimes minutes, following the observation being made at the telescope, often from locations far overseas. The Section is indebted to Antonio Cidadao, Toshihiko Ikemura, Isao Miyazaki, Martin Moberley, Damian Peach and Tan Wei Leong for images received so far; three recent examples appear on the next page.

Damian Peach uses a 300mm Schmidt-Cassegrain and SBIG ST-5c CCD camera combination to good effect to image Saturn from his site close to Kings Lynn, Norfolk, in addition to visual observations of the planet. Toshihiko Ikemura operates a 310mm aperture Newtonian in conjunction with a NEC PICONA digital still camera from Nagoya City, Japan. Both Ikemura and Peach commented on the presence of a 'green' and 'red' band on Saturn early in the apparition. Observing visually on July 18, Peach reported a 'pale green band' in the southern hemisphere towards the pole, which is also evident on images by Ikemura going back to the beginning of July. Measures of Saturncentric latitude carried out on a CCD image by Miyazaki on August 11 infer that the 'green band' coincides with the latitude of the South South Temperate Zone (SSTeZ), occupying a range of  $-45$  to  $-55^\circ$  south. Peach reported the 'green band' still very much in evidence on September 13.

The 'red band' was brought to the attention of the Section via an e-mail from Ikemura to Peach and forwarded to the Director on August 18. The 'red band' occupies a region approximately  $-60$  to  $-70^\circ$  south and contrasts with the distinctly blue South Polar Cap (SPC) which crowns the south pole of Saturn. The 'red band' appears to cover what could be considered to be the northerly confines of Saturn's South Polar Region (SPR) and was confirmed visually by Peach on September 13.

The principle belt visible in the southern hemisphere remains the South Equatorial Belt (SEB) which Peach described as 'rather broad but definitely not double' on July 30. CCD images show the belt as having a prominent north component (SEB(N)), dark

## A double Good Lighting Award in Alloa

BAA Campaign for Dark Skies' Glasgow officer, John Farquharson, presented two CfDS Good Lighting Awards last July in Alloa, Scotland, in recognition of a 'sky-friendly' lighting scheme around

the 14th-century Alloa Tower, a well known local tourist attraction. Councillors Willie Alexander and Andrew Millar, of Clackmannanshire Council, Piers de Salis, Tower Manager, and Douglas Brennan of Lighting Design Partnership were on hand to receive the certificates.

The recently restored tower has been open to the public since 1996, and the council specified an environmentally sensitive lighting scheme which was designed by Mr Brennan. Links have been forged between local astronomical societies and the Council, and local and national publicity has ensured that the message implicit in the awards has been heard by many.

**Bob Mizon**, *Coordinator, Campaign for Dark Skies*



Left to right: Piers de Salis (Tower Manager), Douglas Brennan (Lighting Design Partnership), John Farquharson (CfDS), Cllrs Willie Alexander and Andrew Millar. Photo: Dr Ken McKay (Stirling AS).