THE COMET'S TALE

Newsletter of the Comet Section of the British Astronomical Association

Volume 9, No 1 (Issue 17), 2002 April

JOEL HASTINGS METCALF MINISTER, HUMANITARIAN, ASTRONOMER

Richard R Didick

Joel Hastings Metcalf was born in Meadville, Pennsylvania, on January 4th, 1866, the son of Lewis Herbert and Anna (Hicks) Metcalf. Lewis was a Civil War Veteran, a soldier who lost a leg at the first battle of "Bull Run" and was held at Libby prison until exchanged and discharged.

At the approximate age of 14, Joel Metcalf borrowed Richard Proctor's book, *Other Worlds Than Ours*, from his Sunday school library which led him to an interest in astronomy. This interest was further inspired by the conjunction of Jupiter and Mars on May 7th, 1879, when the planets were slightly over one degree apart, and/or July 22nd, 1881, when the two planets were separated by only seven minutes of arc.

It is said that he made his first telescope at the age of 14. Though he does not give his age, this version of his experience in making a telescope is taken from his own article written in "Popular Astronomy" magazine 1906, vol. XIV, 'An Amateur's Observatory'. *"The writer's first instrument consisted of a two-inch spy-glass, by a French maker, which glass he mounted equatorially. He obtained a high power (100) negative eye-piece from Alvan Clark and Sons, which showed enough planetary detail to keep up his interest. A few years after this he was fortunate enough to get a three and five eighths inch glass by Henry Fitz; this he also mounted equatorially and enjoyed for many years*".

The following account, taken from a newspaper article about him when he lived in Taunton, is somewhat dubious since he actually bought the 7-inch refractor. "*When but 14 years old he built a telescope and ground out a lens with which he was able to observe with success all the principal heavenly bodies. This was a small two-inch lens. His next attempt was a three-inch lens and he later made one of three and a half inches, which he subsequently sold to Harvard College. He followed up these two with a seven-inch visual instrument*." (This refractor was purchased at an auction in Keesvile, New York, as mentioned below).

In his 1906 Popular Astronomy article the Reverend also provides a very informative account of the transportation of his 7 inch Alvin Clark across the ice of Lake Champlain. This is that account in his words: "*In 1901 he was fortunate enough to come into possession of a seven-inch equatorial manufactured by Alvan Clark and Sons in 1885. It had been the property of Elisha Arnold, a wealthy amateur astronomer of Keesville, N.Y., and after his death his executors sold it at a nominal sum. The telescope had been little used and was practically as good as new with all the excellence which one expects from the Clark glasses. In addition to the equatorial, which was the best for the size the Clarks make, the outfit contained a small transit instrument, a four-inch telescope with an altazimuth mounting, a fine micrometer, and a spectroscope which could be used with either a single prism or a grating, both of which were provided.*

In the observatory at Keesville, the instrument was mounted in a very substantial dome, being fastened to a fine cut granite base weighting about a ton. In a February when Lake Champlain had frozen over, the whole outfit was loaded on sleds and started across the Lake on the ice. The ice was thick enough - but there are always long cracks in the Lake due to expansion and contraction! These cracks will sometimes run out as far as four miles from the islands. The moving went well until off Juniper Island, when the large sled having the dome and the cut granite pier fell into a crack, and would have gone to the bottom but for the projected sides of the dome which reached out to the solid ice! There the load stuck with the water within a foot of the top of the dome until after three days when, by laying timbers on the ice, and rigging derricks, the whole was secured with the exception of the four-inch telescope, which now lies buried peacefully in the bottom of the Lake!

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Subscription to the Section newsletter costs £5 for two years, extended to three years for members who contribute to the work of the Section in any way, for example by submitting observations or articles. **Renewals should be sent to the Director and cheques made payable to the BAA.** Those due to renew should receive a reminder with this mailing.

Section News from the Director

Dear Section member,

For once I haven't visited the Antarctic this winter, but at least the beginning of January saw a spell of cold weather that froze the East Anglian fens near Whitlesey and allowed me to join team-mates from the University Ice Hockey Club on the ice. Generally however the weather here has been very frustrating, with far too few gaps in the cloud to glimpse the batch of recent discoveries, though April has seen a great improvement. In particular the amateur discoveries of 2002 C1, 2002 E2 and 2002 F1 fully confirm the point that I have been making that LINEAR and the other search teams are not covering the entire sky and there is still plenty of opportunity for amateur discovery. Who will make the next discovery from these shores ?

C/2002 C1 has generated a lot of media interest, with items about it in many of the broadsheet newspapers, mostly following on from a Society for Popular Astronomy press release. I did an interview about the comet for the BBC2 programme 'Final Frontiers' and you may have seen this at the beginning of the month. This was followed by a live interview for the Today programme at 7:40 on a Saturday morning. John Humphreys gave me a much easier time than the majority of his political interviewees! Several newspapers have also been after information.

The revised edition of the Section Guide to Observing Comets was finally finished a few days before Astrofest. With 58 pages and colour covers, it is packed full of information, much of it revised since the last edition, so do buy a copy. **In particular I urge you to read and implement the reporting guidelines.** It takes Guy and myself a lot of time to reformat the observations of many people who nearly get it right, but not quite, and we would much rather spend the time observing! The Guide is available for £4, post free, from the BAA Office.

The Section meeting in February was a great success and full reports are presented for those who were not able to come. The format of Section meeting, lunch and BAA main meeting seems to have been appreciated and I will try and make similar arrangements for the next Section meeting, which is provisionally scheduled for May 2003, possibly in association with the George Alcock memorial lecture.

Since the last newsletter observations or contributions have been received from the following BAA members: James Abbott, Sally Beaumont, Neil Bone, Owen Brazell, Denis Buczynski, Roger Dymock, Kenelm England, Len Entwisle, James Fraser, Mario Frassatti, Mike Gainsford, Maurice Gavin, Massimo Giuntoli, Peter Grego, Werner Hasubick, Guy Hurst, Nick James, Geoffrey Johnstone, Gordon MacLeod, Brian Manning, Steve Martin, Cliff Meredith, Martin Mobberley, Gabriel Oksa, Roy Panther, Robin Scagell, Jonathan Shanklin, David Strange, Melvyn Taylor, John Vetterlein, Alex Vincent and Graeme Waddington and also from: Jose Aguiar, Alexandre Amorim, Alexander Baransky, Sandro Baroni, Nicolas Biver, Reinder Bouma, Nicholas Brown, Jose Carvajal, Tim Cooper, Matyas Csukas, Mike Feist, Rafael Ferrando, Sergio Foglia, Stephen Getliffe, Antonio Giambersio, Guus Gilein, Bjorn Granslo, Roberto Haver, Michael Jager, Andreas Kammerer, Heinz Kerner, Attila Kosa-Kiss, Gary Kronk, Martin Lehky, Rolando Ligustri, Pepe Manteca, Michael

Mattiazzo, Maik Meyer, Antonio Milani, Andrew Pearce, Maciej Reszelski, Tony Scarmato, Hirita Sato, Carlos Segarro, Giovanni Sostero, Graham Wolf and Seiichi Yoshida (apologies for any errors or omissions). Without these contributions it would be impossible to produce the comprehensive light curves that appear in each issue of *The Comet's Tale.* I would welcome observations from any groups which currently do not send observations to the BAA.

Comets under observation include: 7P/Pons-Winnecke, 19P/Borrelly, 44P/Reinmuth, 51P/Harrington, 65P/Gunn, 77P/Longmore, 96P/Machholz, 1999 U4 (Catalina-Skiff), 1999 Y1 (LINEAR), 2000 SV74 (LINEAR), 2000 WM1 (LINEAR), 2001 A2 (LINEAR), 2001 B2 (NEAT), 2001 HT50 (LINEAR-NEAT), 2001 K5 (LINEAR), 2001 MD7 (LINEAR), 2001 N2 (LINEAR), 2001 OG108 (LONEOS), 2001 Q2 (Petriew), 2001 Q5 (LINEAR-NEAT), 2001 Q6 (NEAT), 2001 R1 (LONEOS), 2001 R6 (LINEAR-Skiff), 2001 TU80 (LINEAR-NEAT), 2001 W2 (BATTERS), 2001 X1 (LINEAR), 2002 C1 (Ikeya-Zhang), 2002 E2 (Snyder-Murakami) and 2002 F1 (Utsunomiya).

As a postscript to the end of my first paragraph, I was inspecting SOHO images on April 12 when I noted a comet entering the C3 field, moving slowly up and to the left. This turned out to be an independent co-discovery, although SOHO policy is that only the first observer receives credit.

Jonathan Shanklin

Tales from the Past

This section gives a few excerpts from past RAS Monthly Notices and BAA Journals.

150 Years Ago: Mr Graham got observations of Encke's comet on the 23rd and 24th inst [Jan], and states that the proximity of a ninth magnitude star troubled him very much; its light weakened that of the comet considerably. He adds that he never before had been so much impressed with the vapoury nature of such bodies, and that one could readily imagine that the comet of Encke could be compressed into the compass of a nutshell. In the report to the 32nd AGM it was noted 'that Faye's comet on its first return in 1850, was observed at Cambridge nearly five weeks before it was seen at any other observatory, and the observations were continued till March 4 of last year. Great credit is deservedly given to the assistants at the observatory, for the manner in which these observations were secured under circumstances of unusual difficulty. An interesting paper 'On the supposed Period of Revolution of the Great Comet of 1680' by Mr Hind appeared in the March issue of MN. This was a spectacular comet and its appearance had attracted the attention of Newton, which perhaps lead to his gravitational theory. Halley thought it might be periodic and associated it with a comet which had appeared in 1106 and perhaps in 531. The author discusses the observations, and concludes that if Halley had had access to them he might have come to a different conclusion about its possible periodicity. [Vol XII, No 5, pp 142-150]. The April issue announces a new publication 'Cometic Orbits, with copious notes' by Edward J Cooper, which had 786 orbits for 198 distinct comets, and cost 5s (25p) *[The 14th edition of the Catalogue of Cometary Orbits has some 2000 orbits for 1500 comets and costs 4400p*]

100 Years Ago: In the October comet notes is recorded 'Prof Hale writes that the Yerkes Staff are in no way responsible for the erroneous intelligence of the position of the great comet in April last, which was circulated in the daily press. Prof Frost suspected a comet-like object north of the sun, but it was much too vague to make any announcement. However a newspaper reporter happened to be on the premises, and got wind of it; his zeal outran his discretion, and the erroneous position was distributed broadcast.' The December Journal has a report on the Great Comet of 1901, which from the description was reminiscent of Hale-Bopp. There was much discussion of the comet's tails and it seems to have had a prominent ion tail or tails. Mr E Walter Maunder followed this up in February by describing Professor Bredikhine's theory of comet tails. Dr D Smart presented a paper on the return of Halley's comet at the December meeting, at the request of Mr Crommelin. He noted that a meteor shower might occur around May 17, with a radiant near ζ Aqr. Mr Crommelin commented that there was a prize for the best theory of the comet, but he didn't know if any Members of the Association were competing for it. *[A C D Crommelin and P H Cowell were subsequently awarded the Lindemann prize for their work on the comet's orbit.]* He also agreed that it would be worth looking for meteors, but didn't know if any were seen. At the next meeting W F Denning pointed out that the May Aquarids were in fact associated with Halley's comet. The April Journal records names and instruments of members of the Section and these included: W F Denning, Bristol, 25cm L; John Grigg, Thames, New Zealand; Edwin Holmes, London, 31cm L; Rev. T E R Phillips, Croydon, 24cm L; Dr R J Ryle, Brighton, 5cm R.

50 Years Ago:. The Presidential Address by Dr Gerald Merton, at the October AGM was on the subject of Comets and their Origins. He appeared to favour the flying sandbank model, although some of the fragments had to be at least a kilometre across. He mentioned Whipple's recent paper which presented the model of a conglomerate of ices and dust. He commented that Whipple "has tried, perhaps successfully - I am not competent to judge - to show that the various physical activities of a comet can be accounted for." At the February meeting Dr Merton gave news of some recent comets. Gordon Taylor had made a naked eye observation of P/Schaumasse at its recent favourable return. [the comet appears to have outburst at this return] Dr Steavenson remarked that comet Wilson-Harrington appeared similar to drawings of the Great Comet of 1882, but on a smaller

scale. A member of the audience, Mr H Thomson responded that "I can remember well seeing the 1882 comet! It was one of the first astronomical observations I ever made."

Obituary: Yuji Hyakutake, the discoverer of the spectacular comet that graced our skies in the spring of 1996 died on 2002 April 10, aged 51, from a heart attack. He graduated from the Kyushu Industrial University, where he studied photography and worked as a lithographer for a regional newspaper in Kagoshima. He began comet hunting in 1988 when he lived in Fukouka, but moved to Kagoshima, which is 1000 km south-west of Tokyo, to get darker skies. He conducted his searches from a mountain top site, some 10 km from where he lived, using a pair of 25x150 Fujinon binoculars. After his discovery he became head of the municipal observatory at Aira near his home. He continued comet hunting, but without further success. He is survived by his wife Shoko and two sons.

Professional Tales

Subaru Approaches Origin of Comets - First Estimate of the Formation Temperature of Ammonia Ice in a Comet
National Astronomical Observatory of Japan: Science, November 2nd, 2001

Observations made with the High-Dispersion Spectrograph (HDS) of Subaru Telescope have, for the first time, allowed astronomers to measure the formation temperature of ammonia ice in a comet. The temperature of 28 ±2 Kelvin (about -245°C) suggests that Comet LINEAR (C/1999 S4), was formed between the orbits of Saturn and Uranus. These observations provide us with not only direct evidence of the environment in which the comet was born, but also establish brand new methods for probing the origin of comets.

Comet LINEAR was discovered in 1999 by the Lincoln Near Earth Asteroid Research project (LINEAR), operated by the MIT Lincoln Laboratory. A team of researchers from the National Astronomical Observatory of Japan, the HDS group, and the Gunma Astronomical Observatory made spectroscopic observations of Comet LINEAR on July 5th, 2000, during the commissioning phase of HDS, when the comet was bright.

The team concentrated on the emission lines produced when NH2 molecules which have been previously excited, lose some energy and emit light at a series of characteristic wavelengths. Previous studies indicate that NH2, which consists of one nitrogen and two hydrogen atoms, is produced when the powerful Solar UV rays free a hydrogen atom from the ammonia (NH3) gas which is constantly boiling off the comet. The emission lines of the NH2 molecules should therefore contain information on their parent ammonia molecules.

Molecules like NH2 and NH3 which contain two or three hydrogen atoms are classified as either "ortho" or "para", depending on whether the quantum mechanical spins of the hydrogen atoms are aligned or not. The ortho-to-para ratio strongly depends on the physical environment, and would have been preserved when the molecules were confined into the icy cometary nuclei. The observed ratio can therefore reveal the temperature at the time the ice was formed.

Molecules in the ortho and para states emit radiation at wavelengths that are very close together, but subtly different due to the differences in alignment between the spins of the hydrogen atoms. The resolving power of HDS is high enough to separate these lines and determine how much light is being emitted by molecules in the ortho and para states. Using code written by Mr. Hideyo Kawakita of the Gunma Astronomical Observatory, the strengths of the emission lines from NH2 could be modeled and compared with the observations to determine the ratio of ortho to para molecules in Comet LINEAR. Furthermore, the team investigated the ortho-to-para ratio of the parent NH3 molecules and estimated that the formation temperature of the ammonia ice to be 28 ±2 Kelvin, which suggests that Comet LINEAR was formed between the orbits of Saturn and Uranus in the primordial Solar System nebula.

Until now, the formation temperature had only been determined for water ice in comets, and this is the first time that it has been measured for another molecule. Dr. Jun-ichi Watanabe of the National Astronomical Observatory of Japan, and a member of the team who performed this research, says "The brand new methods using NH2 molecules have great potential for studying the origin of comets. I have a high expectation for future results obtained by these methods, especially for short-period comets which are thought to have a different origin from long-period comets such as Comet LINEAR."

More on comet 19P/Borrelly
(An amalgamation of reports from the NASA press office, The American Association for the Advancement of Science, Astronomy.com and Space.com)

NASA scientists have strung together images of comet Borrelly to produce short movies of the comet as it travels through space. In one clip, the bare, rocky, icy nucleus wobbles back and forth to reveal its textured surface, with some smooth and some bumpy landscapes. The observations were taken when NASA's Deep Space 1 spacecraft was between 3,700 and 9,500 kilometres from the comet in September 2001.

In the second clip, jets of gas and dust shoot from all sides of the comet's nucleus as it rotates a quarter turn. The biggest jet, shooting from the central sunlit part of the comet, is probably in line with the axis around which the nucleus rotates. This large jet is eroding the central part of the comet, smoothing parts of the terrain into rolling hills. The erosion will eventually break the comet into pieces. Coarsely textured parts of the comet at both ends are geologically inactive areas.

The visible jet shoots out about 60 kilometres from the 8 kilometre, potato-shaped comet. Oddly,

material emanates mostly from the middle of the comet, whereas scientists had expected a more even distribution. Adding to the perplexity, the primary jet does not point toward the Sun, as expected based on observations of other comets. Borrelly dishes out so much material from its midsection -- some 2 tons every minute -- that it will likely break in half within 10,000 years, says Laurence Soderblom, U.S. Geological Survey researcher who led the imaging team.

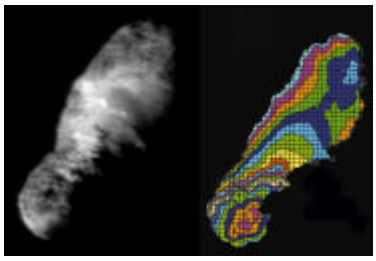
On average, Borrelly's nucleus reflects a low 2.5% to 3% of the light that strikes it, says Deep Space 1 project scientist Robert Nelson of the Jet Propulsion Laboratory in Pasadena, California. That's darker than the 4% reflectance measured for Comet Halley by the European Space Agency's Giotto spacecraft in 1986, and it rivals the dark hemisphere of Saturn's odd moon Iapetus and the rings of Uranus. Struggling to find a substance on Earth with shades as dark as Borrelly's, Nelson could come up with only one thing: photocopy toner.

The real surprise was a cluster of spots on the comet's nucleus that are three times darker than the rest of it, reflecting less than 1% of light. Analysis shows that these spots are real, not just shadows or pits, says Deep Space 1 imaging scientist Larry Soderblom of the U.S. Geological Survey in Flagstaff, Arizona. The team suspects that something in the comet's texture explains its inky blackness, as solid materials don't normally reflect so little light.

A fluffy or honeycombed texture is the most likely explanation, agrees space physicist Tamas Gombosi of the University of Michigan, Ann Arbor, a veteran of the Giotto mission. That texture traps and absorbs most photons of light, Gombosi says. Planetary scientists expect that mixtures of dust and ice turn black after billions of years of irradiation by photons and high-energy particles from the sun, but they don't yet know the details of that composition. Answers may come from Deep Impact, a projectile that will slam into Comet Tempel 1 in July 2005, when a flyby spacecraft will study material beneath its surface.

During the flyby, Deep Space 1 measured the interaction of the comet's coma with the solar wind. As expected, the solar wind flowed around the comet, but the nucleus was not at the centre of the flow. "The formation of the coma is not the simple process we once thought it was," said David Young of the University of Michigan, Ann Arbor.

Nordholt says that while Halley and Borrelly are quite different in terms of their exact composition and behaviour, they are all-in-all very much alike, confirming suspicions that most comets formed in a similar manner and at a similar time - back when the solar system was gathering itself together some 4.6 billion years ago. "Borrelly seems to come from the same primordial stuff that Halley comes from," she said.



19P/Borrelly and topographic map

"The average geometric albedo is black, black, black, and ranges from extremely black to very black," said University of Tennessee geologist Dan Britt, who described the nucleus's color as being like that of photocopier toner. Amidst Borrelly's gloominess, however, Britt managed to identify four main types of landforms on the strange mini-world.

Mottled terrain covers the extended comet's far opposite ends, which are darker than Borrelly's mid-section. These rough areas are filled with bowl-shaped depressions, hills, streaks aligned with the nucleus's long axis, and notable variations in brightness. The ends lack any strong association with the comet's jets. Among the mottled terrain at the ends of the comet's nucleus are spots darker than anything else on Borrelly. These black patches reflect just 0.7 to 1 percent of incoming light, Britt reported.

The middle of the nucleus consists of Borrelly's brightest and smoothest terrain. It also contains the comet's fourth type of feature: dark, flat-topped mesas surrounded by bright slopes. According to Britt, the smooth terrain and slopes probably reveal the comet's freshest material and are the likeliest source of its jets.

Britt pointed to another curious characteristic on Comet Borrelly's nucleus. Several ridges and fractures cut across the comet's slimmest section, which separates its two lobes. Jürgen Oberst of Germany's DLR Institute of Space Sensor Technology and Planetary Exploration, added that a three-dimensional stereo elevation map of the nucleus shows that the smaller end of the bowling-pin-shaped nucleus is not aligned with but tilted (by 30^{o} to 50^{o}) relative to the larger half. Britt and Oberst suggest these observations indicate Borrelly's nucleus may actually be a contact binary - composed of two pieces loosely bound to each other.

Comets are sometimes described as "dirty snowballs," but the close flyby detected no frozen water on Comet Borrelly's surface. It has plenty of ice beneath its tar-black surface, but any exposed to sunlight has vaporized away, say scientists analyzing data from Deep Space 1, managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif.

"The spectrum suggests that the surface is hot and dry. It is surprising that we saw no traces of water ice," said Dr. Laurence Soderblom of the U.S. Geological Survey's Flagstaff, Ariz., station, lead author of a report on the Borrelly flyby results appearing in the online edition of the journal Science. "We know the ice is there," he said. "It's just well-hidden. Either the surface has been dried out by solar heating and maturation or perhaps the very dark soot-like material that covers Borrelly's surface masks any trace of surface ice."

"Comet Borrelly is in the inner solar system right now, and it's hot, between 26 and 71 degrees Celsius, so any water ice on the surface would change quickly to a gas, " said Dr. Bonnie Buratti, JPL planetary scientist and co-author of the paper. "As the components evaporate, they leave behind a crust, like the crust left behind by dirty snow. It seems to be covered in this dark material,

which has been loosely connected with biological material." Buratti said. "This suggests that comets might be a transport mechanism for bringing the building blocks of life to Earth." Comets may have played an important role in supplying organic materials that are required for life to originate.

Soderblom points out that Borrelly's old, mottled terrain with dark and very dark spots -- different shades of black -- are apparently inactive. Ground-based observations estimated that 90 percent of Borrelly's surface might be inactive, and the observations taken by Deep Space 1 show that this is indeed true.

"It's remarkable how much information Deep Space 1 was able to gather at the comet, particularly given that this was a bonus assignment for the probe," said Dr. Marc Rayman, project manager of the mission. Deep Space 1 completed its original goal to test 12 new space technologies and then earned extra credit by achieving additional goals, such as the risky Borrelly flyby. "It's quite exciting now as scientists working with this rich scientific harvest turn data into knowledge."

Contour spacecraft on its way to prelaunch testing. The Johns Hopkins University Applied Physics Laboratory, Office of Communications and Public Affairs

The CONTOUR spacecraft has been shipped to Goddard SFC for prelaunch testing; on its way to a July 2002 launch.

After launch, the solar-powered CONTOUR will visit at least two comets as they travel through the inner solar system. From as close as 100 kilometres, the spacecraft will take the most detailed pictures ever of a comet's nucleus; map the types of rock and ice on the nucleus; and analyze the composition of the surrounding gas and dust. CONTOUR's targets include comet 2P/Encke in November 2003 and 73P/Schwassmann-Wachmann in June 2006, though the spacecraft can also be sent toward an as-yet-undiscovered comet. The data will provide clues into the similarities and differences between comets.

From Kuiper belt object to cometary nucleus: The missing ultrared matter. Jewitt DC: Astronomical Journal 123 (2): 1039-1049 Feb 2002

We combine new and published data to show that the optical color distributions of cometary nuclei and Kuiper belt objects (KBOs) are significantly different. The nuclei are, as a group, bluer than the KBOs, indicating that the surface chemical and/or physical properties of the two types of bodies are different. Objects in the dynamically intermediate Centaur class have optical colors like those of KBOs, while the color distribution of candidate dead comets is indistinguishable from that of the cometary nuclei. We infer that the surfaces of KBOs are modified upon entry to the inner solar system. We consider several mechanisms and conclude that the color change is most likely caused by the rapid burial of ancient surface materials exposed in the Kuiper belt. The distinctive, ultrared material that is present on the surfaces of some KBOs is absent on the cometary nuclei.

Cometary Outbursts - search of probable mechanisms - case of 29P/Schwassmann-Wachmann
P Gronkowski: AN 323 (2002) 1

This paper comes up with another theory of cometary outbursts. The author suggests that an outburst is triggered by polymerisation of HCN (either by uv light or solar wind electrons), which heats the nucleus and triggers a transformation of amorphous water ice into cubic ice. This gives rise to further heating and leads to the release of trapped CO or CO_2 and dust. However, the author admits that the mechanism cannot explain outbursts at small heliocentric distances.

Section Meeting Report, 2002 February 23

Members of the Comet Section and other comet enthusiasts met at the Scientific Societies Lecture Theatre in Saville Row on the morning of February 23. This was a new venture for the BAA, with the hope that a morning Section Meeting would tempt more people to attend the afternoon main BAA Meeting. The doors opened by 10:30 and a steady stream of people arrived for coffee and biscuits and a chance to chat. In total 33 people signed the register, though perhaps there were a few more than that present.

The Director, Jonathan Shanklin, opened the formal meeting at 11:00 and immediately apologised for the lack of comet guides, which were locked up in the BAA Office. The new edition of the Guide was a greatly expanded version of the first edition and he particularly drew attention to the section on formatting observations sent by email. Badly formatted observations took up hours of his and Guy Hurst's time every week. Once formatted correctly he was able to produce light curves from the observations and showed those for 2000 WM1, 2001 OG108 and 2002 C1, which should be readily observable in the coming months. He concluded by mentioning the recently discovered Marsden and Meyer groups of SOHO comets, of which the former were potential NEOs, with 1999 J6 approaching to within 0.03 AU of the Earth.

Guy Hurst then introduced a practical experiment in observing comet tails. He showed an overhead of 1996 B2 (Hyakutake), and asked us to estimate the length in 'daylight' and 'dark' conditions. The estimated length varied from 3.5 to 8°, with longer tails in dark conditions. He has provided the following report:

Estimating tail lengths of comets

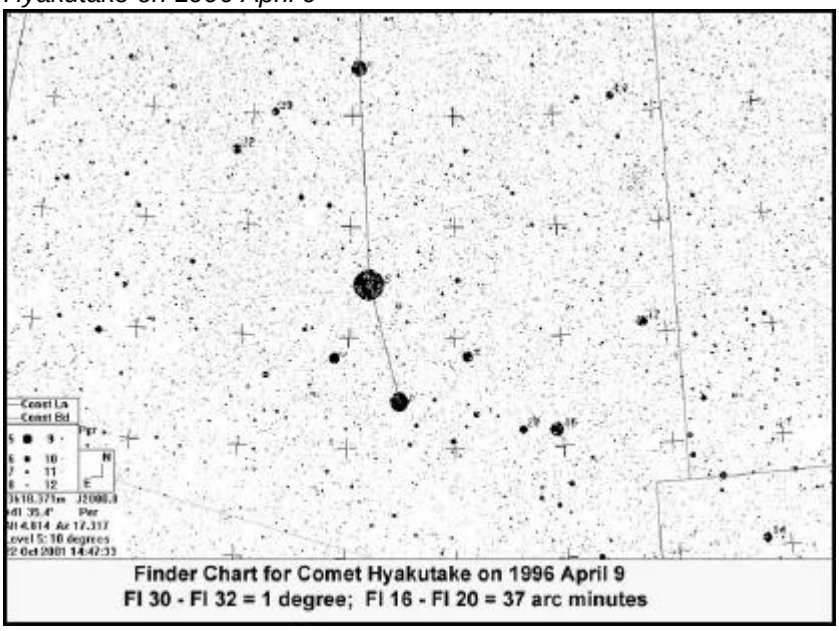
Guy M Hurst, Assistant Director, BAA Comet Section

The Ordinary BAA meeting held in London on Saturday February 23, was preceded, as an experiment, by a Comet Section meeting in the morning and this was very well attended.

With Jonathan's agreement, I conducted a practical experiment on the estimation of the tail length of Comet Hyakutake from studying a photograph secured by Arto Oksanen (Finland) of 1996 April 9 and which was shown on screen. At that time the comet was situated in Perseus near beta, probably better known to most of us as Algol.

Audience members were supplied with a map of the same area of sky, but without the comet depicted (figure 1), which had been derived from CD ROM software, *Guide 7.0* by Bill Gray of Project Pluto.

Figure 1: Field of Comet Hyakutake on 1996 April 9



In reality, this experiment had been conducted for the first time with students attending my evening class in Basingstoke back on 2001 November 5. We anticipated that fireworks might prevent direct viewing of the night sky so an in-class practical exercise was devised as a substitute!

Estimating tail lengths is quite difficult but the simplest technique is to select a gap between two nearby stars which is slightly longer than the tail and record a proportion of the star separation. Figure 1 shows the map supplied and two star gaps with approximate values were quoted:

Fl 30 to Fl 32 = 1 degree
Fl 16 to Fl 20 = 37 arc minutes

Leaving the lights on in the lecture theatre, 'votes' were cast which ranged from 4.0 to 6.5 degrees. Thirty people were brave enough to participate and the average tail length derived was 4.9 degrees. When they dimmed the lights, although leaving them on sufficiently to still see the map, this time the average was 5.9 degrees.

For comparison, 12 of my students, in a brightly light classroom on 2001 November 5, had an average of only 4.02 degrees. Five **visual** observers agreed use of their data for the classroom experiment and estimates recorded on that date from Mauro Zanotta, Bjorn Granslo, Melvyn Taylor, James Fraser and David Storey gave an average of 5.13 degrees.

It is obvious that if one observer is making estimates in strong light pollution and another from a dark country site, that the latter will usually record a much longer tail. However another effect, which may actually bias the observer, can occur when the tail is aligned with a pattern of bright stars, which was the case here with Fl 32 and Fl 30. The brain seems to automatically form a 'tidy' image of the tail just reaching the gap. Similar problems can occur with a comet in a densely populated portion of the Milky Way where mere star asterisms, if arranged in 'lines', can tempt observers to believe the tail is extended much further than is really the case.

The message from the BAA meeting was that comet observing is not quite as difficult as many people attending, who were new to the subject, might have supposed. However a careful technique is needed and for tail lengths making estimates against two pairs of stars and averaging the results might assist. To signify the conditions, it is also helpful to note the limiting magnitude in the field of the comet.

Thank you to all who participated in the experiment!

The next speaker was Giovanni Sostero, who observes from Remanzacco, Italy. The site suffers from severe light pollution but has 90 useable nights per year. He uses a Baker-Schmidt camera and a Newtonian-Cassegrain telescope with a local group of observers. He has provided the following summary of his talk.

CCD imaging of comets

Giovanni Sostero (Remanzacco Observatory, Italy)

The rapid development of optoelectronic technologies has also proved to be very helpful for amateurs astronomers. A classic 20cm Newtonian scope, fitted with a CCD camera, can normally reach down to magnitude 17 in few minutes of exposure time, even from moderately light polluted backyards. In cometary astronomy this is a real help, and by means of CCDs, amateurs can provide additional valuable data with at reasonable expense.

The 20cm Baker-Schmidt camera

We can distinguish among two very broad fields of applications: cometary head photometry and morphological studies. In the first instance it is almost mandatory to provide the CCD camera with an appropriate filter set. Sometimes unfiltered CCD photometry can be helpful without the adoption of standard filters (e.g., in the monitoring of faint comets) but if a serious observing program is to be undertaken, then a Johnson V filter and a Cousin I filter are the right choice. With the first one we would be able to measure the gaseous emissions of cometary comae (mainly due to the so called *Swan-band* emissions) while the second is helpful for the monitoring of dusty emissions. Professional astronomers are routinely using interference filters with very narrow bandpasses, in order to detect the light contribution from single molecular species. But unfortunately these filters suppress most of the incident light and for the amateurs very few comets will be bright enough to be a suitable target with their instrumentation. Normally the measurement of cometary magnitudes through a CCD camera is performed by means of the "aperture photometry" method. In this way, after the appropriate pre-processing, the net amount of ADU is counted within a selected window centred on the coma. Similarly we are measuring the net ADU values produced by a reference star of known magnitude within the same field. Then through Pogson's formula we are able to calculate the magnitude difference between the comet and the standard and, finally, the comet's brightness. Great care should be taken to eliminate the contribution of background stars within the coma and in the selection of the standard stars: their spectral class should preferably be similar to that of the Sun in order to minimise the systematic errors due to the non-linearity of a CCD's spectral sensitivity. It's very helpful to standardise this observing method, adopting an aperture size equivalent to some given amount at the comet distance (e.g. a "window" spanning 100,000 Km). Extended over a range of different apertures, this procedure will also give us some helpful hints about the degree of condensation of the coma. Great care should be taken when a comet is showing a dusty tail: in this instance we risk including in our aperture part of the tail, and this will produce an offset in the total brightness of the coma. An amateur, measuring a comet throughout its apparition by means of a CCD and a couple of standard filters, could provide some meaningful information on the gas/dust production rates of the given object, just taking regular brightness measurements with backyard instrumentation. Also the development of jets, hoods, halos and similar structures within the coma would be recognisable with CCD imaging, as well as the fine details sometime developing in the tails. In this kind of application, as well, the adoption of some standard filters will be helpful, because in this way we will be frequently able to distinguish among gassy or dusty features. For the monitoring of fine details within the central condensation, a scale of the order of 2 arcsec/px and a good seeing are mandatory. For relatively bright comets, this kind of observation is also possible from a heavily light polluted observing site. Some software packages are provided with rotational gradient algorithms that would enhance the subtle details within cometary heads. Anyway, they should be treated with great caution, because without some experience this kind of image processing could dangerously enhance the noise, creating some appealing (but non existant) artefacts! In conclusion, CCD technology is a powerful tool for comet observations. In my opinion, what is missing now in this field is a basic standardisation method, and some guidelines provided (hopefully) by professional astronomers, about which particular kind of observation is most valuable. Sometimes the amateurs are just wondering if it's better to obtain total magnitude estimations or high resolution imaging of fine details within the coma and/or the tail. Frequently we have no time to do both of them... Anyway digital astronomy would not be able to substitute for all visual observations: they are just complementing one another. And, at the end, the target is the same: to understand and enjoy those fuzzy spots of light that we like so much...

Remanzacco Observatory

The author would like to thank very much Guy Hurst and Jon Shanklin for their invitation and kind hospitality.

Alan Fitzsimmons, was our next speaker on 'Big Comets and Little Comets - How many of each ?', which he subtitled as a programme to get the most boring images of comets possible. At 0.5 AU a 1 km comet nucleus spans 0.003" - not even NGST will see it. It is also hidden by dust - a 2km nucleus will be hidden by 10^{18} particles, but this amount only weighs 1000 kg and emission is at 1kg/sec. Most comets produce more. Comets formed beyond Saturn and now reside in the Kuiper Belt. It needs a 30 metre or larger aperture telescope to study the smaller members. Comets are lost by collision or switching off, they also shrink, vaporise, split and fragment. There are usually more little ones than big ones of anything, or mathematically $N(D) \sim D^{\alpha} \Rightarrow \mathrm{Log}_{10}\ N(<H_{10}) \propto H_{10}$ which implies there are more faint comets. If the slope is > 0.5 it implies that most of the mass is in small comets and vice-versa. Collisional processes generate a slope of exactly 0.5.

Only two spacecraft have imaged comets, and spacecraft are expensive. HST can image a few comets per year and so a ground based programme is needed. Alan's programme is to measure Jupiter family comets to measure their size and to monitor activity beyond 3 AU. For 4% albedo, a 5 km nucleus at 3 AU is mag 19.5, whilst a 2 km nucleus at 5 AU is mag 24.1, so big telescopes are needed. Alan had used the 1-m JKT in 1995 and 1999 and the 4.2-m WHT in 1998.

48P was active at 3.4 AU, with a nucleus ≤7km D, cf 7P at 5.6 AU ≤5.2 km and 9P at 3.4 AU ≤4.8 km. Sometimes nothing is seen at all, eg 87P was >24.4 m_r at 4.3

AU, implying it was smaller than 1.2 km. 74P doesn't switch off at all and is <25km. Plotting N vs R_{10}, for D > 3km the slope is 0.32 implying for every comet bigger than 3 km there are 40 bigger than 1 km. This implies there are around 400 active comets in the inner solar system. The slope for NEOs, JFCs and MBAs is around 0.3, which is not collisional, however that for TNOs is 0.69 for D >50 km, but this can't go to small sizes or we would see the Kuiper Belt. The mass must be concentrated in large comets, and some have <0.7% albedo. [This report is based on my notes and subject to error, a full report from Alan will appear in the October Tale.]

At the conclusion of Alan's talk the meeting broke for a splendid lunch cooked by chef 'Louis'. There was plenty of chance for further discussion during the meal, which was served with a glass of wine. By the time we had finished eating, other astronomers were arriving for the main BAA meeting, which commenced at 14:30. There were lots of comments that the meeting had gone well, so we are planning another one for next year. The intention will be to have a morning session devoted to technical issues for the comet Section, with popular talks on comets in the afternoon as the topic of the main BAA meeting. This may include the George Alcock Memorial Lecture, which we hope will be given by a well-known professional expert on comets.

Joel Metcalf (Continued)

Continued from page 1

The observatory was installed in Burlington, Vermont, until 1905, when the writer moved to Taunton, Mass., and then presented the house and dome to the University of Vermont, his previous experience in moving it not being an encouragement to experiment".

The 13-inch triplet

As a telescope maker he has graced the astronomical world with an 8-inch f/80 inch ("broken-backed") comet hunter kept at South Hero, Vermont for use during his summer vacations, a 10- inch photographic triplet now newly restored and in the possession of the Boyden Observatory, University of the Orange Free State, Bloemfontein, South Africa, a 12-inch doublet (which he used in Taunton, Mass.) now located at Oak Ridge Observatory, Harvard, Massachusetts, and a 16-inch f/5.25 doublet, also located at Oak Ridge Observatory. He was in the process of making the 13-inch triplet used in the discovery of the planet Pluto when he died in 1925 (it was completed by C. A. Robert Lundin of Alvan Clark and Sons).

He graduated from Meadville Theological Seminary in 1890, then continued his education at Harvard Divinity School and obtained his degree of Ph.D. at Allegheny College in 1892. He married Elizabeth S. Lockman, of Cambridge, Massachusetts in September of 1891. They had two children, a son, Dr. Herbert E. Metcalf of San Leandro, California, and a daughter, Rachel Metcalf Stoneham. She later wrote a wonderful article about her life with "father", titled "A Nice night For Comets" in the January, 1939 issue of "Popular Astronomy," which was later republished in the September, 1979 issue of "Yankee" magazine. He served in Burlington, Vermont (1893-1903) where it appears his interest in grinding lenses began extensively. He corresponded with Prof. J. M. Schaeberle at Ann Arbour, MI.

Being at risk of a nervous breakdown, he interrupted his ministry for a year in 1902 to attend Oxford University where he is said to have attended an average of twenty-five lectures weekly on philosophy and religion. He was also given the keys to the observatory by Professor Turner, spending much time on astronomical problems. After Oxford, he took a year off to rest before returning to the ministry at the First Congregational (Unitarian) church in Taunton, Massachusetts (1904/5-1910). Taunton at that time was one of, if not the largest, manufacturer of silver products in the United States. It's streets are still lined with the many Victorian style homes, with long and extended porches where the residents would sit and pass away the day conversing with the passers-by.

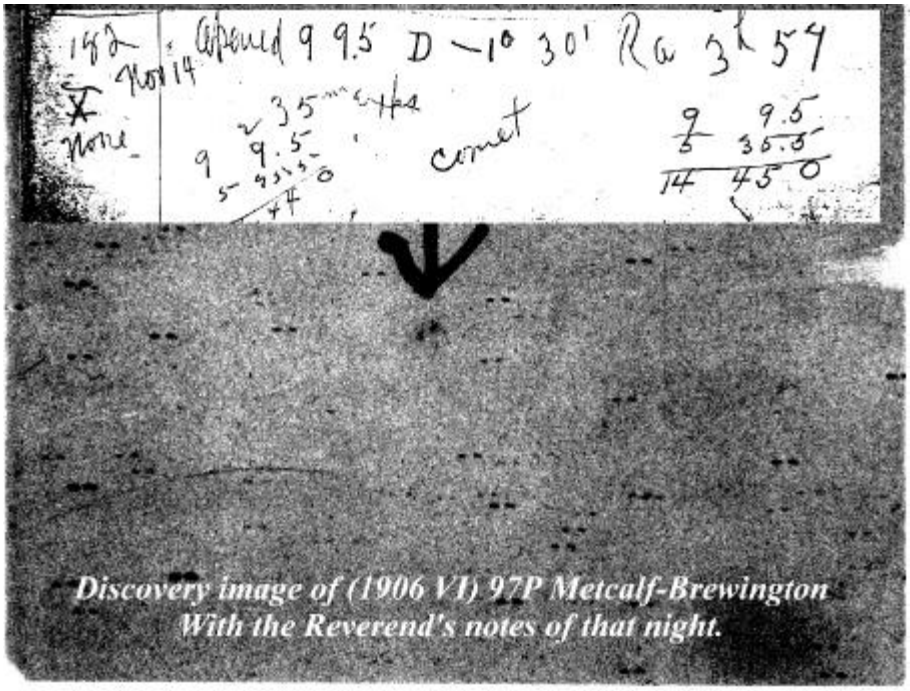
It was from Taunton that most of his asteroids were discovered and where his relationship with Harvard Observatory appears to have begun. He was also a member of the Visiting Committee of Harvard's Observatory. Reverend Metcalf enjoyed a lasting friendship and professional relationship with Dr. Pickering. He also became a member of the Visiting Committee for Brown University's Ladd Observatory, in Providence, Rhode Island.

One of the problems that he sought to follow up on from his time at Oxford was that of comparing and recording measurements from photographic plates take by "Schurs" of the "Praesepe Cluster in Cancer" with new photographs taken from Lick Observatory. He proposed this to Prof. Campbell, at Lick Observatory in a letter dated August of 1904.

His First Comet, 1906 VI, a Record Breaking Photograph

He and his family resided at 54 Summer Street where 38 of his 41 asteroids were discovered. The last four were discovered from Winchester, Mass. Taunton was also where he discovered the first of his 5 comets, 1906VI using his homemade 12-inch doublet, refracting telescope.

This comet was discovered in Eridanus on November 15th, 1906. (Metcalf states in his franticly written observing records that the comet was photographed on November 14th, at 3h 59m -1°). With a discovery magnitude of 11.5, having a round, 2 arcminute coma and a distinct central condensation. It had passed perihelion on October 10, 1906. After discovery the comet slowly faded as it continued on its path away from the sun. By December 10th the comet had reached 12th magnitude. It was last seen on January 16th, 1907 at 13th magnitude. Mr. Kronk goes on to say that it is worth mentioning that; M.E. Esclangon of Bordeaux Observatory observed two



Discovery image of (1906 VI) 97P Metcalf-Brewington With the Reverend's notes of that night.

nebulous objects near the comet on November 22nd which he described as easily visible. One was said to be elongated with a length of 30 arcseconds, the other was circular, with a diameter of 20 arcseconds. The objects were not detected the next evening, so he concluded that water was between the objective lenses. A periodic orbit was computed, but the comet was not recovered.

In early January, 1991, from Cloudcroft, New Mexico Howard Brewington walked out to his 16 inch reflector and began his search efforts for another new comet. (He had just discovered one on November 16, 1989.) It was during this search that he discovered another comet. After receiving the report at the Smithsonian Astrophysical Observatory in Cambridge, Mass., Dr. Brian Marsden noticed that the orbits to date matched those of the lost Comet Metcalf 1906VI. Therefore, although Brewington hadn't discovered a new comet, he did succeed where so many had failed, in the recovery of the Reverend's only short period comet, now designated 97P/Metcalf-Brewington. Also in reference to M.E. Esclangon of Bordeaux Observatory, observing "two nebulas objects" (mentioned above), it's an interesting note that when this author conversed with Dr. Marsden, after reading about the recovery of this comet, Dr. Marsden proposed that the comet may have divided at one time and that because of it's possible rotational period may only go through periods of flair ups when these areas of fresh material are exposed.

One of the greater surprises during my research of the Reverend's life was to learn that he held the record for amateur astro-photographical accomplishments. This he did from Taunton, Massachusetts, according to the unidentified newspaper account from the "Old colony historical society," Taunton, Mass. "*The most expert amateur astronomer in the country. This is the tribute paid by Professor Pickering of Harvard College to a young Bay State Minster. With a telescope which he himself invented and built, the Rev. Joel H. Metcalf of Taunton, a young Unitarian clergyman, has recently startled the scientific world by photographs he made of Phebe, one of the satellites of the planet Saturn, breaking all records for astronomical camera work. The smallest telescope to reflect the image of the ninth satellite has been until now the huge 24-inch instrument at the Harvard Observatory at Arequipa, Peru, but the Rev. Mr. Metcalf, with a 12-inch glass of his own make and a little observatory erected in his backyard, has accomplished the feat which for years has been regarded by scientists as impossible*".

Called To Winchester, Massachusetts. Some more Comets and a War!

He was next called to Winchester, Massachusetts (1910-1920), located just north of Boston, where many of his sermons and editorials were more than occasionally published in the "Winchester Star," the local newspaper.

His other four comets were visually discovered from South Hero, Vermont, where the Unitarian church had a summer camp. It was at this camp where he did most, if not all, of his lens grinding and comet hunting. He even expressed in an interview that he searched for comets "in Vermont, only when he was on vacation"!

His next comet, 1910IV was discovered on August 9th, at magnitude 8.5 and having a diameter of about 2 arcminutes. He used his trusty "broken-backed" comet seeker to discover this long period comet. This comet was discovered in Hercules. The comet's brightness was estimated as being between 9.5 -10th magnitude. The appearance of the comet depended on the instrument used through the month of August, ranging from 8th to 11th magnitude, with a nuclear region ranging from stellar to extremely diffuse. However, observations of its tail length remained constant as having a length of 1.5 arcminutes through the 11th. The comet reached perihelion on September 16th, at 10th magnitude. The coma remained at 2 minutes of arc. During the month of October the tail was reported to have a length of 18 minutes of arc, sustaining a magnitude of 10. The comet remained as such through November and December. January 29th brought on an outburst, bringing the magnitude to 9.5, and 9.3 by February 2nd. At that time the coma diameter was estimated at 1.5 minutes of arc, having a tail length of 5 minutes of arc. By late March the comet's magnitude was estimated at 11, by mid-April, 11.3 and by late May, 13th magnitude. It was last seen on June 23rd, close to magnitude 14.

Back on vacation again in South Hero, Vermont, on September 2nd, 1913 the reverend observed

through his comet-seeker and discovered 1913 IV in Lynx, at magnitude 9.5. The comet was moving slowly northward, and at first was thought to be Comet Westphal. By September 9th, the comet's diameter was estimated between 5-6 minutes of arc. On the 14th of September the comet passed perihelion at 1.36 AU. As the comet approached the earth its diameter grew to 10 minutes of arc with a magnitude of 7.5, passing within 13 degrees of the north celestial pole. After perigee, (0.62 AU) on October 8th, the comet quickly faded as it continued along its retrograde orbit. By October 17th this comet faded to magnitude 9.5 and by early November it had faded to 10th magnitude. On the 21st of November its magnitude was estimated at 11.5. 1913 IV was last seen on November 30th.

In 1918, Reverend Joel Metcalf volunteered to go to France "*Rev. Joel H. Metcalf of the Unitarian Church will sail for France the week of March 4th. Mr. Metcalf will enter the Y.M.C.A. as a secretary and his duties in the war zone will include, besides the regular routine work, hut work and giving illustrated travel talks to the troops ...*" (Winchester Star, February 22nd, 1918)

Rev Joel Metcalf at the front

During the War much of his time was spent at the front lines. He was known to have sung songs while marching in front of the men along marches that were sometimes 25 miles in length! He was also known to have carried some of the wounded and their backpacks as well. Here is part of a letter from Rev. Metcalf while in France, published in "The Calendar", the Unitarian newsletter. Extracts from Mr. Metcalf's Letters of July 25th and 28th:

"*When we broke the rush of Germans over the Metz to Paris road and French were in full retreat and when our boys came along they shouted, "La guerre est finis. Paris est perdu. Allez vite, etc." Instead of retreating, we advanced and fought the battle which centered around Belleau Woods. We relieved the marines for six days, so you can see I was right in it. In the day time I carried supplies into the woods, alone and with runners, and at night we sold supplies in the "Y." This place got several hundred 8-inch shells every day. They simply peppered the "Y." It got so every time I walked out, I made up my mind just what hole or depression in the ground I would drop into when I heard a shell (you can hear them 5 or 6 seconds).*

The second battle of the Marne, that is, the German offensive beginning on the night of July 14, was a tremendous effort on their part. For two nights previous, I had carried chocolate to the men on the bank of the river, and for weeks they had not fired a shot and their trenches in plain sight of where I was seemed deserted. We shelled them all the time with a strafing that must have done some damage. At 12:15 Monday night without an instant's warning they opened with a crash on a 50 mile front. It was the most terrible thing imaginable. Like a thunderstorm and a sudden fall of rain, the heavens seemed to drop steel everywhere for 10 miles back of our lines. I was in bed (that is on the floor) with my shoes off when the first shells fell. By the time I got my coat on and shoes and got to the door, the court yard was raining shells, so I rushed through the chateau, smashed open a window on the lee side of the shells and tumbled into a dugout with about 25 others who were there. The air reeked with gas, high explosive and mustard. Imagine me, the tears running out of my eyes from gas, crouching in a corner sitting on a nail (two nails in fact) gasping for breath, the mask cutting my ears and forehead till they ached. We sat thus for 9 mortal hours, like Paul praying for the day and the end of the bombardment, while the wild roar of the shrieking death continued outside.

At twelve o'clock the worst was over and we came out of our holes in the ground, to find the chateau, except the lower stories, in ruins and many of our company dead and wounded. I helped in first aid all that day. The only things to eat were the Y.M.C.A. stuff which we gave them, the wounded and unwounded, without money and without price, chocolate crackers, etc.- all that we had."

Rev. Metcalf was later offered and refused a position as an officer in the Army out of a desire to continue along with "his boys" at the front.

Coming Home, a Couple More Comets and Off He Goes Again....

Brorsen of Altona Observatory, Germany discovered a comet on July 20th, 1847 at magnitude 9.5, in the constellation Aries. He observed it as vary faint and very diffuse without any nucleus. By mid-August, as the comet approached the sun and earth it reached a magnitude of 6.5, having a tail length of about 15 minutes of arc. During that period the comet faded slowly as it continued toward the sun and was last seen on September 13th at magnitude 9.5.

This was the first comet that the Reverend found, on August 21st, 1919, after his arrival home from his duty in France on the evening of January 24th. His home was in Winchester, Massachusetts at the time. This comet was also independently discovered by 5 other observers at the time. By September 5th, the comet came within 0.19 AU of the earth, having a magnitude of 5.3 and a coma 15 minutes of arc in diameter. As the comet increased its distance from the sun its magnitude increased as well. It's tail reached a length of 1.5 degrees in late September. However, its coma diameter decreased. Two days later, on August 23rd, the Reverend was again out searching and came across Comet 1919 V in the constellation Bootes, at 8th magnitude. Borrelly independently discovered the comet from Marseilles, France. Although the discovery magnitude was estimated to be about 8th, most observers reported estimates of 9th magnitude, having a coma diameter of 2 minutes of arc. During September, as the comet

approached the sun and earth, it brightness increased to 8 or 8.5. A coma diameter was estimated at 4 minutes of arc. It reached 7th magnitude by November. The comet was lost to northern observers during late November as it entered the sun's glare after the 23rd, reaching perihelion on December 7th (1.12 AU). The comet was recovered on the 19th by observers in the Southern Hemisphere remaining visible until February 3rd, 1920.

A short time later, he volunteered to go back to Europe to assist in rebuilding the churches in Hungary. "*Boston's most eminent amateur astronomer, Rev. Joel H. Metcalf, has deserted his astronomical station on the top of the apartment house in which he lives in Winchester, and has gone to Hungary on a mission to the one hundred Unitarian churches in Transylvania. He is one of a commission of three appointed by the American Unitarian Association and has resigned from the pastorate of the Unitarian church of Winchester to fill his mission.*" (Old Colony Historical Society, Taunton, Mass. Unknown (Boston?) newspaper, circa ~ 1919.)

He visited many remote parts of the area, travelling by automobile, making one remarkable journey between Cluj and Bucharest, returning not without peril, with about $10,000 in currency. He made a journey out from Transylvania to England, returning with supplies. He was so loved by the people there that when two other commissions were sent back to the area in 1922 and 1924, they were continually asked when Dr. Metcalf would ever return.

Home Again, a Few More Discoveries and Time To Rest...

It more than appears that the war and his extensive travelling throughout the region of Hungary had taken a toll on this man's relentless body and spirit. Because this time, on returning home to the United States, he moved to Portland, Maine, and with a last spark of discovery, he was able to add at least three new variable stars to his long list of accomplishments, RV Leonis (1919), SV Hydri (1921) and WZ Ophiuchi (1922). He died on February 23rd, 1925 at the age of 59.

The author wishes to acknowledge the help of: Martha Hazen, Harvard College Observatory; Dr. Brian Marsden, Harvard Smithsonian Astrophysical Observatory, Cambridge, Massachusetts; Dorothy Schauimberg, Mary Lea Shane Archives of the Lick Observatory; Mike Saladyga, AAVSO; Don Machholz, ALPO; Gary Kronk.

If you wish to read more of his sermons, and/or other articles by and about Reverend Metcalf you may visit the Joel H. Metcalf Memorial Homepage at http://personal.tmlp.com/richard/metcalf.htm.

Any additional information about this man will be greatly appreciated by Richard. Data on two areas of his life are very much needed: they are any records of his time spent at Oxford, and in Cluj, Romania. You may contact him personally at: richard@tmlp.com

Review of comet observations for 2001 October - 2002 April

The information in this report is a synopsis of material gleaned from IAU circulars 7740 – 7880 and The Astronomer (2001 October – 2002 March). Note that the figures quoted here are rounded off from their original published accuracy. Lightcurves for the brighter comets are from observations submitted to The Astronomer and the Director. A full report of the comets seen during the year will be published in the Journal in due course. I have used the convention of designating interesting asteroids by A/Designation (Discoverer) to clearly differentiate them from comets, though this is not the IAU convention.

SOHO Kreutz group comets

1996 V1 SOHO (IAUC 7760, 2001 November 23)
1996 Y2 SOHO (IAUC 7807, 2002 January 24)
1998 H5 SOHO (IAUC 7842, 2002 March 5)
1998 H6 SOHO (IAUC7842 , 2002 March 5)
1999 H8 SOHO (IAUC 7839, 2002 March 1)
1999 H9 SOHO (IAUC 7839, 2002 March 1)
1999 J13 SOHO (IAUC 7839, 2002 March 1)
1999 K17 SOHO (IAUC 7842, 2002 March 5)
2001 T6 SOHO (IAUC 7750, 2001 November 10)
2001 T7 SOHO (IAUC 7750, 2001 November 10)
2001 U1 SOHO (IAUC 7746, 2001 November 6)
2001 U2 SOHO (IAUC 7746, 2001 November 6)
2001 U3 SOHO (IAUC 7746, 2001 November 6)
2001 U4 SOHO (IAUC 7746, 2001 November 6)
2001 U5 SOHO (IAUC 7746, 2001 November 6)
2001 U7 SOHO (IAUC 7750, 2001 November 10)
2001 U8 SOHO (IAUC 7759, 2001 November 21)
2001 U9 SOHO (IAUC 7759, 2001 November 21)
2001 U10 SOHO (IAUC 7759, 2001 November 21)
2001 V1 SOHO (IAUC 7759, 2001 November 21)
2001 V2 SOHO (IAUC 7759, 2001 November 21)
2001 V3 SOHO (IAUC 7764, 2001 December 3)
2001 V4 SOHO (IAUC 7764, 2001 December 3)
2001 V5 SOHO (IAUC 7764, 2001 December 3)
2001 W3 SOHO (IAUC 7764, 2001 December 3)
2001 W4 SOHO (IAUC 7764, 2001 December 3)
2001 X4 SOHO (IAUC 7797, 2002 January 19)
2001 X5 SOHO (IAUC 7797, 2002 January 19)
2001 X6 SOHO (IAUC 7797, 2002 January 19)
2001 X7 SOHO (IAUC 7797, 2002 January 19)
2001 X9 SOHO (IAUC 7797, 2002 January 19)
2001 Y2 SOHO (IAUC 7797, 2002 January 19)
2001 Y3 SOHO (IAUC 7797, 2002 January 19)
2001 Y4 SOHO (IAUC 7797, 2002 January 19)
2001 Y5 SOHO (IAUC 7797, 2002 January 19)
2002 C3 SOHO (IAUC 7839, 2002 March 1)
2002 C4 SOHO (IAUC 7839, 2002 March 1)
2002 D1 SOHO (IAUC 7839, 2002 March 1)
2002 E1 SOHO (IAUC 7850, 2002 March 12)
2002 E3 SOHO (IAUC 7862, 2002 March 28)
2002 F2 SOHO (IAUC 7862, 2002 March 28)
2002 F3 SOHO (IAUC 7862, 2002 March 28)
2002 G2 SOHO (IAUC 7873, 2002 April 10)
2002 G4 SOHO (IAUC, 2002)
2002 G5 SOHO (IAUC, 2002)
2002 H1 SOHO (IAUC, 2002)

were discovered with the SOHO LASCO coronographs and have not been observed elsewhere. They were sungrazing comets of the Kreutz group and were not expected to survive perihelion. Some of these comets show no tail at all and it is possible that some supposed observations of Vulcan were actually tiny Kreutz group comets.

Meyer group comets

Brian Marsden notes on MPEC 2002-C28 that: While 2002 C3, like some 95 percent of the comets discovered by SOHO, is clearly a member of the Kreutz sungrazing group, it is rather less appreciated that as many as 11 of the two dozen or so non-Kreutz comets discovered by SOHO also seem to be interconnected. The close temporal pairs C/2000 C2-2000 C5, C/2000 C3-2000 C4 and C/2000 Y6-2000 Y7 were remarked on when these comets were announced (cf. MPEC 2000-

C52, 2000-C53 and 2001-B08). There is also the pair C/1999 J6 (MPEC 2000-F30) and C/1999 U2 (MPEC 1999-U29), comets with i = 27 deg separated by more than five months. M. Meyer was the first to point out the similarity between the orbits of C/1997 L2 (MPEC 1997-M06, MPC 35205) and C/2001 X8 (MPEC 2002-B01, MPC 44505), comets with i = 72 deg separated by 4.5 years; it also appears that the poorly observed comet C/2001 E1 can be associated with this pair, if the orbit with i = 107 deg on MPEC 2001-F52 is replaced by the one with i = 73 deg on MPC 44505.

1997 G7 (SOHO) This comet, discovered by Rainer Kracht on February 8, is clearly a seventh member of the Meyer group (cf. IAUC 7832), as already suggested by M. Meyer on Feb. 10 on the basis of preliminary measurements. [MPEC 2002-D16, 2002 February 21, IAUC 7841, 2002 March 4]

1997 H4 (SOHO) & 1997 H5 (SOHO) These comets, discovered by Rainer Kracht on February 11 and 12 in SOHO C2 images, appear to be the eighth and ninth members of the Meyer group (cf. IAUC 7832, MPEC 2002-D16). [MPEC 2002-D41, 2002 February 27, IAUC 7841, 2002 March 4]

1999 K16 (SOHO) & 1999 L9 (SOHO) These comets, discovered by Rainer Kracht on February 22 and 25 in SOHO C2 images, are the tenth and eleventh members of the Meyer group [MPEC 2002-E05, 2002 March 1]

1999 F3 (SOHO) Another Meyer group comet, discovered by Rainer Kracht on 2002 April 14 in C2 images from 1999 March 17.

1998 A2 (SOHO), 1998 A3 (SOHO) & 2000 B8 (SOHO) Meyer's discovery C/2000 B8 (in C2 on 2002 March 4) is a member of the Meyer group. C/1998 A2 (discovered in C2 on 2002 March 3) and A3 (discovered in C2 on 2002 March 8), detected by Kracht, are members of the Marsden group, objects that could in fact have orbits differing significantly from the assumed parabolas. Nevertheless, the objects clearly have orbits that pass rather close to that of the earth (postperihelion), and D. A. J. Seargent has remarked on the similarity to that of the Daytime Arietid meteor stream, with q = 0.09 AU and L = 104, B = +10 (degrees, J2000.0; cf. MPEC 2002-E18). Although q is still larger, and there are substantial differences in the other orbital elements, the L and B values are also similar to those of both comet 96P/Machholz 1 and the Quadrantid meteor stream. [MPEC 2002-E25, 2002 March 9] I pointed out to Brian Marsden that members of this group are NEOs and can potentially come very close to the Earth post perihelion. Indeed the published orbit for 1999 J6 gives a miss distance of 0.03 AU, making it the fourth on the list of comet close approaches, although the orbit is rather uncertain.

1999 M3 (SOHO) A possible member of the Marsden group of comets was discovered by Rainer Kracht in archival SOHO imagery from 1999 June 30 on 2002 February 27.

Marsden group comets

1999 N5 (SOHO) & 1999 N6 (SOHO) The longitudes and latitudes of perihelion (deg, J2000.0) of the orbits for these comets, which were discovered by Rainer Kracht in SOHO C2 images on 2002 March 12, are L = 107.1, B = +12.0 and L = 96.0, B = +10.9, respectively. C/1999 N5 is a clear member of the Marsden group and C/1999 N6 a likely member of the more extended population (cf. MPEC 2002-E18, 2002-E25). Possibly C/1999 N6 is quite closely associated with C/1999 M3 (though not so much with C/2000 O3), but the orbit solution is not unique. [MPEC 2002-F03, 2002 March 16]

Kracht group comets

In a communication to the Minor Planet Center on Mar. 3, R. Kracht suggested that, on the basis of the apparent motion, there was some loose association between C/1999 M3 and C/2000 O3 (cf. MPEC 2000-Q09), despite the evident difference in the usual orbital elements. Nevertheless, it can be noted that the perihelion directions are L = 103.9, B = +11.4 (degrees, J2000.0) for C/1999 M3 and L = 100.6, B = +10.8 for C/2000 O3. On Mar. 4, Kracht wrote that, again despite differences in the usual orbital elements, the perihelion direction for C/2000 O3 is close to the average value, L = 102.6, B = +9.7, for the four clear members of the Marsden group (cf. IAUC 4832). A more extended relationship among these comets is therefore suggested. [MPEC 2002-E18, 2002 March 7]

1999 P6 (SOHO), 1999 P7 (SOHO), 1999 P8 (SOHO) & 1999 P9 (SOHO) These comets were discovered by Rainer Kracht on March 17 (P6) and March 19 in SOHO C2 images. C/1999 P6, 1999 P8 and 1999 P9 belong to the Marsden group, and C/1999 P7 to the Meyer group.

R. Kracht points out that, like C/1999 N6 (cf. MPEC 2002-F03), C/2001 Q7 (cf. MPEC 2001-R36) does not have a unique orbit solution, an alternative low-i solution being:

T = 2001 Aug. 21.80, q = 0.0445, e = 1.0, Peri = 54.77, Node = 43.95, Incl = 13.28

He suggests that, with C/1999 M3 and perhaps C/2000 O3, these comets form part of the extended Marsden population (i.e., having the same longitude and latitude of perihelion). Indeed, we could say that these four comets belong to the Kracht group. [MPEC 2002-F43, 2002 March 22]

2002 A4 (SOHO) A Meyer group comet discovered in archival C2 images from January 1 by Rainer

7P/Pons-Winnecke was discovered by Jean Louis Pons with a 0.12-m refractor at Marseilles in 1819, but was then lost until rediscovered by Friedrich August Theodor Winnecke with a 0.11-m refractor in Bonn in 1858. He demonstrated the identity and recovered the comet in 1869. The perihelion distance has slowly been increasing since the early 1800s. It can make close approaches to the Earth and did so in 1927 (0.04 AU), 1939 (0.11), 1892 (0.12), 1819 (0.13) and 1921 (0.14). An outburst of the meteor shower associated with the comet, the June Bootids, occurred on 1998 June 27.6.

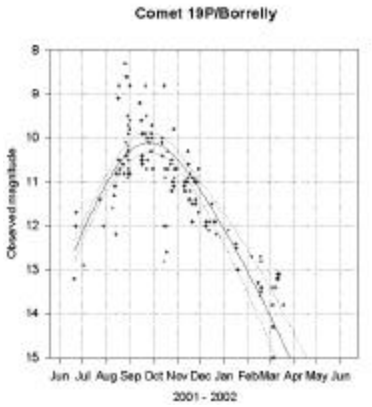
It has proved fainter than expect and no confirmed visual observations have so far been received. It is a morning object, and was predicted to reach 11th magnitude in May after which it is unfavourably placed for observation from the UK.

Observers at lower latitudes will be able to follow it until September. It moves eastwards, being in Aquila in April and Aquarius in May.

19P/Borrelly appears to have peaked in brightness in late September at around 10^{th} magnitude according to the light curve, however observations by a couple of observers put it brighter than 9^{th} magnitude. When brightest it was a morning object, which discouraged observation. After perihelion it steadily faded, becoming more diffuse, although it initially approached closer to the Earth.

2002 December 21, Pepe Manteca

The uncorrected preliminary light curve from 120 observations is m = 6.8 + 5 log d + 18.4 log r



22P/Kopff was discovered photographically by A Kopff at Konigstuhl Observatory in 1906, when it was around 11^{m}. The next return was unfavourable, but it has been seen at every return since then. Following an encounter with Jupiter in 1942/43 its period was reduced and the perihelion distance decreased to 1.5 AU. The following return was one of its best and it reached 8^{m}. The next return was unusual, in that it was 3^{m} fainter than predicted until perihelion, when it brightened by 2^{m}. It suffered another encounter with Jupiter in 1954, but this made significant changes only to the angular elements. 1964 was another good return and the comet reached 9^{m}.

UK observers may follow it until May, but the comet is likely to be only 15^{th} magnitude. Although it continues to brighten, the solar elongation decreases and it is poorly placed when at its brightest (11^{m}) at the end of the year.

29P/Schwassmann-Wachmann is an annual comet which has frequent outbursts and seems to be more often active than not at the moment, though it rarely gets brighter than 12^{m}. It spends the year in Capricornus reaching opposition in early August, fairly close to Neptune. The comet is an ideal target for those equipped with CCDs and it should be observed at every opportunity. Unfortunately opportunities for UK observers are limited, as its altitude will not exceed 20° from this country.

Carl A Wirtanen discovered **46P/Wirtanen** at Lick in 1948. It is in a chaotic orbit, and its perihelion distance was much reduced due to approaches to Jupiter in 1972 and 1984. It has been reported to outburst, but BAA data suggests that it was just rejuvenated after the perihelion distance was reduced. It is a target for the Rosetta mission. A December perihelion would give a close approach to the Earth, however the present period is exactly 5.5 years so that perihelia alternate between March and September.

The comet is a morning object. More southerly placed observers may pick it up in June, but UK observers will probably not find it until August, when it is fading from its best magnitude of 11. The solar elongation only increases from around 40º to 60º by the end of the year, so it is never very well placed. In June it is in Cetus, moving into Taurus in July, Gemini in August and Virgo in November.

65P/Gunn was discovered in 1970 after a perturbation by Jupiter in 1965 had reduced the perihelion distance from 3.39 to 2.44 AU. In 1980 two prediscovery images were found on Palomar plates taken in 1954. The comet can be followed all round the orbit as it has a relatively low eccentricity of 0.32. The comet doesn't reach perihelion until next year, but already a few observers have picked it up at between 14^{th} and 15^{th} magnitude. The solar elongation is now decreasing, but it should remain visible throughout the summer.

The uncorrected preliminary light curve from 11 visual and CCD observations is m = 4.8 + 5 log d + [15] log r

67P/Churyumov-Gerasimenko was discovered in 1969 September, by Klim Churyumov and Svetlana Gerasimenko on a plate taken for 32P/Comas Sola at Alma Ata observatory. It reached its present orbit after a very close encounter (0.05 AU) with Jupiter in 1959, which reduced the perihelion distance from 2.74 to 1.28 AU. At a good apparition, such as in 1982, when it approached the Earth to 0.4 AU and was well observed by the comet section, it can reach 9^{m}.

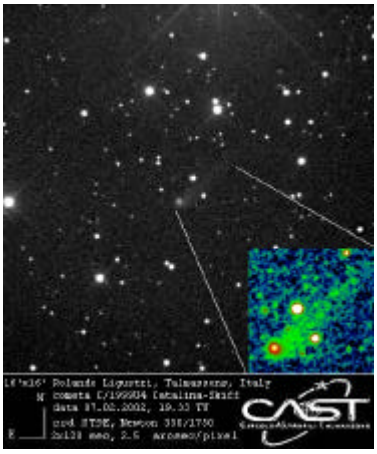
The comet is another morning object, and even at best it probably won't exceed 12^{th} magnitude. Southern observers may pick it up around the solstice, but from the UK we won't pick it up before August, when it will be fading. Again the elongation is not good, increasing from around 50º to 100º at the end of the year. The comet's track closely parallels that of 46P/Wirtanen, entering Gemini in August and ending the year on the border of Leo and Virgo.

95P/Chiron is an unusual comet in that it is also asteroid 2060. It reaches 17^{m} when at opposition in June in Sagittarius. CCD V magnitudes of Chiron would be of particular interest as observations show that its absolute magnitude varies erratically. It was at perihelion in 1996 when it was 8.5 AU from the Sun and will be nearly 19 AU from the Sun at aphelion in around 50 years time.

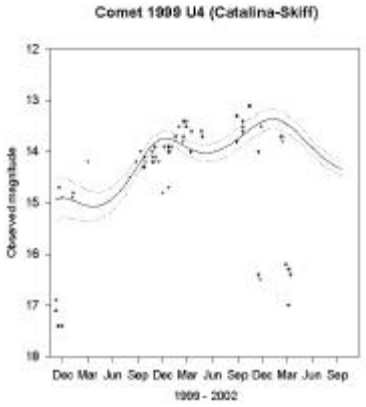
96P/Machholz The orbit of 96P/Machholz is very unusual, with the smallest perihelion distance of any short period comet (0.13 AU), which is decreasing further with time, a high eccentricity (0.96) and a high inclination (60°). Studies by Sekanina suggest it has only one active area, which is situated close to the rotation pole and becomes

active close to perihelion. The comet may be the parent of the Quadrantid meteor shower. It is rarely sufficiently well placed to see visually and the 2002 return is no exception. However, at perihelion on 2002 January 8 it was only a few degrees from the Sun and was seen in the SOHO LASCO coronagraphs from January 6 to 11. On January 7 it was about 2nd magnitude with a 4 degree tail. It brightened to perhaps -2 just after perihelion on January 9.

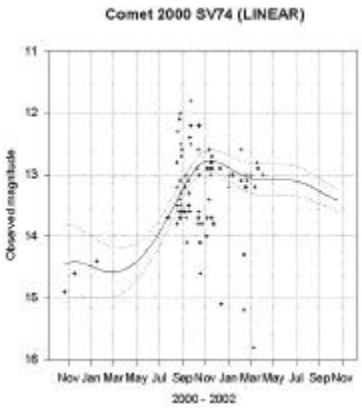
1999 U4 (Catalina-Skiff) The object is very distant, but the extrapolated visual light curve suggests that it should be visible until the autumn, fading from 14th magnitude. CCD observations suggest that the comet is much fainter than this, perhaps 17th magnitude. The uncorrected preliminary light curve from 55 observations is m = 6.9 + 5 log d + 4.6 log r



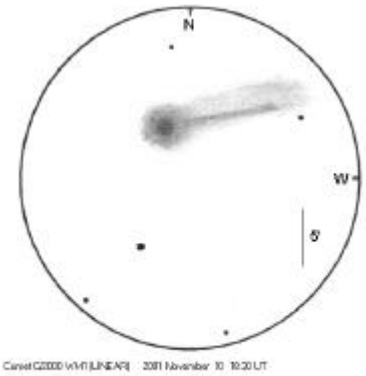
2002 February 7, Rolando Ligustri



2000 SV74 (LINEAR) The extrapolated light curve suggests that the comet will slowly fade from 13th magnitude. As with many comets the visual observations generally put the comet as being brighter than CCD observations. The uncorrected preliminary light curve from 82 observations is m = 8.0 + 5 log d + 3.9 log r.

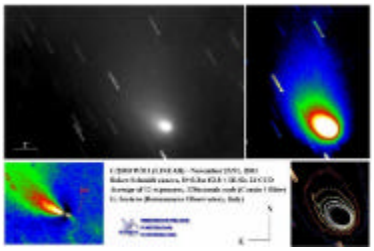


2000 WM1 (LINEAR) Brian Marsden notes on MPEC 2001-U43 [2001 October 23], that 'The "original" and "future" barycentric values of 1/a are +0.000500 and -0.000266 (+/- 0.000002) AU**-1, respectively.' The original value is greater than 10^{-4}, hence the comet is probably not a new arrival from the Oort cloud and has made at least one previous visit to the inner solar system.



2001 November 10, Gabriel Oksa

J. Watanabe, National Astronomical Observatory (NAO) of Japan, reports the following antitail lengths and position angles for this comet from I-band CCD images taken by H Fukushima with the NAO 0.50-m f/12 reflector (noting the earth's passage through the orbital plane of the comet on Nov. 20.18 UT): Nov. 16.503, > 8'.5, 283 deg; 17.542, > 6'.5, 300 deg; 18.526, > 7'.9, 302 deg; 19.555, > 6'.2, 317 deg; 22.372, > 4'.7, 1 deg. Small scale jet-like structure near the nucleus was also recognized on these images. [IAUC 7762, 2001 November 29]



2001 November 25.91 Giovanni Sostero, Remanzacco Observatory

I observed it on October 9 under relatively poor conditions, using the Northumberland refractor x230. The comet was surprisingly easy to see and I estimated it at around 12th magnitude. An observation with the Thorrowgood refractor on October 23 put the comet at 10.3, generally diffuse but with a small star-like condensation.

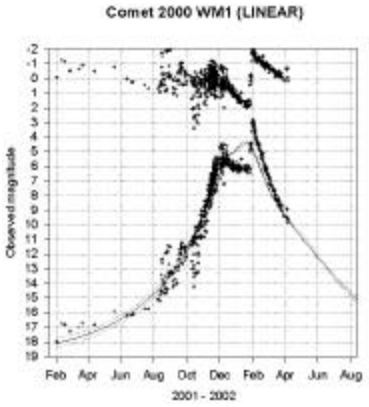
2001 December 5, Martin Mobberley

By the end of November 2001 the comet had reached 5th magnitude and was an easy object. It then slowly faded and observations by Southern Hemisphere observers in mid January put the comet at 6th magnitude, about a magnitude fainter than suggested by the preliminary light curve.

2002 March 23, Rolando Ligustri

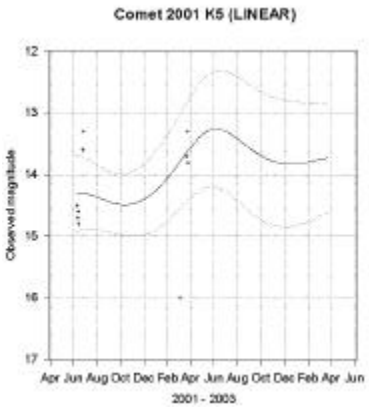
Andrew Pearce reported an outburst on 2002 Jan 27.85UT: m1=4.6, Dia=3.5', DC=8...20x80B...Andrew Pearce (Nedlands, Western Australia)[Comet has clearly undergone a significant brightness increase in the last 24 hours or so.

Surface brightness of the coma has increased significantly. Faintly visible to the naked eye even at only 10 deg altitude. Tail visible 0.5 deg long in PA 195 deg. Estimate made in 8x40B at the same time: m1=4.6, Dia=4', DC=8. I suspected something may be up the previous morning but the observation was hampered with the comet only 1' away from a 6th mag star. Quick examination of the comet through a 20cm reflector (90x) revealed an intense central condensation which appeared distinctly non stellar. No evidence of any split, however the telescope probably lacked the degree of resolution required to confirm this.]



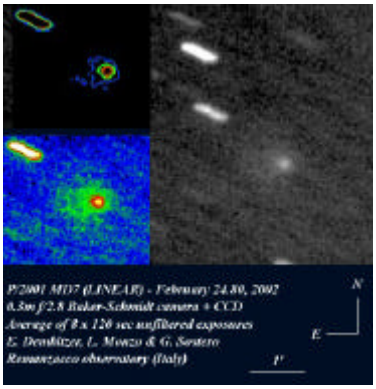
The uncorrected preliminary light curve from 715 visual observations is m = 7.1 + 5 log d + 10.6 log r, though this makes no allowance for the outburst. It will be visible until August 2002.

2001 K5 (LINEAR) The comet is distant and will remain at around 14th mag visually for some time. This is LINEARs 64th comet.

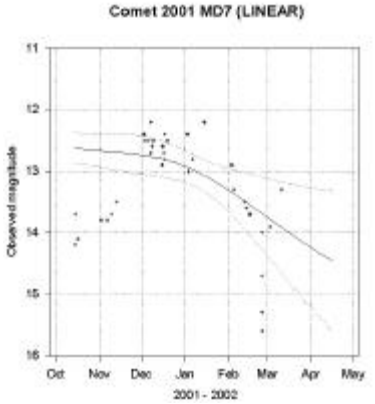


The uncorrected preliminary light curve from 11 visual observations is m = 4.9 + 5 log d + 7.1 log r

2001 MD7 (P/LINEAR). Michael Mattiazzo observed the comet on October 14 when it had brightened to 14.2 in his 0.27-m SCT x88. By December it had brightened to around 12.5. It moved north, but was not very well placed and few Northern Hemisphere observers reported observations. The visual light curve is not very well defined, but can be represented by m = 11.3 + 5 log d + [10] log r from 39 observations.



2002 February 24, Sostero et al



2001 N2 (LINEAR) may reach 13th magnitude between May and August.

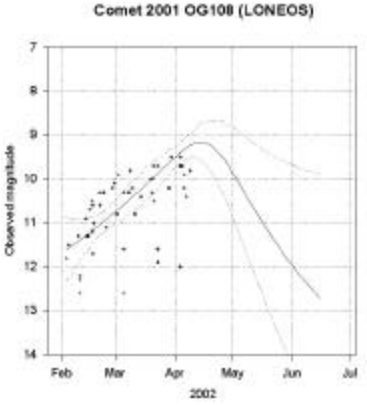
2001 OG108 (LONEOS) As the clue of a cometary type orbit suggested, this object did eventually show cometary activity and brightened rapidly

2002 April 1, Rolando Ligustri

An apparently asteroidal object reported by LONEOS was announced on MPEC 2001-P40 last Aug. 13. Numerous observers could not detect any cometary activity, despite the cometlike orbit. Now approaching perihelion, the object has finally shown cometary activity, detected by several observers as indicated by the following reported total magnitudes and coma/tail data from CCD images: Jan. 11.44 UT, 16.1, 0'.4 coma, 0'.5 tail in p.a. 230 deg (A. Nakamura, Kuma, Ehime, Japan, 0.60-m reflector); 22.39, 14.7, diffuse (S. Wakuda, Shizuoka, Japan, 0.25-m reflector); Feb. 1.40, 13.5, 0'.9 coma, broad tail toward west with the longest segment being 0'.9 long in p.a. 220 deg (Nakamura); 1.41, 12.8, fan-shaped coma spanning p.a. 200-345 deg (T. Oribe, Saji, Tottori, Japan, 1.03-m reflector). Recent astrometry and the orbital elements appear on MPEC 2002-C04. [IAUC 7814, 2002 February 2].

I observed it on February 9.81 and estimated it at 11.3: in the Thorrowgood refractor. The current light curve suggests that it will rapidly fade from around 10th magnitude. It also suggests that the comet might have been observable to visual observers a month before the first reports were made.

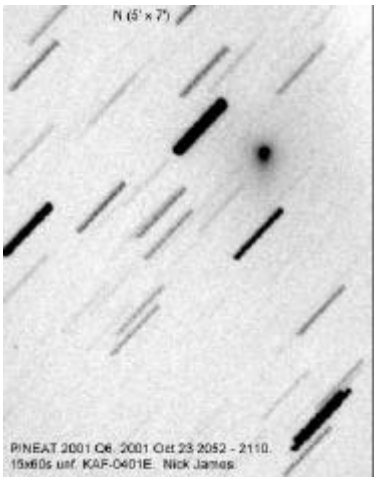
The uncorrected preliminary light curve from 46 visual observations is m = 10.2 + 5 log d + 5.9 log r, though this is a poor fit.

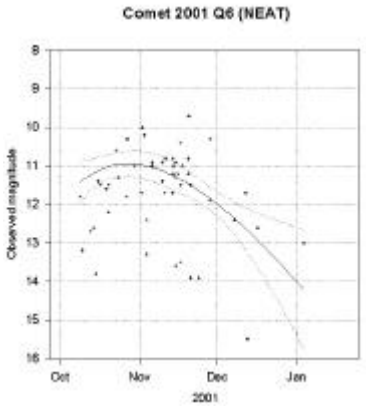


2001 Q4 (NEAT) The latest elements give T as 2004 May 16 with q at 0.96 AU. The value of 1/a is 0.000043, suggesting that this is a new visitor from the Oort cloud. [MPEC 2002-A87] The comet should be a bright object in

May 2004. Adopting a conservative magnitude law (7.5 log r), suggests a peak of around 3rd magnitude, whereas the standard 10 log r gives around 0 magnitude.

2001 Q6 (NEAT) Initial observations suggested that the comet could reach 14th mag at high northern declination in October, however it was unexpectedly a couple of magnitudes brighter. This is NEAT's 15th comet and their 13th this year.





The uncorrected preliminary light curve from 44 visual observations is m = 5.5 + 5 log d + 41.0 log r, but again this is a poor fit.

A/2001 SS107 (LINEAR) is an asteroid discovered by LINEAR on September 20, which has a perihelion distance of 1.51 AU and a period of 5.46 years in a typical Jupiter family comet orbit. Perihelion was on 2002 March 9.4.

2001 T5 (SOHO) A non Kreutz comet discovered by XingMing Zhou on October 17 in C3 images from October 14. [IAUC 7750, 2001 November 10]

2001 TU80 (LINEAR-NEAT) An 18th mag object independently discovered and reported as nebulous with a 3" coma by NEAT at Palomar on Nov. 16.53 UT has been identified by G. V. Williams, Minor Planet Center, with an apparently asteroidal object reported on Oct. 13.44 and 17 by LINEAR (m_2 = 19.8; discovery observations on MPS 39482) and on Oct. 19 by NEAT at Haleakala (MPS 40840), from which an apparently routine minor-planet orbit was computed (MPEC 2001-V35). Following posting on the NEO Confirmation Page, P. Kusnirak at Ondrejov found the comet to be moderately condensed with a 0'.3 coma on CCD images taken on Nov. 17.2 with a 0.65-m f/3.6 reflector. [IAUC 7753, 2001 November 17] The comet is in a short period orbit of 7.2 years, with perihelion of 1.94 AU in mid December and will fade.
The comet passed within about 0.1 AU of Jupiter in 1985, prior to which it was in a more distant, less eccentric orbit.

2001 U6 (LINEAR) An apparently asteroidal object of 19th mag discovered on Oct. 29.40 by LINEAR, posted on the NEO Confirmation Page due to its unusual motion, has been found to be cometary by J. Ticha and M. Tichy (Klet, diffuse with "a slight coma" on Nov. 3.8 UT) and by R. Trentman (Louisburg, KS, Nov. 6.3). [IAUC 7746, 2001 November 6] The comet is distant and will reach perihelion in August 2002. It will not come within visual range.
Brian Marsden notes on MPEC 2002-C55 that the "original" and "future" barycentric values of 1/a are +0.001080 and +0.001158 (+/- 0.000051) AU**-1, respectively. This suggests that it is not a new comet from the Oort cloud.

A/2001 UU92 (NEAT) is an asteroid, of 19th magnitude, discovered by NEAT on October 19.32. With a period of 5.63 years, the orbit is typical of a Jupiter family comet. It will be at perihelion at 1.05 AU at the end of December. [MPEC 2001-W34]

A/2001 VJ75 (LINEAR) is an asteroid, of 20th magnitude, discovered by LINEAR on November 12.45. With a period of 5.20 years, the orbit is typical of a Jupiter family comet. It was at perihelion at 1.07 AU at the beginning of November. [MPEC 2001-W05]

2001 W1 (LINEAR) A 19th mag object reported by LINEAR as apparently asteroidal but with unusual motion on November 17.43, and thus posted on the NEO Confirmation Page, has been found to appear cometary by other observers. CCD images taken by J. Nomen (Barcelona, Spain, 0.40-m f/2 Schmidt telescope) on Nov. 18.15 UT show the object to be slightly diffuse (m_1 = 18.0). CCD observations obtained by T. Spahr at the 1.2-m Mount Hopkins reflector on Nov. 18.33 show a very diffuse coma of diameter about 7" and a very faint tail about 15" long in p.a. 200 deg. [IAUC 7754, 2001 November 19]. The comet will brighten a little.

2001 W2 (BATTERS) S. Nakano, Sumoto, Japan, reports the discovery of a 14th mag comet on November 21.45 by A. Asami on CCD images taken with the Bisei Spaceguard Center 0.50-m f/2.0 reflector in the course of the "Bisei Asteroid Tracking Telescope for Rapid Survey" program. Additional observations were reported following posting on the NEO Confirmation Page. [IAUC 7758, 2001 November 21]
A. Hale, Cloudcroft, NM, reports that this comet showed a 0'.8 coma and total visual magnitude 12.7 on Nov. 22.09 UT (0.41-m reflector). Additional astrometry and preliminary parabolic orbital elements appear on MPEC 2001-W53. [IAUC 7760, 2001 November 23] The comet reached perihelion in late December, at 1.05 AU, but did not become much brighter than at discovery. The latest elements show that it is in a Halley type orbit with period 76 years.

The comet was never well placed for observation, but a few observers reported it at around 11th magnitude in December.

A/2001 WS1 (LINEAR) is an asteroid, of 17th magnitude, discovered by LINEAR on November 17.07. With a period of 4.92 years, the orbit is typical of a Jupiter family comet. It was at perihelion at 1.03 AU in late October. [MPEC 2001-W36]

A/2001 WU1=1979 WN8 (Palomar-LINEAR) is an

asteroid, of 18th magnitude, re-discovered by LINEAR on November 18.22 and originally found at Palomar on 1979 November 24. With a period of 5.56 years, the orbit is typical of a Jupiter family comet. It will reach perihelion at 1.35 AU in early June 2002. [MPEC 2001-W38]

2001 WF2 (P/LONEOS) An apparently asteroidal object of 19th magnitude discovered by LONEOS on November 17.27 and designated 2001 WF_2 (cf. MPEC 2001-W42) was found to have a well-defined 45" tail in p.a. 320 deg on CCD images obtained on Feb. 13.5 UT by T. B. Spahr with the 1.2-m reflector at Mount Hopkins. Following notification by Spahr, C. W. Hergenrother also found a 27" tail in p.a. 320 deg and a stellar central condensation on a 1500-s co-added R-band image taken with the Catalina 1.54-m reflector. [IAUC 7827, 2002 February 13] The object was at perihelion in late January at 0.98 AU and has a period of 5.0 years. It is intrinsically very faint and will fade.

2001 X1 (LINEAR) R. Huber, Lincoln Laboratory, Massachusetts Institute of Technology, reports the discovery by LINEAR of a comet on images taken on Dec. 13.44 that show a bright core surrounded by a diffuse coma (comet's magnitude given as 16.5-17.0) and exhibiting a tail at least 95" long in p.a. 295 deg. CCD observations on Dec. 14.1 UT by R. Stoss and P. Geffert (Starkenburg Sternwarte, 0.45-m f/4.4 reflector) reveal a well- condensed coma with a thin tail 5' long in p.a. 300 deg (m_2 = 16.5). CCD images taken in twilight and poor seeing by A. C. Gilmore (Mount John, 1.0-m f/7.7 reflector) on Dec. 14.6 show the object as diffuse (m_1 = 14.6-15.1) with a broad, faint fan tail 1' long in p.a. about 315 deg. [IAUC 7774, 2001 December 14]. The comet was around 15th magnitude visually. Brian Marsden notes on MPEC 2002-F19 [2002 March 18] that the "original" and "future" barycentric values of 1/a are +0.02285 and +0.001659 (+/- 0.000042) AU**-1, respectively. These values show that the comet is not a new one from the Oort cloud.

2001 X2 (P/Scotti) J. V. Scotti, Lunar and Planetary Laboratory, reports his discovery of a 19th mag comet on CCD images taken with the 0.9-m Spacewatch telescope on December 14.44, noting a coma diameter of 5" and a tail 0'.40 long in p.a. 283 deg (and m_2 = 22.7). Confirming observations were made at Klet by J. Ticha, M. Tichy, and P. Jelinek, who reported a 8" coma and a faint westward tail. [IAUC 7775, 2001 December 14]. The latest orbit shows that the comet is of short period (7.3 years), with perihelion at 2.5 AU in 2001 October. It will fade.

2001 X3 (11P/Tempel-Swift-LINEAR) R. Huber, Lincoln Laboratory, Massachusetts Institute of Technology, reports that a 20th mag object discovered by LINEAR on Dec. 7.08 was found to be diffuse on Dec. 17 (with prediscovery LINEAR data back to Sept. 10). G. Hug, Eskridge, KS, reports that the object is probably diffuse on CCD images taken on Dec. 19.1 UT (red mag 17.2-17.8). [IAUC 7778, 2001 December 19] The comet has a period of 6.4 years, with perihelion at 1.6 AU. It will fade.

C. Hergenrother, Lunar and Planetary Laboratory; and K. Muraoka, Kochi, Japan, suggested a link between comet 11D (last seen in 1908) and P/2001 X3 (cf. IAUC 7778) - a linkage confirmed at the Minor Planet Center and by S. Nakano (Sumoto, Japan). The orbital elements by Nakano (from 43 observations, 1908-2001, have mean residual 0".8; nongravitational parameters A_1 = +0.13 +/- 0.01, A_2 = -0.0134 +/- 0.0007). The comet was not found in 1963 despite a prediction by B. G. Marsden (IAUC 1838, 1839, 1840). More recent predictions were made by Marsden and Sekanina (1971, A.J. 76, 1142), by Nakano (Comet Handbooks for 1989, 1995, and 1996, Oriental Astronomical Association; and NK 686), and by Muraoka (Comet Handbook for 2001, OAA). The indicated correction to Nakano's 2001 prediction (1998, NK 686) is Delta(T) = +3.4 days. [IAUC 7779, 2001 December 20] The comet was listed amongst those due to return in my predictions for 2001 in the BAA Journal for December 2000.

2001 X8 (SOHO) A non Kreutz comet discovered by Alexander Mimeev on December 12 in real-time C2 images. [IAUC 7797, 2002 January 19] Studies by Maik Meyer show that it forms a triplet with 1997 L2 and 2001 E1.

A/2001 XQ (LINEAR) is an asteroid, of 15th magnitude, discovered by LINEAR on December 6.16. It was at perihelion at 1.04 AU in mid December. [MPEC 2001-X24] With a period of 6.87 years, the orbit is typical of a Jupiter family comet. It approached to 0.53 AU of Jupiter in 1983, which made small changes to the orbit.

A/2001 XU (NEAT) is an asteroid, of 18th magnitude, discovered by NEAT on December 7.45. With a period of 4.93 years, the orbit is typical of a Jupiter family comet. It will reach perihelion at 0.41 AU in early February. It is a PHA, possibly coming as close as 0.005 AU, but on this occasion only gets to within 0.22 AU. [MPEC 2001-X28]

A/2001 XL16 (Spacewatch) is an asteroid, of 21st magnitude, discovered by Spacewatch on December 10.13. With a period of 5.73 years, the orbit is typical of a Jupiter family comet. It will reach perihelion at 1.50 AU in mid January. [MPEC 2001-Y44]

2001 Y1 (152P/Helin-Lawrence) This periodic comet, first observed in 1993, has been recovered by T Oribe at the Saji observatory. It will reach perihelion at the end of 2002.
On 2001 Dec. 25, S. Nakano (Sumoto, Japan) reported that T. Oribe had apparently recovered comet P/1993 K2 (= 1993 XI = 1993l) the night before (December 24.86) with the 1.0-m reflector at the Saji Observatory. The position was within 2" of the prediction by B. G. Marsden on MPC 34423 (ephemeris on MPC 43696). No information was provided about the object's appearance other than m_1 = 19.5. The comet has now been independently reported by K. Sarneczky and Z. Heiner in 2002 Jan. 11 data obtained with the 0.6-m Schmidt at Piszkesteto, at m_1 = 20, but again with no information about the appearance. These observations confirm a tentative single-night detection by C. W. Hergenrother and D. Means

of an object of stellar appearance (in an 840-s co-added exposure) at the comet's expected position a year ago with the Steward Observatory's 2.3-m reflector at Kitt Peak. [IAUC 7790, 2002 January 14]

Further to IAUC 7790, K. Sarneczky reports that his 300-s unfiltered CCD images taken on Jan. 11.2 UT show a diffuse, 8" coma and a faint, narrow, 13" tail in p.a. 283 deg. [IAUC 7792, 2002 January 15] Further to IAUC 7790, T. Oribe reports that his CCD images taken on 2001 Dec. 24.86 UT show a 0'.15 coma and an 8" tail in p.a. 295 deg. [IAUC 7794, 2002 January 17]

2001 YX127 (P/LINEAR) An object previously reported as asteroidal by LINEAR has been shown to have cometary characteristics. It is distant and faint, and will fade from 20th magnitude.
An apparently asteroidal object of 20th mag discovered by LINEAR on December 17.32 and designated 2001 YX_127 (cf. MPS 47220, MPO 24028) has been found to have a broad, fan-shaped extension in p.a. 100 deg on CCD images obtained on Feb. 14.2 UT by T. B. Spahr with the 1.2-m reflector at Mount Hopkins. Co-added CCD R-band images taken at about the same time by C. W. Hergenrother with the Catalina 1.54-m reflector show a 7" coma and a broad tail 8" long in p.a. 100 deg. [IAUC 7828, 2002 February 14]

2002 A1 (LINEAR) and 2002 A2 (LINEAR) Two 19th mag objects of asteroidal appearance separated by <1 degree and having similar, somewhat unusual motion were reported by LINEAR on Jan. 8.32. Further observations were made following placement of the objects on the NEO Confirmation Page, and prediscovery observations in Nov.-Dec. 2001 were identified at the Minor Planet Center in LINEAR and NEAT data. Orbit computations for the two objects gave very similar results (basically differing only in T) and showed that the objects were only 0.7 AU from Jupiter at discovery. Observations by T. B. Spahr and P. Berlind with the 1.2-m reflector at the F. L. Whipple Observatory on 2002 Jan. 11.4 UT showed that the objects had faint, narrow tails around p.a. 250 deg. Independent observations by R. H. McNaught with the 1.0-m reflector at Siding Spring on Jan. 11.6 showed that the first object, now designated C/2002 A1, was slightly diffuse with a very faint 25" tail in p.a. 260 deg, and that the second object, C/2002 A2, was almost stellar with a very narrow 20" tail in p.a. 250 deg. The respective discovery observations and orbital elements are given in MPEC 2002-A62 (which also contains all the relevant astrometry and ephemerides). The 2001 Dec. 13 and 17 observations of C/2002 A1 originally appeared on MPS 45271 under the designation 2001 XG_115. The minimum distances from Jupiter were ><0.4 AU around 2001 July 9 and 18 for C/2002 A1 and C/2002 A2, respectively. [IAUC 7788, 2002 January 11] The latest orbits, on MPEC 2002-C58 and C69, gives them a periodic orbit of around 77 years, with perihelion distance of 4.7 AU in early December 2001.

2002 A3 (LINEAR) An 18th mag object reported as asteroidal by LINEAR on January 13.23 has been noted by several CCD observers to be cometary: Jan. 19.9 UT, slightly diffuse, m_1 = 17.3 (J. Nomen, Barcelona, Spain); 20.6, 10" coma, m_1 = 17.3 (J. Broughton, Reedy Creek, Qld.); 21.2, fuzzy coma of diameter about 10" (R. Dyvig, Quinn, SD); 21.2, m_1 = 17.0, 22" tail in p.a. 250 deg (R. Fredrick, R. Trentman, and R. Gruenke, Louisburg, KS). [IAUC 7799, 2002 January 21] It has a perihelion distance of 5 AU and reaching perihelion in May. It will fade.

2002 AR2 (P/LINEAR) An asteroid discovered by LINEAR on January 6.15 has been found to be a comet, initially suggested by its orbit, with follow up observations showing a coma. The object is in a 12.5 year orbit, with perihelion at 2.0 AU in mid January. It will fade from 18th magnitude.

A/2002 AZ1 (Spacewatch) is an asteroid, of 21st magnitude, discovered by Spacewatch on January 7.27. It will reach perihelion at 0.67 AU in late March. [MPEC 2002-A31] With a period of 4.86 years, the orbit is typical of a Jupiter family comet. It passed 0.72 AU from Jupiter in 1999, though this did not significantly affect the orbit.

A/2002 AR4 (LINEAR) is an asteroid, of 20th magnitude, discovered by LINEAR on January 8.23. It will reach perihelion at 1.13 AU in mid March. [MPEC 2002-A51] With a period of 5.17 years, the orbit is typical of a Jupiter family comet. It has made no recent close approaches to Jupiter.

A/2002 AO7 (LINEAR) is an asteroid, of 20th magnitude, discovered by LINEAR on January 8.16. It will reach perihelion at 1.10 AU in early April. [MPEC 2002-A63] With a period of 5.10 years, the orbit is typical of a Jupiter family comet. It has made no recent close approaches to Jupiter.

A/2002 AF29 (NEAT) is an asteroid, of 20th magnitude, discovered by NEAT on January 13.41. It will reach perihelion at 1.25 AU at the end of January. [MPEC 2002-A94] With a period of 5.97 years, the orbit is typical of a Jupiter family comet. It has made no recent close approaches to Jupiter.

A/2002 AO148 (LINEAR) is an asteroid, of 20th magnitude, discovered by LINEAR on January 11.36. It is in a 13.5 year orbit, with perihelion at 4.1 AU and an eccentricity of 0.27. [MPEC 2002-C107]

2002 B1 (LINEAR) An 18th mag object reported as asteroidal in appearance by LINEAR on January 26.09, and posted on the NEO Confirmation Page, has been found to be cometary on CCD images taken by M. Tichy and J. Ticha at Klet (coma diameter 7"-8", on Jan. 29.8 and Feb. 1.8 UT; coma diameter 9" with m_1 = 17.7-18.0 and a faint tail in p.a. 165 deg on Feb. 4.8) and by A. Galad and L. Kornos at Modra ('slightly diffuse' on Feb. 1 and 2). [IAUC 7817, 2002 February 4] It is intrinsically faint and will fade from 17th mag. The latest orbit (MPEC 2002-C70 gives it a periodic orbit, with period around 31 years.

2002 B2 (LINEAR) An apparently asteroidal 19th mag object reported by LINEAR on January 23.40 and posted on the NEO Confirmation Page has been found to be cometary by M. Tichy and J. Ticha at Klet (coma diameter 6", with m1 = 17.2, and

faint 9" tail in p.a. 90 deg on Feb. 3.05 UT) and by R. H. McNaught at Siding Spring (8" coma and 10" tail in p.a. 60 deg on Feb. 6.66). [IAUC 7821, 2002 February 6] It was quite distant and near peak brightness and will fade from 17th mag.

2002 B3 (LINEAR) F. Shelly, Lincoln Laboratory, Massachusetts Institute of Technology, reports that an apparently asteroidal object of 19th mag, discovered by LINEAR on Jan. 26.12 (and placed on the NEO Confirmation Page) was found to show a clear tail in p.a. about 330 deg on Feb. 11.09 UT. T. B. Spahr, Harvard-Smithsonian Center for Astrophysics, reports that CCD images taken with the 1.2-m reflector at Mt. Hopkins on Feb. 12.13 show the object to be very faintly diffuse with a faint extension in p.a. 315 deg. [IAUC 7826, 2002 February 12] It is very distant and near peak brightness and will fade from 19th mag.

2002 C1 (Ikeya-Zhang) Kaoru Ikeya and Daqing Zhang discovered a 9th magnitude comet on February 1. It reached perihelion on March 18 at 0.5 AU and brightened to 3rd magnitude. Kaoru Ikeya discovered 5 comets in the 1960s, including the spectacular sungrazer Ikeya-Seki (1965 S1).

Word has been received of the independent visual discovery of a comet by Kaoru Ikeya (Mori, Shuchi, Shizuoka, Japan; 0.25-m reflector, 39x; communicated by S. Nakano, Sumoto, Japan; coma diameter 2' with weak condensation; motion about 5' northeastward in 30 min) and by Daqing Zhang (near Kaifeng, Henan province, China; 0.2-m reflector; communicated by J. Zhu, Peking University; coma diameter 3').

2002 UT	R.A. (2000)	Decl.	m1	Observer
Feb. 1.408	0 08.9	-17 42	9.0	Ikeya
Feb. 1.47	0 09	-17 30	8.5	Zhang

[IAUC 7812, 2002 February 1]

Precise astrometry (Feb. 1-2) and the preliminary parabolic orbital elements given below appear on MPEC 2002-C03. Visual m_1 and coma-diameter estimates: Feb. 1.910 UT, 7.5:, 5' (P. M. Raymundo, Salvador, Brazil, 0.25-m reflector; independent discovery); 2.081, 9.5:, 3' (A. Hale, Cloudcroft, NM, 0.41-m reflector; thin clouds); 2.43, 8.8, about 4' (K. Yoshimoto, Yamaguchi, Japan, 20x100 binoculars); 2.47, 8.8, 3' (D. Zhang, Kaifeng, Henan, China, 0.20-m f/4.4 reflector, 28x, as used for the discovery on Feb. 1.47; comet more condensed than on previous day); 2.53, 9.1, 3' (A. Pearce, Nedlands, W. Australia, 0.2-m reflector); 2.53, 8.5, 5' (N. Brown, Quinns Rocks, W. Australia, 0.15-m refractor). [IAUC 7813, 2002 February 2]

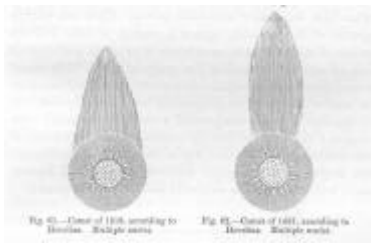
Nakano, Muraoka and Sato note that there is a possibility that the comet is identical with comet 1532 R1. Brian Marsden notes on MPEC 2002-C111 : A parabolic orbit no longer adequately fits the observations, and a revolution period of 400-500 years is likely. There is a possibility that the comet is identical with C/1532 R1, as first suggested by S. Nakano on the basis of observations through Feb. 10.4.

Further observations render this possibility unlikely, but make it more probable that the comet is a return of comet 1661 C1. Brian Marsden notes on MPEC 2002-D36 [2002 February 26] : Numerical integration backward of the perturbed equivalent of the above unperturbed orbit solution yields a previous perihelion date in March 1659. This suggests a likely identity with C/1661 C1, rather than with C/1532 R1 (cf. MPEC 2002-C111). If this identity is confirmed it will be the longest period comet so far known to return.

A new orbit is given on MPEC 2002-F21 [2002 March 18] and Brian Marsden notes that the orbital elements yield the year of the previous perihelion passage as T = 1660.9 +/- 0.4 (1 sigma), in very close agreement with the value T = 1661.1 for comet C/1661 C1. [See also Nakano's orbit, which links C/1661 C1 with C/2002 C1 and Kenji Muraoka 's orbit (in Japanese).

2002 April 1, Nigel Bryant

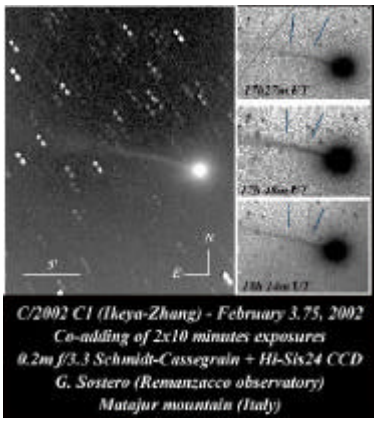
King Charles II was crowned in 1660 and had created the Royal Society in the same year. In 1661, Isaac Newton was 18, and went up to Cambridge in June of that year. It is unlikely that he observed the comet as his notebook suggest that the first comet that he observed was the one of December 1664. Halley would have been too young to record the comet (he was 5), but later he computed an orbit similar to that of the 1532 comet and suggested a possible link. Charles Messier noted this possible link, but that it had been refuted by Mechain.



Drawing of the 1661 comet (right) by Hevelius taken from Guillemin, 'The world of comets', 1877

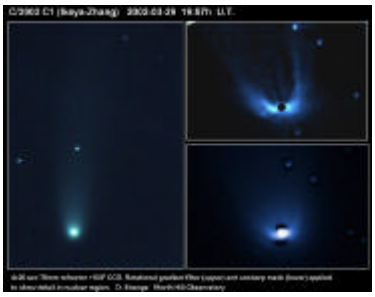
The comet was observed and drawn by Hevelius. The optical quality of his telescope was far inferior to those of today and the features drawn may be imaginary. The comet was thought to be a portent for 'Black Bartholomew's Day' when 900 non-conformist clergymen were ejected from their benefices following the Act of Uniformity of 1662. Succeeding bright comets were associated with the Plague and the Fire of London. The comet was illustrated by Johann Gabriel Doppelmayr in 1742.

The following excerpt about C/1661 C1 is from volume 1 of Cometography by Gary Kronk:



2002 February 3.75, Giovanni Sostero

Discovered: 1661 February 3.2 (D=0.62 AU, r=0.48 AU, Elong.=23 deg.) Last seen: 1661 March 28.1 (D=0.99 AU, r=1.39 AU, Elong.=88 deg.) Closest to the Earth: 1661 January 29 (0.6062 AU) Calculated path: DEL (Disc), AQL (Feb. 6), SER (Mar. 26)



2002 March 29, David Strange

The Polish astronomer Johannes Hevelius (1668) provided the most extensive set of observations of this comet. He discovered it on 1661 February 3.2, shortly after morning twilight had begun. Computations using the orbit below indicate the comet was then exiting the twilight after having passed only 17 degrees from the sun on January 28. Within a few days Hevelius estimated the tail length as 6 degrees and noted the comet appeared fainter than Alpha Aquilae. Hevelius noted a multiple structure of the nucleus on several occasions up to February 20. The comet was last detected on March 28.1 by Hevelius.

The observations of Eberhard Welper (Strasbourg, France) were included in the 1788 volume of the Berliner Astronomisches Jahrbuch. Welper first saw the comet on February 8 and said the tail extended 5 degrees and was perpendicular to the horizon. He noted the same orientation on the 9th. By the 10th Welper said the tail was basically extending perpendicular to the horizon, although he noted a slight tilt toward the west. Welper's observation of February 11 was his last, because of an extended period of bad weather.

In volume 46 of Travels and Explorations of the Jesuit Missionaries in New France (1899), Jerome Lalemant (superior of the Jesuit missions in New France, now Canada) wrote of this comet. He said, "the comet which was visible here, from the end of January to the beginning of March, was soon followed by the disasters of which those stars of evil omen are the forerunners." In describing its appearance, he said, "Its tail, extending westward, pointed toward us and seemed to threaten us with a flagellation, of which it was, to us, a brilliant but fatal portent." He continued, "it did indeed move from West to East, following the flight of the constellation of the Eagle, at whose head it appeared, although by another movement it tended a little Northward from us."

Marie de l'Incarnation (1671), superior of the convent at Quebec, Canada, wrote a letter to her son in 1661 September which also described this comet. She said, "A comet was seen, its rods pointed toward the earth. It appeared at about two or three o'clock in the morning and disappeared toward six or seven with the day. In the air was seen a man of fire, enveloped in fire. A canoe of fire was also seen and, towards Montreal, a great crown likewise of fire."

Edmond Halley (1705) and P. F. A. Mechain (1785) computed very similar parabolic orbits, with the former noting a similarity to the orbit of the comet of 1532. Mechain's orbit is given below. It indicates the comet reached a maximum declination of +6 degrees (apparent) on February 14. The orbits are as follows:

Computer	T	AOP	AN (2000.0)	i	q	e
Halley	1661 Jan. 27.4868 (UT)	33.552	87.169	32.596	0.448510	1.0
Mechain	1661 Jan. 27.381 (UT)	33.450	86.562	33.015	0.442722	1.0

Despite Halley's suggestion that C/1532 R1 and C/1661 C1 might be related, the idea was ignored until Nevil Maskelyne (1786) looked into the matter. Maskelyne took the elapsed time between the perihelion date of these two comets, added it to the 1661 perihelion date, and predicted the comet would arrive at perihelion around 1789 April 27. He added that assumed perturbations by Jupiter would probably cause the perihelion date to occur earlier, possibly as soon as late 1788. With an assumed perihelion date of 1789 January 1, he computed an ephemeris for the period of 1788 April 23 to 1789 January 1. Maskelyne said the comet could be recovered as early as 1788 September by observers near the equator or south of it, and added, "The Cape of Good Hope would be an excellent situation for this purpose." Early in 1788, both Johann Elert Bode and Capel Lofft made similar predictions for the probable return of this comet. However, despite the preparation and numerous searches, the comet was not found.

Full moon: February 14, March 15 Sources: J. Hevelius (1668), p. 483; Marie de l'Incarnation (1671), pp. 263-4; E. Halley, Philosophical Transactions of the Royal Society of London, 24 (1705), pp. 1882-99; A. G. Pingré, Cometographie (1784), p. 10; P. F. A. Méchain, Memoirs of the Pres. of Paris (1785), p. 395; Philosophical Transactions of the Royal Society of London, 76 (1786), pp. 426-31; N. Maskelyne, Gentleman's Magazine, 57 (1787), p. 59; Berliner Astronomisches Jahrbuch (1788), pp. 195-6; C. Lofft, Gentleman's Magazine, 58 (1788), pp. 1048-50; Berliner Astronomisches Jahrbuch (1790), pp. 184-6; The London and Edinburgh Philosophical Magazine and Journal of Science (Series 3), 7 (1835 Jul.), p. 37; Travels and Explorations of the Jesuit Missionaries in New France, Volume 46, edited by Reuben Gold Thwaites, Cleveland: The Burrows Brothers Company (1899), p. 205; S. K. Vsekhsvyatskij, Physical Characteristics of Comets (1964), p. 50; Journal of the Royal Astronomical of Canada, 70 (1976 Dec.), pp. 311-12.

Graeme Waddington provides the following information on orbital computations:

Nakano has a new linked solution forcing the identification of C/2002 C1 (Ikeya-Zhang) with C/1661 C1 (Hevelius). Nakano specifies the elements at epochs in 2002 and 1661. Integrating the 2002 set back to 1661 gives a difference of 0.12 days in the time of perihelion passage when compare to Nakano's 1661 set.

Integrating both sets backwards gives an estimate of the likely uncertainites involved and we now get the sequence

1661 Jan 28.9	(+- 0.1 d)
1273 Apr 25	(+- 1.5 d)
879 Jan 10	(+- 15 d)
426 May	(+- 500 d)

Integrations of Nakano's previous linked solution also gave a perihelion in 1273 Apr/May and Muraoka gave 1273 Mar 26 for his integration of Nakano's previous solution. [My own rough integration of Nakano's orbit suggested previous returns around 1273 May, 879 January and 425. Gary Kronk's Cometography lists a comet for 877, but not 879].

Ho Penk Yoke gives as #439 in his catalogue a comet of bluish-white colour and with the appearance of loose cotton that appeared in 1273 April. The details given (movement through Auriga towards U.Maj) mimic the expected appearance of the integrated object for 1273 - the agreement can be improved by having a periheilon passage ~ 20-30 days earlier than my integrations give (i.e. around 1273 April 1, near to Muraoka's result).

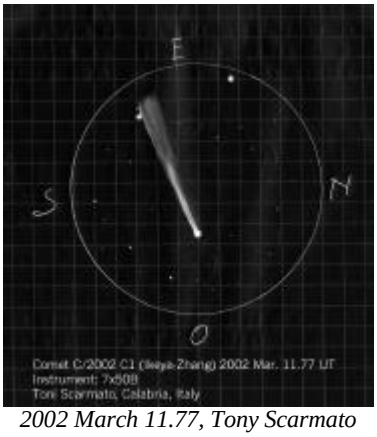
Thus is seems to me likely that the 1273 April comet mentioned in the Oriental annals can be equated with Ikeya-Zhang (2002) = Hevelius (1661) and as such could be used refine the long-term integration uncertainties.

The comet of 1273 April is also listed by Hasegawa (1980) and appears on page 223 of Gary Kronk's Cometography.

Hirohisa Sato provides the following information:

The comet of 11th February, 877 has a record in Japan. "On the 25th day in the first month of the first yaer of the Genkei reign-period a 'guest star' appeared to the west of the (Tung-) Pi (14th lunar mansion)."(Dainihonshi ch. 359; K; Hsi.) Ho Peng Yoke (1962)'s 'Ancient and Mediaeval Observations of Comets and Novae in Chinese Sources' p 176. Time is about 18:00?('Tori-no-koku').

The comet of 5th February, 1273 has a record in Japan. "On the 16th day in the first month of the tenth yaer of the Bun-ei reign-period [5th February, 1273] a (hui) comet was seen....."(Dainihonshi ch. 359; K.). Ho (1962) p194. The observation on 11th April was a 'guest star' and is not this comet. (Sato)

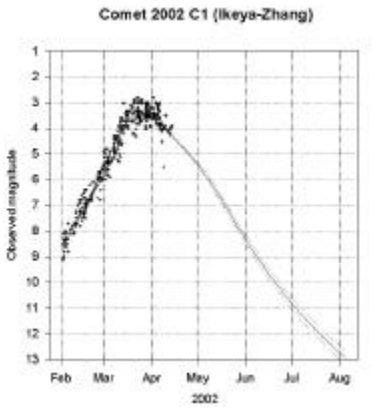


2002 March 11.77, Tony Scarmato

Early observations suggested that it was brightening quite rapidly. On February 5.77 I estimated it at 7.7 in the 20cm Thorrowgood refractor x40, however other observers made it a little fainter on the same evening. On February 9.77 I made it 8.1 in the same instrument x70, though this time other observers were indicating a brighter magnitude. The coma was well condensed, DC5 - 6, with a coma diameter of 4'. The comet was also easily visible in 14x100 and 20x80 binoculars. Observations on February 11 suggest a magnitude of about 7. Maciej Reszelski reports that the comet had reached 6.5 in 20x60B on February 15.72. On February 26.76 I observed the comet in rather bright twilight with 20x80B and estimated it at 5.9, with a 9' ion tail in pa 85. It was distinctly brighter on February 28.78 when I made it 5.6 with a 0.5 degree tail in pa 65.

2002 March 6, Michael Jager

By the end of February the comet had reached naked eye brightness and a steady stream of reports began to arrive. The comet had become very well condensed, with an almost stellar nucleus. At its brightest in late March, images show that the coma was distinctly green. From dark sky sites, the comet showed a prominent tail, with a maximum length reported by visual observers of around 6 degrees.



357 observations received February 2 - April 13 give a preliminary light curve of m = 7.1 + 5 log d + 10.6 log r

Stop press: The latest orbit for 2002 C1 on MPEC 2002-H23, which includes non-gravitational parameters gives the perihelion time for the last return as 1667.9±0.3.

2002 C2 (LINEAR) R. Huber and F. Shelley, Lincoln Laboratory, Massachusetts Institute of Technology, report the discovery by LINEAR of an 18th mag comet on February 1.09 with a tail 42"-47" long in p.a. 12.5 deg. Cometary activity has been confirmed via CCD observations by A. Galad and L. Kornos at Modra on Feb. 1.8 (m_1 = 16.3, asymmetric coma extending 15" toward p.a. about 30 deg) and 2.7 UT (slightly diffuse with coma diameter about 10"), by J. Ticha and M. Tichy at Klet on Feb. 2.7 (coma diameter 10"), and by T. Payer at Duesseldorf, Germany, on Feb. 2.8 (coma visible, m_1 = 16.6). [IAUC 7815, 2002 February 2] It is a distant object and will fade.

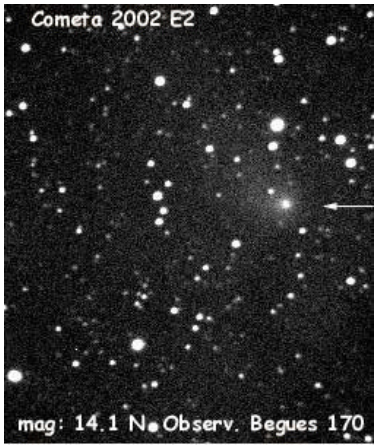
2002 CW134 (P/LINEAR) A 20th magnitude object, discovered by LINEAR on February 7.47 has been found to have a coma. It was near perihelion at 1.84 AU and has a period of 6.8 years.

A/2002 CE10 (LINEAR) This asteroid discovered by LINEAR is in a retrograde cometary type orbit with period of 25 years. It is still some 16 months from perihelion at 1.9 AU in June 2003, so it may begin to show cometary activity in the future. Discovered on February 6.32 at around 20th magnitude it is still 4.8 AU from the Sun. [MPEC 2002-C83, 2002 February 13]

2002 E2 (Snyder-Murakami) A new comet has been discovered by US astronomer Douglas Snyder and Japanese astronomer Shigeki Murakami. The comet is about 11th magnitude and moving northwards. It is just past perihelion and will slowly fade from around 11th magnitude. There is some similarity (pointed out by "Mitch") between the orbital elements and those of C/1998 H1 (Stonehouse).

Doug Snyder has provided the following information to the comet mail list: I was using a magnification of 149x, which was providing me with a field of 32' on my 20" f/5 Obsession. Occasionally, I would boost the magnification up to 212x to look at a particular object, but not for sweeping the skies. This was a deliberate search, although I am relatively new at comet searching. I had spent only about 70 hours up to the time of the finding. A real lucky find! I have been deep sky observing for about 20 years.

Not that I'm too much of a believer in the psychic side of things, but my wife and I had gone out to dinner with another couple very involved in amateur astronomy and we ate at a Chinese restaurant (this was on Sunday evening, the evening before the discovery). After the meal, we received our fortune cookies. Mine read "You will soon be the center of attention". On every other occasion where I get one of these fortunes, I just toss it away. Well, on this particular evening, I stuck it in my shirt pocket and took it home with me. Well, I stayted up the entire night and it was 8 hours later that I came across the comet. Now, for the time being, I guess I've been at the center of attention! My wife wants to frame it - but gee, its only 70 x 13 mm!



2002 April 17, Pepe Manteca

Stargazer finds comet by Lyn Southerland Sierra Vista Herald March 14, 2002

Palominas - With his eyes on the skies and the strains of "Some Enchanted Evening" playing in the background, Doug Snyder made the discovery of a lifetime early Monday morning.

The amateur stargazer discovered a new comet streaking through the Aquila Constellation in the heart of the Summer Milky Way galaxy.

At 3:40 on Monday morning, he happened across "a little gray smudge" nestled in the Aquila Constellation. He did some quick research using a sky atlas and numerous databases, but couldn't locate any references to his find.

Trying not to get his hopes too high, Snyder checked the comet's location again. "The comet had moved a bit, but not too much, and I found it again fairly easily. Dawn was coming, and my view of the comet was fading, but by now I was becoming more sure of my discovery," Snyder said.

He immediately e-mailed news of his discovery to the Central Bureau for Astronomical Telegrams, the Harvard-affiliated clearinghouse for new discoveries. It was 4 a.m. and the world was being told the latest space find had been made at a small observatory in Southeastern Arizona.

Several anxious hours later, he received a reply. CBAT has spent the interim time researching his find, verifying Snyder's experience and credentials, and locating the comet. CBAT asked for additional information, which Snyder provided, and then he waited.

"It's been a whirlwind couple of days," Snyder said. "But yesterday (Tuesday), they finally let me know that I had really discovered a new comet."

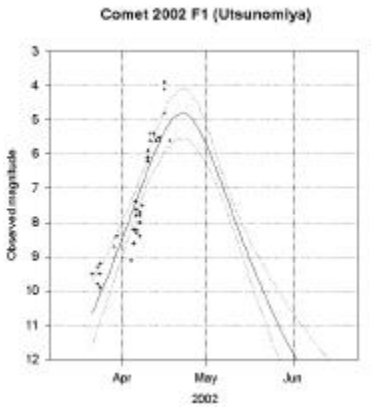
Visual observers have put the comet at around magnitude 11 over the last month, with a 2' diameter, diffuse coma.

26 observations received March 13 - April 7 give a preliminary light curve of m = 8.0 + 5 log d + [10] log r

2002 F1 (Utsunomiya) Syogo Utsunomiya from Japan has discovered another comet. The object is diffuse, with a weak condensation and visible in the morning twilight. Images show a tail up to 90' long. The comet reached perihelion in April and will fade thereafter, though the solar elongation remains poor.

Syogo Utsunomiya

2002 March 23.15, Giovanni Sostero



The comet was highly condensed and showed a short tail when I observed it on April 6.14 and 7.15. The observations up to April 9 suggested that it was only brightening slowly and would reach mag 7 when brightest. Nicolas Biver, observing on April 10.16 noted a significant brightening, with the comet at magnitude 5.9, with a nearly stellar appearance, suggesting a recent outburst. The following morning he reported that the comet had brightened further, but had become more diffuse and showed jets. I was able to observe it in brightening skies on April 13.16 and estimated it at 5.6 in 20x80B. A further observation in misty conditions on April 14.15 put the comet at 3.9. Several observers in better skies were able to observe it and 2002 C1 with the naked eye, a rare opportunity to see two naked eye comets at the same time.

33 observations received March 21 - April 18 give a preliminary light curve of m = 10.6 + 5 log d + 17.0 log r

A/2002 FC (LONEOS) is an asteroid, of 19th magnitude, discovered by LONEOS on March 16.24. It will reach perihelion at 0.96 AU at the end of May. [MPEC 2002-F14] With a period of 4.85 years, the orbit is typical of a Jupiter family comet. It is a potentially hazardous asteroid, and can pass 0.022 AU from the Earth.
Kracht on April 8.

2002 G1 (SOHO) A non sungrazing group comet discovered in real-time C2 images by Rainer Kracht on April 2. It remains at small elongation from the sun and is not expected to be detected from the ground.

2002 G3 (SOHO) XingMing Zhou discovered a moderately bright comet on C3 frames on April 12.4, with Jonathan Shanklin making an independent discovery shortly afterwards. The bright, slow moving, object appeared at the bottom of the frames beginning at around 00:00 on April 12 and was moving up and to the left. It had no obvious tail, and was brightening quite rapidly. At its brightest, just before perihelion, it reached around 1st magnitude, and although it grew a short tail, began a dramatic fade, turning into a ghostly blur, last seen around April 19.0. Although potentially observable from the ground in late April, it seems very unlikely that the object will be recovered.

I made the independent discovery of the comet whilst at work. I had been configuring a number of computers with the Windows 2000 operating system and used the SOHO real time images to test the Internet connection and memory. In the process I discovered that Microsoft Internet Explorer seemed to give much better views of the SOHO real-time movies than did Netscape 4.7, which was my preferred web browser. Initially I put this down to the limited amount of software running on the new machines and the fact that they were higher performance than my office PC. One of the PCs had a faulty mother board, and whilst this had been replaced, I left the movie loop running and checked it intermittently to see if there were further problems. On April 12 I had checked the SOHO recent discoveries page from my office PC and seen no new reports, but didn't immediately check the latest images. After coffee I went to look at the loops on the test PC and immediately spotted the new object, which I reported to Doug Biesecker, but discovered that XingMing Zhou had reported it first. Subsequently I've found that Internet Explorer works better than Netscape on my office computer as well, so if you want to search for SOHO comets using the real-time images I would recommend using this browser.

A/2002 GJ8 (NEAT) is an asteroid, of 19th magnitude, discovered by NEAT on April 12.41. It will reach perihelion at 0.51 AU at the end of June. [MPEC 2002-G62] With a period of 4.45 years, the orbit is typical of a Jupiter family comet.

A/2002 GO9 (NEAT) is an asteroid, of 20th magnitude, discovered by NEAT on April 12.34. It reached perihelion at 10.45 AU (just outside the orbit of Saturn) at the end of December 1996. [MPEC 2002-H03] With a period of 399 years and aphelion at 98 AU, the orbit is typical of a long period comet.

I have begun to compile an archive of all the images that I receive and you can find this on the Section web pages. This includes all the images included here, at far better resolution. When submitting images **please** use the naming format that you see there as this makes it easy to catalogue the images.

For the latest information on discoveries and the brightness of comets see the Section www page:
http://www.ast.cam.ac.uk/~jds or the CBAT headlines page at http://cfa-www.harvard.edu/cfa/ps/Headlines.html

Produced by Jonathan Shanklin
E&OE