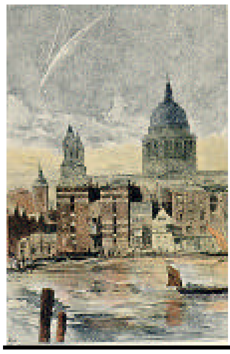

THE COMET'S TALE

Newsletter of the Comet Section of the British Astronomical Association

Volume 8, No 2 (Issue 16), 2001 October

DEEP SPACE 1 ENCOUNTERS 19P/Borrelly

Donald K. Yeomans

NASA/JPL, Near-Earth Object program office

On Saturday evening at 7:00 PM, sustained applause broke out in the Deep Space 1 spacecraft control room at the Jet Propulsion Laboratory. The first high resolution images of comet's Borrelly nucleus had reached Earth (Figure 1). The images were sharper than expected and revealed a very dark, outgasing nucleus shaped a bit like a bowling pin except this bowling pin was nearly the size of Mt. Everest. Examination of the surface features reveals ridges, fault lines, and bright areas that are thought to be source regions for the nucleus' jets that emanate toward the solar direction. These jets are thought to be the vaporization of the comet's ices as the active regions are heated by sunlight (Figure 2). The strong linearity, or collimation, of these jets is a bit of a mystery that scientists will have to solve in the near future. Although the infrared spectral data and charged particle detector data have not yet been completely analyzed, this information should help determine the composition of these gases and hence the nature of the parent ices of the comet's nucleus.

While the Deep Space 1 spacecraft (DS1) was not designed to encounter a comet and lacked any dust shielding to protect it from the bullet-like dust particle environment through which it was moving, DS1 survived the flyby without a problem. All the science data were successfully received on Earth within a few hours after the flyby itself. The DS1 spacecraft was designed to test various space technologies including the ion drive engine that first ionizes xenon and then electrostatically accelerated these charged particles to form a modest, but continuous, rocket thrust.

Figure 1 This black and white image of comet Borrelly's nucleus was taken while the spacecraft was about 3400 km from the comet. The dimensions of the nucleus are about 8 kilometers long by at least 3.5 kilometers wide. While the contrast of this image has been altered to show surface features, the entire nucleus would appear coal black to the naked eye.

Before running out of fuel, and without the used of a star tracker to provide orientation information to the spacecraft, the DS1 operations team had to work hard to keep the spacecraft operating and pointed properly. They did so with remarkable success. The lessons learned from this comet encounter will be used in the next ten years to facilitate the five upcoming cometary encounters provided by the CONTOUR, Stardust, Deep Impact, and Rosetta spacecraft.

For more information, see:
http://nmp.jpl.nasa.gov/ds1/

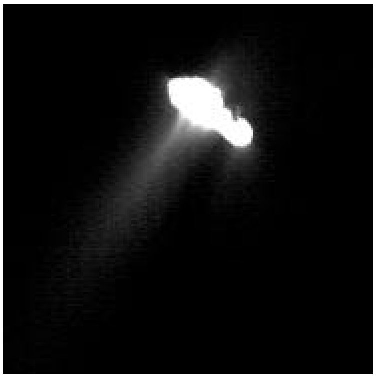

Figure 2 This image of comet Borrelly's nucleus has been purposely overexposed to show the strongly collimated jets on the sunward side of the nucleus. These jets are thought to be composed mostly of water vapor and entrained dust particles.

Images: courtesy of NASA/JPL

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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,

It has been rather a busy summer for me, so this edition of the comet's tail is a little late in appearing. The weather has not been very favourable for observing, but the odd gap in the cloud has allowed me, and I hope you, to make occasional observations. Hopefully the autumn will be better and we will get good views of 2000 WM1 (LINEAR) as it brightens on its way to perihelion. Two significant comet discoveries have been made - 2001 Q2 discovered by amateur Vance Petriew at a star party and 2001 Q4 (NEAT) discovered a long way from perihelion and which may become a prominent object in 2004. In addition Deep Space 1 flew past 19P/Borrelly and produced some exciting images of the comet.

The revised edition of the Section Guide to Observing Comets is taking a little longer to produce than anticipated should be available at BAA events or through the BAA Office early next year. The new edition has significant changes, including revised sections on comet discovery procedures, CCD observations, observing very bright comets and electronic submission of observations. One problem has been that every time I've re-read it I've found further points that I'd like to amend. Hopefully I won't find any more!

Many more observers are taking up CCD imaging and submitting their images. Quite a few of these get submitted as linear.jpg or something similar. This makes it rather hard to identify once I've archived it and I'm having to spend a lot of time re-naming images. Please try and use the standard format of comet_yyyymmdd_(hhmm)_observer.img where (hhmm) is optional. As an example 2001a2_20010701_sha.jpg would be an image of 2001a2 that I took on July 1st. More details are on the web page and in the Section guide.

Since the last newsletter observations or contributions have been received from the following BAA members: Tom Boles, Neil Bone, Len Entwisle, John Fletcher, Mario Frassatti, Maurice Gavin, Peter Grego, Werner Hasubick, Guy Hurst, Nick James, Albert Jones, John Mackey, Nick Martin, Steve Martin, John McCue, Cliff Meredith, Martin Mobberley, Michael Oates, Gabriel Oksa, Roy Panther, Robin Scagell, Jonathan Shanklin, David Storey, Melvyn Taylor and Alex Vincent and also from: Jose Aguiar, Alexandre Amorim, Alexander Baransky, Sandro Baroni, Nicolas Biver, Reinder Bouma, Jose Carvajal, Tim Cooper, Matyas Csukas, Fraser Farrell, Mike Feist, Rafael Ferrando, Stephen Getliffe, Antonio Giambersio, Guus Gilein, Shelagh Godwin, Bjorn Granslo, Roberto Haver, Michael Jager, Andreas Kammerer, Paul Kemp, Heinz Kerner, Martin Lehky, Rolando Ligustri, Pepe Manteca, Michael Mattiazzo, Maik Meyer, Antonio Milani, Yurij Nesterov, Andrew Pearce, Stuart Rae, Maciej Reszelski, Tony Scarmato, Carlos Segarro, Giovanni Sostero, Graham Wolf, 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*.

Comets under observation include: 19P/Borrelly, 24P/Schaumasse, 29P/Schwassmann-Wachmann, 44P/Reinmuth, 45P/Honda-

Mrkos-Pajdusakova, 74P/Smirnova-Chernykh, 1999 J2 (Skiff), 1999 T1 (McNaught-Hartley), 1999 T2 (LINEAR), 1999 U4 (Catalina-Skiff), 1999 Y1 (LINEAR), 2000 CT54 (LINEAR), 2000 OF8 (Spacewatch), 2000 SV74 (LINEAR), 2000 WM1 (LINEAR), 2001 A2 (LINEAR), 2001 B2 (NEAT), 2001 HT50 (LINEAR-NEAT), 2001 K3 (Skiff), 2000 K5 (LINEAR), 2001 MD7 (LINEAR), 2001 Q2 (Petriew) and 2001 Q6 (NEAT).

Section Meeting

Finally some details about the Section meeting on February 23. This will be at the Scientific Societies Lecture Theatre at Savile Row in London and will take place prior to the afternoon BAA meeting, starting at 10:30am for coffee. The main speakers are Alan Fitzsimmons of Queen's University of Belfast speaking on "Big comets and little comets: how many of each" and Giovanni Sostero of Remanzacco Observatory in Italy, speaking on his experiences of CCD imaging. I'm allowing plenty of time for informal discussion over coffee, and lunch will be available at Savile Row, so do come along and make a day of it. After lunch the main BAA meeting begins at 14:30, with the main speakers being David Whitehouse speaking on 'A biography of the Moon' and Melvyn Taylor on 'Variable Stars'. The meeting will also feature Martin Mobberley's famous Sky Notes. Please book lunch through the BAA office, enclosing a cheque payable to the BAA. If you would like a vegetarian meal please state this clearly. The cost of lunch is not known at the time of going to press, but will be about £5 - £10; the exact price will be given on the Section and BAA Web pages, in a BAA Circular and in the Journal. The booking deadline is 2002 February 1 and there is a limit of 75 places. If you would like to make a provisional booking let me know. Hopefully stocks of the revised Section Observing Guide will be available on the day!

Jonathan Shanklin

Tales from the Past

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

150 Years Ago: An astrometric observation of Faye's comet by Professor Challis with the Northumberland equatorial in Cambridge on March 4 has the note 'Of the last degree of faintness on account of the zodiacal light: could scarcely be observed.'. [I wish this were still true today, as light pollution is now the major enemy]

The Northumberland equatorial as it is today. The dome was replaced in the 1930s, and the telescope had a new lens in 1988 to mark its 150th anniversary. Much of the rest of the telescope is unchanged since Professor Challis observed with it. For more details see http://www.ast.cam.ac.uk/IoA/northumberland.html

100 Years Ago: The May Journal notes 'The first comet of the new century is one of a rather sensational nature. It is probably the brightest comet that has appeared since 1882'. [comet 1901 G1 'Great Comet'] A note from W G Lavender at Willow Dam Camp, near Mafeking sent on April 25 notes: 'We have to stand to arms at 5.30 every morning, and it is then, of course, dark. In the east there has been for two days a most beautiful comet - due east, almost end on - 24th and 25th April, just above the rising sun; brighter today than yesterday'. The *Times* reported that Botha sent a message to his forces saying that this comet was the presage of peace and independence for the Boers. The *Daily Mail* reported that a soldier had written home describing it like a veldt fire with a rocket on top of it. At the May meeting Mr Crommelin showed a diagram of the positions of the comet on the epidiascope. There had been a lot of confusion over the comet. Yerkes observatory had reported seeing a bright object 15 degrees north of the sun on April 26 and Mr Chambers reported seeing a comet's tail in the morning sky at 3.00 am. It later transpired that neither of these reports matched the real comet and comet seekers had wasted a lot of time in searching for it. Mr Crommelin said that the comet must have been well placed for observation some weeks or months before it was discovered, so that it seemed strange it was not discovered sooner. This was a point that might make comet seekers feel ashamed of themselves. It was possible that the comet might have been seen at the total eclipse in Sumatra. Several newspaper reports said that it had been seen from England, but sadly they were false. Captain Noble commented how carefully one ought to eschew newspapers when they required any real astronomical information. If the statements which he had seen in some of the newspapers had any foundation in fact, this new comet must have squirmed round the sun like one of the penny snakes which were sold in the streets! At the June meeting Mr Chambers described his observations of a tail in detail and said that it was definitely there on May 1, but not on the two following nights, but he could not otherwise explain the observation. Lantern slides of observations and drawings of the comet were exhibited but unfortunately when slides from photos of recent comets were being shown for comparison, the acetylene lamp exploded, fortunately without doing any damage. The final issue for the session includes a paper from Rev J T Bird, Chaplain to Her Majesty's Forces in the Transvaal. He describes his observations of the great comet and also describes the ideas of the Kaffirs about the comet. He notes that these were remarkably similar to those of Britain a few centuries earlier and that it portended plague or war.

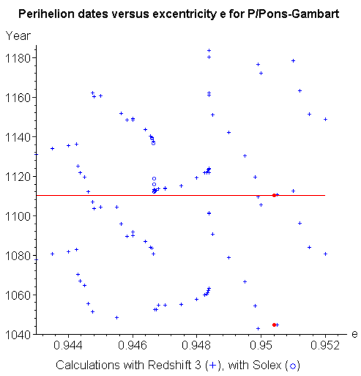
50 Years Ago: During the May meeting Dr Merton reported on observations of comet 1950b Minkowski by Albert Jones, drawings of comet 2P/Encke by George Alcock and several other comets. This generated considerable discussion on split comets and motion in comet tails.

Awaiting Comet P/Pons-Gambart

Volker Kasten, Garbsen, Germany

It is often a difficult task to predict the behaviour of a comet. For example, no one knows for sure the evolution of a comet's brightness or tail. And there are still a few periodic comets with poorly known orbits, making predictions about their next perihelion date very uncertain. One prominent example was comet P/Swift-Tuttle, the progenitor of the Perseids, which finally came to perihelion in 1992, ten years later than most had expected.

A similar case is that of comet P/Pons-Gambart. This periodic comet was only seen at one apparition, in 1827, when it passed perihelion on June 7. Due to investigations by Ogura (1917) and Nakano (1978), the period of revolution seems to be in the range of 46 - 67 years. In 1979, Hasegawa considered the possible identity P/Pons-Gambart = C/1110 K1. According to his computations, comet C/1110 K1 had fairly similar elements, reaching perihelion on 1110 May 18. More about comet C/1110 K1 can be found in Gary Kronks book "Cometography", Volume 1, p. 193 ff.



In their paper "Periodic Comets Found in Historical Records" (Publ. Astron. Soc. Japan 47, 699-710, 1995), Hasegawa and Nakano tried to link the orbits of Pons-Gambart and 1110 K1, resulting in a period of revolution of 65.58 years for Pons-Gambart in 1827, the eccentricity of its orbit being e = 0.9503946. With these elements, the next perihelion of the comet would be as late as 2022 Jan 31.

In addition, the authors present a table of previous perihelion times of Pons-Gambart, starting from the year -194 until 2022. According to this table, there should have been five additional perihelia with good observing conditions after the apparition of 1110, including that of 1827. But there is only one historical record of a comet in 1239, which could have been comet Pons-Gambart. According to Hasegawa and Nakano, a more recent perihelion passage took place on 1892 June 12. With this perihelion date, the comet should have been visible as a 4 mag circumpolar object in the northern sky at the end of June of that year, strolling through the Big Dipper at the beginning of July with a magnitude of 5.5 mag. However, no appropriate comet was observed. It seems unlikely to assume that such a bright object was simply overseen in 1892. Thus, if one is not willing to accept the ad hoc assumption that the comet was unusually faint during this apparition, serious doubts arise about the given perihelion time in 1892. As a consequence, the orbital resolution of Hasegawa and Nakano for Pons-Gambart in 1827 must be considered as uncertain.

I therefore found it interesting to make my own investigations regarding the orbit of comet Pons-Gambart. With the help of integration machines in REDSHIFT3, SOLEX 7.0 (a public- domain program written by Aldo Vitagliano) and DANCE OF THE PLANETS, I integrated various sets of osculating elements of Pons-Gambart backward in time until 1110, starting from the year 1827. The starting elements were chosen from GUIDE7, with the exception of the eccentricity e, which I varied in the range e=0.943 to e=0.952, corresponding to osculating periods of revolution in 1827 from 53 to 69 years.

In the adjacent figure, the resulting perihelion times are plotted as a function of the osculating eccentricity in 1827. The "predicted" perihelion in 1110 is indicated by a horizontal line. Integrations performed with REDSHIFT 3 are labelled by a cross (+), those computed with SOLEX 7 are shown as a circle (o); the Hasegawa-Nakano-solution is marked with a red circle. The results of both used programs seem to be consistent. Also, some tests with DANCE yield fairly similar results.

As the figure demonstrates, there are several possible intervals for the eccentricity in 1827 that yield perihelia not far from the year 1110. The first such interval goes from e=0.9446 to 0.9455 with computed perihelion times between 1103 and 1112. Given such eccentricities, Pons-Gambart would have returned as early as 1990 - 1995, but the comet was not discovered during those years.

The solution e=0.9503946 of Hasegawa and Nakano fits very well in this figure, lying in the interval e=0.9499 - 0.951 of possible values for the eccentricity. As already mentioned above, in this case we have to wait another twenty years for the next return of comet Pons-Gambart.

However, there is some hope for an earlier return of the comet. As can be seen from the figure, there are two other good fits for the eccentricity, namely around e=0.94667 and at the sharply defined value e=0.948379, were the perihelia make a steep jump backward in time (resulting in 12 revolutions of the comet until 1827 in each case). This jump could have its origin in the 14th century, where due to DANCE the comet in 1365 had an aphelion unusual far from the sun, although the program didn't reveal any single reason for this.

Integrating from 1827 onward, the former value of e yields the next return at the end of the year 2003, while the latter value results in a perihelion in 2012. Anyway, if the comet has not already been overlooked in recent years and has yet to come, a return of Pons-Gambart prior to the end of the year 2003 seems to be very unlikely.

See also the article by Andreas Kammerer published in The Comet's Tale in 1997 November, which is additionally available at http://www.fg-kometen.de/ponsetab.htm

Comet Prospects for 2002

2002 sees a number of returns of periodic comets, however none of them are particularly exciting. The brightest periodic comet of the year is predicted to be P/Brewington, which is making its first predicted return early in 2003 and this comet may reach 10^{th} magnitude at the end of the year. Several long period comets discovered in previous years are still visible. Theories on the structure of comets suggest that any comet could fragment at any time, so it is worth keeping an eye on some of the fainter periodic comets, which are often ignored. This would make a useful project for CCD observers. Ephemerides for new and currently observable comets are published in the *Circulars*, Comet Section Newsletters and on the Section, CBAT and Seiichi Yoshida's web pages. Complete ephemerides and magnitude parameters for all comets predicted to be brighter than about 18^m are given in the International Comet Quarterly Handbook; details of subscription to the ICQ are available from the comet section Director. The section booklet on comet observing is available from the BAA office or the Director; a new edition is at the printers.

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 will be a morning object, becoming visible in February and reaching 11^{th} 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 Serpens in February, Ophiuchus in March, Aquila in April and Aquarius in May.

Comet **19P/Borrelly** reached perihelion in September 2001 and begins the year at 11^m moving northward in Canes Venatici. It remains quite well placed as it fades, passing into Ursa Major in late February when it is 12^{th} magnitude.

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 pick up the comet in March, when it is at opposition and follow it as it retrogrades in Virgo until May, but the comet is only 13^{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 1 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 also 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.

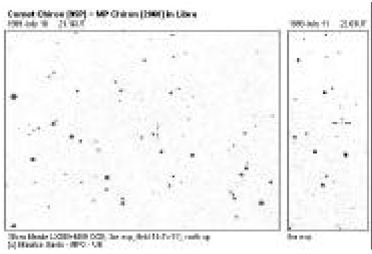
67P/Churyumov-Gerasimenko was discovered in 1969 September, by Klim Churyumov and Svetlana Gerasimenko on a plate taken for 32P/Comas Sola at Alma Ata observatory. It reached its present orbit after a very close encounter (0.05 AU) with Jupiter in 1959, which reduced the perihelion distance from 2.74 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.

81P/Wild 2 is a new comet that made a very close (0.006 AU) approach to Jupiter in September 1974. Prior to this it was in a 40 year orbit that had perihelion at 5 AU and aphelion at 25 AU. The comet was discovered by Paul Wild with the 40/60-cm Schmidt at Zimmerwald on 1978 January 6. The Stardust spacecraft is due to visit the comet in 2004 and recover material for return to earth in 2006.

The comet is at opposition in Taurus in December when it will be around magnitude 13.5. It will brighten into 2003, when it is at perihelion, but is too close to the Sun for observation when at its brightest (11^m).

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.



95P/Chiron imaged by Maurice Gavin in 1999 July.

Comets reaching perihelion in 2002

Comet	T	q	P	N	H1	K1
1999 F1 (Catalina)	Feb 13.7	5.79			5.0	7.5
2000 SV74 (LINEAR)	May 1.3	3.54			5.0	10.0
2000 WM1 (LINEAR)	Jan 22.7	0.56			6.5	10.0
2001 C2 (LINEAR)	Mar 28.3	5.10			6.0	10.0
2001 K5 (LINEAR)	Oct 12.1	5.18			2.5	10.0
2001 N2 (LINEAR)	Aug 19.9	2.67			7.5	10.0
2001 R1 (P/LONEOS)	Feb 17.5	1.36	6.48	0	14.0	10.0
2001 T3 (NEAT)	Jan 27.3	2.52	16	0	12.0	10.0
2001 T4 (NEAT)	Jan 4.7	8.56	53	0	5.5	10.0
6P/d'Arrest	Feb 3.6	1.35	6.53	17	10.0	20.0
7P/Pons-Winnecke	May 15.7	1.26	6.38	21	10.0	15.0
15P/Finlay	Feb 7.2	1.03	6.75	12	12.0	10.0
18D/Perrine-Mrkos	Sep 10	1.29	6.76	5	11.5	20.0
22P/Kopff	Dec 12.1	1.58	6.46	14	6.6	12.5
26P/Grigg-Skjellerup	Nov 29.7	1.12	5.31	18	12.0	40.0
28P/Neujmin 1	Dec 27.4	1.55	18.2	5	8.5	15.0
30P/Reinmuth 1	Dec 24.4	1.88	7.32	9	9.5	15.0
31P/Schwassmann-Wachmann 2	Jan 18.4	3.41	8.72	11	6.7	11.3
39P/Oterma	Dec 22.2	5.47	19.5	3	5.0	15.0
46P/Wirtanen	Aug 27.0	1.06	5.44	8	9.0	15.0
54P/de Vico-Swift	Aug 7.5	2.15	7.32	3	10.0	15.0
57P/du Toit-Neujmin-Delporte	Jul 31.2	1.73	6.42	5	12.5	15.0
67P/Churymov-Gerasimenko	Aug 18.3	1.29	6.57	5	9.5	10.0
77P/Longmore	Sep 4.7	2.31	6.83	4	7.0	20.0
89P/Russell 2	Mar 23.0	2.29	7.42	3	10.0	15.0
90P/Gehrels 1	Jun 23.0	2.97	14.8	2	8.5	15.0
92P/Sanguin	Sep 23.1	1.81	12.4	2	12.0	15.0
96P/Machholz 1	Jan 8.6	0.12	5.23	3	13.0	12.0
115P/Maury	Dec 23.9	2.04	8.79	2	11.5	15.0
124P/Mrkos	Jul 27.0	1.47	5.74	2	13.1	15.0
125P/Spacewatch	Jan 28.1	1.53	5.54	2	15.5	10.0
P/Shoemaker 3	Dec 15.0	1.81	17.1	1	10.5	10.0
P/Helin-Lawrence	Dec 22.4	3.11	9.52	1	10.0	10.0

The date of perihelion (T), perihelion distance (q), period (P), the number of previously observed returns (N) and the magnitude parameters H1 and K1 are given for each comet.

Note: $m_1 = H1 + 5.0 * \log(d) + K1 * \log(r)$

The orbit of **96P/Machholz 1**. 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 this return is no exception. However, at perihelion on 2002 January 8 it is only a few degrees from the Sun and may be seen in the SOHO LASCO coronagraphs from January 5 to 11.

116P/Wild 4 was discovered on 1990 January 21.98 by Paul Wild with the 0.40-m Schmidt at the Zimmerwald station of the Berne Astronomical Institute at a photographic magnitude of 13.5. At its brightest the comet only reached 12^m, but it was surprisingly well observed. The comet was perturbed into its present orbit after a close approach to Jupiter in mid 1987.

The comet emerges from the solar glare in November, moving south-eastwards in Virgo, but is poorly placed for viewing from the UK. It brightens from 13th magnitude near the end of the year to 12th magnitude in April as it nears opposition but is a long way south and will be difficult to observe from the UK. It is at perihelion in January 2003.

P/Shoemaker 3 (1986 A1) is also making its first return since discovery. It will be quite faint, around 14-13th magnitude, when it is picked up in November and does not get much brighter by the time it reaches opposition in February 2003. It moves eastwards from Cancer into Leo at the end of the year.

P/Brewington 2 (1992 Q1) makes its first return since its discovery in 1992. It was discovered by Howard J Brewington of Cloudcroft, New Mexico, as a small diffuse 10^m object on August 28.41 using a 0.40-m reflector x55. This was his fourth discovery and his second periodic one. The comet is in a Jupiter crossing orbit, but has not approached the planet for several revolutions. At a favourable return it could reach 7^m.

It will be too far south for viewing from the UK when it gets into visual range in June. It reaches opposition in August when it may be 12th magnitude and continues to brighten. We may pick it up in November as it brightens to 10th magnitude and we will be able to follow it into the New Year as it continues to move north. It is an evening object, but its solar elongation decreases from 80º in November to 50º at the end of the year. It will not reach perihelion until 2003. By October it is moving north-eastwards in Capricornus and ends the year in Aquarius.

Several recently discovered parabolic comets will be visible during 2002. 2000 SV74 (LINEAR) will be fading from 13th magnitude and may remain visible until December. 2000 WM1 (LINEAR) begins the year too far south to be visible from the UK, but it is well placed for Southern Hemisphere observers and may be a binocular object. In March it will have moved far enough north for UK observation and should still be a binocular object as it emerges into the morning sky in Sagittarius. It continues to move rapidly north and will probably be best for northern viewers in mid month when the moon is out of the sky. It passes from Aquila into Hercules in April and will probably be too faint for easy observation by June. 2001 N2 (LINEAR) may reach 13th magnitude between May and August. 2001 HT50 (LINEAR) will become visible towards the end of the year as it brightens towards its perihelion in mid 2003. 2001 MD7 (P/LINEAR) may be visible to Southern Hemisphere observers at the beginning of the year fading from around 13th magnitude.

Several other comets return to perihelion during 2002, however they are unlikely to become bright enough to observe visually or are poorly placed. 6P/d'Arrest, 15P/Finlay, 26P/Grigg-Skjellerup and 28P/Neujmin 2 have unfavourable returns. 30P/Reinmuth 1, 31P/Schwassmann-Wachmann 2, 39P/Oterma, 54P/de Vico-Swift, 57P/du Toit-Neujmin-Delporte, 77P/Longmore, 89P/Russell 2, 90P/Gehrels 1, 92P/Sanguin, 115P/Maury, 124P/Mrkos, 125P/Spacewatch, 1999 F1 (Catalina), 2001 C2 (LINEAR), 2001 K5 (LINEAR) and 2001 R1 (P/LONEOS) are intrinsically faint or distant comets. Ephemerides for these can be found on the CBAT WWW pages. 18D/Perrine-Mrkos has not been seen since 1968.

Looking ahead, 2003 has a good return of **2P/Encke,** which might be observable from September until the end of the year, when it could be 6th magnitude. This may however be optimistic as observations from the SOHO spacecraft in 2000 showed that it suddenly brightened after perihelion, which does not occur until late December 2003.

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Jonathan Shanklin

Professional Tales

Many of the scientific magazines have articles about comets in them and this regular feature is intended to help you find the ones you've missed. If you find others let me know and I'll put them in the next issue so that everyone can look them up.

The following abstracts (some shortened further for publication) are taken from the Cambridge Conference Network (CCNet), which is a scholarly electronic network devoted to catastrophism, but which includes much information on comets. To subscribe, contact the moderator Benny J Peiser at <b.j.peiser@livjm.ac.uk>. Information circulated on this network is for scholarly and educational use only. The abstracts, taken from daily bulletins, may not be copied or reproduced for any other purposes without prior permission of the copyright holders. The electronic archive of the CCNet can be found at http://abob.libs.uga.edu/bobk/cccmenu.html

NASA to track more asteroids with new NEAT camera. Ron Baalke, Media Relations Office, Jet Propulsion Laboratory

Asteroid search efforts got a boost from a new, improved camera installed for NASA's Near Earth Asteroid Tracking system on the 1.2-meter (48-inch) Oschin telescope at the Palomar Observatory near San Diego, Calif. The camera has a new three-eyed design with three lenses. It can provide three times more data and survey 1.5 times more sky than the present NEAT camera that operates currently at the Maui Space Surveillance Site's 1.2-meter telescope in Hawaii. The NEAT team can operate the telescope from their desks at JPL, as though the camera were a spacecraft.

"The new camera has the flexibility to do a wide and shallow sky survey, or one not-so-wide but deeper," said Dr. Steven Pravdo, NEAT project manager at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "We plan to do more deep observing, so that we can see as many objects as possible." The asteroid observers will be able to take panoramic views of the sky with the three camera eyes or to take a deep exposure showing many faint objects in a narrow swath.

The whole control system on the Oschin telescope was upgraded to a computer-controlled system. The old manual system pointed to only 10 positions each night, but the camera now needs to point to different positions 1,000 times a night. The new system captures about 3.75 square degrees of the sky per image, hundreds of square degrees per night, and most of the accessible sky each month.

The new NEAT camera takes pictures with 48 million pixels, three times more than the system it replaced, and it can see fainter objects. The Palomar staff, headed by Superintendent Bob Thicksten, has helped with the improvements. Palomar Observatory is a facility of the California Institute of Technology.

"This will be a new lease on life for a very famous survey telescope, which conducted the first comprehensive survey of the northern skies in the 1950s and which is now targeting some exciting astronomical goals - searching for near-Earth asteroids and examining supernovae and their role in determining the fate of the cosmos," said Richard Ellis, the director of Palomar Observatory.

The new camera's installation closes the era of using photographic plates, and marks the rebirth of Palomar Observatory's Oschin telescope in the electronic age. "It has been a dream 20 years in the making," says NEAT's principal investigator Eleanor Helin, who has been discovering asteroids from Palomar's two wide-field telescopes since the early days of near-Earth object search.

This new camera system will continue NASA's effort to find 90 percent of all large, near-Earth asteroids by 2010. "We installed the camera on April 9th, and hope to get results in the next few days," Pravdo said. [It has been remarkably successful in discovering new comets, with 14 so far this year.]

ASTEROIDS, COMETS, METEORS - ACM2002

The next meeting of the International Conference ASTEROIDS, COMETS, METEORS - ACM2002 will be held in Berlin from July 29 to August 2, 2002. The Conference will take place on the campus of the Technical University (TU-Berlin), located in the centre of Berlin. Further information will be provided in the second announcement, and on the web page http://earn.dlr.de/ACM2002

LIGHTCURVE & COLOURS OF UNUSUAL MINOR PLANET 1998 WU24 Davies JK, Tholen DJ, Whiteley RJ, Green SF, Hillier JK, Foster MJ, McBride N, Kerr TH, Muzzerall E: ICARUS 150 (1): 69-77 MAR 2001

Minor planet 1998 WU24 is unusual in having the orbital characteristics of a Halley family comet but showing no sign of cometary activity. We present optical data that reveal a double-peaked lightcurve with a period of 7.283 +/- 0.003 h and a peak-to-peak amplitude of similar to0.54 mag. Infrared spectroscopy and quasi-simultaneous BVRIJHK photometry reveal a featureless K-band spectrum and colors typical of D-type asteroids, and suspected "bare" comet nuclei (B-V 0.78 +/- 0.034, V-R 0.53 +/- 0.037, V-I 0.99 +/- 0.035,V-J 1.67 +/- 0,043, V-H 2.10 +/- 0.076 and V-K 2.34 +/- 0.102). Image profiles from co-added frames in the R band indicate no apparent cometary activity, with an implied upper limit to the dust production rate of 150 g s(-1). Assuming a D-type albedo of 0.04 we derive a spherical equivalent diameter of 5.28 +/- 0.07 km although the lightcurve amplitude implies an irregular body with an axial ratio of 1.64: 1. We conclude that 1998 WU24 is probably an inactive comet nucleus. (C) 2001 Academic Press.

COMET LINEAR 1999 S4 [An amalgam of several reports on this comet, which were published in the journal Science]

Astronomers analyzing debris from this comet that broke apart last summer spied pieces as small as smoke-sized particles and as large as football-field-sized fragments. But it's the material they didn't see that has aroused their curiosity.

Tracking the doomed comet, named C/1999 S4 (LINEAR), NASA's Hubble Space Telescope's Wide Field and Planetary Camera 2 found tiny particles that made up the 100,000-kilometer-long dust tail and 16 large fragments, some as wide as 100 meters. Hubble detected the small particles in the dust tail because, together, they occupy a large surface area, which makes them stand out in reflected sunlight. However, the estimated mass of the observed debris doesn't match up to the comet's bulk before it cracked up.

The mass of the original, intact nucleus is estimated to be about 300 billion kilograms, according to some ground-based observers who were measuring its gas output. However, the total mass in the largest fragments measured by the Hubble telescope and the VLT is only about 3 billion kilograms, and the dust tail has an even smaller mass of about 0.3 billion kilograms. In other words, the total mass measured following the breakup is about 100 times less than the estimated total mass prior to the breakup.

So where is the rest of the comet's fractured nucleus? Perhaps, suggest Weaver and other investigators, most of the comet's bulk after the breakup was contained in pieces between about 2.5 millimetres and 50 meters across. These pebble-sized to house-sized fragments cannot be seen by visible-light telescopes because they do not have enough surface area to make them stand out in reflected sunlight.

If the midsized cometary fragments exist, then the fundamental building blocks that comprised LINEAR's nucleus may be somewhat smaller than what current "rubble pile" theories of the solar system's formation suggest. These theories generally favour football-field-sized fragments, like the ones observed by the VLT and the Hubble telescope. The analysis of LINEAR's fragments indicates that the "rubble" comprising cometary nuclei may be somewhat smaller than previously thought.

Another puzzling question is why the comet broke apart between June and July of last year as it made its closest approach to the Sun. "We still don't know what triggered the comet's demise," Weaver says. "But we do know that carbon monoxide (CO) ice probably did not contribute to the breakup." Hubble's Space Telescope Imaging Spectrograph detected low levels of this volatile material, about 50 times less than was observed in comets Hale-Bopp and Hyakutake. Carbon monoxide ice sublimates [changes directly from a solid to a vapor] vigorously, even at the cold temperatures in a comet's interior. This activity could lead to a buildup of pressure within the core that might cause the nucleus to fragment.

"One question we tried to answer was, 'Did everything happen at one time, or did the pieces of the comet slowly fragment off?'" said Dr. Zdenek Sekanina of JPL. He identified some of the fragments in the pictures from Hubble and the Very Large Telescope, determined their sizes and relative motions and the times they separated. "We found that the comet's breakup was gradual but episodic. Also, the distances among the mini-comets grew as time went by, and we wanted to find out how rapidly."

There are two forces working on the different distances between the mini-comets, Sekanina said. One is that the fragments broke off at different times. The other is that gases flowing from the broken chunks of dust and ice were propelling them to different speeds depending on their size.

Sekanina predicted that the tail would become a narrow, bright band, made from the sunlight-reflecting dust released as the comet crumbled. While the new tail was relatively bright at first, the comet's original head disappeared, confusing calculations of the orbit. The last pictures of the tail were taken in the second half of August 2000, about four weeks after the event. Then the comet's remains vanished forever.

The French-Finnish SWAN instrument on the SOHO spacecraft observed Comet LINEAR by ultraviolet light from late May, and continued to watch it till the remnants faded from view in mid-August. The SWAN team reports that their observations showed four major outbursts in June and July.

The fragmentation seen by SWAN began on 21 July, almost a week before observers on the ground noticed it. Between 25 May and 12 August, the dying comet released altogether 3.3 million tonnes of water vapour into space, as its ice evaporated in the warmth of the Sun. The data also suggest that the density of Comet LINEAR was extremely low.

"Only SWAN on SOHO saw the entire drama of this self-destroying object," comments Teemu Mäkinen of the Finnish Meteorological Institute, lead author of the report in Science. "The ice on the surface of the comet's nucleus did not simply vaporize as in a normal comet, but came away in large chunks. We saw 90 per cent of the ice falling off before the complete fragmentation of the remainder began."

SWAN's unique capability in observing comets comes from its continuous scanning of the whole sky, at just the right ultraviolet wavelength to see the cloud of hydrogen atoms that surrounds every moderately active comet. The hydrogen comes from the break-up of water molecules released from the comet by the Sun's warmth. SWAN also benefits from its location on the ESA-NASA SOHO spacecraft 1.5 million kilometres from the Earth, well clear of a hydrogen cloud that surrounds the Earth itself.

The character of the comet did not change throughout the months of observation by SWAN, even when deep layers inside the nucleus were being laid bare. Comet scientists usually have to consider the possibility that the surface of the nucleus is different in composition from the interior. One lesson from Comet LINEAR seems to be that, in this case at least, the surface exposed at the outset was representative of the whole nucleus.

The SWAN team also suspects that Comet LINEAR was as flimsy and light as the expanded polystyrene used for packing fragile equipment. The density of its water ice may have been as low as 15 kilograms per cubic meter, compared with 917 kg/m3 for familiar non-porous ice on the Earth. Even allowing for a possibly equal mass of dust grains within the comet, a total density of 30 kg/m3 would be far less than the 500 kg/m3 often assumed by comet scientists. By this reckoning, the initial diameter of Comet LINEAR on its approach to the Sun was about 750 metres.

"Our opinion about the low density is tentative and controversial," says Jean-Loup Bertaux. "We expect plenty of arguments with our colleagues when we put all the observations of Comet LINEAR together. But we start with the advantage of having seen the whole course of events, which no one else did."

Dr. Tony L. Farnham, a planetary scientist at The University of Texas at Austin, and his colleagues discovered a deficiency in the molecule carbon-2 in Comet C/1999 S4 (LINEAR). The carbon-2 deficiency indicates that the comet formed near Neptune, probably billions of years ago. Most comets were formed during the solar system's earliest years in two regions: near Jupiter and Saturn, and farther out, near Neptune. They didn't stay in those regions, however, because the force of gravity of those giant planets catapulted the comets away, and created two comet habitats: the Oort Cloud (a halo of Jupiter-origin comets enveloping the solar system) and the Kuiper Belt (a belt of Neptune-origin comets orbiting in the plane of the solar system along with the planets, beyond Neptune's orbit).

Different lines of evidence may indicate another history for C/1999 S4 (LINEAR). Other researchers found the comet to be lacking in other carbon-chain molecules, pointing to a Jupiter-region origin. He said the discrepancy "may be telling us that it has a surface material different from what's inside. It's possible that the comet formed near the Jupiter region, and other materials formed on the surface as it migrated out," into the outer solar system. But Farnham cautioned that there is no proof of this.

Farnham also calculated a lower limit for the radius of the comet's nucleus before break-up: about 0.4 kilometers.

FORCED PRECESSION MODELS FOR SIX ERRATIC COMETS. Krolikowska M, Sitarski G, Szutowicz S: ASTRONOMY AND ASTROPHYSICS 368 (2): 676-688 MAR 2001

The non-gravitational motion of six "erratic" short-period comets is studied on the basis of published astrometric observations. We present the precession models which successfully link all the observed apparitions of the comets: 16P/Brooks 2, 21P/Giacobini-Zinner, 31P/Schwassmann-Wachmann 2, 32P/Comas Sola, 37P/Forbes and 43P/Wolf-Harrington. We used the Sekanina's forced precession model of the rotating cometary nucleus to include the non-gravitational terms into equations of the comet's motion. Values of six basic parameters (four connected with the rotating comet nucleus and two describing the precession of spin-axis of the nucleus) have been determined along the orbital elements from positional observations of the comets. The solutions were derived with additional assumptions which introduce instantaneous changes of modulus of reactive force, and of maximum cometary activity with respect to perihelion time. The present precession models impose some constraints on sizes and rotational periods of cometary nuclei. According to our solutions the nucleus of 21P/Giacobini-Zinner with oblateness along the spin-axis of about 0.29 (equatorial to polar radius of 1.41) is the most oblate among six investigated comets.

NASA gives go-ahead to build 'Deep Impact' spacecraft. Media relations office, Jet Propulsion Laboratory.

The Deep Impact mission, has successfully completed its preliminary design phase and has been approved by NASA to begin full-scale development for a launch in January 2004. The encounter with Comet Tempel 1 on July 4, 2005 will reveal clues to the origin of comets and the composition and structure of perhaps the most mysterious objects in our solar system.

Now the Deep Impact team is completing the final design details and will begin building the mission's two spacecraft: a flyby spacecraft and a 350-kilogram impactor spacecraft. They will be launched together in early 2004 and travel to Comet Tempel 1's orbit where they will separate and operate independently. The flyby spacecraft will release the impactor into the comet's path, then watch from a safe distance as the impactor guides itself to collide with the comet, making a football field-sized crater in the comet's nucleus.

As the gases and ice inside the comet are exposed and expelled outward by the impact, the flyby spacecraft will take pictures and measure the composition of the outflowing gas. The images and data will be transmitted to Earth as quickly as possible. Many observatories on Earth should be able to see the comet dramatically brighten just after the impact on July 4, 2005.

CONTOUR to provide first surface 'fingerprint' of comet Encke's nucleus. Andrew Yee, News Service, Cornell University

Instruments aboard a spacecraft that will be launched next year to explore two, and perhaps three or more, comets in the solar system will for the first time provide a "fingerprint" of the surface of cometary nuclei, giving the first firm evidence of the composition of the icy, rocky objects. The spacecraft's infrared imaging spectroscopy will map the composition of the nucleus of comet Encke at a resolution of 100 meters to 200 meters, detailed enough to see craters and other large geologic features and to determine their composition.

Comet Encke will be the first target of NASA's Cornell University-led Comet Nucleus Tour (CONTOUR), scheduled for launch July 1, 2002. The surface resolution of Encke's nucleus by the CONTOUR spectrometer will be even better than that obtained by the infrared spectrometer on the Near Earth Asteroid Rendezvous spacecraft during its recent orbital mission to asteroid 433 Eros. "The CONTOUR spacecraft will come within about 100 to 160 kilometres of the nucleus, although the exact distance is still in doubt because we don't know the orbital position of the nucleus with extreme precision".

The imaging instrument, called the CONTOUR remote image/spectrograph, also will send back digital-camera images of Encke's nucleus. The camera will capture the images as the spacecraft speeds through the comet's coma, at 28 kilometres a second in November 2003. Joseph Veverka, Cornell professor of astronomy and principal investigator on the $155 million mission, noted that "success" will be defined as obtaining digital images of the nucleus showing automobile-size details, such as rocks, about 4 meters (4 yards) across. Encke, first discovered 225 years ago, is about 8 kilometres long and has an average radius of about 2.5 kilometres. It orbits the sun once every 3.2 years, and its most recent apparition from Earth was last year. It is unique in that it has been observed from Earth on 56 of its apparitions, more than any other comet, including Halley.

Encke will not be the only comet on CONTOUR's agenda. In June 2006 the spacecraft is scheduled to encounter Comet Schwassmann-Wachmann 3 and, possibly, Comet d'Arrest in 2008. These targets are so-called "Jupiter family" comets because they are thought to have had their orbital periods shortened by previous gravitational encounters with the giant planet. The science team hopes it also might be possible to visit other kinds of comets, particularly primitive members of the so-called "dynamically young" family that are in long elliptical orbits and might be making one of their first close passes by the sun.

The scientific team will be particularly searching the coma for evidence of curious particles previously detected in interstellar clouds by Jochen Kissel, a comet researcher at the Max-Planck-Institute for Extraterrestrial Physics in Garching, Germany. Kissel made his discovery in data sent back by NASA's Stardust mission, which will reach comet Wild 2 in 2004. The mission is using the same dust analyzer as will be carried by the CONTOUR. Said Veverka, "The particles have a completely weird composition and don't seem to have minerals in them but seem to be made of chains of carbon-hydrogen and oxygen-nitrogen, like polymers. But there isn't any polymer with that kind of composition that we are normally familiar with."

There is an indication, said Veverka, that some particles might have weathered the massive meltdown of material when the sun and planets were formed from interstellar dust and clouds. "The question now is, have any of these particles been preserved in comets? We have to get close enough to a comet to find out." Although Encke has been much studied from ground-based observatories, little is known about its composition. Most assumptions about Encke, are drawn from data gathered by the European Space Agency's Giotto spacecraft, which visited comet Halley in 1986. Much of what astronomers know about comets "comes from the one object we've come close to, comet Halley," noted Casey Lisse. However, the CONTOUR images from Encke will be 25 times higher resolution than those from Halley.

The CONTOUR web site is at http://www.contour2002.org/

LOW ALBEDOS AMONG EXTINCT COMET CANDIDATES Fernandez YR, Jewitt DC, Sheppard SS: ASTROPHYSICAL JOURNAL 553 (2): L197-L200, Part 2 JUN 8 2001

We present radiometric effective radii and visual geometric albedos for six asteroids in comet-like orbits. Our sample has three of the four known retrograde asteroids (1999 LE31, 2000 DG(8), and 2000 HE46) and three objects [(18916) 2000 OG(44), 2000 PG(3), and 2000 SB1] on prograde but highly elliptical orbits. These measurements more than double the number of known albedos for asteroids with a Tisserand invariant in the cometary regime. We find that all six of our objects, and nine of the 10 now known, have albedos that are as low as those of active cometary nuclei, which is consistent with their supposed evolutionary connection to that group. This albedo distribution is distinct from that of the whole near-Earth and unusual asteroid population, and the strong correlation between Tisserand invariant and albedo suggests that there is a significant cometary contribution to this asteroid population.

Two Amateur Astronomers from the Pacific Rim to Share the 2001 Edgar Wilson Award for the Discovery of Comets. Ron Baalke

This year's award is to be shared by comet hunter Syogo Utsunomiya of Kumamoto, Japan, and Albert Jones, the dedicated variable star observer from Nelson, New Zealand. Their co-discovery of comet C/2000 W1 is an example of astronomical and international coordination. On the night of November 18, 2000, Syogo Utsunomiya was observing the southern constellation of Vela with his 25x100mm binoculars when he spotted a fast-moving comet low on his southern horizon. Utsunomiya dutifully noted the comet to be approximately 5 arcmin across, magnitude 8.5 and moving rapidly to the southeast. The fast moving comet would soon be unobservable from his position.

On November 19, after confirming his observation, Utsunomiya relayed his report to the Central Bureau for Astronomical Telegrams (CBAT) at the Smithsonian Astrophysical Observatory. Soon afterwards, a description of the comet and its predicted position was sent from CBAT to a few other observers for confirmation. Despite the efforts of those astronomers, Utsunomiya's fast-moving comet went unnoticed for almost another week. Then in the early morning on November 26, the 80-year-old eagle-eyed Jones spotted what he recognized as a comet with his 78-mm refractor, not knowing it to be one that Utsunomiya had seen a week earlier further to the north. Jones had chanced upon the comet as he was quickly moving from star to star or "star hopping." He was actually trying to observe the variable star T Apodis before the approaching morning sun ruined the sky. Jones' luck that morning would earn him two more distinctions:

he is now the oldest person to have discovered a comet, and he has set the record for the longest time interval between discovering comets at 54 years!

Damn those damocloids.
Duncan Steel

I'd like to make a few comments about the significance of the newly-discovered 'Damocloid' 2001 OG108 likely the largest known Earth-crossing asteroid and similar objects; that is, Earth-crossing asteroids on Halley-type orbits. The high inclination of this object (80 degrees) adds weight to the conviction that it may well be an extinct (or dormant) comet. That in turn leads to an idea that the albedo is low (a few percent) and so the size in somewhat larger than would be calculated based on typical asteroidal albedos, as Ted Bowell suggested: 15 km or maybe more. To tie this down it would be useful if thermal infra-red observations could be made as the object get closer to the Sun, rendering the albedo and hence the size. Similarly a cometary nature - cometary outgassing activity, I mean - might be indicated by high spatial resolution imaging showing a coma, or high spectral resolution observations showing emission lines.

Let me compliment the LONEOS team on their interesting discovery. There is more to it than that, though. Two Damocloids are now known with Earth-crossing orbits, this one and 1999 XS35, the latter being 1-2 km in size (absolute magnitude H7.2). Both have been found by LONEOS. Given that LONEOS discovers only a small fraction of all NEOs (due to the high productivity of LINEAR, NEAT and Spacewatch, rather than any fault of LONEOS), this requires an explanation unless one puts it down to chance. There are of course various other Damocloids with perihelia outside the terrestrial orbit (such as 1996 PW found by NEAT, and 1997 MD10, 1998 QJ1, 2000 AB229, 2000 DG8, 2001 QF6 and (20461) 1999 LD31 found by LINEAR, and (15504) 1999 RG33 found by the Catalina Sky Survey, and 2000 VU2 found by W.K. Yeung, plus 2000 HE46 found by LONEOS: see http://cfa-www.harvard.edu/iau/lists/Others.html), but the fact remains that it is LONEOS that has turned up the two Earth-crossers amongst them all.

Let us step back a decade. After we found Damocles at the Anglo-Australian Observatory in 1991 (it was actually Rob McNaught who spotted it, as 1991 DA, on a photographic plate taken using the UK Schmidt Telescope), we predicted that awaiting discovery there must be many dark asteroids on elongated, comet-like orbits crossing the path of the Earth. It is nice to see that prediction being borne out at last, even if they do pose a worrying danger to us. (5335) Damocles itself has a present orbit that comes sunwards only so far as to just overlap the aphelion distance of Mars, but its orbital instability is obvious (see, for example, D.J. Asher, M.E. Bailey, G. Hahn & D.I. Steel, 'Asteroid 5335 Damocles and its implications for cometary dynamics,' Monthly Notices of the Royal Astronomical Society, 267, 26-42, 1994), and so the name given it should not be surprising to anyone knowing the story of the Sword of Damocles.

Based solely on the existence of Damocles, David Asher and I suggested that perhaps ten percent of the large-body (>1-km) impact hazard might be due to dark Halley-type asteroids: D.I. Steel & D.J. Asher, 'The past and future orbit of (extinct comet?) 1991 DA,' pp.65-73 in Periodic Comets (eds. J.A. Fernandez & H. Rickman), Universidad de la Republica, Montevideo, Uruguay, 1992.

Damocles itself, though, is large (H3.3, much the same as the H3.0 of 2001 OG108). Asher and I were working on the assumption that some form of usual mass distribution would rule among Damocloids, with much larger numbers of smaller objects yet unseen. Both the LONEOS discoveries in question are rather larger than the norm for present NEO discoveries, 2001 OG108 very much so. One might then suggest that this is because LONEOS has a small aperture (limiting discoveries to brighter objects), but its wide field explains why the other programmes have not turned up similar objects. However, if indeed there are many smaller (<2-km) Earth-crossing Damocloids then one might expect the search projects using larger apertures (LINEAR, NEAT, Spacewatch) to have turned some of them up. One wonders, then, whether they do exist; or is there some systematic selection effect that is stopping the other searches from detecting them? Let me caution again, though, that this is based on a statistic of just two objects. On the other hand, all the Damocloids known are large (bigger than 2 km, most much larger).

The existence or otherwise of a significant population of (say) 0.3 to 2 km dark asteroids in Halley-type orbits is an important one from the perspective of planetary defence. For the sake of argument, let us assume that the above given proportion of the impact hazard due to these Damocloids (10 percent) is broadly correct. There are arguments over the proportion due to active comets, long-period or otherwise, but again 10 percent is in the right ballpark. Together those make 20 percent, leaving 80 percent as being the contribution of asteroids in inner solar system orbits. I won't worry about renormalisation: the figures are hazy, and if we knew the real figures then we'd know a lot more than we do now.

The point from that is that the NASA Spaceguard goal (of 90 percent of inner solar system asteroids larger than 1 km), which many people have criticized as being not ambitious enough, may in fact be overdoing it. Think carefully about the figures. Once one has found three-quarters of such objects then one has 60 percent of the hazard tied up (that is, three-quarters of 80 percent), with 20 percent of the hazard still available for attack by present means (80 minus 60): the brighter asteroids in inner solar system orbits, being found by relatively small telescopes. But that 20 percent is equalled by the 20 percent of the hazard (by my assumed figures) posed by Damocloids and active comets: objects on moderate-to long-period orbits that must be found on their apparition of impact when they are still at least beyond Saturn, and so in essence all are dark. This requires a deep, at least annual search of the whole sky with apertures of at least three metres, and preferably more. That is what needs to be done to make the biggest inroads into the hazard, once 75 percent of the larger inner solar system Earth-crossing asteroids have been found. The time is upon us.

Finally I note that the existence of large objects like 2001 OG108 on Earth-crossing orbits must lead to a re-assessment of the expected frequency of impacts of sufficient energy to cause a mass extinction event.

OBSERVATIONS REQUESTED FOR COMET LINEAR (2000 WM1)

Professional observers associated with the Ulysses spacecraft have put in the following request for observations. Could CCD and photographic observers who are able to obtain good images of the comet please send them to the contacts given below, with copies to me. Jonathan Shanklin

Observations of comet LINEAR in December 2001 and January 2002 could be valuable in understanding the solar-wind/comet interaction at high solar latitudes near solar maximum. The ULYSSES spacecraft has established that the solar wind consists of distinct equatorial and polar regions. The equatorial solar wind has an average speed of 450 km s^{-2} and a proton-electron density of 9 cm^{-3}. Variations in these quantities can be large. This region also contains the heliospheric current sheet (HCS). The polar solar wind has an average speed of 750 km/sec and a proton-electron density of 3 cm^{-3}. Variations in these quantities are small. Specifically, the HCS does not extend into the polar region. The boundary is determined by the maximum extent of the HCS in latitude. The HCS is expected to have a small latitude extent near solar minimum and a large latitude extent near solar maximum. This picture is expected to hold for most of the solar cycle, but its applicability at the time of solar maximum, when the solar magnetic field reverses, is open to question.

These solar-wind properties are reflected in the plasma tails of comets. In the equatorial region, the plasma tails appear relatively disturbed, the orientation of the plasma tail is consistent with the average solar-wind speed of 450 km/sec, and disconnection events (DEs) occur when a comet pierces the HCS. In the polar region, the plasma tails appear relatively undisturbed, the orientation of the plasma tail is consistent with the solar-wind speed of 750 km/sec, and DEs do not occur. These properties are described in ICARUS, Vol. 148, pp. 52-64, November 2000. The ULYSSES spacecraft made a South Polar Pass from September 2000 to January 2001 and will make a North Polar Pass from September to December 2001.

Comet LINEAR (2000 WM1) can also serve as a probe of solar-wind conditions near solar maximum. It should be a good Northern Hemisphere object in December 2001 and a good Southern Hemisphere object in January 2002. During January 2002, the comet will probe high southern latitudes, reaching ecliptic latitude 72.5° South on January 21, 2002. Thus, comet LINEAR will be a true probe of the solar wind with an extensive range in latitude. Properly exposed images of the plasma tail in December 2001 and January 2002 will document this comet and help determine the state of the solar-wind flow and the location or existence of the HCS at high latitudes near solar maximum.

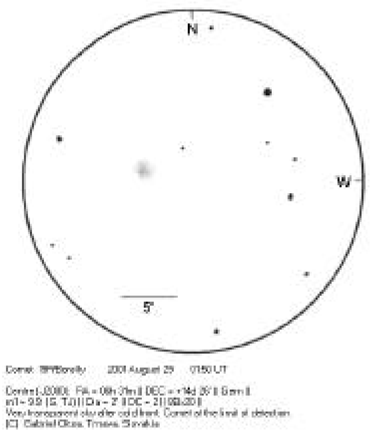
Specific observations that have potential scientific value are time sequences of plasma tail images. These could provide data on the rate of tail ray folding (information on the solar-wind velocity), the frequency of ray occurrence (information on the rate at which discontinuities encounter the comet), and kinematic information on DEs (if any are seen). Images posted on the Comet Observation Home Page or other sites with the usual documentation and sufficient field to allow identification of stars for the reduction will be fine. For further information or to make suggestions, contact: Jack Brandt <jbrandt@as.unm.edu> or Martin Snow <snow@lasp.colorado.edu>

All observations, of course, will be used only with the permission of the observer and will be fully credited to the observer.

Review of comet observations for 2001 April - 2001 October

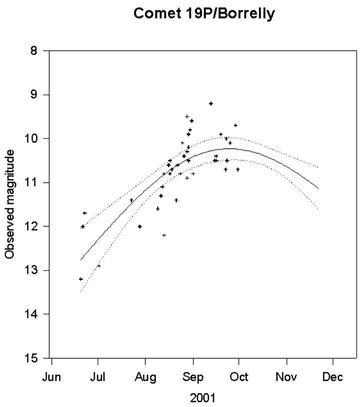
The information in this report is a synopsis of material gleaned from IAU circulars 7606 – 7739 and The Astronomer (2001 April – 2001 September). Note that the figures quoted here are rounded off from their original published accuracy. Lightcurves for the brighter comets are from observations submitted 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.

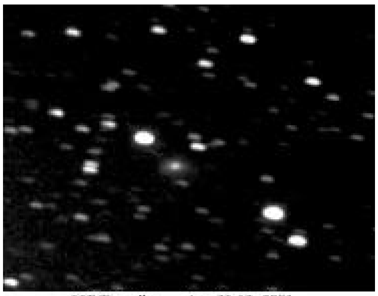
Comet 19P/Borrelly This is the comet's 13th observed return, with two poor ones having been missed. The solar elongation is only slowly increasing, but the comet moves north, although remaining a morning object. Slowly fading as it passes through the Leos (October) and into Ursa Major (November), the comet begins to move north more rapidly and ends the year at 11^m in Canes Venatici. It begins 2002 at 11m moving northward in Canes Venatici. It remains quite well placed as it fades, passing into Ursa Major in late February when it is 12th magnitude.



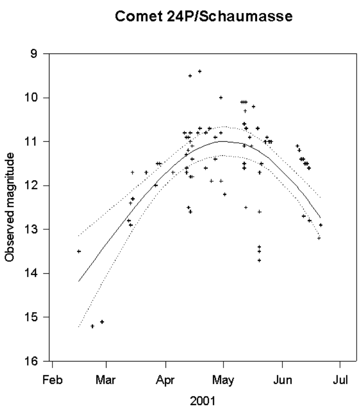
19P/Borrelly drawn by Gabriel Oksa on August 29.

The comet was first picked up by Michael Mattiazzo, who estimated it at 13th mag in mid June. By July 22 it had brightened to 11.4, a bit fainter than expected. Observing on August 28.11 with my 0.20-m SCT x75 I made it 10.3, DC4, diameter 1.7'. It reached a peak of around 10th magnitude in September, shortly after perihelion, and is now slowly fading. The spacecraft Deep Space 1 successfully imaged the comet on September 22. The uncorrected preliminary light curve from 43 observations is m = 6.8 + 5 log d + 19.2 log r





19P/Borrelly - Aug 21.13, 2001
Average of 5 x 30 sec exposures
0.3m f/2.8 Baker + Hi-Sis 24 CCD + R filter
0.5' x 1' elliptical coma
G. Sostero (Remanzacco Observatory, Italy)



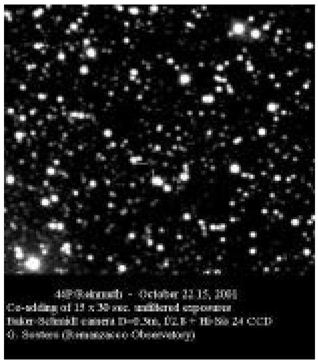
Comet 24P/Schaumasse The comet peaked in brightness in late April at around 11th magnitude. The uncorrected preliminary light curve from 78 observations is m = 7.7 + 5 log d + 29.2 log r

24P/Schaumasse imaged by Rolando Ligustri on May 19.

Comet 29P/Schwassmann-Wachmann 1 This annual comet has frequent outbursts and over the past couple of years seems to be more often active than not, though it rarely gets brighter than 12m. It is possible that its pattern of behaviour is changing. The randomly spaced outbursts may be due to a thermal heat wave propagating into the nucleus and triggering sublimation of CO inside the comet. The comet was noted in outburst in June, July and August. The comet will be observable in Libra for the rest of the year, though it is not well placed for observing from the UK. This comet is an ideal target for those equipped with CCDs and it should be observed at every opportunity.

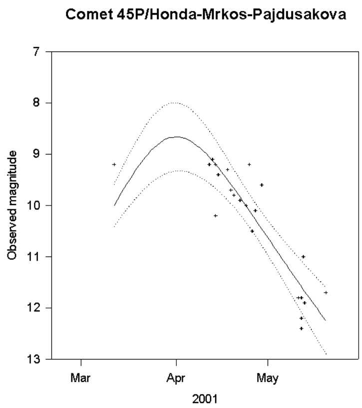
29P/Schwassmann-Wachmann 1 imaged by Rolando Ligustri and the CAST team on August 15.

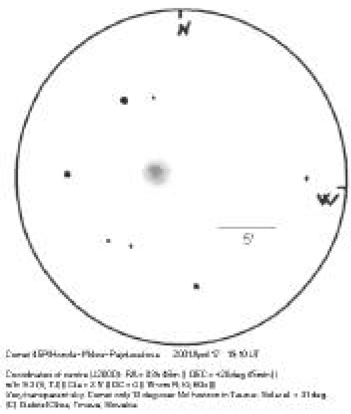
Comet 44P/Reinmuth has been image by Giovanni Sostero in October at around 16th magnitude.



44P/Reinmuth on October 22.

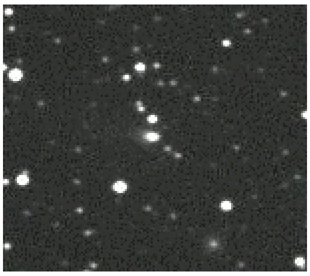
Comet 45P/Honda-Mrkos-Pajdusakova made its 10th observed return since discovery in 1948 (it was missed in 1959). On Apr. 4.42 UT, K. Kadota, Ageo, Saitama, Japan, reported m_1 = 10.5 and coma diameter 0'.8 (0.18-m reflector + CCD. [IAUC 7608, 2001 April 9] Gabriel Oksa reported a visual observation on April 17.8, when he estimated the comet at 9.3 in a 0.15m R x60, coma 2.5' diameter, DC4. The uncorrected preliminary light curve from 22 observations is m = 11.0 + 5 log d + 11.1 log r





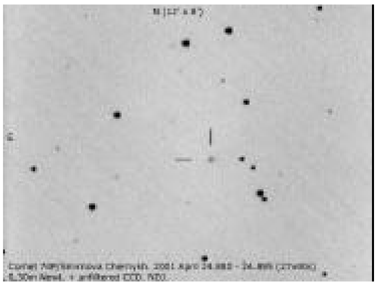
45P/ drawn by Gabriel Oksa on April 17.

51P/Harrington has been imaged by a few CCD observers, who show it as well condensed with a faint tail.

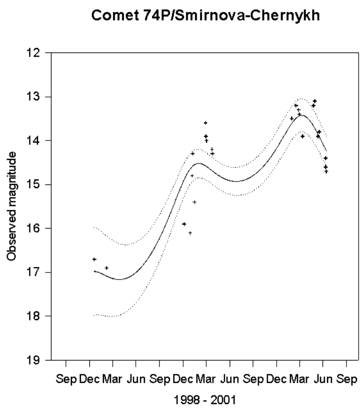


51P/Harrington imaged by Rolando Ligustri on September 24.

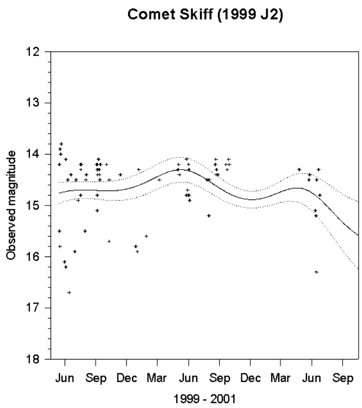
Comet 74P/Smirnova-Chernykh was at perihelion in January 2001. The uncorrected, rather unlikely, preliminary light curve from 27 observations is m = -9.8 + 5 log d + 38.4 log r



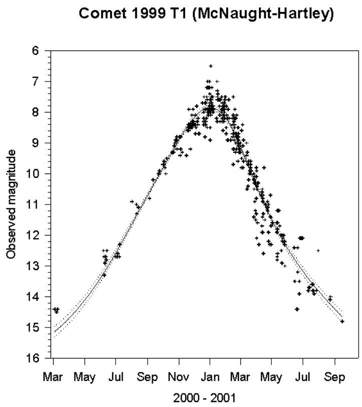
74P/Smirnova-Chernykh imaged by Nick James on April 24.



1999 J2 Skiff The comet is at high northern declination, and is very distant at over 7 AU, with perihelion in October 1999. It will remain near 15th mag for some time. The uncorrected preliminary light curve from 93 observations is m = -1.2 + 5 log d + 13.4 log r

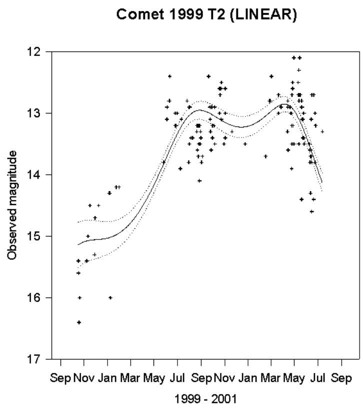


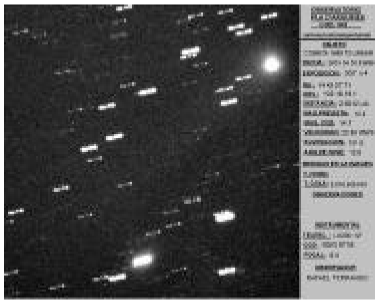
1999 T1 McNaught-Hartley On April 24 I estimated it at around 12th mag in the Thorrowgood refractor. It continued to fade and became quite diffuse. The uncorrected preliminary light curve from 419 observations is m = 6.3 + 5 log d + 9.4 log r



1999 T1 imaged by Rolando Ligustri on May 12.

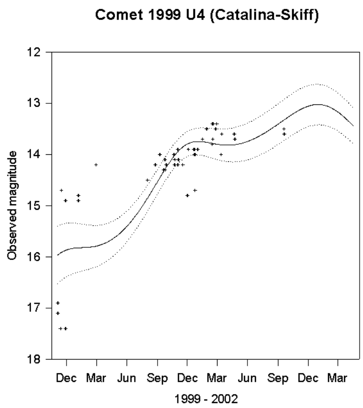
1999 T2 LINEAR On 2001 April 24 I was able to see the comet clearly in the Northumberland refractor, estimating it at 13.5. Observations are generally quite scattered. The uncorrected preliminary light curve from 151 observations is m = 6.5 + 5 log d + 8.2 log r



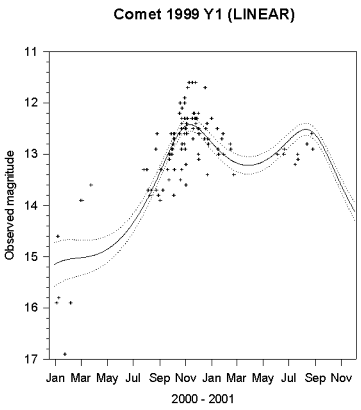


1999 T2 imaged by Rafael Ferrando on April 30.

1999 U4 Catalina-Skiff The object is very distant, but the extrapolated light curve suggests that it should be visible until mid 2002, fading from 13th mag. Pepe Manteca imaged the comet on August 25. The uncorrected preliminary light curve from 49 observations is m = 1.0 + 5 log d + 12.7 log r



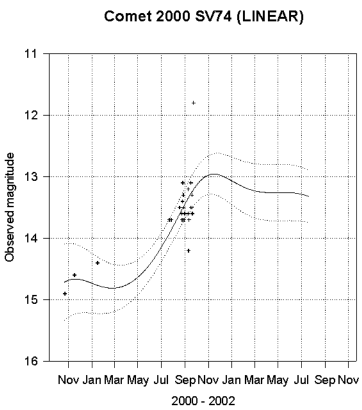
1999 Y1 LINEAR The comet is now beginning to fade and is a southern hemisphere object. Pepe Manteca imaged the comet on several times in August. Michael Mattiazzo has been following it from the Southern Hemisphere. The uncorrected preliminary light curve from 120 observations is m = 6.4 + 5 log d + 7.6 log r

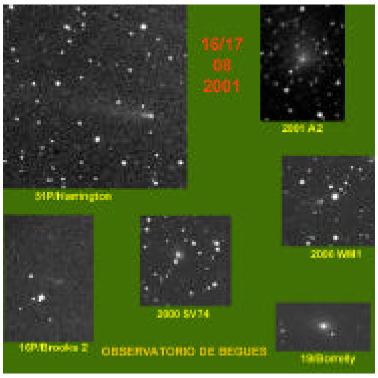


2000 CT54 LINEAR Yet another apparently asteroidal LINEAR object, of 19th mag, discovered on February 2.44. Reinder Bouma made a few observations in June when it was 14th mag.

2000 OF8 Spacewatch The comet reached perihelion in August 2001 at 2.2 AU. An improved hyperbolic orbit published on MPEC 2001-H34 [2001 April 24] gives 1/a (orig) as 0.000047, showing that the comet is a new one from the Oort cloud. Reinder Bouma estimated it around 14th mag in June.

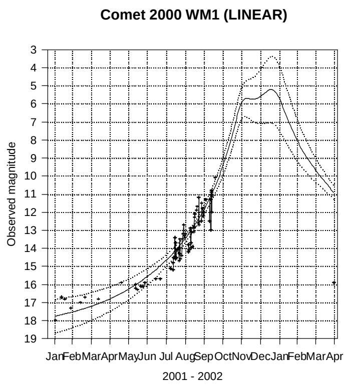
2000 SV74 The extrapolated light curve suggests that the comet will slowly fade from 13th magnitude. As with many comets the visual observations generally put the comet as being brighter than CCD observations. The uncorrected preliminary light curve from 26 observations is m = 8.0 + 5 log d + 4.1 log r.

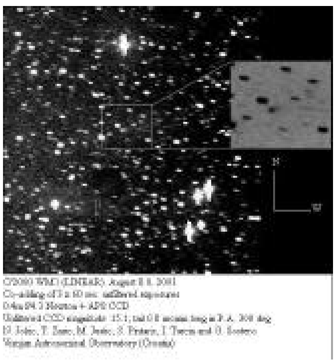




Montage of 6 comets imaged by Pepe Manteca on August 16/17

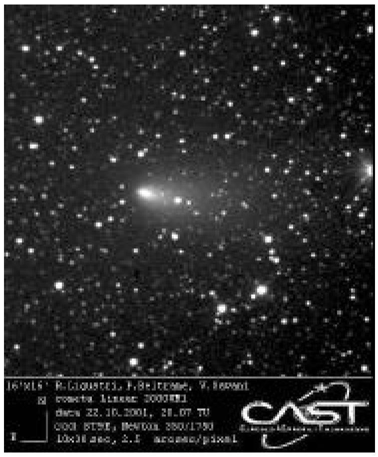
2000 WM1 LINEAR Brian Marsden notes on MPEC 2001-M50 [2001 June 28] that 'The "original" and "future" barycentric values of 1/a are +0.000516 and -0.000250 (+/- 0.000010) AU**-1, respectively.' The original value is greater than 10E-04, hence the comet is probably not a new arrival from the Oort cloud and has made at least one previous visit to the inner solar system. The corrected preliminary light curve from 76 CCD and visual observations is m = 6.5 + 5 log d + 9.7 log r, which predicts a peak magnitude in the range 4 - 7. The comet does not reach perihelion until January 2002. It will be too far south at perihelion, but will return to northern skies and will then be visible until August 2002.





2000 WM1 imaged by Giovanni Sostero and colleagues from the Visnjan observatory in Croatia on August 8.

2000 WM1 imaged by the CAST team on September 9.



2000 WM1 imaged by the CAST team on October 22.

Previously unnamed comets The IAU Committee on Small Bodies Nomenclature has agreed upon the names for the following five comets: C/2000 S3 (LONEOS); 150P/2000 WT_168 (LONEOS); C/2000 Y2 (Skiff); C/2001 G1 (LONEOS); C/2001 HT_50 (LINEAR-NEAT). [IAUC 7674, 2001 July 30]

SOHO Kreutz group comets

1996 A2 SOHO (IAUC 7718, September 17)
1996 B4 SOHO (IAUC 7726, 2001 October 3)
1996 B5 SOHO (IAUC 7730, 2001 October 9)
1996 L1 SOHO (IAUC 7606, 2001 April 2)
1996 R4 SOHO (IAUC 7730, 2001 October 9)
1997 K7 SOHO (IAUC 7646, 2001 June 20)
1997 M5 SOHO (IAUC 7606, 2001 April 2)
1997 W3 SOHO (IAUC 7650, 2001 June 23)
1998 V7 SOHO (IAUC 7612, 2001 April 23)
2001 G2 SOHO (IAUC 7613, 2001 April 25)
2001 G3 SOHO (IAUC 7613, 2001 April 25)
2001 H1 SOHO (IAUC 7613, 2001 April 25)

2001 H2 SOHO (IAUC 7613, 2001 April 25)
2001 H3 SOHO (IAUC 7613, 2001 April 25)
2001 H4 SOHO (IAUC 7613, 2001 April 25)
2001 H6 SOHO (IAUC 7631, 2001 May 23)
2001 H7 SOHO (IAUC 7631, 2001 May 23)
2001 J2 SOHO (IAUC 7631, 2001 May 23)
2001 J3 SOHO (IAUC 7631, 2001 May 23)
2001 J4 SOHO (IAUC 7631, 2001 May 23)
2001 K2 SOHO (IAUC 7631, 2001 May 23)
2001 K4 SOHO (IAUC 7634, 2001 May 28)
2001 K6 SOHO (IAUC 7641, 2001 June 6)
2001 K7 SOHO (IAUC 7641, 2001 June 6)
2001 K8 SOHO (IAUC 7641, 2001 June 6)
2001 K9 SOHO (IAUC 7642, 2001 June 8)
2001 L1 SOHO (IAUC 7642, 2001 June 8)
2001 L2 SOHO (IAUC 7642, 2001 June 8)
2001 L3 SOHO (IAUC 7642, 2001 June 8)
2001 L4 SOHO (IAUC 7642, 2001 June 8)
2001 L5 SOHO (IAUC 7646, 2001 June 20)
2001 L6 SOHO (IAUC 7646, 2001 June 20)
2001 L7 SOHO (IAUC 7646, 2001 June 20)
2001 L8 SOHO (IAUC 7646, 2001 June 20)
2001 L9 SOHO (IAUC 7646, 2001 June 20)
2001 M2 SOHO (IAUC 7650, 2001 June 23)
2001 M3 SOHO (IAUC 7650, 2001 June 23)
2001 M4 SOHO (IAUC 7650, 2001 June 23)
2001 M5 SOHO (IAUC 7650, 2001 June 23)
2001 M6 SOHO (IAUC 7650, 2001 June 23)
2001 M7 SOHO (IAUC 7655, 2001 July 2)
2001 M8 SOHO (IAUC 7655, 2001 July 2)
2001 M9 SOHO (IAUC 7655, 2001 July 2)
2001 M11 SOHO (IAUC 7667, 2001 July 19)
2001 O1 SOHO (IAUC 7667, 2001 July 19)
2001 R3 SOHO (IAUC 7718, September 17)
2001 R4 SOHO (IAUC 7718, September 17)
2001 R5 SOHO (IAUC 7718, September 17)
2001 S2 SOHO (IAUC 7730, 2001 October 9)
2001 T2 SOHO (IAUC 77xx, 2001) and several other comets not yet given identities 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.

2001 A2 LINEAR The latest orbit has 1/a (orig) of 0.001164, demonstrating that this is not the first time that the comet has visited the inner solar system. Michael Mattiazzo points out that the orbital plane crossing took place around July 15-16th. This should have enhanced the dust tail in the solar and anti solar directions.

C. W. Hergenrother, M. Chamberlain, and Y. Chamberlain, Lunar and Planetary Laboratory, University of Arizona, report that 60-s R-band images of C/2001 A2 taken on Apr. 30.12 UT with the Catalina 1.54-m reflector show a double nucleus. The two components are nearly equal in brightness and 3".5 apart and aligned precisely on an east-west line. Both components are highly condensed. Observations (with the same telescope) on Apr. 24.14 show only a single nucleus. [IAUC 7616, 2001 May 1] Using the absolute astrometry for Apr. 30 (see IAUC 7616) and May 9 given on MPC 42656 (where the western primary is labeled B and the eastern secondary is labeled A), Z. Sekanina, Jet Propulsion Laboratory, obtained a separation time of Mar. 17 +/- 12 and an acceleration of 7.1 +/- 2.4 (in units of 10**-5 solar gravity). [IAUC 7625, 2001 May 15]

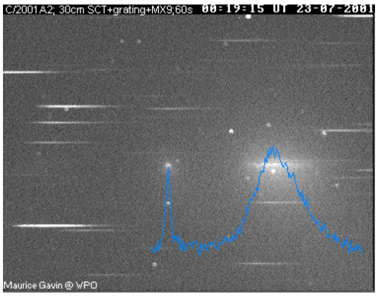
Photograph by Michael Mattiazzo on 2001 June 12

Z. Sekanina, Jet Propulsion Laboratory, writes: "Astrometric offsets of component A from B reported between Apr. 30 and May 18 (IAUC 7616, 7625, 7627, MPC 42656, MPEC 2001-K14) indicate that the splitting occurred on Mar. 29.9 +/- 1.6 UT (thus coinciding with the major outburst) and that the companion's relative deceleration is 15.2 +/- 0.7 units of 10**-5 solar attraction. Assuming that the separation of component C (IAUC 7627) from B coincided with the outburst of May 11, the single available offset suggests that C is subjected to a deceleration of approximately 40 units of 10**-5 solar attraction.

Image by Nick James on July 15

O. Schuetz, E. Jehin, X. Bonfils, H. Boehnhardt, K. Brooks, A. Delsanti, O. Hainaut, E. Jourdeuil, P. Leisy, M. Sterzik, and E. Wenderoth, European Southern Observatory (ESO); J. Helbert, DLR, Berlin; G. Garradd, Loomberah, N.S.W.; F. Marchis, University of California at Berkeley; B. Stecklum, TLS-Tautenburg; and G. Tozzi, Osservatorio Astrofisico di Arcetri, report that an intensive high-resolution monitoring of the inner coma on June 16-21 indicates that the comet continues to fragment. The images obtained at ESO (La Silla) in the thermal infrared with the 3.6-m telescope (+ TIMMI2, N band), and in the optical region with the 3.5-m New Technology Telescope (+ EMMI, R filter) and the ESO/MPG 2.2-m telescope (+ WFI, R filter), show faint companions drifting away from the principal nucleus (B) in an approximately antisolar direction. Analysis by Z. Sekanina, Jet Propulsion Laboratory, shows that all the observations can be satisfied by three fragments, D, E, and F. The analysis implies that fragment D separated from B on June 3.5 +/- 1.8 with a differential nongravitational deceleration of 17 units (of 10**-5 the solar attraction) and with an initial velocity of 1.0 +/- 0.1 m/s (approximately normal to the orbit plane); fragment E on June 9.5 +/- 0.7 with a deceleration of 53 units and a velocity of 0.3 +/- 0.1 m/s; and fragment F on June 11.3 +/- 0.5 with a deceleration of 102 units and a velocity of 0.8 +/- 0.2 m/s. These breakup events apparently triggered another major outburst (cf. IAUC 7630), reported by visual observers to have peaked on June 12.

L. M. Woodney and D. G. Schleicher, Lowell Observatory; and R. Greer, Wittenberg University, report narrowband gas and dust imaging of this comet: "On June 29-30, the comet displayed CN jet(s) symmetrical about p.a. 250 deg. Three successive arcs separated by approximately 12 000 km were observed on each side; outward motion of the arcs was detected. These arcs were not observed in the dust continuum." [IAUC 7666, 2001 July 18]

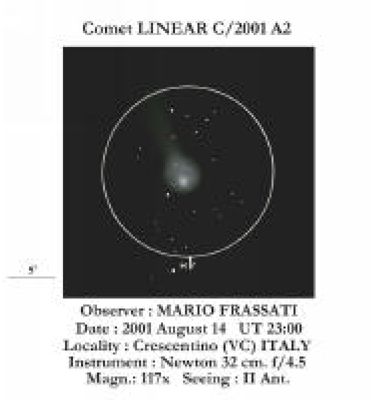


Spectral scan of the coma by Maurice Gavin on July 23

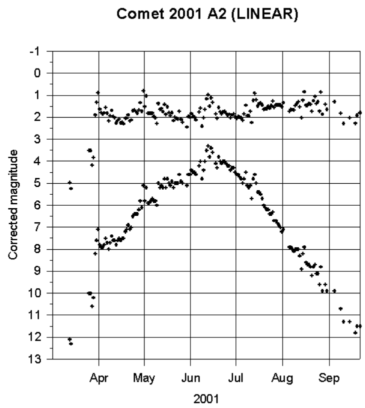
P. D. Feldman, H. A. Weaver, and E. B. Burgh, Johns Hopkins University, report observations of comet C/2001 A2 with the Far Ultraviolet Spectroscopic Explorer beginning July 12.58 UT and coinciding with the photometric event reported on IAUC 7679: "Spectra (range 91-118 nm; spectral resolution 0.03 nm) were obtained using the 30" x 30" aperture. Several new cometary emissions were identified, particularly the (0,0) bands of the CO Birge-Hopfield systems (C-X and B-X) at 108.8 and 115.1 nm, respectively; O I [(^1)D-(^1)D] at 115.2 nm; and three lines of the H_2 Lyman system at 107.16, 111.86, and 116.68 nm, pumped by solar Lyman-beta fluorescence. Also detected were O I multiplets at 98.9, 102.7, and 104.0 nm, and several lines of the H I Lyman series. The rotational envelopes of the CO bands are resolved and appear to consist of both cold and warm components, the cold component accounting for 80 percent of the flux and having a rotational temperature of 60 K. The warm component may be indicative of a CO_2 source. Both the CO bands and the O I 115.2-nm emission (an indicator of H_2O production) decreased by a factor of two over the 7.5 hr observation. Preliminary estimates of the production rates at the beginning of the observation are Q(CO) = 4 x 10^(27) s^(-1) and Q(H_2O) = 3 x 10^(29) s^(-1) (vectorial model). These values may be uncertain by as much as a factor of two, due to uncertainties in the solar flux. No emission is detected from Ar I at 104.8 and 106.7 nm and He I at 58.4 nm (in second order). We derive Q(Ar) </= 6 x 10^(25) s^(-1) (5-sigma upper limit), which implies that Ar/O is more than a factor of ten less than solar. In addition to the features listed above, more than two dozen other emissions remain unidentified." [IAUC 7681, 2001 August 15]

2001 A2 imaged by Martin Mobberley on 2001 July 23

David Seargent reported a visual observation at 13.1 on March 14, a little brighter than expected. It brightened very rapidly and reached 8th mag by the end of the month. It continued to brighten and became more condensed as it approached the sun. An estimate by Andrew Pearce on April 20.51 put it at 7.1 in 20x80B. Several estimates on April 24 commented that the comet had brightened rapidly in the last 24 hours and was now around 6.5. By the end of April it had reached 6th mag, but during early May the rate of brightening has slowed significantly, perhaps associated with the nuclear splitting observed at the end of April. More rapid brightening resumed around May 10 and the comet reached around 5th mag. An obsevation from Michael Mattiazzo on May 17.42 put it at 5.2 in 7x50B with a tail at least 1.6 degrees long; the comet was also visible to the naked eye. As of May 21 it was still 5th mag. Andrew Pearce reported that the comet had brightened to 4.8 on May 31.44 and the comet had a 1.5 degree long tail. The coma was noticeably blue-green in colour. On June 11.91 Andrew reported further brightening, estimating the comet at 3.6 to the naked eye and a 1.7 degree long tail in 20x80B. Michael Mattiazzo photographed the comet on June 12.



In the Northern Hemisphere, Giovanni Sostero recovered the comet on June 27. I picked it up on July 1.05 with 7x50B and estimated it at 5.3. It was an easy object, well condensed and diameter 11'. On July 10.9 it was an easy object in 8x30B of about mag 5.5, DC3 and diameter 12'. A further outburst took place on July 12, and on July 12.95 it was just visible to the naked eye from central Cambridge. The comet is now fading quite rapidly and has become very diffuse, making it a difficult object to pick out against the Milky Way background. Observations in mid August put it at around 9th magnitude, DC 1 - 2 and around 6' diameter. Observing on August 28.06 with my 0.20-m SCT x75 I made it 10.8, DC1 and diameter 2.3'



The uncorrected preliminary light curve from 879 observations is m = 7.3 + 5 log d + 10.6 log r, with several small outbursts after the major one at the end of March. One a week or so later and another in mid June. The light curve also suggests that there was quasi- periodic variation in the light curve with an amplitude of about a magnitude.

2001 H5 P/NEAT E. F. Helin, S. Pravdo, and K. Lawrence, Jet Propulsion Laboratory, report the discovery of a 17th mag comet on April 24.35, on CCD images taken with the 1.2-m Oschin Schmidt telescope at Palomar in the course of the NEAT program. CCD images taken on Apr. 25.0 UT by M. Tichy and M. Kocer at Klet (0.57-m f/5.2 reflector) show the diffuse object to have a coma diameter of 9". C. E. Lopez reports that CCD observations obtained on Apr. 25.2 at El Leoncito (0.5-m f/7.5 double astrograph) also show the object to be diffuse. Additional astrometry (including LINEAR prediscovery observations on Mar. 20 identified by B. G. Marsden) and orbital elements (T = 2001 Jan. 27.0 TT, q = 2.390 AU, i = 8.4 deg, P = 15.0 yr) are given on MPEC 2001-H37. [IAUC 7613, 2001 April 25] The comet will fade.

2001 HT50 LINEAR-NEAT S. Pravdo, E. Helin and K. Lawrence, Jet Propulsion Laboratory, report the discovery of a possible 18th mag comet by NEAT on CCD images obtained with the 1.2-m Schmidt at Palomar on May 14.22. T. B. Spahr, Minor Planet Center, has identified the object with the apparently asteroidal object 2001 HT50, observed by LINEAR on Apr. 23 and by LONEOS on Apr. 26 (MPS 30375), and has now found observations back to Mar. 3. Further details and parabolic orbital elements (T = 2003 July 8, q = 2.80 AU, Peri = 324 deg, Node = 43 deg, Incl. = 163 deg, equinox 2000.0) are given on MPEC 2001-J31. [IAUC 7624, 2001 May 14] The comet could reach 11th mag or brighter at its two oppositions in 2003.

2001 J1 NEAT S. Pravdo, E. Helin, and K. Lawrence, Jet Propulsion Laboratory, report the discovery of a 17th mag comet by NEAT on CCD images taken with the 1.2-m reflector at Haleakala on May 11.25. The object appears diffuse also on confirming CCD observations taken by L. Sarounova at Ondrejov (coma diameter about 15") and by M. Tichy and J. Ticha at Klet (coma diameter about 8"-10"). [IAUC 7623, 2001 May 11] The comet is intrinsically very faint.

As hinted on IAUC 7625, this is a short-period comet, and observations by C. W. Hergenrother, T. B. Spahr, and M. Nelson with the 1.8-m f/1 VATT Lennon telescope on May 27 make it clear that the orbital period is about 7.5-7.9 years. Spahr has also identified the comet with a very faint object (not described as cometary) discovered by A. E. Gleason with the Spacewatch telescope on 2000 Oct. 7 and placed on The NEO Confirmation Page but removed on Oct. 20 for lack of follow-up. The additional astrometry and orbital elements (P = 7.64 yr) are given on MPEC 2001-K43. S. Nakano has noted some rough similarity to the orbit of comet 3D/Biela. [IAUC 7635, 2001 May 29]

Brian Marsden has provided some additional information about this possibility: *While I cannot exclude with 100-percent certainty the possibility that the new comet P/2001 J1 (NEAT) is the long-lost 3D/Biela, I really don't think it is.*

What, indeed, happened to 3D/Biela after 1852? Did it break up completely? Some 30 years ago I looked into the possibility of finding that comet again and published a number of different orbits based on different possibilities for the action of the nongravitational forces on the comet after 1852. For an epoch around 1971 these orbits all had perihelion distances under 0.83 AU and inclinations to the ecliptic under 8.1 degrees.

Coming now to the recent comet, although unusually large inconsistencies among the observations made it particularly difficult to establish the orbit, and given that the comet's position in the sky makes it difficult to observe, I note that some careful observations on May 27 by Carl Hergenrother and Tim Spahr with the Vatican Advanced Technology Telescope in Arizona isolated the revolution period to 7.5-7.9 years. Tim then realized that the object had in fact been reported as unusual--though not of cometary appearance--by Arianna Gleason at Spacewatch on October 7 last year. The object was then listed on The NEO Confirmation Page for almost two weeks, although it was obviously too faint for essentially all of the likely follow-up observers, and Spacewatch itself evidently just missed the comet's position when it recorded the region again on October 19. The October 7 linkage is clearly correct, and this pins down the current period as 7.64 years.

Running this orbit back gives a moderately close approach to Jupiter (0.8 AU) in 1972, before which the P/2001 J1 perihelion distance was 0.96 AU and the inclination 11 degrees. While there was tolerably good agreement in orbital eccentricity, argument of perihelion and nodal longitude, it is difficult to reconcile the perihelion distance and inclination with the 3D/Biela values. To get these elements to agree would require the nongravitational forces to act in some special way, together with the gravitational effects of occasional approaches to Jupiter.

Whether or not the comets are identical, why was the current comet not observed earlier in the twentieth century? After all, the perihelion distance of under 1 AU does allow moderately close approaches to the earth--with a minimum orbital distance of perhaps 0.15 AU and an actual minimum distance of perhaps 0.5 AU in 1955. Actually, it is quite clear that at many passages through perihelion the small elongation from the sun would completely preclude observations, and by the time the object had moved around to opposition it would be as faint as when Spacewatch fortuitously observed it last October. Even under the more favorable circumstances of the 1955 perihelion passage, the best one could hope for at a 90-degree elongation from the sun would be magnitude 15, and more typically (as this year), one would have to contend with a maximum elongation of 70-80 degrees and magnitude 16 if one were lucky. We _were_ lucky that NEAT was observing this year so far from opposition, and there would have been no observing program with the capability of making the discovery at the previous comparable elongation in 1985. Unless the comet is now anomalously faint, that it escaped prior detection is fully reasonable--a situation not a bit like that of 3D/Biela on several occasions in the late eighteenth and early nineteenth centuries.

2001 K1 P/NEAT S. Pravdo, E. Helin and K. Lawrence, Jet Propulsion Laboratory, report the discovery of a 19th mag comet by NEAT on CCD images taken with the 1.2-m reflector at Haleakala on May 20.5 and 21.4 UT. M. Tichy and M. Kocer, Klet Observatory, note that the object had a 14" coma on May 21.9. P. Pravec and P. Kusnirak, Ondrejov Observatory, report a 0'.3 coma and a 0'.8 tail in p.a. 290 deg on May 21.9. T. B. Spahr, Minor Planet Center, has identified asteroidal observations of the object in LONEOS and LINEAR data back to Feb. 2. Full details are on MPEC 2001-K17. [IAUC 7629, 2001 May 21] The comet is periodic and will fade.

2001 K3 Skiff B. A. Skiff, Lowell Observatory, reports his discovery of a 16th mag comet on images taken with the LONEOS 0.59-m Schmidt on May 22.4; the coma was well condensed, about 20" in diameter, and a tail extended about 60" in p.a. 225 deg. Following placement in The NEO Confirmation Page, further observations were reported, and they are listed on MPEC 2001-K24, together with preliminary parabolic orbital elements (T = 2001 Jan. 12, q = 1.87 AU, Peri. = 315 deg, Node = 281 deg, Incl. = 37 deg, equinox 2000.0). M. Tichy and M. Kocer (Klet, 0.57-m reflector) reported a compact 8" coma; D. T. Durig (Sewanee, TN, 0.30-m reflector) a 30" tail; K. Smalley (Olathe, KS, 0.75-m reflector) a tail approximately 30 deg wide, brightest along the southern edge (p.a. about 210 deg), where it extended for about 2'; R. Dyvig (Quinn, SD, 0.66-m reflector) a possible coma and faint tail in p.a. about 225 deg. [IAUC 7631, 2001 May 23]

2001 K5 LINEAR A 17th mag object reported as asteroidal by the LINEAR program on May 17.28 (with prediscovery LINEAR observations on Apr. 30 identified by G. V. Williams) and posted on The NEO Confirmation Page has been found to be slightly diffuse with coma diameter 8" on CCD images taken at Klet on May 27.0 UT by M. Tichy and J. Ticha and to be strongly condensed with a 12" coma and a 13" tail in p.a. 210 deg on 300-s R-band exposures taken with the 1.8-m f/1 Vatican Advanced Technology Telescope at Mt. Graham on May 27.3 by C. W. Hergenrother, T. B. Spahr, and M. Nelson. [IAUC 7634, 2001 May 28] The comet is distant and will remain at around 14th mag visually for some time. This is LINEARs 64th comet.

2001 M1 P/Helin M. Busch, A. Seib, F. Hormuth, and R. Stoss, Starkenburg- Sternwarte, Heppenheim; and A. Gnadig and A. Doppler, Archenhold-Sternwarte, Berlin, report the recovery of P/1987 Q3 (= 1987w = 1987 XVII) on CCD images taken by Busch, Seib, and Hormuth with the EOCA 1.52-m reflector at Calar Alto on June 20.14 at 20th magnitude. The indicated correction to the prediction by B. G. Marsden on MPC 31664 (ephemeris on MPC 42160) is Delta(T) = -1.0 day. [IAUC 7648, 2001 June 21] The comet will brighten a little.

2001 M10 NEAT K. J. Lawrence, E. F. Helin, and S. Pravdo, Jet Propulsion Laboratory, report the discovery by NEAT of a 19th mag comet on 2001 July 20.28 with the Palomar 1.2-m Schmidt and the Haleakala 1.2-m reflector on June 29.58. [IAUC 7654, 2001 June 30] The comet is in a distant (q=5.3) orbit with a period of 138 years. M. D. Hicks, Jet Propulsion Laboratory, reports that this comet shows a diffuse coma of diameter about 5" and a faint tail about 7" long in p.a. 240 deg in a 10-min R-band CCD exposure obtained on June 30.3 UT with the 0.61-m reflector at Table Mountain (observers D. Esqueda, Hicks, and T. Ha). Hicks' name also should be added to the list of NEAT team members on IAUC 7654. [IAUC 7655, 2001 July 2]

2001 MD7 P/LINEAR N. Blythe, Lincoln Laboratory Experimental Test System, reports the discovery by LINEAR of an 17th mag comet on images obtained on July 11.22, when it appeared diffuse. Subsequent observations permitted identification with the object 2001 MD_7, so designated on MPS 31852 as a result of LINEAR observations made on June 21.31 and 24. L. Sarounova reports that CCD images of the comet obtained on July 12.9 UT at Ondrejov show a bright nucleus and faint coma. [IAUC 7660, 2001 July 12] The comet could reach 13th magnitude in the autumn. This is LINEARs 65th comet. Michael Mattiazzo observed it on October 14 when it had brightened to 14.2 in his 0.27-m SCT x88.

2001 MD7 imaged by the CAST team on October 14.

2001 N1 SOHO Discovered by Xavier Leprette, the orbit for this SOHO comet published on MPEC 2001-N24 [2001 July 11] is substantially different from the bulk of the Kreutz group members. Although the comet has a similar perihelion distance to that of the Kreutz group, the inclination, at 95 degrees, is far from the usual value of around 144 degrees. This is SOHO's 340th comet.

2001 N2 LINEAR An apparently asteroidal 18th mag object reported by LINEAR on July 11.38, which was posted on the NEO Confirmation Page, has been found to have a diffuse coma and a faint 5" tail in p.a. about 90 deg in a 3 min r-band CCD exposure taken with the 0.6-m reflector at Table Mountain by M. Hicks, D. Esqueda, and T. Ha. [IAUC 7661, 2001 July 13] The comet reaches perihelion in August 2002 and could reach 13th magnitude.

2001 O2 NEAT K. J. Lawrence, S. Pravdo, and E. F. Helin, Jet Propulsion Laboratory, report the discovery by NEAT of a diffuse 19th mag comet with some central condensation on July 25.42; on July 29, it showed nebulosity 12" toward the east. [IAUC 7673, 2001 July 30] Regarding the announcement of this comet on IAUC 7673, the observations on July 25 were made at Haleakala, while those on July 29 were made at Palomar. Additional astrometry and very uncertain parabolic orbital elements (from 17 observations, July 25-Aug. 1) and an ephemeris appear on MPEC 2001-P01. [IAUC 7676, 2001 August 1].

The comet is a distant one, past perihelion and will fade.

A/2001 OG108 (LONEOS) This asteroid was discovered by LONEOS on July 28.39 at 19th magnitude. It has a high inclination cometary type orbit, though no activity has so far been detected. With a period of 51 years it doesn't reach its perihelion of 1AU until March 2002, when it may reach 14th magnitude at high northern declination. If it does show any cometary activity it may well be brighter than this. Details of the observations and orbit were given on MPEC 2001-P40 on August 13.

Large Earth-Crossing Asteroid Found. A newly discovered rare asteroid may be the largest Earth-crosser known. Vanessa Thomas, Astronomy.com, 24 August 2001

During the past decade, astronomers have begun finding members of an unusual breed of asteroids. Called Damocloids after the first of their kind discovered, 5335 Damocles, these asteroids have elliptical orbits that resemble those of short-period comets like Comet Halley. A new member of this strange astronomical club has now been found, and its brightness suggests that it might be the largest Earth-crossing asteroid known.

Provisionally titled 2001 OG108, the object was first spotted on July 28 by Michael Van Ness, an observer for the Lowell Observatory Near-Earth-Object Search (LONEOS) program in Arizona. Over the next two weeks, observers tracked the newfound asteroid to determine its path about the sun. Like other Damocloids, 2001 OG108 has an elongated orbit. Each trip about the sun takes it from beyond Uranus to just within Earth's orbital path.

Because Damocloids mimic the course of short-period comets, astronomers suspect these unique asteroids might actually be "dead" comets. While the gas and ices that cause comets to flare up when they approach the sun may have been exhausted, the dark, rocky remains continue to travel through the solar system. If this notion is correct, these asteroids should have the same dark surfaces typical of short-period comet nuclei.

However, 2001 OG108 is one of the brightest Earth-crossing asteroids found so far. According to LONEOS director Ted Bowell, just two other Earth-crossers rival it in brightness. But 1866 Sisyphus and 2000 WF129 orbit the sun in the inner solar system and are unlikely to be as intrinsically dark as 2001 OG108, Bowell says. If the newly discovered asteroid is darker and reflects less light than Sisyphus and 2000 WF129, but appears just as bright, it must be larger.

Based on its brightness, its current distance, and an expectation of its albedo, Bowell estimates that 2001 OG108 could be as large as 10 miles (15 kilometers). The median size of the approximately 800 known Earth-crossing asteroids is less than one kilometer, so "this object really sticks out," he says.

Although 2001 OG108 will occasionally zip past Earth during its 50-year journey about the sun, Bowell assures that Earthlings need not worry that the asteroid will impact Earth - at least not in the near future. In its present orbit, the Damocloid will not come any closer to us than about 28 million miles (about 45 million kilometers), or more than 100 times the distance between Earth and its moon. The astronomer points out, however, that the asteroid could potentially pass within 100 million miles of Jupiter, which may result in an orbital adjustment by the giant planet's gravitational manipulation.

Currently passing through the main asteroid belt toward the inner solar system, 2001 OG108 will make its next close approach to Earth in April of next year. As it zooms past Polaris in our northern skies, the asteroid will be bright enough for amateur astronomers to spot with moderately sized telescopes. Professional astronomers will likely take interest in this rare space rock as well, in order to study its composition and attempt to confirm its once-cometary nature.

2001 P1 SOHO Discovered by Tony Scarmato, the orbit for this SOHO comet published on MPEC 2001-P22 [2001 August 8] is substantially different from the bulk of the Kreutz group members. Although the comet has a similar perihelion distance to that of the Kreutz group, the inclination, at 151 degrees, is far from the usual value of around 144 degrees and the value of L is around 208. This is SOHO's 343rd comet.

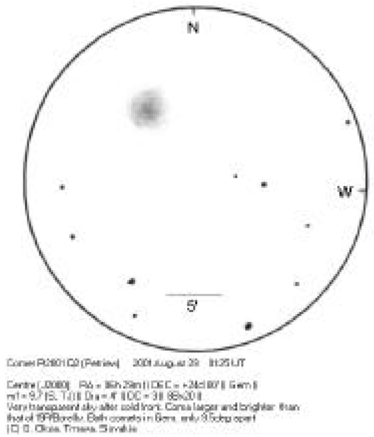
2001 P2 SOHO Discovered by Sebastian Hoenig, the orbit for this SOHO comet published on MPEC 2001-Q02 [2001 August 16] is substantially different from the bulk of the Kreutz group members. Although the comet has a similar perihelion distance to that of the Kreutz group, the inclination, at 130 degrees, is far from the usual value of around 144 degrees and the value of L is around 220 degrees. This is SOHO's 344th comet.

2001 P3 39P/Oterma Y. R. Fernandez, University of Hawaii, reports his recovery of comet 39P on CCD frames obtained on Aug. 13.42 at 22nd mag with the 2.2-m University of Hawaii reflector, confirmatory images being obtained on Aug. 20 and 21 by K. J. Meech and J. Pittichova. The object, a point source, was located about 2' from the prediction by B. G. Marsden on MPC 34423 (ephemeris on MPC 42373). Meech then succeeded in locating the comet on her CCD frames from 1999 May 9 and July 15. M. A. Kadooka and J. M. Bauer assisted, and the measurements by Meech are given on MPEC 2001-Q35. The recovery also confirms the correctness of positions tentatively measured by G. V. Williams from images obtained by D. C. Jewitt, J. X. Luu, and C. A. Trujillo on 1998 May 1 and 22. MPEC 2001-Q35 also includes orbital elements from 227 observations (1942-2001) and a revised ephemeris. Last observed in Aug. 1962, comet 39P passed 0.095 AU from Jupiter on 1963 Apr. 12, after which q increased from 3.4 to 5.5 AU and P from 7.9 to 19 years (with T = 1983 June 18 and 2002 Dec. 22). [IAUC 7689, 2001 August 24]

A/2001 PT13 This is a distant asteroid, with perihelion at 8.5 AU in 1999 February, with a period of 35 years.

2001 Q1 NEAT K. J. Lawrence, E. F. Helin, and S. Pravdo, Jet Propulsion Laboratory, report the discovery by the Near Earth Asteroid Tracking program of a new 19th mag comet on CCD images obtained with the 1.2-m Oschin Schmidt telescope at Palomar on August 17.20 Lawrence notes that the object is diffuse with a nuclear condensation of diameter about 3". Following posting on the NEO Confirmation Page, P. Pravec and P. Kusnirak (Ondrejov 0.65-m reflector) confirmed its cometary appearance on CCD images obtained on Aug. 18.9 UT, and M. Kocer (Klet 0.57-m reflector) reports that the object is diffuse and at m_1 = 18.0 on Aug. 18.9. T. B. Spahr, Minor Planet Center, has also identified the object in data obtained by LONEOS on July 16.2. Full astrometry and parabolic orbital elements appear on MPEC 2001-Q18. [IAUC 7685, 2001 August 18]. The comet is distant and will not get any brighter.

2001 Q2 P/Petriew Vance Avery Petriew, Regina, SK, reported his visual discovery of an 11th mag comet with a round coma of diameter 3' and condensed nucleus and no tail during a star party at Cypress Hills Interprovincial Park, Saskatchewan on August 18.42 using a 0.51-m f/5 reflector at 80x. The object's presence was also confirmed visually by R. Huziak (0.25-m reflector) and P. Campbell (0.32-m reflector) at Cypress Hills. [IAUC 7686, 2001 August 19] Additional astrometry and orbital elements by B. G. Marsden, Smithsonian Astrophysical Observatory, appear on MPEC 2001-Q31. The eccentricity is very uncertain, and the orbit indicates a close approach to Jupiter in 1982. S. Nakano, Sumoto, Japan, has also computed an elliptical orbit and notes the similarity to the orbit of comet 103P. [IAUC 7688, 2001 August 21] The ephemeris suggests that the comet should have been within visual range since July, which suggests that either the comet has recently outburst (or has a steep light curve) or that the morning sky is not being well patrolled by amateur comet hunters.



2001 Q2 drawn by Gabriel Oksa on August 29.

The following is taken from the SPA ENB 2001 August 27 : In centuries past astronomers discovered new comets the old-fashioned way: they peered through telescopes or simply looked toward the sky, hunting for faint smudges that no one had seen before. It was hard work, but lots of people did it. Comets are named after their discoverers, after all, and finding a new one can mean instant fame. Hale-Bopp, Hyakutake and Shoemaker-Levy are just a few of the names we know ... because of comets.

But lately it seems just about every new comet is called "LINEAR" or "NEAT." Those are names, too, but not the names of humans. They're robots -- automated, computer controlled telescopes that scan the skies in a relentless search for near-Earth asteroids and comets. This year between January and mid-August such telescopes recorded 18 new comets, while humans had found none. Comet hunters -- the human kind -- just can't compete! At least that's how many beleaguered sky watchers have been feeling. But now Canadian amateur astronomer Vance Petriew has proved humans can still discover a comet the old-fashioned way.

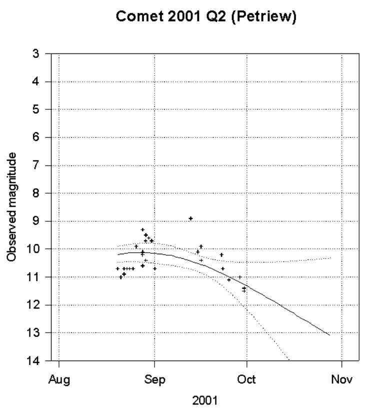
Petriew was at the Saskatchewan Summer Star Party on August 18th when he turned his 20" telescope toward the Crab Nebula. Hopping from one star to another across the constellation Taurus, Petriew guided his telescope toward the famous supernova remnant -- but he never made it. He stopped instead at a curious smudge that appeared unexpectedly in his eyepiece. Thinking it might be a galaxy, he looked at his star charts to see if any were nearby, but there was no galaxy in the vicinity.

Petriew announced his comet discovery hours later, and since then astronomers have been monitoring the newfound comet to learn more about it. Based on data spanning less that a week, it appears that Comet Petriew may be travelling around the Sun once every 5.5 years following an elliptical path that stretches from a point just inside Earth's orbit (0.95 AU) out to the realm of the giant planet Jupiter (5.3 AU).

Says Brian Marsden of the Smithsonian Institution's Minor Planet Center: "We're still not completely sure of the orbital period, but Comet Petriew might have passed close to Jupiter in 1982 -- an encounter that could have nudged the comet into its current orbit." Before 1982 Comet Petriew's orbit was probably bigger than it is now. It couldn't have come so close to Earth in decades past, which might explain why it was never spotted before.

2001 Q2 imaged by Pepe Manteca on August 21.

The comet was a relatively easy object in the morning sky. Observing on August 27.12 with 20cm T x75 I made it 10.1, DC3 and 1.6' diameter, and in 14x100B it was 9.3, DC3 and 4.7' diameter. An observation in mid September suggested that it had changed little in brightness, however it is now fading and is likely to be fainter than 13th magnitude by the end of October. The uncorrected preliminary light curve from 30 observations is m = 10.8 + 5 log d + 20.3 log r



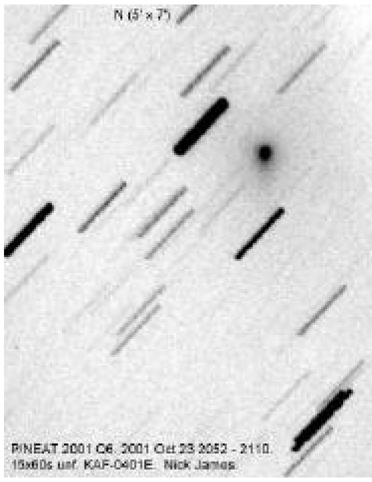
2001 Q3 SOHO This non Kreutz comet was discovered by Chen Hua Dong on SOHO imagery on August 25. Further to IAUC 7689, D. Hammer reports astrometric measurements of a comet found by Chen Dong Hua on SOHO website images. The object was first detected on August 25.34 at mag 8.3 in LASCO C2 coronagraph images, moving southward from directly underneath the occulter; the comet brightened and showed a nice tail before entering the C3 field-of-view, where it began to fade, as indicated by the following additional V magnitudes provided by D. Biesecker and Hammer: Aug. 25.393 UT, 7.6; 25.463, 7.4; 25.977, 5.7; 26.102, 4.8; 26.221, 5.2; 26.227, 4.6; 26.446, 5.8; 26.811, 8.0. [IAUC 7694, 2001 August 28]

2001 Q4 NEAT S. H. Pravdo, E. F. Helin, and K. J. Lawrence, Jet Propulsion Laboratory, report the discovery of a 20th mag comet on CCD images taken on August 24.40 with the 1.2-m Schmidt telescope at Palomar in the course of the NEAT program; their images on Aug. 24, 26, and 27 show a spherically symmetrical nebulosity with diameter about 8". CCD total magnitude estimates: Aug. 27.08 UT, 17.8 (J. Ticha, M. Tichy, and P. Jelinek, Klet Observatory, 0.57-m reflector); Aug. 27.47, 17.3 (P. J. Shelus, McDonald Observatory, 0.76-m reflector). [IAUC 7695, 2001 August 28] The comet was discovered when still over 10 AU from the Sun.

The elements on MPC 43604 give T as mid May 2004, with q of 0.96 AU. The uncertainty in the elements is greater than the precision to which they are given so extrapolation of the comet's position could lead to predictions which are considerably in error. Magnitude parameters are also extremely uncertain. At the moment they suggest an object of perhaps 0 magnitude in early May, though as it brightens it is at high southern declination. Perihelion a little earlier than given by the elements would give a potentially spectacular object in April 2004, whereas a month later the apparition would be fairly average.

2001 Q5 P/LINEAR-NEAT K. J. Lawrence, E. F. Helin, and S. H. Pravdo, Jet Propulsion Laboratory, reported the discovery by the NEAT program of a comet, of 17th mag, having a nuclear condensation of diameter about 6" and a 100" tail toward the southwest, on CCD images taken with the 1.2-m Schmidt telescope at Palomar on Aug. 28.35. Following posting on the NEO Confirmation Page, T. B. Spahr (Minor Planet Center) identified this object with an object reported as asteroidal by the LINEAR program (first detected on Aug. 17.40 at m_2 = 18.6-19.4). Other reported physical descriptions from CCD images include: Aug. 29.04 UT, m_1 = 16.0, tail 50" long in p.a. 237 deg (M. Tichy, Klet, 0.57-m reflector); 29.05, small coma, tail at least 4' long (L. Sarounova, Ondrejov, 0.65-m reflector); 29.08, diffuse (A. Galad and D. Kalmancok, Modra, 0.6-m reflector); 29.30, 40" tail in p.a. 243 deg (K. Smalley, Louisburg, KS, 0.75-m reflector); 29.38, well-condensed coma, broad tail 2' long in p.a. 246 deg (D. Balam, Dominion Astrophysical Observatory, 1.82-m Plaskett telescope); 29.43, m_1 = 16.9, tail about 70" long in p.a. about 240 deg (P. J. Shelus, McDonald Observatory, 0.76-m reflector). Additional astrometry and orbital elements by B. G. Marsden (from 35 observations, Aug. 17-29) appear on MPEC 2001-Q69 [IAUC 7697, 2001 August 29] The comet was at perihelion in June and will not get significantly brighter. It has a period of 6.6 years. This is LINEAR's 65th comet.

2001 Q6 NEAT S. H. Pravdo, E. F. Helin, and K. J. Lawrence, Jet Propulsion Laboratory, report the discovery of another comet, of 18th mag on CCD images taken with the 1.2-m Schmidt telescope at Palomar in the course of the NEAT program; their discovery image on Aug. 28.41 shows a central nebulosity of diameter about 3" and a tail about 10" long toward the west-southwest. Other reported physical descriptions from CCD images include: Aug. 28.98 UT, diffuse (M. Tichy, Klet, 0.57-m reflector); 29.05, diffuse object (m_1 = 16.4) with a bright nucleus, m_2 = 17.9 (L. Sarounova and M. Wolf, Ondrejov, 0.65-m reflector); 29.38, coma diameter about 10" (K. Smalley, Louisburg, KS, 0.75-m reflector); 29.44, well-condensed coma, broad tail 15" long in p.a. 240 deg (D. Balam, Dominion Astrophysical Observatory, 1.82-m Plaskett telescope); 29.47, fuzzy with a hint of a bulge to the southwest (P. J. Shelus, McDonald Observatory, 0.76-m reflector). Additional astrometry and preliminary parabolic orbital elements (from 25 observations, Aug. 28-29) appear on MPEC 2001-Q70. [IAUC 7698, 2001 August 29] 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.



P/2001 Q6 imaged by Nick James on October 23.

2001 Q7 SOHO A non Kreutz object of 8th magnitude discovered by R Kracht on C2 images on August 21.

A/2001 QF6 (LINEAR) Discovered by LINEAR on August 16.27, this 19th mag asteroid has a 23 year period, with perihelion at 2.2 AU. It will reach perihelion in February 2002.

A/2001 QL169 (NEAT) Discovered by NEAT on August 17.47, this 20th mag asteroid has a 5.5 year period, with perihelion at 1.53 AU and is just past perihelion. The orbit is typical of a short period comet and makes close approaches to Jupiter. The orbit is not significantly changed by approaches in 1860 (0.74 AU), 1943 (0.74 AU), 2014 (0.78 AU) and 2098 (0.84 AU). [MPEC 2001-R05, 2001 September 1]

2001 R1 P/LONEOS An apparently asteroidal 18th mag (red) object discovered by LONEOS on September 10.19 and posted on the NEO Confirmation Page has been found cometary. It has a period of 7.89 years and will be at perihelion on 2002 January 30. [IAUC 7713, 2001 September 11] It will brighten a little, but will not come within visual range. Improved orbital elements by B. G. Marsden were published on MPEC 2001-S05, including prediscovery observations on Aug. 19 by LINEAR and these indicate that this comet will pass only 0.014 AU from Mars on 2002 Jan. 10.7 TT, as first suggested by C.-I. Lagerkvist (Uppsala) and G. Hahn (German Aerospace Center, Berlin). [IAUC 7720, 2001 September 19]

2001 R6 P/LINEAR-Skiff B. A. Skiff, Lowell Observatory, reports his discovery of a 17th mag comet on CCD images taken by him with the LONEOS telescope on Sept. 25.32. The object shows a moderately condensed 15" coma and a broad tail about 25" toward the west-northwest. T. B. Spahr identified this comet with an object observed on two nights (Sept. 11 and 16, previously linked; m_2 = 19.4-20.0) and reported as asteroidal in appearance by LINEAR; subsequently LINEAR observations from Aug. 19 were also identified. J. G. Ries reports that CCD images obtained with the 0.76-m reflector at McDonald Observatory on Sept. 27.3 UT also show this object to be diffuse. [IAUC 7723, 2001 September 27] The comet has a period of 8.3 years and a perihelion distance of 2.1 AU.

2001 RX14 LINEAR The linkage by the Minor Planet Center of subsequent observations of an apparent 19th mag main-belt minor planet observed by LINEAR on Sept. 10.32 and 11 showed that this object, designated 2001 RX_14 on MPS 34978, had a nearly parabolic orbit. After placement on the NEO Confirmation Page, many further observations were received, with M. Tichy (Klet, 0.57-m f/5.2 reflector + CCD) on Oct. 18.7 UT indicating that the comet appeared to be diffuse with a coma of diameter 13" and red mag 16.7. R-band images taken by C. Hergenrother and J. Barnes (Lunar and Planetary Laboratory) with the 1.54-m Catalina reflector on Oct. 24.32 show a highly condensed coma of diameter 6" and no hint of a tail. [IAUC 7739, 2001 October 26] The comet reaches perihelion at 2.06 AU in January 2003 and could reach 10th magnitude. It will come within visual range in August 2002.

2001 S1 Skiff B. Skiff, Lowell Observatory, reports his discovery of an apparent 20th mag comet on LONEOS telescope images obtained on Sept. 26.4 UT, when the object appeared distinctly less well concentrated than nearby stars (despite poor seeing), with an apparent 17" coma. Observations by R. H. McNaught at Siding Spring on Sept. 26 show a coma barely different from the 2"-3" seeing but with a short tail (< 10" long) in p.a. about 40 deg. J. G. Ries reports that CCD images obtained with the 0.76-m reflector at McDonald Observatory on Sept. 28.4 confirm the northeastward tail of length about 10". [IAUC 7725, 2001 September 29] The comet is distant and past perihelion and will fade.

A/2001 SS287 (LINEAR) A 19th mag asteroid discovered by LINEAR on September 27.41 has a perihelion distance of 1.07 AU and a period of 6.13 in a typical Jupiter family comet orbit. Perihelion is due on Oct. 20.75.

2001 T1 SOHO A non Kreutz object discovered by Xavier Leprette on C2 images on Oct. 9.

2001 T3 P/NEAT K. Lawrence, S. Pravdo, and E. F. Helin, Jet Propulsion Laboratory, report the discovery on October 14.45 by the NEAT program of an 18th mag comet with a faint coma on CCD images taken with the Palomar 1.2-m Schmidt telescope. The object also appears cometary on CCD images taken by P. Pravec and P. Kusnirak at Ondrejov (moderately condensed coma of diameter 0'.2 on Oct. 14.9 UT) and by J. Ticha, M. Tichy, and P. Jelinek at Klet (diffuse 11" coma on Oct. 14.9; 10" coma and m_1 = 17.0 on Oct. 15.8). [IAUC 7733, 2001 October 15] The comet is in a 16 year periodic orbit with perihelion at 2.5 AU. It will fade.

2001 T4 NEAT S. Pravdo, E. F. Helin, M. Hicks, and K. Lawrence, Jet Propulsion Laboratory, report the discovery by the NEAT program of a 20th mag comet with a diffuse coma of diameter about 4" and a southward tail about 10" long on CCD images taken on Oct. 15.35 with the Palomar 1.2-m Schmidt telescope. Additional NEAT images on Oct. 21.4 UT show the comet as very diffuse and faint, elongated east-west. The comet has a perihelion distance of 8.6 AU and a period of 53 years. [IAUC 7738, 2001 October 23]

A/2001 TD45 (LINEAR) is another faint asteroid of 20th magnitude, discovered by LINEAR on October 15.40. It's 0.72 year orbit takes it to within 0.17 AU of the Sun at perihelion and out to the orbit of Mars at aphelion.

A/2001 TX16 (LINEAR) is an asteroid, of 17th magnitude, discovered by LINEAR on October 13. With a period of 6.77 years, the orbit is typical of a Jupiter family comet. There were approaches to Jupiter of 0.80 AU in 1985 and 0.73 AU in 1937. No observer has reported this object to have cometary appearance. [MPEC 2001-U45, 2001 October 25] It reaches perihelion at 1.44 AU in January, so may yet show cometary activity.

A/2001 UO16 (LINEAR) is an asteroid, of 19th magnitude, discovered by LINEAR on October 21.26. With a period of 6.13 years, the orbit is typical of a Jupiter family comet. It was at perihelion at the beginning of October.

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