COMET
NEWS SERVICE

A QUARTERLY REVIEW AND IRREGULAR BULLETIN

Contributions from Donald E. Machholz (1952-2022)

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LETTERS

SIR,- In the 26 months since I began comet hunting, I have logged 930 hours in 414 separate observing sessions. I am presently using a 10-in. f/3.8 reflector, 42x, with a 2.4° field. As of yet - no comet. Some of your readers may be interested in the "fringe benefits" of this type of program.

I have gained a much more extensive knowledge and appreciation of the night sky. One comes to enjoy the independence involved in the study of and hunting of comets. More tangible, though, is the observation of telescopic meteors that are picked up during the course of comet hunting. In 1976, I recorded 262 meteors in 177.5 hours of evening hunting, and 1050 during 375.25 morning search hours, which works out to evening and morning hourly rates of 1.47 and 2.80, respectively. Much more information in this field could be supplied by comet hunters - perhaps some of your readers could gather this data, too.

Don Machholz 1977 February 21
34 B Fillmer Ave.
Los Gatos, CA 95030

Mr. Machholz's results are presented in greater detail in the current J.ASSOC.LUN.PLAN.OBS. (Feb. '77). His letter was referred to E. Friton, American Meteor Society, who comments:

It is well worthwhile recording telescopic meteor observations while persuing other observing programs. The American Meteor Society, now under the leadership of Dr. David Meisel, is interested, as it has been for a long time, in telescopic meteor observations - from simple sporadic records of just skeleton data on up to the most complete information. Reports can be sent to Mr. Martin Hale, AMS Assistant Director, 98 Maple St., Canisteo, NY 14823. I believe that the British Astronomical Association is interested in the same. Members of the American Association of Variable Star Observers, incidentally, have been contributing their off-fall in this area to the AMS for a long time on a yearly basis.

A very interesting and comprehensive bulletin entitled "Telescopic Meteor Observation" by Karl Simmons, Southeast Regional Director of the AMS, may be obtained for 50 cents from the Astro-gater Astronomy Club, 1025 Gulf Life Dr., Jacksonville, FL 32207. Mr. Simmons outlines what is needed and how to go about the observing on a systematic basis. He explains, for instance, how the observations can be used, advises how long to observe at a time, what data to record for any one of four types of programs, and gives some very helpful hints on how to work efficiently - shielding oneself from extraneous light, and the value of a comfortable observing position, for example.

Incidentally, I have been persuing telescopic meteor observing off and on for many years, and have compiled a comprehensive record of what was seen in this category during the local Moonwatch program here some years ago. Occasionally I still observe in 15 minute periouds devoted exclusively to telescopic meteors with a five-inch apogee refractor that was used by the St. Louis Moonwatch team.

Edwin E. Friton
Missouri and Southern Illinois
Regional Administrator
American Meteor Society
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Webster Groves, MO 63119

ACKNOWLEDGMENTS: Dr. Brian Marsden supplied Comet 1977c orbit elements hot off the computer for inclusion in this issue, as well as some details on the Uranian ring discovery. Drs. Zdenek Sekanina and Fred. L. Whipple kindly forwarded some of their recent preprints. Ephemerides for P/Comet Grigg-Skjellerup have been received from Martin Grossman, Gronau, West Germany, and Charles Townsend, Oxnard, California. Phil Sturmfels, St.Louis, ran calculations pertinent to 1977b.

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COMET NEWS SERVICE

Review Issue

A QUARTERLY REVIEW AND IRREGULAR BULLETIN

Issue No. 78-6 McDONNELL PLANETARIUM, St. Louis / Editorial New Haven, CT 1978 October 12

BULLETIN--ADDED IN PRESS-- NEW COMET SEARGENT 1978m / DISCOVERED OCT 1 AT RA 11^h54^m, DEC -37^o / BRIGHT AT MAG 5 WITH TAIL $>1^o$ / CURRENT INFO SUGGESTS AN EXCLUSIVELY SOUTHERN HEMISPHERE OBJECT.

The Latest on Pluto's Satellite

Last issue COMET NEWS SERVICE reported in depth the dramatic discovery of the satellite of Pluto, provisionally designated 1978 P 1. Any initial skepticism on the reality of the elongation to Pluto's image, or what that elongation represents, is now pretty much dissolving. For example SCIENCE reported J. Derral Mulholland, University of Texas, as initially "interested, but unconvinced," but with more information, and having since detected the elongation on some of his own plates, Mulholland has now written back to "withdraw (his) name from the ranks of the unconvinced" (see SCIENCE 201:516, Aug. 11; letter, Sept. 8).

Meanwhile, the initial unclear expression of the satellite's orbit elements by the Naval Observatory on IAU CIRCULAR 3241, which announced the discovery — and in which only one inclination was provided — has led to some confusion. Using these, rather than later elements that appeared in the discovery paper preprint (now in ASTRON. J. 83: 1005), Dr. Leif Andersson, Lunar and Planetary Laboratory, had calculated and reported to SKY AND TELESCOPE that the earth passed through the Pluto-satellite orbit plane near 1970, when mutual eclipses could thus have been expected to have occurred. But the later elements, as reported last COMET NEWS SERVICE, allow for two possible inclinations — $+105^o$ or -105^o to the sky plane — and Dr. Andersson, queried early October by CNS, now in fact favors the other inclination (by the time the latter elements became available to him, however, it was too late to update the incorrect "News Note" that eventually appeared in the September SKY AND TELESCOPE). The other inclination, he writes, gives a "slightly better" fit of the observed position angles of the elongations of the satellite image, and a "distinctly better" fit of the existing photometric data (based on the changes in Pluto's light curve, Drs. Andersson and John Fix had correctly calculated the possible position domains for Pluto's pole - see ICARUS 20:279, 1973). "Thus eclipses in the near future seem somewhat more likely than eclipses around 1970," Andersson writes. "My best guess right now is 1980 $\pm$ 4 years; in other words, the eclipse phenomena may have started already."

With Pluto embarrassingly bereft of mass as a consequence of the satellite discovery (perhaps Pluto more properly should be considered an asteroid!), what, if anything, is apparently perturbing the motions of Uranus and Neptune? Might there be yet another distant undiscovered planet, or perhaps a trans-Neptunian comet belt as some have proposed? Queried on these points Dr. Brian G. Marsden writes, "I don't believe there is unequivocal evidence for residuals in the orbit of Neptune that need to be explained by perturbations by a trans-Plutonian planet." And although inferences in the past have been made on the mass of a possible belt of comets beyond Neptune's orbit based on the small anomalous motions in long-period comets like Halley's, this was before the full realization that "non-gravitational" forces act on comets. "Now that we know them to exist," Marsden adds, "I really don't think we can say anything about the mass of the proposed comet belt."

Comet Machholz 1978*l* the Prize of Californian's 1700-Hour Search

Don Machholz

"I went out there that morning expecting to find a comet. For all those previous 690 observing sessions, I went out expecting to find a comet. I would not comet-hunt if I did not think there was a chance of my finding a comet."

— Don E. Machholz

DON MACHHOLZ, 25, Los Gatos, California, has discovered a comet. The dedicated and organized amateur astronomer was an incredible 1,700 hours and 5 minutes into an epic comet-chase that began 3½ years ago.

Officially designated 1978ℓ (the "ℓ" a cursive letter "l", so as not to be confused with the number "1"), Comet Machholz is past perihelion in a retrograde orbit and rapidly moving deep into southern hemisphere skies. At visual magnitude 10½-11, it was and is faint, and shall remain so, declining to $m_1 \sim 13$ by the turn of the year. At press a definitive orbit is still not available because enough precise positions have not been reported, and thus the ephemeris track is somewhat uncertain. A very preliminary orbit from M.P. Candy, Perth Observatory (IAUC 3273), derived from 6 days of observations, gives the following elements (1950 equinox): Perihelion time T = 1978 Aug. 11.251 ET; perihelion distance q = 1.7617 AU; eccentricity e = .9812; longitude of ascending node Ω = $289^o.71$; inclination i = $130^o.58$; argument of perihelion ω = $233^o.19$. Closest approach to the earth appears to occur in mid-October at $\Delta \sim 1.45$ AU.

"It was quite windy on Loma Prieta this morning," Machholz writes in an account of the discovery to be published in full by a California astronomy club newsletter. "I estimated gusts up to 40 mph; later in the morning they blew my clipboard part way across the road. But I've learned to brave cold temperatures and strong winds, and heavy dew, and fatigue, and all that comet-hunting has to offer, so at 2:10 a.m. PDT, on the morning of September 12, 1978, I began Comet-Hunting Session No. 691."

Discoveries & Recoveries

UNDESIGNATED COMET. Way back in 1952, an 18-19 magnitude comet left a short trail on print no. 471 of the Palomar Sky Survey. Over a quarter century later, R. Weinberger in Austria discovered and reported it to the IAU Central Telegram Bureau (IAU CIRCULAR 3246, 1978 July 18). Confirmatory observations subsequently not having been reported, this very faint object is probably hopelessly lost, as an orbit and ephemeris cannot be calculated.

UNDESIGNATED COMET. R.D. Eberst of the Royal Observatory in Edinburgh has reported an 18th-magnitude comet image on plates taken with the U.K. 122-cm Schmidt telescope at Siding Spring last year on July 18 and 19 (IAUC 3247). Because of the reporting delay this faint comet too is probably hopelessly lost. Another possible Eberst comet found with this instrument in 1976 and also reported after delay is also probably lost (IAUC 3019).

1978j PERIODIC COMET HANEDA-CAMPOS. Independently discovered Sept. 1 by Toshio Haneda, Japan, using only an 8.5-cm refractor, and José da Silva Campos, South Africa, this new comet is making a very close approach to the earth, to about .15 AU in early October, when it also reaches its perihelion (on Oct. 9.5 ET at q = 1.10 AU), in a 6.0-year period orbit inclined only $6^o.0$ to the ecliptic (IAUC 3271). Even though intrinsically very small, its very favorable placement at opposition (especially for southern hemisphere observers) has rendered this comet visible in modest amateur instruments (e.g., C. Morris, Harvard, MA, saw it

Machholz observes from a dirt road at the 3300-ft level of the 3800-ft Loma Prieta in the Santa Cruz Mountains, 15 miles south of the lights of San Jose. The site is a 17-mile, 30-minute drive from his home in Los Gatos, a situation analogous to that of the famous southern hemisphere comet discoverer William A. Bradfield who hunts from points remote from his home near Adelaide, S. Australia. In fact, Machholz admits to inspiration from Bradfield's example as published several years ago in ECLIPSE magazine. Machholz uses a mainly homebuilt 10-in f/3.8 reflector with an eyepiece he improved which gives 38 X.

"After 2½ hours," writes Machholz, "I picked up a faint patch of diffuse light about 2° SSW of the star Sirius. It was 5:16 a.m. I was excited. I knew this area rather well, and I knew there was supposed to be nothing here. But I have taught myself to 1) not get excited — I had some serious work to do on this object — and 2) try all I can to prove this to be something other than a comet."

"FIRST CHECK: Star charts. I keep the **Skalnate** Pleso Field Edition next to me; I checked Chart XIII and saw only nebula 2283 here." He located 2283 in the telescope; thus the comet suspect was not on the chart. "SECOND CHECK: Catalog. My Revised NGC Catalog would list anything I would ever see. I keep it in the car and looked up the position — nothing listed. So far, so good. THIRD CHECK: Higher power. Under 100 X it still did not resolve. It looked more promising all along. FOURTH CHECK: Motion. A comet will appear to move against the stars within an hour or so. I drew three sketches of the area...However, the sky brightened before I could detect motion. FIFTH CHECK: Glare from Sirius. As I moved the tube, the object moved with the stars, so it was not glare. I even rotated the tube.

"At that point I got excited and started jumping around."

Later that day Machholz telegrammed the position of the "possible comet" to the Smithsonian Astrophysical Observatory. When he viewed the object 1° further south the next morning — it indeed had moved — all doubts in his mind vanished. His friend, Dr. Edgar Everhart, near Denver, happily agreed to confirm the comet. The third morning, after Machholz and now Everhart observed the object, Dr. Brian Marsden at Smithsonian telephoned: "'The comet has been confirmed,' he said," writes Machholz. "'It is now known as Comet Machholz 1978ℓ.' Now that was exciting!" The discoverer was then of course deluged with newspaper, wire service, television, and radio interviews, including one with Charles Osgood for CBS's "First Line Report."

Informed of the discovery by CNS, one of Machholz's California friends was elated: "Don is very dedicated and self-assured... I knew it was just a matter of time for him." A year ago an Arizona correspondent wrote CNS, "I met Don Machholz in August in Tucson. He seems to be a good observer, and is very single minded. He can get by for days on end with 3 hours sleep a night. I am envious!" The Arizonian is Peter Collins, who co-discovered Nova Cygni 1978 two nights before Machholz discovered 1978ℓ.

Machholz has divided his observable sky into 68 sectors most of which he sweeps in a given month. His equatorial telescope mount has an ingenious flashlight battery-powered circuit that closes and lights a dim bulb near the finder when he reaches the declination limits of a given region during sweeping. His pupil has been measured as 9 mm diameter, rather large; a semi-reformed carrot eater, the discoverer pops 10000 IU Vitamin A a day hoping to improve his dark sensitivity (Ed. note: Increased dark sensitivity with supplemental Vit A beyond normal dietary intake has never been demonstrated; prospective users should first consult a physician as excess intake can cause very serious disease). During his search time Machholz records telescopic meteors that cross his field, and he has reported these results here (CNS 77-1, letter) and elsewhere. His comet observations are frequently reported on the IAU CIRCULARS.

The Machholz story has in it a touch of the epic — almost the quality of the quest for the whale in Melville's Moby Dick, or of the trials in Homer's Odyssey. Odysseus has now landed home, but how long will he stay? Writes Machholz, "I am presently planning on continuing my comet-hunting, but I'm not sure... at such a rate as I now do... "

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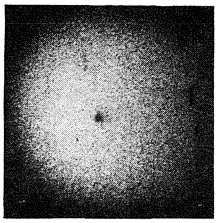
at m_1 = 9.9 in 20 X 80 binoculars on Sept. 10.20 UT). During October it should be mag. 9-10, with right ascensions and declinations at 0^h UT on these dates as follows: Oct. 14, 0^h44^m10, $-42°00'9$; 19, 1^h22^m24, $-38°32'1$; 24, 1^h54^m03, $-34°10'5$; 29, 2^h19^m34, $-29°23'7$. Quite interestingly, the comet was only mag. 13-14 in an Aug. 10 prediscovery observation by Eleanor Helin with the 46-cm Palomar Schmidt telescope, and a month before that (July 10-14) was completely invisible in Palomar Schmidt (122-cm) exposures that had a limiting magnitude of 19½ — thus the comet seems almost literally to have burst into view over the summer.

1978k PERIODIC COMET GICLAS. Since 1936, Henry L. Giclas has taken over 1500 plates of comets with the 13-in astrograph at Lowell Observatory. Last Sept. 8 he photographed one never seen before, and so it now bears his name — his first comet discovery. Dr. Brian Marsden's orbit shows a period of 7.2 years and an inclination of 8°9 to the ecliptic, with perihelion on 1978 Nov. 22.0 ET at a distance q = 1.76 AU from the sun. Giclas writes, "I was making a couple of large field plates for a proper motion field at RA 0^h12^m, Dec $-10°$ on Sept. 2-3. We always give these cursory examination for moving objects and a faint suspect was marked. I made long-exposure check plates on Sept. 9-10; no sign of the original suspect, but 1978k appeared northeast of the center. Going backwards it could not be located on the Sept. 2-3 plates of shorter exposure. A highly enlarged one hour exposure following the comet's motion shows some tail activity to the west."



1978L COMET MACHHOLZ. See accompanying article.

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The Last of the Big Time Comet Hunters?

by Don Machholz
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The discoveries of Comets IRAS-Araki-Alcock 1983d and IRAS 1983f reminded me once again that the era of the visual comet hunter is limited, and that "space-age technology" is helping to bring it to a close.

The first recorded telescopic observation of a comet was by Kepler in 1618, the first comet discovered with a telescope being that of 1680 by Kirch. Some 80 years later, in 1760, telescopic searches for comets began. The Frenchmen Messier, Mechain and Pons, then the Americans Swift, Brooks and Barnard, championed in comet discoveries — almost all telescopic visual discoveries.

Photographic comet discoveries began in the late 1800s and reached prominence in the 1940s and 1950s when the large-field Schmidt cameras were pressed into service for nova and asteroid patrol. While some of these comets became bright enough to have been discoverable by amaterus' telescopes, most were short-period faint comets, never getting near the sun or earth. Between 1975 and 1982, 64 comets were discovered, 39 by professional astronomers using photographic techniques, and 25 by amateurs using visual means. Only a handful of the 39 "professional" discoveries would have been found by amateurs, an example being Comet West 1975n.

But now the satellites are beginning to discover comets. In the last two years the SOLWIND satellite, which watches the sun, accidently discovered three sungrazing Kreutz comets. And recently, the earth-orbiting IRAS has made two discoveries.

We have known for years that a well-placed comet-hunting satellite would have several advantages over the earth-based observer. Weather would always be clear, no horizons would obstruct the areas near the sun, and no atmosphere would scatter the sunlight. The point is that no one can afford to send up a satellite for comet-hunting only — these discoveries have been made by satellites involved in other activities. As more satellites are sent up, more comets are likely to be discovered by them.

I recall the conversation I had in 1977 with Dr. Edgar Everhart, of Colorado, a comet expert with a couple of comet discoveries in the 1960s. I mentioned the possibility of a comet-searching satellite bringing the era of the visual comet-hunter to a slow end, but Edgar foresees the time when it will become automated. An observer could hook up a television camera to his telescope, boost the signal, then introduce high contrast so he can easily spot comets as they sweep across his television screen. Indeed, with a little money he could place automated telescope-cameras in both the northern and southern hemispheres at the clearest and darkest locations) and transmit the video to his home, where he could sit and watch the sky sweep across his TV screen, with ever-changing coordinates flashing across the bottom of his screen.

Somehow, it seems like it would be more fun to peer through a telescope or binoculars from some mountaintop in 30° weather, spending a thousand hours of lone sweeping to cross paths with an undiscovered comet. Such days, and such comets, are numbered.

Ed. Note: Machholz is the discoverer of Comet 1978m (for a full account see CNS 78-6) and he still hunts several hundred hours a year. In the short time since he wrote this article in mid-June, the IRAS satellite has discovered two additional comets, 1983j and 1983k, detected a hitherto unsuspected 10° dust tail in P/Tempel 2, and discovered material orbiting Vega, the first definitive evidence of a solar system beyond our own. This high-sensitivity satellite detects infrared radiation otherwise absorbed by the atmosphere and invisible on earth. IRAS's lifetime is only one year but others will follow it. The era of visual comet discoveries by earth-based amateurs inevitably is drawing to a close.

Editorial Note

Effective immediately, COMET NEWS SERVICE has a new subscription office address. All subscription requests and renewals should be sent to: COMET NEWS SERVICE, P.O. Box TDR, No. 92, Truckee, CA 95734, USA (Phone 916-587-8785). Marie D. Oleson, Circulation Director of CNS and President of the McDonnell Planetarium Friends, has moved from St. Louis to this address, from where she will continue to administer CNS subscriptions. Mrs. Oleson has been streamlining and expanding subscription operations, which now are being processed through an Apple II microcomputer. Readers can look forward to continued efficient service thanks to Mrs. Oleson's fine work over the last several years.

From our international subscribers, we must ask that subscription payments be made by a bank draft drawn on a United States bank and payable in United States currency. This is not hard to do, and even small banks in villages will assist you in this process. Because our (and most American) banks charge us a considerable fee to convert foreign currency, we regrettably must return all drafts not made out in American dollars. Readers in England should be aware that the British Astronomical Association offers, as one of its services, subscription to COMET NEWS SERVICE, and will handle this fund conversion for you — please see its JOURNAL for details.

Some editorial correspondence still is being addressed to Cincinnati. Correspondents are reminded that the new CNS editorial address is: 6805 "A" Plaza No. 51, Omaha, NE, USA (Phone 402-397-6197). CNS operations are now geographically diverse: neither editorial nor subscription operations are any longer handled in St. Louis. However, the Friends of the McDonnell Planetarium, St. Louis, continue as before their support of this publication. Regarding McDonnell Planetarium proper, there is news of note. The voters of the City of St. Louis and St. Louis County approved on April 5 a substantial property tax increase, part of which will be used to merge the Planetarium with the Museum of Science. Planners are hoping that the new science center will become one of the nation's leading such institutions.

Next CNS review issue is currently planned for December.

COMET PREDICTIONS FOR 1984

Geocentric ephemerides for 17 periodic comets in 1984 are provided in this 29 page compendium by amateur astronomers Charles Townsend, John Rogers, and Scott Hanssen. Most of the orbit elements are from standard sources, and six are by the authors themselves. The ephemerides provide 1950 right ascension, declination, sun and earth distances, phase angle, elongation, and predicted visual magnitude. They are available for $4.00 (continental U.S.) and $5.00 (elsewhere) from Charles L. Townsend, 3521 San Juan Ave., Oxnard, CA 93033. 1984 comet ephemerides also will be available in the British Astronomical Association Handbook, long a definitive sourcebook, due out in several months (price 5 pound-sterling; B.A.A., Burlington House, Piccadilly, London W1V ONL).

Discoveries & Recoveries

1983h PERIODIC COMET JOHNSON 1949 II. Alan C. Gilmore and Pamela M. Kilmartin, Mount John University Observatory, New Zealand, recovered this comet on plates exposed June 7 at $m_2 = 19$ (IAU CIRCULAR 3824). Reaching perihelion on T = 1983 Dec. 3 at q = 2.30 AU from the sun, this periodic comet (P= 6.943 yr) is too faint for amateur size telescopes.

1983i PERIODIC COMET RUSSELL 3. Kenneth S. Russell, U.K. Schmidt Telescope Unit, Siding Spring, Australia, telexed his discovery of this object on plates exposed June 14 and 15 with the 1.2-m Schmidt (IAUC 3828). Dr. Brian Marsden's orbit (IAUC 3830) indicates it to be periodic (P = 6.76 yr is uncertain currently) with a perihelion of q = 2.61 AU reached on 1982 Nov. 20. At $m_1 = 16$ with a 3-4' tail, the comet is too faint for visual surveillance by amateur astronomers. Russell's other comet discoveries are P/Russell 1 1979 V (CNS 79-3), P/Russell 2 1980 III (CNS 80-4) and Russell 1980 1 (CNS 80-4).

1983j PERIODIC COMET IRAS. J. Davies, U. of Leicester, reported that the orbiting Infrared Astronomical Satellite (IRAS) detected its third comet this year June 28 (IAUC 3833). Confirmed June 30 by J. Gibson at Palomar Mountain with the 1.2-m Schmidt as a nearly stellar object of blue photographic magnitude 15, elliptical orbit elements now have been computed by Marsden (IAUC 3845): T = 1983 Aug. 23.7, q = 1.70 AU, P = 13.3 yr. The inclination, i = 46°.2, is unusually high for a short-period comet. The object may reach 12th magnitude in September, judged by its detection visually, J. Bortle informs us, in his 32-cm reflector.

1983k COMET IRAS. Davies reports yet another comet discovery on July 11 by the IRAS satellite (IAUC 3839), the fourth in less than four months, confirmed as a m = 18 object by J. Dawe and K.S. Russell at the U.K Schmidt telescope unit, Australia. Preliminary parabolic elements by Marsden on IAUC 3847 from positions July 11-19 give perihelion T = 1983 Apr. 28 at q = 2.39 AU with i = 139°. At $m_1 = 18$ and dimming, the comet is too faint for monitoring by amateur astronomers.

1983 l COMET ČERNIS. Yu. V. Batrakov, Institue for Theoretical Astronomy, Leningrad, reported by telex on IAUC 3840 the discovery of a comet July 19 in southern Aries by Kazimeras Černis, Vilnius Observatory. Confirmed by Dennis di Cicco, SKY & TELESCOPE, on July 21, its visual magnitude was estimated as $m_1 = 10.5$ and 10.4 on July 22 and 23 by Charles S. Morris, Harvard, MA, using a 10-in reflector. Preliminary orbit elements by Marsden (IAUC 3848) give T = 1983 July 24.196 ET, q = 3.31349 AU, $\omega = 186°.918$, $\Omega = 208°.877$, and i = 134°.808. The comet appears to be a distant, perhaps Bowell-type comet (see article this issue), brighter than Bowell, from which more information about coma grains may be learned. The comet is visible in moderate-aperture amateur instruments and is due to brighten to 10th magnitude as indicated by the following ephemeris:

1983 0^h UT	RA (1950)	Dec	Δ	r	m_1
Aug. 24	2^h27^m35	+ 2°03'.9	2.783	3.326	10.4
Sep. 3	2 16.62	- 1 49.0	2.633	3.336	10.3
13	2 02.41	- 6 10.1	2.522	3.348	10.3
23	1 45.60	-10 49.9	2.450	3.363	10.2
Oct. 3	1 26.16	-15 27.9	2.437	3.380	10.2
13	1 05.45	-19 43.1	2.481	3.400	10.3
23	0 44.96	-23 18.1	2.578	3.422	10.4
Nov. 2	0 26.08	-26 05.2	2.720	3.447	10.5
12	0 09.85	-28 05.7	2.898	3.474	10.7
22	23 56.82	-29 26.8	3.098	3.503	10.9

1983m PERIODIC COMET WOLF. Nearly stellar in appearance at $m_2 = 20$, this periodic (P = 8.215 yr) was recovered by J. Gibson with the 1.2-m Schmidt telescope at Palomar. Perihelion is due 1984 May 31 at q = 2.15 AU, a distance much larger than earlier in this century, when the comet was brighter and observable in modest size instruments (see, e.g., Barnard article, this issue).

1983n PERIODIC COMET CROMMELIN 1818 I. This 27.4-year periodic was recovered independently by Lubos Kohoutek, Hamburg Observatory, 0.8-m Schmidt, and Susan Wycoff and Peter Wehinger, Arizona State University, using the Kitt Peak National Observatory 0.9-m reflector and CCD camera. At magnitude 19½ and stellar in appearance, the object is "much brighter than anticipated" according to B.G. Marsden (IAUC 3851). This "brightening," like that of P/d'Arrest (see article this issue), is likely artifactual, a result of older-style visual methods which greatly underestimate the comet's true brightness when measured by the modern Sidgwick method. In the first quarter of 1984 this object should be visible in binoculars, possibly reaching threshold naked eye visibility near perihelion on Feb. 20. There will be more on this comet in the next CNS review issue.

Amateur Comet Discoveries, 1975-1984: I. The Discoverers and Their Comets

by
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San Jose, CA 95124

Ed. Note: This first of a three-part series is editorially condensed from the author's 111-page privately published new book, A Decade of Comets, which is available from him at the above address for $8.00 postpaid ($12.00 overseas paid in U.S. $). The author, himself a dedicated and methodical comet hunter, discovered one of the comets, Machholz 1978 XIII (see CNS 78-6) in this decade period. This May he scored his second success with Machholz 1985e (details elsewhere this issue).

OF THE 162 comets discovered or recovered during the decade 1975-1984, 33 were discovered by amateur astronomers. In this first part of the series, we will examine these amateur discoveries as a group. These articles will be necessarily condensed, but they do cover the most salient points of my study. Those who wish to learn more about the individual comets and their discoverers, or see more detailed statistics, may wish to obtain full book.

"AMATEUR" AND "PROFESSIONAL" COMETS IN CONTEXT

No amateur astronomer recovered any of the 75 short-period (P < 200 yr) comets that returned in the 1975-1984 decade, if one is willing to consider Tsutomu Seki, Japan, and Dr. Edgar Everhart, U.S.A., as "professional" astronomers. Of the remaining 87 comets which were true discoveries, amateurs netted 33, or While amateurs found only five (16%) of the 32 new short-period comets, they fared much better with the long-period comets, accounting for the majority of these discoveries (28 of 50, or 56%).

Of the 54 new comets discovered by professional astronomers, only nine of them, in my assessment, were discoverable by amateurs, with the following estimated probabilities: West 1975n, 100%; Hartley-IRAS 1983v, 100%; Shoemaker 1984s, 85%; P/Wild 2 1978b, 70%; Bowell 1980b, 70%; Shoemaker 1984f, 60%; IRAS 1983j, 50%; Shoemaker 1983p, 30%; Shoemaker 1984q, 20%.

During this decade, comets were discovered from space by satellites for the first time. The three sungrazing comets found by the SOLWIND satellite (1979 XI, 1981 I, 1981 XIII; see CNS 81-4, 82-1, 82-4) were not ever observed from earth and are therefore not included in the above statistics. On the other hand, the Infrared Orbiting Satellite (IRAS) found six comets which were seen from earth. The four found solely by IRAS (1983f, j, k, o), plus the one co-discovered by Hartley with an earth-based instrument (Hartley-IRAS 1983v), are included as "professional" discoveries in the above figures. The sixth, the famous earthgrazing Comet IRAS-Araki-Alcock 1983d (see CNS 83-3, 83-4, 84-1, 85-1), similarly is entered as an "amateur" discovery.

A TABULATION OF AMATEUR DISCOVERIES

The large table which accompanies this article is a compendium of many smaller ones which appeared in my book. It gives, here in one place, information on the comet, its amateur discoverer, the discovery instrument, and the comet's brightness and placement. A few words of explanation and amplification are in order.

The first two columns give the comet's designation, per IAU convention, with the year and letter indicating temporal order of discovery, and the year and Roman numeral indicating generally the temporal order of the comet's passage through perihelion (Roman numeral designations for 1983 and 1984 were not yet available at the time of this study). The third column gives the discoverer's first and last names, except for Sugano of Comet 1983e (might any Japanese reader be able to supply it to the author?). In the cases where there were multiple discoverers, their names are listed in the order in which they appear on the comet's full name.

The countries and hemispheres from which the discoveries were made are listed in columns 4 and 5 (the country refers only to the site of discovery — e.g., David Levy, U.S.A., is a Canadian citizen). We see that of the 45 discoveries, Japan boasts 15, with Australia in second place at 11 (10 due to William Bradfield), and the U.S.A. in third place at 6. In terms of the num-

TA

Comet Designations		Name
1975a	1975 I	Leo Boethin
1975d	1975 V	William Bradfield
1975h	1975 IX	Toru Kobayashi Doug Berger Dennis Milon
1975j	1975 XII	Hiroaki Mori Yasuo Sato Shigehisa Fujikawa
1975k	1975 X	Shigenori Suzuki Yoshikaza Saigusa Hiroaki Mori
1975p	1975 XI	William Bradfield
1975q	1976 I	Yasou Sato
1976a	1976 IV	William Bradfield
1976d	1976 V	William Bradfield
1977m	1977 XIV	Merlin Kohler
1978c	1978 VII	William Bradfield
1978f	1978 XXI	Rolf Meier
1978j	1978 XX	Toshio Haneda Jose de Silva Campos
1978ℓ	1978 XIII	Don Machholz
1978m	1978 XV	David Seargent
1978n	1978 XIX	Shigehisa Fujikawa
1978o	1978 XVIII	William Bradfield
1979c	1979 VII	William Bradfield
1979i	1979 IX	Rolf Meier
1979ℓ	1979 X	William Bradfield
1980k	1980 IV	Kazimeras Cernis Jovaras Petrauskas
1980q	1980 XII	Rolf Meier
1980t	1980 XV	William Bradfield
1980u	1981 II	Roy Panther
1982g	1982 VI	Rodney Austin
1983d	1983 __	Genichi Araki George Alcock
1983e	1983 __	M. Sugano Yoshikaza Saigusa Shigehisa Fujikawa
1983ℓ	1983 __	Kazimeras Cernis
1984a	1983 __	William Bradfield
1984i	1984 __	Rodney Austin
1984j	1984 __	Kesao Takamizawa
1984o	1984 __	Rolf Meier
1984t	1984 __	David Levy Michael Rudenko

tervals:

1985 UT	R.A. (1950)	Dec.	Δ	r	m_1
July 28.0	0^h44^m50	+59°37'8	0.63	1.16	8.9
Aug. 3.0	1 26.81	59 39.3	0.60	1.13	8.7
8.0	2 11.33	58 38.3	0.57	1.10	8.6
13.0	2 55.42	56 26.1	0.54	1.08	8.4
18.0	3 36.58	52 59.6	0.51	1.06	8.3
23.0	4 13.29	48 22.8	0.49	1.05	8.2
28.0	4 45.11	42 45.4	0.48	1.03	8.1
Sep. 2.0	5 12.34	36 21.8	0.47	1.03	8.0
7.0	5 35.57	29 31.0	0.47	1.03	8.1
12.0	5 55.45	22 27.5	0.47	1.03	8.2
17.0	6 12.51	15 31.9	0.48	1.04	8.3
22.0	6 27.21	8 55.8	0.50	1.06	8.4
27.0	6 39.87	2 47.5	0.52	1.07	8.6

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I. AMATEUR COMET DISCOVERIES, 1975 - 1984

Discoverer		# Disc.		Search	Instrument				Brightness and Placement					
Country	Hem	Dec	Life	Hours	Ap	T	f	Pwr	m_1	$\Delta m_1/d$	E^o	M/E	H_o	n
hillipines	N	1	1	-	8	L	-	-	11.0	0.00	61	E	10.3	4.0
ustralia	S	1	3	145	6	R	5.5	26	9.3	-0.03	30	E	6.7	4.0
apan	N	1	1	117	6	L	-	30	7.6	-0.14	133	M	7.3	3.8
.S.A.	N	1	1	A	8	L	8.5	-						
.S.A.	N	1	1	A	4	L	-	-						
apan	N	1	1	-	4.8	B	-	20	10.7	-0.04	65	M	6.7	3.3
apan	N	1	3	-	6	L	-	25						
apan	N	1	3	~500	6.2	L	-	23						
apan	N	1	2	-	5.8	L	-	22	8.8	-0.10	52	M	9.6	4.0
apan	N	1	1	-	6	L	-	27						
apan	N	2	2	< 1	4.8	B	-	20						
ustralia	S	2	4	106	6	R	5.5	26	9.7	-0.09	58	M	9.1	2.9
apan	N	2	4	-	6	L	-	25	9.8	-0.14	78	M	11.0	4.0
ustralia	S	3	5	57	6	R	5.5	26	9.4	-0.06	56	E	10.8	5.3
ustralia	S	4	6	9	6	R	5.5	26	8.8	-0.05	44	M	11.3	4.0
.S.A.	N	1	1	-	8	S	10	100	9.5	-0.05	68	E	6.7	4.3
ustralia	S	5	7	360	6	R	5.5	26	8.0	-0.08	48	M	7.1	2.9
anada	N	1	1	50	16	L	5	56	10.4	-0.03	71	E	0.0	6.6
apan	N	1	1	463	3.3	R	-	-	10.0	-0.06	147	E	12.3	4.0
. Africa	S	1	1	116	5	R	-	-						
.S.A.	N	1	1	1700	10	L	3.8	36	10.7	-0.01	72	M	6.8	4.0
ustralia	S	1	1	~650	3.2	B	-	15	5.0	+0.11	35	M	7.5	4.0
apan	N	2	4	-	-	-	-	-	10.0	+0.07	39	M	13.7	4.0
ustralia	S	6	8	75	6	R	5.5	26	8.4	+0.01	32	M	11.6	4.0
ustralia	S	7	9	98	6	R	5.5	26	10.2	-0.09	44	E	10.8	4.5
anada	N	2	2	29	16	L	5	56	11.8	-0.01	69	E	9.2	4.0
ustralia	S	8	10	67	6	R	5.5	26	5.0	-0.01	26	M	8.0	5.3
.S.S.R.	N	1	1	808	4.4	B	-	20	8.5	+0.09	43	E	7.7	4.0
.S.S.R.	N	1	1	100	3.2	B	-	12						
anada	N	3	3	25	16	L	5	56	10.3	+0.01	75	E	7.4	4.0
ustralia	S	9	11	113	1.4	B	-	7	6.0	-0.24	22	M	8.0	3.0
ngland	N	1	1	601	8	L	4	35	9.7	-0.01	63	E	5.9	4.0
ew Zealand	S	1	1	151	6	R	8	18	10.4	-0.08	68	M	7.9	4.0
apan	N	1	1	-	-	-	-	-	6.4	-0.34	92	M	9.5	4.0
ngland	N	1	5	-	3.2	B	-	11						
apan	N	1	1	-	-	-	-	-	7.0	+0.04	28	M	11.5	6.0
apan	N	2	2	-	-	-	-	-						
apan	N	3	5	-	-	-	-	-						
.S.S.R.	N	2	2	297	19	L	4.8	65	10.7	-0.01	73	M	2.8	4.0
ustralia	S	10	12	384	10	L	5.6	44	10.7	0.00	46	M	8.0	4.0
ew Zealand	S	2	2	43	6	R	8	18	5.8	-0.14	69	M	8.8	4.0
apan	N	1	1	-	4.8	B	-	20	9.4	+0.01	171	M	7.7	4.0
anada	N	4	4	86	16	L	5	56	11.7	+0.01	52	E	11.4	4.0
.S.A.	N	1	1	917	16	L	5	64	9.4	-0.04	60	E	9.1	4.0
.S.A.	N	1	1	247	6	R	8	30						

ber of discoverers by country, Japan far and away leads at 10, with the U.S. next at six, and Australia, U.S.S.R., and England tied for third place at two each.

The next two columns (# Disc) give the number of named comets found by the discoverer in the decade (Dec), and in his full career (Life), at the time of each discovery. For the decade, Bradfield leads the list with 10 finds, followed by Rolf Meier with four, and Shigehisa Fujikawa with three. Of the discoverers in this table, George Alcock had discovered the most comets (four) before this decade. The eighth column gives the number of hours of search required to find each comet, where this information is available (might any correspondents be able to supply missing entries?). "A" indicates that the discovery was accidental. The mean search period is 287 hours, but the median is much less, 113 hours. Mori had the shortest search to find 1975k: he had found 1975j less than an hour earlier on the same morning (see CNS 75-1)! At 1700 hours, your author spent the longest time.

The next four columns give discovery instrument aperture (in inches), type (L = reflector; R = refractor; B = binoculars; S = Schmidt-Cassegrain), focal ratio, and magnification. In eight instances binoculars were employed, while reflectors were used 18 times, refractors 13 times, and a Schmidt-Cassegrain, once. Apertures range from a 7 x 35 mm binocular to a 19-inch reflector.

The remaining columns give the total magnitude (m_1) of the comet at discovery, derived from a combination of early estimates, estrapolated formulae, or discoverers' comments; the change of magnitude per day ($\Delta m/d$), determined by a subsequent magnitude formula and not necessarily reflecting the actual performance of the comet at the time (a minus sign indicates that it is brightening); the discovery elongation in degrees (E^o); placement at discovery (M/E: M = morning, E = evening sky); and the photometric parameters H_o (absolute magnitude, as the comet would appear at 1 AU from the sun and the earth) and n (the inverse power by which the comet's intrinsic brightness varies in relation to the distance from the sun). H_o and n are taken from various sources, with n frequently assumed equal to four. We will look closer at these last six columns in the third part of this series.

In the next installment, we will look at various aspects of the times at which these comets were discovered.

Discoveries & Recoveries

1985b PERIODIC COMET RUSSELL 1 (1979 V). This faint periodic comet was recovered at photographic m_1 = 19.5 on Apr. 9-10 by J. Gibson with the 1.5-m reflector and CCD at Palomar (IAUC 4053), and is making its first return after discovery by Ken Russell in 1979 (CNS 79-3). Orbit elements from the Brit. Astron. Assn. Handbook (1985) indicate the comet in a 6.10-yr orbit of low inclination (22°66) and eccentricity (0.517), having reached perihelion q = 1.612 AU on T = 1985 July 5.22 ET.

1985c PERIODIC COMET HONDA-MRKOS-PAJDUŠÁKOVÁ (1980 I). This recovery is unusual because it was made by amateur astronomers. M. Clark, A. Pearce, and J. Athanasou of the Australian Comet Section take the credit for scooping up this difficult object in the morning sky near the sun at m_1 = 10-11 on Apr. 18 and 20 UT (IAUC 4055). It last reached perihelion in 1980 in its 5.29-yr orbit and again is unfavorably placed in its present apparition. As Don Machholz reports in this issue, no amateur astronomers recovered any comets in the 1975-1984 decade.

1985d PERIODIC COMET TSUCHINSHAN 2 (1965 II). Gibson also recovered this comet, first observed in 1965, with the 1.6-m Palomar reflector and CCD. This faint periodic (P = 6.846 yr) reached perihelion on T = 1985 July 21 according to the BAA Handbook and is too faint for amateurs' instruments.

Machholz's Second Comet

AT 1:25 A.M. on this morning, May 27, 1985, I began comet hunting session No. 1385. This started as any other, with anticipation and excitement, because I never know just what I will find..."

Nearly three hours into that session, amateur astronomer Don Machholz, of San Jose, California, found his second comet. He was hunting 400 miles away from Camp Oakes, where the Riverside Telescope Makers were holding their annual conference, near Big Bear City, CA. He was there on a four-day vacation with his wife Laura, but it by no means was a "vacation" from his passion and recreation, comet hunting.

He had brought with him his 10-in. f/3.8 reflector, which had won the Warren Estes Award three years previously at the Riverside Conference for telescopes made from original materials (all but the optics were homemade). He had used this telescope to discover his previous comet, 1978 XIII (see CNS 78-6 for a full account and photo). On this occasion he was using a cardboard frame in the 32x eyepiece, giving a square 1.°6 field which he believes has some advantages for comet hunting.

The skies at this 7700-ft. site were dark and excellent, somewhat better than the usual ones at Loma Prieta, which are somewhat affected by the light pollution from San Jose. *"At 4:13 a.m. PDT, I picked up a fuzzy object, not too faint, which suddenly aroused my suspicion,"* writes Machholz. *"It was in a part of the sky where I know there were no galaxies or clusters, and it appeard pearly white, like a comet. I stopped my sweeping and started my work of determining the nature of the object."*

Quick work was needed since dawn was approaching and the object's position had to be secured to assure it wasn't a galaxy or cluster, and so that others would be able to confirm the discovery. Machholz plotted a small pencil mark at the object's position in a sparse star field in Pisces on his Skalnate Pleso atlas. After a quick rough measure of its position, he checked a more extensive catalog which listed no object in that position. With a "comet filter" the object appeared more prominent in the approaching twilight. *"By now it was difficult to see the object, as the sky was rapidly brightening,"* Machholz continues. *Furthermore, I had not detected movement. The 27° temperature was nipping at my hands because I had removed my gloves some 20 minutes earlier. I felt quite sure that I had discovered a comet, and yet the lack of motion prevented me from being absolutely certain. I had searched 1742 hours since my first comet find."* He awakened Laura to break the news.

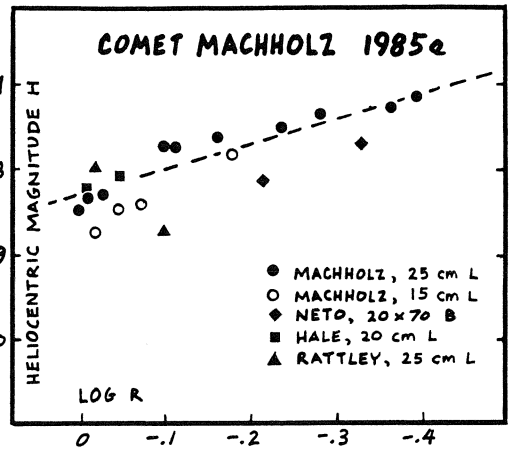


Figure shows visual magnitude estimates m_1 corrected for the effect of instrument aperture (Morris, P.A.S.P. 85:470, 1973) and reduced to $\Delta = 1$ AU by the formula $H = m_1 - 5 \log \Delta$. The observers for whom two or more observations were available at the time of press are: Don Machholz, near Big Bear City, CA (discovery), San Jose (15-cm), and Loma Prieta, CA (25-cm); V.F. de Assiz Neto, Sao Francisco de Oliveira, Brazil; Alan Hale, Mt. Wilson and Montrose, CA; and C. Rattley, Magma, AZ. Instrument aperture (in cm) and type (B = binoculars, L = reflector) are listed. Machholz has by far the most extensive series. Least-squares regression on the 10 25-cm Loma Prieta observations, with the equation $H = H_o + 2.5n \log r$, gives $H_o = 8.26 \pm 0.08$ (SD), $n = 1.27 \pm 0.14$ (SD), which can be considered as definitive preperihelion photometric parameters. The n value is unusually low. The solution is shown by the dotted line.

"Reporting the comet was nearly as hard as finding it," Machholz relates. He composed a telegram to the Smithsonian Astrophysical Observatory, the clearinghouse for astronomical discoveries in Cambridge, MA, but could not get through to an operator from the camp pay telephone, which finally jammed. After some car trouble on the way to their motel in Big Bear City, they found that Western Union was not answering its phones, nor was the Smithsonian Observatory on this Memorial Day holiday. *"I tried to call Dr. Brian Marsden (Director of the Smithsonian Central Telegram Bureau) at home, but his number was not listed. Suddenly, among my notes Laura found his home telephone number. I tried it and reached him. Dr. Marsden said he had no reports of a comet being found, and we could not recall any known periodic comets in the region."*

The Machholzs drive back to San Jose that day. The following morning saw them atop Loma Prieta where the clouds finally cleared to reveal that the object had moved 1½° east-northeastward from the previous morning's position. Confirmation also came from G. Harlan of Lick Observatory, as well as from amateur astronomers C. Morris and A. Hale (near Mt. Wilson, CA) and G. Rattley, Magma, AZ. Morris estimated the magnitude as $m_1 = 9.1$ with a 4' coma in a 25-cm reflector (IAUC 4067). Subsequent parabolic orbit elements, by S. Nakano (IAUC 4078) gave: T = 1985 June 28.7397 ET; q = 0.106289 AU; ω = 274.°4998; Ω = 194.°7300; i = 16.°2825. The perihelion distance, reached on the opposite side of the sun, was quite small, and there was concern that the comet, which itself was intrinsically small, might not survive passage. This concern may have been justified. As the comet approached the sun through June, it brightened up less than might have been expected, to 7.6 in Machholz's last observation on June 19.48 UT (25-cm refl), made before superior conjunction. Indeed, after conjunction, as the comet would have emerged into the evening sky in mid-July, only T. Seki, Japan, has reported a sighting on July 8 (at m_1 = 10½-11 photographically and visually, according to Machholz), while many other keen observers, including Machholz, have failed to pick it up. The last previous sighting was by J. Stoddart and E. Ney, U. Minnesota: the infrared magnitude, measured in daylight at 2.2 microns through a 27" diaphragm, was 4.4 (IAUC 4080). The comet's visual brightness behavior preperihelion is shown and discussed in the accompanying figure and caption. For those who might want to try to pick up this questionably extant comet, the following ephemeris is provided (from "Comet Comments" by D. Machholz, 1950 equinox, 0^h U.T.):

DATE	R.A. (1950)	DEC	ELONG	MAG.
07-29	12h 35.7m	+11° 11'	59°	10?
08-03	13h 10.1m	+08° 06'	64°	10?
08-08	13h 38.1m	+05° 25'	67°	11?
08-13	14h 01.2m	+03° 08'	68°	11?
08-18	14h 21.0m	+01° 11'	69°	12?
08-23	14h 37.5m	-01° 28'	69°	12?
08-28	14h 52.3m	-01° 54'	68°	12?
09-02	15h 05.4m	-03° 08'	67°	12?

1985e COMET MACHHOLZ. See separate article in this issue.

1985f PERIODIC COMET HARTLEY. Malcolm Hartley, U.K. Schmidt Telescope Unit, reports his discovery of a 16th-magnitude comet with the 1.2-m Schmidt telescope on June 13 (IAUC 4077, 4079). After several weeks, at presstime, a telegram from the Smithsonian Astrophysical Observatory arrived, giving these elliptical preliminary elements: T = 1985 June 11.621 ET; q = 1.5407 AU; e = 0.5148; ω = 174°11; Ω = 40°34; i = 24.94 (1950 equinox). No visual sightings have been reported.

Editorial Note

Marie Oleson, Circulation Director, notes that several overseas subscribers have complained that their envelopes for Issue 85-1 were incorrectly stamped "Subscription Expired" when in fact their subscriptions had several issues remaining. This was another unfortunate error on the part of our Omaha printing and mailing service, and we apologize to these readers for the inconvenience. Earlier the mailing service had affixed insufficient airmail postage on the overseas mailings of CNS 84-3, resulting in great delays. Steps have been taken to prevent any further repetition of these problems. Any overseas subscriber who has not received Issues 84-3, 84-4, or 85-1 should let us know so that replacement copies can be sent.

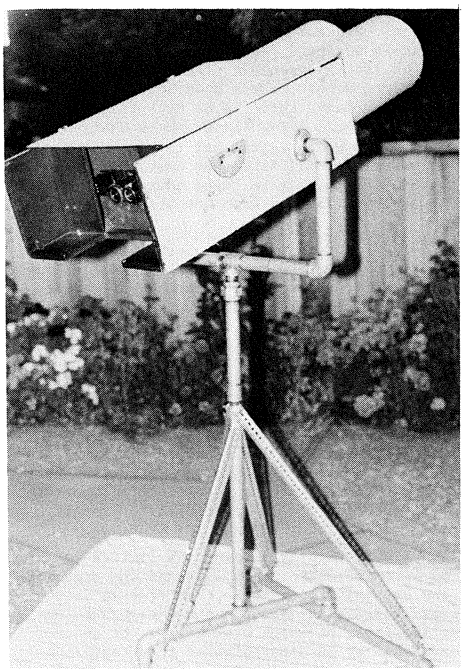
The CNS schedule has been somewhat behind in recent months, but we hope to do some catching up with the next issues, so CNS 85-3 should be appearing in not too many more weeks.

We are pleased to begin in this issue a series on amateur astronomer comet discoveries, condensed from Don Machholz's new book on this subject. Don is no stranger to CNS pages. His "The Last of the Big Time Comet Hunters" (CNS 83-4) philosophized on the potential of satellites such as IRAS to end the era of amateur comet discoveries. His pioneering work has shown that differences exist in comet total magnitude estimates which depend on the method employed (CNS 81-1), an important result which the Dutch Comet Section confirmed and extended (CNS 83-1).

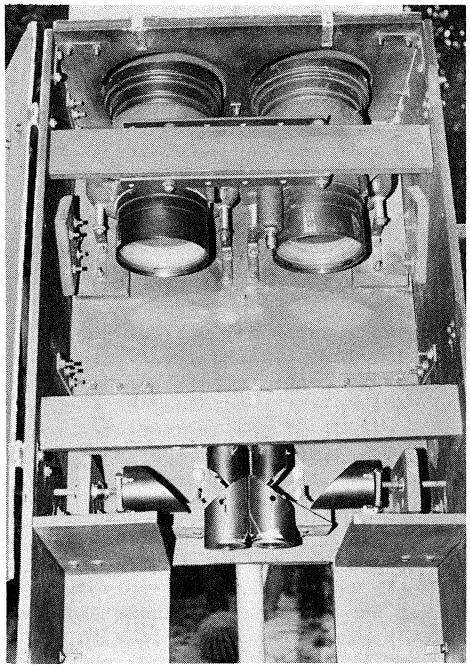
Meanwhile, Don has just discovered another comet (1985e, elsewhere this issue), although it will not be considered in his CNS series, which only covers comets discovered during 1975-1984. Not only did Don find 1985e, but he also made what probably will be the largest and most definitive series of brightness estimates (see analysis, this issue).

Your editor finally met Don, and his gracious wife Laura, in March of last year during a trip to San Francisco and San Jose. The three of us arose bright and early at 1 a.m., packed away the telescopes, and proceeded on an often bumpy 40-minute ride to near the top of Loma Prieta, where Don usually comet hunts. There it was cold and windy (to this writer's taste, at least), but the skies were dark, although far in the distance the lights of San Jose were supplying a gentle illumination to pillow layers of fog which lay below our altitude. No comet was discovered that morning. THe mammoth forest fires in California have consumed part of Loma Prieta, where National Guard troops and firefighters had to use napalm left over from the Vietnam war to arrest the blaze before it reached key communications towers at the summit. A late check with Don indicates that the fire did not seem to reach his observing site, but it is not yet safe to return to it.

The Giant Homemade Binoculars with Which Machholz Discovered Comet 1986e



The assembled alt-az-mounted 27 x 125-mm binoculars with which Machholz sometimes comet hunts weigh over 100 pounds.



With the top plywood panel casing opened, the two 5-inch surplus lenses are seen, along with the secondary mirror pairs and eyepiece assembly. Photos courtesy Mr. Machholz.

TO DISCOVER HIS first two comets, 1978 XIII and 1985e (see CNS 78-6 and 85-2`, Don E. Machholz used a 10-inch f/3.8 reflector which was pictured along with the discoverer in CNS 78-6. For the present find, however, he was searching with the giant binoculars pictured here.

Machholz communicates: "They are homemade. The lenses (actually aerial telephoto lenses) are five inches across and magnify 27 times. The instrument weighs over 100 pounds.

"In April, 1983 I had seen these lenses being sold at our astronomy club auction. At first sight I wasn't overly impressed with them. Calling Jim Van Nuland, who had conducted the auction, I learned that Steve Greenberg owned the lenses and that they had not been sold. I called Steve and he said I could have them for $50 each, a bargain price. I spent the next two weeks planning and designing a binocular system using secondary mirrors. When I was convinced that it would work and be completed for under $300, I bought the lenses and ordered the mirrors.

"Following two weeks of construction, I now had a pair of large binoculars. Everything is enclosed in a plywood box measuring 36 inches long, 22 inches wide and 12 inches high. Each of the two light paths has two elliptical mirrors, one measuring 2.60 inches in minor axis, and the other measuring 1.87 inches. The light strikes the first mirror, right angles toward the center of the optical system, then strikes the second mirror and exits out the eyepieces through the back. The eyepieces are surplus 30 mm Plössls that I already had and give a 2.4 degree field. They set into plastic PVC pipes, making focusing difficult. Originally I was able to vary the distance between the eyepieces, but then I changed them to a fixed position so that the alignment remained more stable.

"The contrast is good in this instrument. I can see 'star clouds in every constellation.' However, I use them for about one-third of my comet hunting. For most of my searching I use my 10-inch at 32 x. The field of view has been stopped down to a 1.6 degree square.

"The binoculars and the telescope are roughly equal at picking up faint diffuse objects. Although the telescope is larger and gathers more light, using two eyes in the binoculars helps to acquire faint objects too. I can cover the skies faster with the binoculars, but it is harder to boost magnification to check out suspicious objects. Each instrument has its advantages and disadvantages."

circulated at an international meeting in 1982. A draft was not received directly by the Dutch Comet Section in that year, however.

Wolf's Naked Eye 1910 Halley Sighting Revisited

SIR, — Regarding P/Halley 1982i, I enclose a list of my visual magnitude estimations, and one by Rob van de Weg. Of particular interest are the observations on Dec. 1 and 3 by Sidgwick method:

1985 UT	m_1	Instrument	Observer
Dec. 1.73	4.1	3 x 18 binoc.	Bus
1.74	4.3	8 x 46 refr.	v d Weg
3.73	4.1	3 x 18 binoc.	Bus

On Dec. 2, Halley reached the same heliocentric distance (r = 1.789) as Max Wolf's naked eye sighting on 1910 Feb. 9 UT. Adjusting for the differing earth distances, our estimates would indicate Halley had a brightness of m_1 = 6.4 at the time that Wolf saw the comet. I congratulate for your correct inference and forecast in CNS 82-4.
— SINCERELY,

E. Peter Bus
Dutch Comet Section
1e Spoorstraat 16
9718 PB Groningen
The Netherlands

1985 Dec. 4

Ed. Note: Bus is referring to "Max Wolf's Early Naked Eye Sighting of Halley's Comet in February, 1910," which appeared in CNS 82-4. In that article the contradiction between the formal visual estimates in small instruments, averaging m_1 = 8½, and Wolf, whose sighting would imply that the comet "could then have been no fainter than magnitude 6½-7," was pointed out. Others estimating P/Halley 1982i in small instruments by Sidgwick method last Dec. 1-3 were about ½ mag. fainter than Bus and van de Weg, which would make P/Halley 1910 II closer to m_1 = 7 at the time of Wolf's sighting. Wolf's naked eye sighting was but one of many problems in the 1910 light curve that led us to a brighter magnitude forecast (CNS 83-2) that essentially has been borne out. Based on four corrected observations from the 1607, 1682, and 1835 apparitions, Bus arrived at a similar conclusion for the preperihelion brightness (KOMETEN NIEUWSBRIEF No. 17, April, 1983).

Comet Predictions for 1987

Several sources provide information on returning periodic comets in 1987. Orbit elements, ephemerides, and predicted magnitudes are published in Comet Predictions for 1987, by Charles Townsend, John Rogers, and Scott Hanssen. The 58-page unbound handbook is available for $6.00 in the continental U.S. and $8.00 abroad from Townsend, 3521 San Juan Ave., Oxnard, CA 93033. The British Astronomical Association Handbook 1987 also contains ephemerides of the returning periodics as well as information on other solar system objects, and can be ordered from the B.A.A., Burlington House, Piccadilly, London W1V ONL, England (we do not have the current price). Ottewell's Astronomical Calendar 1987 has a comet section with orbit diagrams and sky map treks, although not ephemerides, for the 1987 periodics, as well as a Halley retrospective. Price is $12.00 by check payable to Astronomical Workshop, Furman University, Greenville, SC 29613, U.S.A.

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