



The Ford Amateur Astronomy Club Newsletter

Volume 5, Number 5

May 1996

LATEST SENSORS DISCOVER NEW ASTEROIDS AND A COMET

Operating a newly installed electronic camera pointed at the night sky from atop Maui's Haleakala volcano, NASA astronomers have discovered four new Earth-crossing asteroids and a fast-moving comet, just months after initiating a new near-Earth asteroid and comet discovery program.

The camera — called NEAT, for Near-Earth Asteroid Tracking system — enabled astronomers at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA, to make their first discovery of a new long-period comet on March 15, the first night of the monthly observing program. The comet was officially designated 1996 E1, after confirmation was received from observers in Maui, Australia, Japan, the Czech Republic and Camarillo, CA.

"This relatively bright, magnitude 16 comet was discovered in the constellation of Cancer," said Dr. Eleanor Helin, principal investigator of the NEAT camera team at JPL. "It was diffuse, with strong central condensation, sporting a 15-arcsecond tail. Its closest approach to Earth, at about 30 million miles, occurred at the end of March."

The comet, which has a parabolic orbit highly inclined to the ecliptic plane, is on a long journey through the Solar System. Named NEAT 1, the long-period comet was discovered automatically by NEAT's software and was sighted, coincidentally, on the Ides of March, "a most auspicious beginning for a discovery program," Helin added.

Four unusual Earth-crossing asteroids also were discovered using NEAT, which is the world's first autonomous imaging system. These near-Earth asteroids have been designated 1996 EN, 1996 EO, 1996 FR3 and 1996 FQ3.

"All are noteworthy for different reasons," Helin said. "1996 EN is a large, 1.8 mile-diameter asteroid which moves in a very elliptical orbit and displays a high inclination of 39 degrees relative to the ecliptic plane. As a result of its brightness at magnitude 15.5, and its placement with respect to Earth, it will be accessible for observations through the end of the year."

Of the other Earth-crossers, 1996 EO has a diameter of a little more than 1/2 mile. It is not on a collision course with Earth, but asteroids of this size and larger have been identified by the scientific community as sufficient to cause severe damage over a large area of Earth should one impact the planet.

Significant because it moves in a long elliptical orbit extending well inside the orbit of Venus, 1996 FR3 is one of only a handful of asteroids that passes so close to the Sun. Astronomers speculate that this object may be an extinct comet, having passed close to the Sun enough times to have lost its gaseous atmosphere.

About 328 feet in diameter, 1996 FQ3 is a small near-Earth asteroid with an absolute magnitude of 21. Although small, Helin believes this asteroid may prove to be a possible candidate for a future spacecraft fly-by mission, given its very low inclination of one degree relative to the ecliptic plane.

The discovery of the four new Earth-crossing asteroids represents half of all the Earth-crossing asteroids discovered worldwide during the month of

March. Two of the discoveries — 1996 EN and 1996 FR3 — are classified as "potentially hazardous asteroids," capable of coming exceedingly close to the Earth.

"These discoveries certainly suggest that we could face a surprise encounter with a large, unseen object," Helin said. "If these newly discovered Earth-crossing asteroids have not been seen before, then there is strong evidence that many others are near the vicinity of Earth and the inner planets, which NEAT and other programs are designed to discover."

March was the first "good weather" month for NEAT astronomers since the new electronic camera came on-line in December 1995, said Dr. Steven Pravdo, manager of the project at JPL. The March observing run alone produced more than 1,000 asteroid sightings, including high-inclination inner-belt asteroids and a number of potential Mars-crossers.

Total detections since NEAT went on-line in December 1995 have climbed to more than 2,400 objects, of which about 45 percent are known objects and more than 200 to date are new discoveries receiving new asteroid designations.

"These discoveries certainly suggest that we could face a surprise encounter with a large, unseen object."

When the camera is upgraded later this month to use a very large 4,096 by 4,096-pixel charge-coupled device (CCD), astronomers expect to detect four times the number of comets and asteroids currently being observed.

Developed at the JPL, the NEAT system and its operation mark the beginning of a new era in observing programs focused on discovering and tracking asteroids and comets — fleeting chunks of rock and ice — as they enter the inner solar system from deep space. The autonomous imaging system contains a sophisticated computer controller and a highly sensitive CCD camera sensor.

"NEAT is next-generation technology that will significantly improve our capabilities to detect near-Earth objects," Pravdo said. The NEAT camera is installed on a 39-inch telescope operated at the summit of Mt. Haleakala by the U.S. Air Force. With its short exposure time and fast electronics, NEAT is able to achieve wide-sky coverage and detect objects much fainter than was possible using the photographic Schmidt telescope at Palomar Observatory in Southern California.

Systematic searches for asteroids and comets destined to cross Earth's orbit have been the topic of renewed interest in recent years, especially in the aftermath of Comet Shoemaker Levy-9 and the recent arrival of Comet Hyakutake.

Today charge-coupled devices — light detectors made of silicon — are emerging as a favored approach to asteroid detection because CCD sensors can record light 100 times more efficiently than the most sensitive photographic film.

NEAT will be managed jointly by JPL and the U.S. Air Force. JPL manages its portion of the program for NASA's Office of Space Science.

COMET X-RAYS DISCOVERED

A team of U.S. and German astrophysicists have made the first ever detection of X-rays coming from a comet. Their discovery of a strong radiation signal — about 100 times brighter than even the most optimistic predictions — was made during observations of Comet Hyakutake using Germany's ROSAT satellite.

"It was a thrilling moment when the X-rays from the comet appeared on our screen," said Dr. Konrad Dennerl of the Max-Planck-Institute for Extraterrestrial Physics (MPE) in Garching, Germany. Following the initial detection, the team reported repeated X-ray emissions from the comet over the next 24 hours. The comet was near its closest approach to the Earth at a distance of less than 10 million miles when it was first detected by ROSAT. The strength of the X-ray emission from Comet Hyakutake took the astronomers by surprise, and they are also puzzled by the rapid changes in their intensity.

"We had no clear expectation that comets shine in X-rays," said Dr. Michael J. Mumma of NASA's Goddard Space Flight Center (GSFC) in Greenbelt, MD, "but the opportunity to search for this radiation in a comet coming so close to the earth was too good to miss. Now we have our work cut out for us in explaining these data, but that's the kind of problem you love to have." The comet was detected repeatedly during March 26-27 as it swept across the sky at a rate equivalent to crossing twice the diameter of the full Moon in an hour. As a result, the comet actually raced through the field of view of ROSAT's X-ray telescope during each 2,000-second exposure. The German scientists were able to correct for the comet's motion during each observation, and produce accurate images with the aid of a computer.

The difficult observations of the swift comet were made possible because of special arrangements made between MPE and the German mission control center in Oberpfaffenhofen, Germany. The comet observations were scheduled to take place exactly when ROSAT would be in real-time contact with the ground station at Weilheim, Germany. Also, the usual two-week period for processing of the ROSAT data was expedited for the comet program, so that the data were transmitted to the science team shortly after they were acquired. "It's a great example of international cooperation in science," said the U.S. Project Scientist, Dr. Robert Petre (GSFC). "We're very grateful to our German colleagues for the opportunity to work with them on a historic discovery."

X-rays were never found from a comet before, and scientists had optimistically predicted an intensity that turned out to be about 100 times weaker than the radiation actually detected by ROSAT. Strong changes in the brightness of the X-rays were another surprise. There were pronounced increases and decreases in the X-ray brightness from one ROSAT observation to another, typically over a time difference of a few hours. Still another puzzle is the nature of the physical process that generates the X-rays, but the ROSAT image may contain clues to this process. In the image, the X-rays from the comet seem to come from a crescent-shaped region on the sunward side of Comet Hyakutake. Unlike the visible light from the comet, the nucleus or solid body is not only not the brightest point in the comet. In fact, the scientists say, the nucleus does not show up in the X-ray image from ROSAT.

Explaining the unexpected bright X-ray emission is the next major task for the science team. One preliminary theory is that X-ray emission from the Sun was absorbed by a cloud of gaseous water molecules surrounding the nucleus of the comet, and then were re-emitted by the molecules in a process physicists call "fluorescence." According to this idea, the cloud is so thick that its sunward side absorbs nearly all the incoming solar X-rays, that none reach the remainder of the cloud. This could explain why the cometary X-ray emission has the form of a crescent, rather than that of a sphere around the nucleus.

A second possible explanation is that the X-rays are produced from the violent collision between the comet material and the supersonic "wind" of plasma and particles streaming away from the sun. "We always learn something new when we study an object at different wavelengths," commented Dr. Carey M. Lisse of GSFC, the leader of the X-ray investigation. "Now we have to determine why the comet is so bright in X-rays, and see what we can learn about its structure and composition from these unique images."

The research was conducted by GSFC planetary scientists Lisse and Mumma, along with Drs. Konrad Dennerl, Jakob Englhauser, Jurgen Schmitt of the MPE, and the German and U.S. ROSAT Project Scientists, Professor Joachim Trumper of MPE and Dr. Petre (GSFC), respectively. Comet Hyakutake was discovered on January 30, 1996, and was subsequently approved as a Target of Opportunity for ROSAT, which means that the regular schedule of satellite operations was reorganized to enable the observations of the comet. ☆

STAR STUFF

Monthly Publication of the Ford Amateur Astronomy Club

Star Stuff Newsletter

P.O. Box 7527

Dearborn, Michigan 48121-7527

1996 CLUB OFFICERS

President:	Bob MacFarland	33-79750
Vice President:	Patti Forton	84-51740
Secretary:	Harry Kindt	313-835-1831
Treasurer:	Kevan Granat	24-87628

GENERAL MEETINGS

The Ford Amateur Astronomy Club holds regular general meetings open to the public on the fourth Thursday of the month at 5:00 PM. Meetings are held at the Ford Motor Credit Company (FMCC) building, Northeast of the World Headquarters build in Dearborn, in conference room 1491, lower floor, East side of the building.

OBSERVING SITE

The Ford Amateur Astronomy Club has an established observing site, by permit, at the Spring Mill Pond area of the Island Lake Recreational Area in Brighton, Michigan located near the intersections of I-96 and US-23. Members are responsible for opening and closing the gate after the parks 10:00pm closing time. The combination for the lock should be available on our hotline number. Always close the gate behind you after 10:00pm whether entering or leaving the park.

OBSERVING HOTLINE NUMBER - (313) 39-05456

On Friday and Saturday nights, or nights before holidays, you can call the hotline number up to 2 hours before sunset to find out if we will be observing that night. Assume that any clear Friday or Saturday night is a candidate observing night unless something else is going on or none of the club officers are able to make it.

MEMBERSHIP AND DUES

Membership to the Ford Amateur Astronomy Club is open to both Ford and Non-Ford Motor Company employees. The general public is also welcome to join. The dues structure is as follows:

Annual Individual/Family	\$20.00
Lifetime Membership	\$100.00

Membership benefits include a subscription to the Star Stuff newsletter, discounts on subscriptions to Astronomy and/or Sky & Telescope magazine(s), after hour use of the observing site at Island Lake, and discounts at selected area astronomical equipment retailers.

NEWSLETTER STAFF





Editor:	Paul Mrozek	313-33-73619
	PROFS: pmrozek; MD 3014 Building 3	
	pmrozek@av3168.pd8.ford.com	
	pmrozek@ford.com (outside of Ford)	
Contributing Editors:	Greg Burnett	313-84-53586

NEWSLETTER SUBSCRIPTION

A yearly subscription at a rate of \$12.00 is available to those who are not members of the Ford Amateur Astronomy Club. Subscription are free to any other astronomy clubs wishing to participate in a newsletter exchange.

Articles presented herein represent the views and opinions of their authors and not necessarily those of the Ford Amateur Astronomy Club or the Star Stuff Newsletter. Commercial advertisers appearing in the newsletter are not endorsed or in any way affiliated with Ford Motor Company, the FAAC, or Star Stuff newsletter.

MAY 1996

SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3 	4
5	6	7	8	9	10 	11
12	13	14	15	16	17 	18
19	20	21	22	23 FAAC Meeting	24	25 
26	27	28	29	30	31	

- May 01 Comet C/1996 B2 (Hyakutake) Perihelion (0.229 AU)
- May 03 Full Moon (7:20 am)
- May 04 Venus at Greatest Brilliancy (Magnitude -4.5)
- May 05 Eta Aquarids Meteor Shower
- May 07 Asteroid Vesta at Opposition
- May 08 Lunar Occultation of Comet Hale-Bopp
- May 10 Last Quarter Moon (12:35 am)
- May 12 Comet West-Hartley Perihelion (2.13 AU)
- May 17 New Moon (7:19 am)
- May 18 Asteroid 1991 JR, Near-Earth Flyby (0.1087 AU)
- May 22 Pluto at Opposition
- May 22 Asteroid Parthenope at Opposition
- May 25 First Quarter Moon 9:45 am)
- May 29 Asteroid Ceres at Opposition

MEETING ANNOUNCEMENT

The Ford Amateur Astronomy Club (FAAC) holds regular general meetings on the fourth Thursday of each month, except November and December. Our next meeting will be **Thursday, May 23, at 5:00 pm**. The program for the meeting has not been determined at this time.

The FAAC meets in the Ford Motor Credit Company (FMCC) building, conference room 1491, located on the lower east side of the building. FMCC is the low building immediately northeast of (but not attached to) Ford World Headquarters in Dearborn. The FMCC building is secured with a card entry system. The easiest way to enter the building for meetings is to park in the northeast lot (Employee Lot 7) and enter through the lower northeast or lower east doors. At 5:00 pm no one seems to have trouble getting in because many people are leaving around that time. At the east door you can dial 0911 on the security phone and say you are here to attend a Ford club meeting, and security will admit you. You may find your way into the building any way you see fit, but direction signs will only be posted at lower northeast and lower east doors. ☆

MEETING MINUTES 4/25/96

by Harry A Kindt, Sec'y FAAC, (73521.1710@CompuServe.COM)

In the absence of our president, the meeting was chaired by our treasurer, Kevan Granat. The meeting was called to order at 5:05 PM. There were 25 members and guests present. The treasurers report was read and accepted. There was no report from the Public Relations/Education Committee due to the absence of the chairperson. George Korody reported on the progress of those members who are in the process of building their own telescopes. Kevan Granat reported on the progress of the effort get the membership to supply him with their completed Profile Survey/Membership Updates. Thus far the response has been good, and we would encourage you to complete your survey and return them as soon as you can.

Jack Kennedy and Barry Craig reported on the progress of our efforts to organize a star party at the Justin's Family Campground near Bad Axe Michigan. A flyer, with all of the details regarding this event, is included with this newsletter. You will note that the sponsorship of this event includes many other clubs from the Southeastern part of Michigan. We would like to take this opportunity to thank them for their participation. A brief discussion was held regarding the possibility of seeking a new viewing site. Dave King was looking

into a leased site somewhere West of Jackson MI. Details are not available and further discussions will be held. We will probably be hearing more on this issue at future meetings.

Apparently the issue of getting food to our meetings has been resolved. We've made arrangement to have pizzas delivered on the dates of our monthly meetings. We still need volunteers to pick up the drinks (pop, soda) and bring them to the meetings. You will be reimbursed, by check, when you arrive with the goodies. Contact Bob MacFarland before the meeting and let him know that you will be bringing the refreshments. At this point in the meeting, the members introduced themselves and were given the opportunity to describe some of the astronomical activities that they were involved in since our last meeting.

Our lecturer for the evening was David Kropp. Mr. Kropp is a solar system educational consultant. Mr. Kropp spoke on the current knowledge and news about the planets in our solar system. He maintains an extensive library of up to date information on the exploration of the planets and on the information and knowledge returned by these "explorers". A question and answer period followed his presentation. Our thanks to Mr. Kropp for his unique presentation. The meeting was adjourned at 6:45 PM. ☆

NEW MEMBERS

The FAAC welcomes the following new member for 1996.

Kristie Brown
Michael Bruno
Robert Fiolek
Ray Fowler
Susan Fowler
Dave Gatti
Bobbie Howarth
Harvey Johnson
Howard Klix
Raja (Hanasoge) Rajasekhara
Mark Ten Brink
James Tokarczyk
Marcia Tokarczyk
Shelly Tokarczyk
Jeffrey Tokarczyk
Lawrence Vassallo ☆

MAY SPACE HISTORY

The following May events come from the 3/30/96 edition of "Space Calendar." This calendar is compiled and maintained by Ron Baalke (baalke@kelvin.jpl.nasa.gov). Note that launch dates are subject to change.

- May 05 35th Anniversary (1961), 1st US Man in Space, Alan Shephard
- May 19 25th Anniversary (1971), Mars 2 launch (Soviet Mars orbiter/lander)
- May 25 35th Anniversary (1961), John F. Kennedy's Moon goal speech
- May 28 25th Anniversary (1971), Mars 3 launch (Soviet Mars orbiter/lander)
- May 30 25th Anniversary (1971), Mariner 9 launch (Mars orbiter)
- May 30 30th Anniversary (1966), Surveyor 1 launch (Moon soft lander) ☆

MAY 1996 SPACE EVENTS

The following May 1996 events come from the 3/30/96 edition of "Space Calendar." This calendar is compiled and maintained by Ron Baalke (baalke@kelvin.jpl.nasa.gov). Note that launch dates are subject to change.

- May 01 MSTI-3 Pegasus XL Launch
- May 06 Progress M-32 Launch (Russia)
- May 08 Galaxy 9 Delta Launch
- May 15 Cluster Ariane 5 Launch (ESA/NASA)
- May 15 Palapa-C2 Ariane 4 Launch
- May 16 STS-77, Endeavour, SPACEHAB-4
- May 23 GE-1 Atlas IIA Launch ☆

HELP WANTED!

As with any other non-profit organization, our club will only do that which our members have the energy to do. Whether it is in the planning and execution of the various club activities, helping to get speakers or just helping to get refreshments to the meeting, most everyone can help in some way. Getting involved is a great way to have fun and to get to know everyone better. Please pitch in however you can. Let one of the officers know that you will help. ☆

FAAC STAR TRAILS

by Bob MacFarland (bmacfarl)

Promises - Promises

I think that I have the best chance of any president to accomplish everything that I promised that I would do during the long election campaign. I've heard it said that if you really want to learn a subject you should try teaching it. Now I can say that if you really want to learn about how a club works, become it's president!

It has been a very interesting climb up the learning curve. One thing for sure is that the climb would be much more difficult without the former and current officers to guild us along. Thank you Greg, Chuck, Al, Harry, John, Patti and Kevan for your guidance so far. And thanks go out to all the membership for your patience during the transition. I should also point out that as I meet and get to know more club members, I am more and more impressed with the diversity of talents that you possess.

The First 100 Days

Looking back, the club has made great progress in their accomplishments so far this year. In addition to some interesting monthly meeting topics, several field activities were conducted for the public. The January Astronomy presentation at the Lake Erie Metropark drew the largest crowd of all of their Winter Festival activities. In March, two relatively impromptu Comet Parties were held on consecutive nights again at Lake Erie. Thank you comet Hyakutake! These outings were well documented with a club photograph on the front page of the Monroe Evening News. These events served as a great medium to further develop a very good relationship with the Metropark folks.

In April, a small group set up at Lake Erie for daytime public observing on Astronomy Day. Unfortunately, their night time plans were hindered by the accursed cloud cover.

Side Bar: One of the areas where we need improvement is short notice communications. In our club we have the Ford employee E-mail bunch, the non-Ford home internet surfers and all others. It's this last group that is difficult to reach on the impromptu events. We're working on a phone fan out to fix this. In the meantime keep checking the Hotline.

So Where To Now?

The club has very ambitious field plans that will continue throughout the rest of the year. Included in these are the Huron County/Bad Axe Star Party Campout in May. This one should be fun because it will involve seven lower Michigan astronomy clubs. There must be someone there with very similar astronomy equipment and interests as yourselves. This will be a great way to get away to share some dark skies with friends new and old at night and to get to know them better during the day.

The Public Relations Committee has mini star parties planned for June and October. At these events, special invitations will be given to Boy Scouts, Girl Scouts, school science classes and other general public to come out and look at the universe. What astronomer among us doesn't enjoy listening to the Ohs!! and Ahs!! when someone gets close up and personal with the sky objects they never realized they could see.

And don't forget the Fourth Annual Fall Ford Amateur Astronomy Club Star Party on September 7th! This is the Granddaddy event for which our club has become so well known. It's also the one which brought me back into the hobby two years ago. I'm sure it'll be even better this year.

Other potential 1996 club outings or activities that have been suggested by members include special club only planetarium visits, arrangements for the weekend club use of exclusively dedicated "Dark Sky" properties, a club Web Page, "How To Do....." videos, club slide/photo albums and others. Some future meeting topics might include some basic astronomy subjects, astrophotography techniques, the latest astronomy software and How we will make a comet before your very eyes. Speaking of comets, we must get a jump start on Hale-Bopp! This one will bring a broad range of club opportunities to us later this year and on into 1997.

Go Ahead. Tell Us Where To Go

My point of all this is that we need your input to help us decide where we should be going as a club. If you haven't already, by all means, send in your Equipment & Interest Survey. This will not only give us some direction, but it will help you meet and get to know other club members with similar interests to yours. If you have already sent your form in and have some new ideas, send in another. Clear skies, Bob MacFarland. ☆

ON CLEANING OPTICS

by Greg Burnett (gburnett)

While out on the World Wide Web looking for something totally unrelated to astronomy, I stumbled across the home page of the Antique Telescope Society (ATS) at <http://www1.tecs.com/OldScope/> (that's how most of the best stuff is discovered on the web, when you're looking for something else!). My attention was drawn to an article posted there entitled "A Professional Method for Cleaning Optics" by Robert Atrial. The author expounded at length on the wondrous properties of a substance called "collodion", which could lift every speck of dirt and dust from a mirror or lens without any rubbing whatsoever. Well, it sounded like a pretty neat idea, so I went in search of the magical collodion. Here is what I have discovered in the process of obtaining the stuff and using it to clean a couple of things.

Collodion is a solution of pyroxylin in a mixture of ether and ethyl alcohol. Pyroxylin is another name for cellulose nitrate, a basic ingredient in some types of explosives. Collodion is not unlike "airplane cement" for plastic models; about the same appearance and smell. It comes in two forms: "flexible" and plain. The flexible variety contains camphor and some other stuff, and is intended for medicinal use (as a coating for wounds). The "plain" variety is exactly that, just pure collodion, and is exclusively preferred for optical cleaning.

I had to try a couple of pharmacies before finding one that even knew what collodion was. This was Frank's Pharmacy in Clinton township. They also carry lots of surgical stuff, and actually had flexible collodion in stock. (By contrast, the folks at Myers were just baffled.... "How do you spell it again?") Frank's Pharmacy gave me the name of two suppliers, but they were unable to ship to individuals because of insurance constraints. I returned to Frank's and they were able to order it for me. Thus, I obtained a 500ml bottle (about a pint) of "Collodion U.S.P./N.F." for \$22.98. Your pharmacist can obtain it from the Spectrum Chemical Division of A-A Spectrum, Inc. Their 500ml bottle is item number CO120. The collodion was accompanied by an 8-page Material Safety Data Sheet that spelled out all the precautions appropriate for its use. It's worth reading; collodion is fairly nasty stuff.

The first trial was cleaning the mirror from my old Edmund Scientific 4-1/4" reflector. The mirror was removed from the scope and from its cell. It was already very scratched and pitted, so it would not be a major loss if things didn't go as planned. As described in the ATS article, I applied a layer of collodion with a 1/2-inch artist's brush, laid a layer of gauze over it, then applied several more coats of collodion. This was done without allowing any significant drying time between coats. **FIRST LESSON:** Use this stuff only with lots of ventilation. This doesn't mean just open a window, this means you want a breeze going by! Collodion is extremely volatile, and since it contains ether, inadequate ventilation could cause problems. **SECOND LESSON:** Collodion sticks to Formica. Don't get it on your kitchen table or counter top. If you do, clean up with alcohol.

The applied collodion took a few minutes to dry. It dries to a hard, cellophane-like substance, which is still flammable (it's what old-time movie film was made of, which caused many theater fires). The gauze ensures that the dried coating is tough enough to be pulled off the optic in one piece without tearing. **THIRD LESSON:** Use cotton gauze. Some of the new-fangled bandage material sold as gauze is actually made of cellulose products, and will start to dissolve in the collodion. The dry coating peeled off the mirror very easily. When dry, the edges were already starting to lift because of shrinkage, and the whole thing just popped right off in one piece. I examined the removed coating carefully with a magnifying glass for any sign of aluminum that may have come off the mirror, and found none. The mirror was left absolutely, positively clean as a whistle! Examination with a magnifier showed that even the pits and scratches were clean.

Emboldened by this first successful experience, I next set about cleaning the objectives of my 11x80 binoculars. This would verify the performance of collodion on coated optics. The binoculars have what appears to be a single magnesium-fluoride coating. The collodion and gauze were applied and removed as before, with equally good results. **FOURTH LESSON:** Let the collodion dry thoroughly before attempting to remove it. It adheres a little more tightly to glass than to mirrors, and will leave some residue if it's not completely dry. If this happens, a re-application will pick up any "leavings", or you can pull them off with masking tape (I don't like this method, but it does seem to work.). **FIFTH LESSON:** The binoc objectives were cleaned in situ, and the collodion stuck pretty badly to the mounting hardware. You should use this stuff only on optics that can be removed from their mountings.

(continued on page 6)

MESSIER 102

by Hartmut Frommert (phfrom@nyx.uni-konstanz.de)

"102. Nebula between the stars omicron Bootis and iota Draconis: it is very faint, near it is a star of 6th magnitude."

Messier in Connaissance des Temps for 1784, page 267.

Charles Messier compiled his 'Catalogue of Nebulae and Star Clusters' during the years 1758 to 1781 (or 1782 if one counts the additions by Pierre Mechain, which are contained in most modern versions of the catalog). Contrary to prior and contemporary observers who had a large number of nonexistent objects in their lists, the entries of his catalog correspond to actual astronomical objects in all cases with one exception, his entry number 102 (there are positional errors M47, M48, and M91, which could be figured out by the time). For this object, Messier gives above description together with M101 and M103 as communicated to him "through M. Mechain, which M. Messier has not yet observed." He gives no position for M102 (and M103). Shortly after the publication, some three or four years after the entry was made, Pierre Mechain retracted his discovery and claimed that the observation was an error, a duplicate observation of M101, and a star chart error of Messier. In a letter to Bernoulli he wrote:—

'On page 267 of the "(Connaissance des Temps) for 1784" M. Messier lists under No. 102 a nebula which I have discovered between omicron Bootis and iota Draconis: this is nothing but an error. This nebula is the same as the preceding No. 101. In the list of my nebulous stars communicated to him M. Messier was confused due to an error in the sky-chart.'

Kenneth Glyn Jones [1], and even more definite, Owen Gingerich in his contribution to Sky & Telescope [3] (reprinted in Mallas/Kreimer's Messier Album [2]) regard this issue as solved, in the sense that M102 is a duplication of M101. One could easily join this conclusion, as the discoverer himself admitted a fault and retracted. However, there remain some doubts and arguments which still allow for other possibilities, as also Kenneth Glyn Jones admits. First of all, both Mechain and Messier were very careful observers, indicated by the fact that M102 is the only possible "non-object" left in the catalog, and only for 3 further objects there were positional errors. Also, as the descriptions for M101 reads:

March 27, 1781. 101. 13h43m28s, 55°24'25". Dia. 7'. Nebula without stars, very obscure and pretty large, 6'-7' in diameter, between the left hand of Bootes and the tail of Ursa Major. Difficult to distinguish when graticule lit.

It appears not necessarily obvious that this is the same object as M102, with the description given above. Also, Mechain's "retraction" occurred about 3 years after the "discovery", giving room for speculations anyway, and it was never published in the (Connaissance des Temps), where Messier's catalog and supplements were first printed. Messier personally had added by hand a position to M102, which both Owen Gingerich and Kenneth Glyn Jones claim as erroneous "because there is no obvious object". As Messier was certainly a careful observer, he probably has seen 'something', but maybe he did a reduction error again. Might it be he found another object, one of the candidates discussed below, a comet, or even some completely other object? At last, there are at least two candidates, the more probable being NGC 5866, near the position Mechain describes; wouldn't one know of his letter mentioned above, today's astronomers would probably believe that this was the observed object!

To step the way down, note that omicron Bootis is about 40 degrees away and south of iota Draconis, thus (at least) one of them must be a mistype; Admiral Smyth in his 'Bedford' Catalogue suggests the obvious possibility that it must read 'theta' instead of 'omicron' Bootis. The other possibility would be, according to J.L.E. Dreyer in (Notes and Corrections to the NGC), that iota Draconis was mistaken for iota Serpentis; then M102 would be situated near the position of the faint galaxy NGC 5928, at RA 15h23.9m, Dec +18°15' (1950). However, Dreyer's proposition of NGC 5928 can be waived with great certainty for the obvious reason that it is only a 14th mag galaxy, according to the RNGC [4], so that both Mechain and Messier could hardly have seen it with their instrumentation, even under exceptionally good conditions. Thus we can also exclude Dreyer's assumption that iota Draconis was a mistake for iota Serpentis, since there's no sufficiently bright object in that region of the sky, and are left with the possibility proposed by Smyth, that omicron Bootis was mistaken for theta Bootis. Between those stars, about 3° SW of iota Draconis, is a small group of galaxies, the brighter of which could be viewed as candidates for M102:

- NGC 5866 (William Herschel's 215 H.I, John Herschel's 1909), the brightest of the group at 10.0 mag vis.

- NGC 5879 (W.H. 757 H.II, J.H. 1910), Smyth identified this as M102
- NGC 5907 (759 H.II, J.H. 1917), a bright edge-on galaxy.
- NGC 5908 (760 H.II), too faint as a candidate.

Most probably is NGC 5866, as Shapley and Davis suggest in their contribution to the PASP Vol. 29 (according to Glyn Jones). Another fact makes NGC 5866 a good candidate for M102: Imagine you want to find NGC 5866 with a telescope, how do you procede? I would look for the stars iota Draconis and theta Bootis and then locate the 5.21 mag star GC 20332 which is little more than 1° south and almost exactly at the same right ascension. This star is one of 5 in the rectangular region between RA/Dec limits given by the two stars and listed in Becvar's catalog of stars brighter than 6.25 (NGC 5866 is at RA 15h05.1m, Dec +55d57'):

	RA (1950.0)	Dec (1950)	mag
23 theta Boo	14h23m48.8s	+52d04'52"	4.06
GC 19627	30 56.9	55 37 03	5.99
GC 19666	32 45.2	57 17 12	6.25
GC 19742	36 40.0	54 14 19	5.52
*GC 20332	15 04 59.9	54 44 53	5.21
GC 20641	18 36.8	52 08 16	5.52
12 iota Dra	15 23 48.8	59 08 26	3.47

A mis-estimate of a 5.21 as 6th mag star would eventually be not too far off, so that the '6th mag star' in Messier's description might be GC 20332. Then the description matches well with that visually 10th mag lenticular galaxy, as it appears probable that Mechain perhaps wanted to describe a route to his newly 'discovered' object. Another possibility is that the star mentioned is the 6.8 mag star lying only 0.4 degrees NW of NGC 5866. However, as Mechain has disowned the discovery, one may keep the position that due to his claim, Mechain's discovery was spurious and eventually a duplicate observation of M101 as he claimed. As also Don Machholz admits, it may well be that he was correct with this statement, then there remains only the puzzle of Messier's handwritten position. To summarize:

The object that really deserves the designation "Messier 102" should be identical to one of the 2 observed by Mechain and Messier, may they be identical or not. As nobody is still alive who has witnessed them during their observation and recording, we can currently not reconstruct what they actually observed. Mechain's description gives good evidence that the object M102 could be NGC 5866, which most probably everybody would believe if he had not retracted the discovery in the letter mentioned, or if this letter had stayed forgotten. It may now depend on taste to speculate which was erroneous: The observation or the letter.

Sources claiming that "M102=M101":

- * Gingerich [3] and Glyn Jones [1]
- * Mallas and Kreimer's Messier Album [2] (quoting Gingerich [3])
- * Tirion's Sky Atlas 2000 and Hirshfeld & Sinnott's Sky Catalogue 2000
- * Messier Chart, Messier Poster and other products from Sky Pub. Co.
- * Becvar, see below.

Sources identifying M102 with NGC 5866:

- * Don Machholz in his Messier Marathon Observer's Guide [5] discusses the subject and comes to similar conclusions as the present author.
- * Antonin Becvar in his 'Atlas Coeli, Atlas of the Heavens - II, Catalogue 1950', 1964 gives in the 'Anagalactic Nubulae' section for NGC 5866 the alternative name M102 (p. 329). Oddly, in the 'Catalogue of Messier' section on p. 339, he gives: M102 = NGC 5866, Type S [galaxy], [No other data], Notes: '= M101' Perhaps this reflects the situation.
- * Hans Vehrenberg, in his Atlas of Deep Sky Splendors, claims that Owen Gingerich had added it, which I do not believe because Gingerich [3] claims the opposite.
- * RNGC [4], p. 273, gives M102 as alternative name for NGC 5866.
- * Erich Karkoschka in his Atlas states in the description to chart N16: "Messier's list contains as its object 102 a galaxy [the first time I hear that Messier knew that] near the position of NGC 5866. However, his description points to a duplication of M101 [I cannot verify this; my impression is more that NGC 5866 is a better match]. Did Messier do a mistake of 1 hour in right ascension [How, as he gave no measured position]? Therefore, the designation M102 is nonunique."
- * J.D. Wray, The Color Atlas of Galaxies, Cambridge UP, 1988
- * Nasa's extragalactic database has M102 as a name for NGC 5866.
- * Tony Cecce in his Twelve Month Tour of the Messier Catalog.

(continued on page 6)

(continued from page 5)

Sources with other identifications:

- * Admiral Smyth proposes either NGC 5879 or NGC 5866. Kenneth Glyn Jones gives his description: "A small but brightish nebula on the belly of Draco with four small stars spreading across field N of it. Doubt as to whether this is the nebula discovered by Mechain in 1781 since Messier describes it as "very faint", situated between omicron Bootis and iota Draconis. If omicron Bootis should be theta Bootis, this is probably the object seen by Mechain and J.H.'s 1910, being the brightest nebula of five in that vicinity." The problem is that John Herschel's number 1910 is NGC 5879, which is however [not] the brightest of the group; the brightest is NGC 5866.
- * Dreyer (NGC) oddly proposes 14th mag galaxy NGC 5928.

References:

- [1] K. G. Jones. Messier's Nebulae & Star Clusters, Cambridge University Press, 1991. Practical Astronomy Handbooks Vol. 2. 1968, Faber.
- [2] J. H. Mallas and Evered Kreimer. The Messier Album. 1st edition. Sky Publishing Corporation, 1978 (Second revised printing 1979).
- [3] O. Gingerich. The Missing Messier Objects. Sky & Telescope, Vol 20, October 1960.
- [4] J. W. Sulentic, W. G. Tift. The Revised New General Catalogue of Nonstellar Astronomical Objects. University of Arizona Press, 1976.
- [5] D. Machholz. Messier Marathon Observer's Guide — Handbook and Atlas. MakeWood Products, P.O.Box 1716, Colfax, CA 95713. 1994. ☆

ASTROPHOTOGRAPHY 101

by Greg Burnett (gburnett)

"Experience is a dear teacher, but fools will learn at no other."

— Poor Richard's Almanac

Experts claim one of the best balms for psychological trauma is to talk about it. In that spirit, I will share one of "life's little lessons" that I experienced. On a recent Friday night at our Island Lake observing site, I loaded up the astro-camera to shoot Comet Hyakutake. In the course of the evening I shot about half of a 36-exposure roll of Ektachrome 1600P, including piggyback shots with 50mm and 135mm lenses, and carefully guided telescopic shots at the prime focus of my 6" Astro-Physics refractor.

As it happened, it was clear again on Saturday, so I was back out at Island Lake, shooting up the remaining frames on that same roll of film. As before, I made a variety of piggyback and telescopic exposures. Imagine my dismay, when at last the precious roll of photos was complete, to find that the film had not engaged the take-up spool in the camera. I had been "shooting blanks" throughout both nights!

Well,... I have been doing photography for years (even started college as a photo major, believe it or not!), and I know all the checks I should have made: Turn the rewind handle to see if the film is tight; watch the rewind handle when you advance the film to see if it's turning; check for normal resistance (and normal sounds) when advancing the film; and so on. No excuses—just didn't do it. Of course, when I discovered what had happened, I went into immediate denial mode, and sent the film in for processing anyway. It returned blank, as expected, along with the obligatory pre-printed note from the photofinisher, politely suggesting a number of errors I might possibly have made that could have resulted in blank film. (No kidding!)

With the denial phase complete, the rationalization mode has set in: They would have been crummy pics anyway, because the Moon was pretty bright on both nights. Yeah,... yeah, and I probably didn't guide them very well, and,... and... If nothing else, you can be sure I won't make THAT mistake again (but there are plenty of others still waiting for me!)

☆

(continued from page 4)

The advantage of this process is that you never have to rub the optical surface with anything. No matter how careful you are, any kind of rubbing will cause scratching by whatever dirt is already on the surface. This can be minimized but not totally eliminated. It doesn't matter that what you're using, cotton or whatever, is too soft to scratch; that's not what does the scratching.

My ultimate project will be to clean the objective of my 6-inch refractor, although I may try a few more small, less irreplaceable items first. I will let you know how it goes.

☆

COMET OBSERVING REPORT

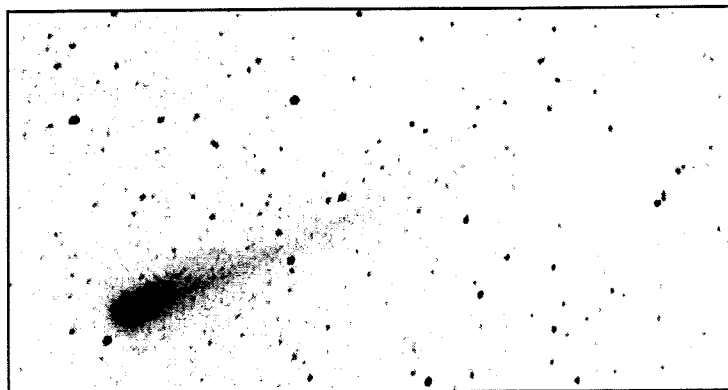
by Paul Mrozek (pmrozek; pmrozek@av3168.pd8.ford.com)

Amazing! That and similar words have been used by many people to describe the performance of Comet Hyakutake, but I would also like to apply that word to our luck in having clear skies. It wasn't incredible weather, because it was very cold. Nevertheless, I was still amazed that the weather cooperated with the comet's closest approach to Earth (Tuesday, March 26). I had already been viewing from my front yard the prior two weeks, watching the comet get brighter. However, even on the 26th, I would say that the view from my home in the middle of Sterling Heights was a little disappointing. With the unaided eye, the comet only looked like a slightly elongated blob, with no apparent tail (there are just too many lights near my house to properly dark-adapt my eyes). The view was slightly better through my cheap 7x50 binoculars, and I could actually see a short tail. Still, the surrounding light pollution made the comet nothing like the reports I was reading in the USENET newsgroups of a 60 degree tail.

I knew I needed to get to a darker site, but I did not want to make the long trip to Island Lake on a Tuesday night (in retrospect, I should have just taken Wednesday off). Instead, I decided to take the advice of a friend who used to also live in the Northeast metro area. It was too cold to take my scope, so I just loaded up my camera and headed out to the Stoney Creek Metropark entrance at 26 mile and Shelby road. The park is not open that late, but I was told that many people just pull off onto the shoulder. For those of you who have never been to Stoney Creek, the 26 mile road entrance is one of the highest points in Macomb County. On a clear day, you can easily see the Renaissance Center. I was a little unsure of what to expect, but I was relieved to see about 4 or 5 other cars on the side of the road. One of the vehicles was actually a police car, and it looked like somebody was putting a telescope back into the trunk.

As soon as I got out of my car, I immediately saw a tail with my unaided eye that was longer than with my binoculars at home. The site is not perfect, because the nearby visitors' center has a lot of exterior lighting [which can be blocked off by a hill if you go far enough around the corner]. The road is also used by people who just want to get from 26 mile to Shelby road. Still, the area is not bad for anyone in the Northeast metro area who is looking for a relatively close site that is probably much darker than their backyard, except for the metro area light pollution to the South. I will probably go there again during one of the better meteor showers.

After a few minutes of just looking, I was ready to start taking some pictures. The timing between passing cars was enough to take some long exposures, but you still had to be ready quickly stop or cover the lens. The picture below is about 30 seconds using Kodak Royal Gold 400 and a 50mm lens at f2.8. After a couple of shots I was so cold I had to go back into my car to warm-up. From there I did some binocular observing of both the comet and downtown Detroit. If I had remembered to bring my log book, I might have wrote the word "amazing", after spending several minutes defrosting my hands.



When I got back home around 11:30 pm, I went into my back yard for another comparison view. It didn't take long for me to realize what my mission should be if comet Hale-Bopp has a similar performance. I will have to go around and tell my friends and co-workers that if you can't get to a dark site, then don't even bother looking. (Over the next few days I did here from several people who looked at the comet from their homes and only saw a fuzzy blob with no tail)

[NOTE: The Star Stuff newsletter is always in need of observing reports, or astronomy related articles, written by FAAC members. See page 2 for information to submit work to the newsletter or any club officer.] ☆

HOW TO PLAN/OBSERVE

from STARTEK@delphi.com

The following article was reprinted from ASTRONET, Issue 36, April 1, 1996. For more information, please contact resource@resource-intl.com.

THINK QUALITY: Whenever I plan my observing session - however simply - things go more smoothly. Plan on viewing fewer things more carefully. We seem to have a statistical fever in America. But, Messier Marathons aside (I don't know why I make this exception, but it seems like an excusable pastime - perhaps because it's a good way to get a crash course in the 'lay of the sky') astronomy is - to me - a quality, not quantity, endeavor. But, to each their own.

DRESS: First thing I do, is dress properly. I like to coordinate my colors and fabric combinations into an impressive but subtle ensemble sure to impress anyone who may come my way (a constable, for example) ... good for astronomy public relations. Swashbucklers and barnstormers dressed for the occasion, why not the heroes of our time: the amateur astronomer?

OBSERVING REPORT: So, with that backdrop, what to do about the "before" part of an observing session? The array of observing session type is wide here, so it really depends on if I'm simply cruising the sky, or if I have a specific agenda (photoelectric photometry or CCD imaging). But the one thing I do always, is make an observing report. It's easy: On a home computer, using a basic word processor, produce a form and make zillions of copies. On it should be...

1. Where you are, including latitude and longitude (use a topographic chart, and determine your altitude - this is important for occultation reports).
2. Who you are (287 years from now it may be helpful).
3. Universal Time of the start and finish of your observing session. Also indicate time of specific observations, a bright meteor for example.
4. Who else was present.
5. Weather/sky/seeing conditions. Note anything that is making you uncomfortable, it may be a factor in your observing.
6. Draw a circle (typically 3" dia., or so) on an open portion of your sheet. I use this in two ways:
 - a) As my telescopes' or binoculars' field of view ... (indicate field diameter in seconds, minutes or degrees, as applicable).
 - b) The form of the Moon or major planet ... to sketch in or on. (Sketch a lot! You will never regret it. If you are lousy as an illustrator, you'll get better with time ... and in astronomy the eye sees a great deal differently than ANY optical device).
7. And, of course, allow space to write down what you saw, how it looked to you (even familiar objects should be described). And feel free to include subjective impressions as well as objective ones, though it is my habit to separate the two into different paragraphs.
8. Also, at the top, indicate the page number and total number of pages. Such as 2/4 (meaning this is page two of a report composed of 4 pages total).

Place your reports in a three-ring binder, with tabs for either months and/or years, depending on your frequency and volume of observing and reporting. Include copies of your astrophotography, applicable journal articles (photocopy newspaper articles, the original newsprint tends not to preserve well with time), and reflections during non-observing times.

LONG TERM PLANNING: When Sky & Telescope and Astronomy arrive at your door, and with a copy of "Observer's Handbook" (University of Toronto Press; comes out annually about October/November for following year...absolutely indispensable) at your side, plan observing sessions out ahead, comparing lunar phases, and locations (as we all discovered was a factor in seeing Hyakutake last week), your professional and personal obligations (few things are as frustrating as planning a terrific lunar graze occultation only to discover that's the day you are getting married. One of the two events will have to be postponed.) and confirming what equipment/instrumentation you will require. Typically, I have observing sessions planned, at least tentatively, many months ahead of time. Keep this in mind for vacations too.

EQUIPMENT: Days/weeks ahead, be sure all the equipment/instrumentation is in proper working order. If you make a catastrophic discovery (broken eyepiece) you have time to replace/repair.

PRACTICE: Especially if you are intending to time an asteroidal occultation, familiarize yourself with that star field over a few evenings before the actual event (which, typically, will be clouded out anyway).

STORAGE: If practical, keep equipment in a housing (small observatory is ideal, if you can swing it), or have a place indoors that makes it convenient to take your equipment outdoors and will also be out of the way from domestic traffic. The fewer calories expended between your desire to look at the sky and actually looking, the more likely you will be DOING observing.

CHARTS: By planning ahead, you will be able to determine which chart(s) is(are) most applicable to the scale of observation you will be engaged in. I make photocopies of charts ahead of time. That way I can mark them up to my hearts' content and 3-hole punch them as part of my observing record.

CLOCK: The alarm clock may be the most valuable instrument of all. Use it and keep the batteries fresh (for critical events - I time occultations). I use two alarm clocks to ensure I am up and about. Set the clocks to go off 5 min apart and place one on the other side of the room. Needless to say, have all items ready to go so as to minimize 'fumbling time' between alarm clock and celestial event.

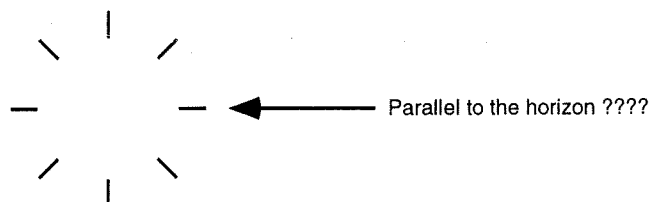
By planning ahead, you will be delighted to discover how much time you spend actually observing, instead of fumbling. ☆

POLAR ALIGNMENT SECRET

by Rick Colman (rick@mail.calypso.com)

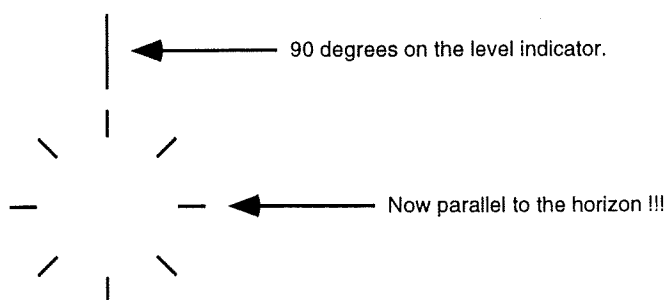
The following article was reprinted from ASTRONET, Issue 29, January, 1996. For more information, please contact resource@resource-intl.com.

I would like to offer a technique for better polar alignments using a "polar alignment finderscope" like the ones offered by Meade, Celestron, etc. I have never seen this technique published anywhere, but it works for me. Have you ever used one of these polar alignment reticles without great results. The problem for me was that I could never figure out how to rotate the reticle. Documentation says reticle so that it is "parallel to the horizon" like below:



The problem is, where the hell is the horizon? If you are in the mountains, or in the back yard surrounded by buildings, it is not so easy to figure out where the horizon is. If you are off a bit, then you end up placing Polaris in the wrong part of the "hour marks" of the reticle and your alignment is no good.

Here is the secret. Get a angle level with compass-style face and sweeping indicator arm that will measure angles when held vertically. You can find them at large hardware stores, builders supply houses, etc. Hold it near the reticle eyepiece and rotate it until the sweep indicator line is on 90 degrees. That is your reference line. Now, rotate the reticle eyepiece until the 12 o'clock vertical line is coincident with or parallel to the indicator on the level, like below:



You will probably need a small flashlight to alternately view the level indicator and then look through the eyepiece until everything is lined up. When I started using this technique, I noticed a dramatic increase in the accuracy of my polar alignments for CCD imaging without going through the lengthy process of dec. drift alignments, etc. This technique is very good if you are mobile most of the time, etc. Hope it helps you out. Good luck. ☆

WHAT BINOCULAR EXIT PUPIL

by Jay Reynolds Freeman (freeman@netcom.com)

The following article was reprinted from ASTRONET, Issue 37, April 15, 1996. For more information, please contact resource@resource-intl.com.

If I may be allowed to summarize, the Sky and Telescope piece is a slightly simplified rehash of the Observer's Handbook article; the author of the latter in essence makes three undocumented assertions, which I shall list before discussing: (That means, hold your fire.)

- (a) Magnification and image brightness are both important.
- (b) At constant aperture, increasing magnification above the lowest usually used for binoculars increases the stellar limiting magnitude (by darkening the background and thus improving contrast).
- (c) At constant aperture, similarly increasing magnification improves the visibility of detail in faint extended objects by increasing their apparent size while holding contrast (the ratio of object brightness to background brightness) fixed.

The author next suggests that perhaps the product of magnification by objective diameter would be a suitable simple figure of merit for binocular performance. Whether or not you think that figure of merit makes sense in a qualitative way, there is certainly no evidence presented or cited, that the this quantity correlates numerically with any kind of objective measure of performance obtained by the observer. Yet meaningful numerical agreement is "precisely" what is required if we are to use that figure of merit as a detailed criterion for which binocular to buy. In fact, the only source that the Observer's Handbook article author refers to is an equivalent figure of merit used by the Carl Zeiss company (no reference to a specific document is given); namely, the square root of (magnification times objective diameter). Thus it appears to me that:

All the excitement about the New Standard for the Best Way to choose astronomical binoculars, stems ultimately from commercial advertising.

If you think that's a reliable source, then perhaps you would be interested in purchasing, on generous terms, a part interest in a bridge I happen to own, that runs from New York to Brooklyn. :-)

Back to those undocumented assertions. Surprise — I agree with all of them; (a) and (b) are widely acknowledged, and (c) fits my own experience, though not perfectly so. Notwithstanding, there is no logic whatsoever in the jump from a rough qualitative effect to a precise numerical criterion, usable across the board as a guide to how to spend hundreds of dollars. The Observer's Handbook calculations about image size, and about the brightness of object and background, all look good to me, but what is lacking is information about how eye and brain respond to these changes. That information is required before we can reliably predict what the observer will see.

Furthermore, there is also lacking any discussion of the matter of simple detectability of a faint, diffuse object in the first place. This aspect of performance is quite important to many deep-sky observers. My personal experience here is that there is more going on than, um, meets the eye, so I have a feeling the issue is still open. I will append an example, but the important thing is not one specific observation, what matters is that the observing community is jumping furiously to conclusions that are not warranted by the data. That's easy to do, because there aren't any data.

So, let's do the experiments. And I have to say before I close, that in my opinion both articles (1) and (2) are well-written and worth reading; the flaw is as much in the readers, for jumping to unwarranted conclusions, as in the writers for presenting numerical quantities not warranted by data and without proper (and loud) qualification about their meaning.

1) MacRobert, Alan M., 1995. "Backyard Astronomy: The Power of Binoculars", Sky and Telescope 89:5, 48-49. MacRobert edits the "Backyard Astronomy" column, and seems to have written this particular essay.

2) _____, 1994. "Binoculars", pp. 30-32 in The Royal Astronomical Society of Canada's Observer's Handbook 1995, Roy L. Bishop (ed.), University of Toronto Press. Note the 1995 edition of this venerable annual does bear a 1994 copyright date. The author of this article is not named. Substantially the same article appears as pp. 32-34 of the 1996 edition; I did not read the 1996 version carefully enough to determine if it was exactly the same.

(continued on page 9)

ASTRONOMY BOOK REVIEW

from Rene@Mindlink.bc.ca via ASTRONET, Issue 37, April 15, 1996.

I came across a flyer for Cliff Pickover's latest book which might interest readers of this newsgroup. The book has lots of beautiful computer graphics and an appendix with computer recipes in C and BASIC so you can become your own black hole explorer. Also includes some fractal images.

BLACK HOLES - A TRAVELER'S GUIDE

by Cliff Pickover, John Wiley and Sons: New York 1996.

Some Endorsements:

"Dr. Pickover, with his usual enthusiasm, wit, and knowledge, accompanied by his familiar superb computer graphics, has turned his attention toward black holes and their bizarre properties. Many books have been written about black holes, but none that surpass this one in arousing emotions of awe and wonder toward the mysterious structure of our universe."

- MARTIN GARDNER

"As one of the thousands who contracted incurable fractaphilia by exposure to the Mandelbrot set, I've much enjoyed Cliff Pickover's earlier books on this infectious disease. Now he has ventured into an even more dangerous territory — the exploration of Black Holes. All would-be tourists are strongly advised to read his traveler's guide before they set out. However, like Cliff's earlier books, this should carry the warning: 'Reading may be dangerous to your wealth.' It may create an overwhelming impulse to buy a more powerful computer."

- ARTHUR C. CLARKE

"For years writers, artists, and scientists have complained about the division between the sciences and the arts. Some have tried to build bridges across the line, but Clifford Pickover is one of the *very* few who successfully erases the line itself. In *Black Holes: A Traveler's Guide*, Pickover provides a wonderfully illustrated explanation of some of the strangest objects in the universe. While aimed at the beginning black hole explorer, there are marvelous discoveries waiting here for both the novice and the expert."

- MARC HAIRSTON, *Hanson Center for Space Sciences*

"A fascinating computer-assisted 'science fiction' [sic] tour of the physics and mathematics of black holes, presented in Clifford Pickover's inimitable offbeat and always readable style. Isaac Asimov, in devil's advocate mode, once asked if these 'invisible nothings' are worthy of serious consideration. They are!"

- IAN STEWART, *Author of "Does God Play Dice?"*

"Solid science illuminated by vivid images and amusing dialogs, Cliff Pickover's latest computer-aided adventure takes readers on an entertaining, edifying trek to the brink of a black hole."

- IVARS PETERSON, *Math/Physics Editor, Science News*

"Pickover conveys the weirdness of black holes better than anyone else who's tried."

- MICHAEL SWAINE, *Editor, Dr. Jobb's Journal, April, 1996*

Here is the book's TABLE OF CONTENTS:

Chapter 1. How to Calculate a Black Hole's Mass
Chapter 2. The Black Hole's Event Horizon Circumference
Chapter 3. Black Hole Tidal Forces
Chapter 4. A Black Hole's Gravitational Lens
Chapter 5. A Black Hole's Gravitational Blueshift
Chapter 6. Gravitational Time Dilation
Chapter 7. Anatomical Dissection of Black Holes
Chapter 8. Embedding Diagrams for Warped Spacetime
Chapter 9. Gravitational Wave Recoil
Chapter 10. Optical Appearance of a Collapsing Star
Chapter 11. Gravitational Distension Near a Black Hole's Heart
Chapter 12. Quantum Foam
Chapter 13. Black Hole Recreations
Chapter 14. Mathematical Black Holes
Chapter 15. Black Holes Evaporate
Chapter 16. Wormholes, Cosmological Doughnuts, and Parallel Universes
Postscript 1. Could We be Living in a Black Hole?
Postscript 2. The Grand Internet Black Hole Survey
Author's Musings
Smorgasbord for Computer Junkies

STATISTICALLY SPEAKING

Location (Dearborn, MI): 42°19'12" N, 83°10'48" W, 180 meters elevation
Local Time = Universal Time - 4.5 hours (Eastern Daylight Time)

Abbreviations used in reports:

FM Full Moon FQ First Qtr Moon LQ Last Qtr Moon NM New Moon
MR Moon Rise MS Moon Set SR Sun Rise SS Sun Set

Calendar Report for May 1996

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Lunar Events						
FM: 7:20 May 03			1	2	3	4
LQ: 0:35 May 10			SR: 5:58	SR: 5:56	SR: 5:55	SR: 5:54
NM: 7:19 May 17			SS: 20:03	SS: 20:04	SS: 20:05	SS: 20:06
FQ: 9:45 May 25			MR: 18:16	MR: 19:22	MR: 20:30	MR: 21:37
			MS: 4:56	MS: 5:30	MS: 6:09	MS: 6:53
5	6	7	8	9	10	11
SR: 5:52	SR: 5:51	SR: 5:50	SR: 5:49	SR: 5:48	SR: 5:46	SR: 5:45
SS: 20:07	SS: 20:08	SS: 20:09	SS: 20:10	SS: 20:11	SS: 20:12	SS: 20:14
MR: 22:40	MR: 23:38	MR: None	MR: 0:30	MR: 1:16	MR: 1:56	MR: 2:32
MS: 7:43	MS: 8:40	MS: 9:43	MS: 10:50	MS: 11:58	MS: 13:07	MS: 14:15
12	13	14	15	16	17	18
SR: 5:44	SR: 5:43	SR: 5:42	SR: 5:41	SR: 5:40	SR: 5:39	SR: 5:38
SS: 20:15	SS: 20:16	SS: 20:17	SS: 20:18	SS: 20:19	SS: 20:20	SS: 20:21
MR: 3:06	MR: 3:38	MR: 4:11	MR: 4:45	MR: 5:21	MR: 6:00	MR: 6:42
MS: 15:21	MS: 16:27	MS: 17:32	MS: 18:35	MS: 19:36	MS: 20:34	MS: 21:28
19	20	21	22	23	24	25
SR: 5:37	SR: 5:36	SR: 5:36	SR: 5:35	SR: 5:34	SR: 5:33	SR: 5:33
SS: 20:22	SS: 20:23	SS: 20:24	SS: 20:25	SS: 20:26	SS: 20:26	SS: 20:27
MR: 7:28	MR: 8:17	MR: 9:09	MR: 10:04	MR: 10:59	MR: 11:56	MR: 12:54
MS: 22:18	MS: 23:03	MS: 23:43	MS: None	MS: 0:20	MS: 0:53	MS: 1:24
26	27	28	29	30	31	
SR: 5:32	SR: 5:31	SR: 5:31	SR: 5:30	SR: 5:29	SR: 5:29	
SS: 20:28	SS: 20:29	SS: 20:30	SS: 20:31	SS: 20:32	SS: 20:32	
MR: 13:53	MR: 14:54	MR: 15:57	MR: 17:02	MR: 18:09	MR: 19:17	
MS: 1:53	MS: 2:23	MS: 2:53	MS: 3:26	MS: 4:02	MS: 4:43	

Planet View Info Report for May 1996

Mercury	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
5/ 1/1996	6:35	21:35	3h41m35s	22°13'38"	17°31'28"	0.172	0.69755
5/ 8/1996	6:13	20:58	3h41m34s	20°58'36"	10°21'38"	0.046	0.59751
5/15/1996	5:45	20:05	3h29m15s	18°17'54"	0°37'10"	0.000	0.55376
5/22/1996	5:16	19:15	3h16m18s	15°33'09"	10°39'13"	0.042	0.56765
5/29/1996	4:51	18:42	3h13m03s	14°09'21"	18°33'32"	0.142	0.63008
Venus	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
5/ 1/1996	7:51	23:47	5h24m14s	27°41'12"	41°21'41"	0.308	0.47937
5/ 8/1996	7:39	23:34	5h40m12s	27°45'32"	38°08'13"	0.248	0.42949
5/15/1996	7:22	23:13	5h49m59s	27°27'24"	33°32'27"	0.183	0.38368
5/22/1996	7:00	22:43	5h52m06s	26°46'20"	27°14'12"	0.116	0.34393
5/29/1996	6:31	22:01	5h45m38s	25°39'46"	18°58'48"	0.055	0.31294
Mars	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
5/ 1/1996	5:30	18:55	1h47m24s	10°29'52"	12°14'07"	0.994	2.38394
5/ 8/1996	5:16	18:55	2h07m25s	12°23'01"	13°45'25"	0.993	2.38199
5/15/1996	5:01	18:55	2h27m34s	14°09'45"	15°18'01"	0.991	2.37905
5/22/1996	4:47	18:54	2h47m51s	15°49'15"	16°52'08"	0.989	2.37494
5/29/1996	4:34	18:53	3h08m17s	17°20'47"	18°27'47"	0.987	2.36957
Jupiter	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
5/ 1/1996	1:05	10:16	19h16m27s	-22°11'49"	113°15'46"	0.992	4.74003
5/ 8/1996	0:38	9:49	19h16m29s	-22°12'33"	120°02'23"	0.993	4.63921
5/15/1996	0:10	9:20	19h15m51s	-22°14'33"	126°57'04"	0.994	4.54494
5/22/1996	23:37	8:51	19h14m34s	-22°17'43"	133°59'44"	0.995	4.45873
5/29/1996	23:08	8:21	19h12m40s	-22°21'58"	141°09'46"	0.996	4.38207
Saturn	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
5/ 1/1996	4:37	16:34	0h11m57s	-0°58'47"	38°35'57"	0.999	10.33079
5/ 8/1996	4:11	16:10	0h14m38s	-0°42'40"	44°39'01"	0.999	10.25353
5/15/1996	3:45	15:46	0h17m09s	-0°27'43"	50°43'41"	0.998	10.16751
5/22/1996	3:19	15:22	0h19m29s	-0°14'06"	56°50'19"	0.998	10.07361
5/29/1996	2:53	14:57	0h21m37s	-0°01'56"	62°59'08"	0.998	9.97294
Uranus	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
5/ 1/1996	2:06	11:39	20h28m12s	-19°40'34"	96°20'41"	0.999	19.62803
5/ 8/1996	1:38	11:11	20h28m18s	-19°40'26"	103°06'02"	0.999	19.51252
5/15/1996	1:11	10:44	20h28m14s	-19°40'54"	109°52'38"	0.999	19.40013
5/22/1996	0:43	10:16	20h28m01s	-19°41'56"	116°40'32"	0.999	19.29252
5/29/1996	0:15	9:48	20h27m38s	-19°43'30"	123°29'31"	1.000	19.19132
Neptune	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
5/ 1/1996	1:38	11:08	19h58m57s	-20°07'41"	103°09'03"	1.000	29.91693
5/ 8/1996	1:11	10:40	19h58m52s	-20°07'52"	109°57'02"	1.000	29.80264
5/15/1996	0:43	10:12	19h58m41s	-20°08'22"	116°45'24"	1.000	29.69313
5/22/1996	0:15	9:45	19h58m24s	-20°09'10"	123°34'10"	1.000	29.59001
5/29/1996	23:44	9:17	19h58m00s	-20°10'14"	130°23'07"	1.000	29.49481
Pluto	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
5/ 1/1996	20:57	8:11	16h11m35s	-7°24'39"	154°53'12"	1.000	28.98327
5/ 8/1996	20:29	7:43	16h10m54s	-7°22'11"	160°21'06"	1.000	28.94753
5/15/1996	20:01	7:15	16h10m10s	-7°20'01"	164°37'18"	1.000	28.92541
5/22/1996	19:32	6:47	16h09m26s	-7°18'11"	166°31'32"	1.000	28.91729
5/29/1996	19:04	6:19	16h08m41s	-7°16'43"	165°08'51"	1.000	28.92324

Planet Conjunction/Opposition Report for May 1996

5/14/1996 Mercury @ Inferior Conjunction Hour: 20
5/22/1996 Pluto @ Opposition Hour: 19

May 1996

Planet/Moon Apsides Report for May 1996

5/ 6/1996 Moon @ Perigee Hour: 17 Distance: 366526 km Diameter: 0.543°
5/22/1996 Moon @ Apogee Hour: 11 Distance: 405089 km Diameter: 0.491°
5/23/1996 Mercury @ Aphelion Distance from Sun: 0.47 AU

Meteor Showers Report for May 1996

Date	Meteor Shower	ZHR	RA	DEC	Illum. Frac.	Longitude
5/ 4/1996	eta-Aquarids	35	22h20m	-1°	0.98	45°
5/11/1996	alpha-Scorpiids	5	16h04m	-24°	0.32	52°

Twilight Report for May 1996

Date	Sun Rise	Sun Set	Astronomical Begin	Astronomical End	Nautical Begin	Nautical End	Civil Begin	Civil End
5/ 1/1996	5:58	20:03	4:04	21:57	4:45	21:16	5:22	20:38
5/ 8/1996	5:49	20:10	3:50	22:09	4:34	21:25	5:12	20:47
5/15/1996	5:41	20:18	3:38	22:21	4:24	21:35	5:04	20:55
5/22/1996	5:35	20:25	3:27	22:32	4:15	21:44	4:57	21:03
5/29/1996	5:30	20:31	3:18	22:43	4:08	21:52	4:51	21:10

SKY & TELESCOPE NEWS BULLETINS

from the editors of SKY & TELESCOPE magazine

HEART OF THE "GREAT ATTRACTOR"

Nearly a decade ago, astronomers declared that hundreds of galaxies, including ours, are collectively swarming toward a supermassive entity dubbed the Great Attractor. Strictly speaking, they described a subtle distortion in the universe's otherwise stately expansion, not its wholesale reversal. Nevertheless, the Great Attractor exerts the gravitational muscle of 100,000 galaxies. But its center has remained hidden by our own Milky Way's opaque dust clouds. Now an international team of observers has found what may be the attractor's very core along the Circinus-Centaurus border. A previously known cluster of galaxies, Abell 3627, appears to be the richest galaxy cluster in the southern sky. The team has estimated the cluster's mass at a hefty 5 million billion Suns. Details appear in S&T's June issue.

A NEW PLANET BEYOND

While you're marveling at the sights of the solar system in the western sky, you may want to glance slightly eastward along the ecliptic to the constellation Cancer, where another planet outside our solar system has been discovered. The team of California astronomers who reported finding a couple of planets in Virgo and Ursa Major (and confirmed the existence of the one in Pegasus), have bagged another one. As part of an ongoing survey of 120 Sun-like stars, Geoffrey Marcy and Paul Butler examined 55 Cancri (also called designated rho-1 Cancri or HR 3522). Their spectroscopic observations of the 5.3-magnitude G8 star's radial velocity revealed that it is circled by a mass of no more than 80 percent that of Jupiter, every 14-3/4 days. The new planet orbits at a distance of 16.5 million kilometers, less than a third of the average distance between the Sun and Mercury. At that distance, Marcy notes that the surface temperature of the planet would be about 500 degrees Celsius. 55 Cancri is located at Right Ascension 8 hours 52.6 minutes, Declination +28.3 degrees, about 15 degrees to the upper left of the star Pollux.

PHYSICS NEWS UPDATE

from The American Institute of Physics News (physnews@aip.org)

INTERSTELLAR DUST PARTICLES ENTERING EARTH'S ATMOSPHERE have been detected by astronomers in New Zealand. Their radar scanner not only spots the tiny objects (tens of microns in size) but also determines the meteoroid velocities. Those with speeds of more than 100 km/sec (about 1% of the sample), well above the solar escape velocity of 73 km/sec, are believed to come from other planetary systems. The researchers, furthermore, use the annual variability in the flux of these fast meteoroids to identify several possible discrete extra-solar sources. (A.D. Taylor et al., Nature, 28 March 1996.)

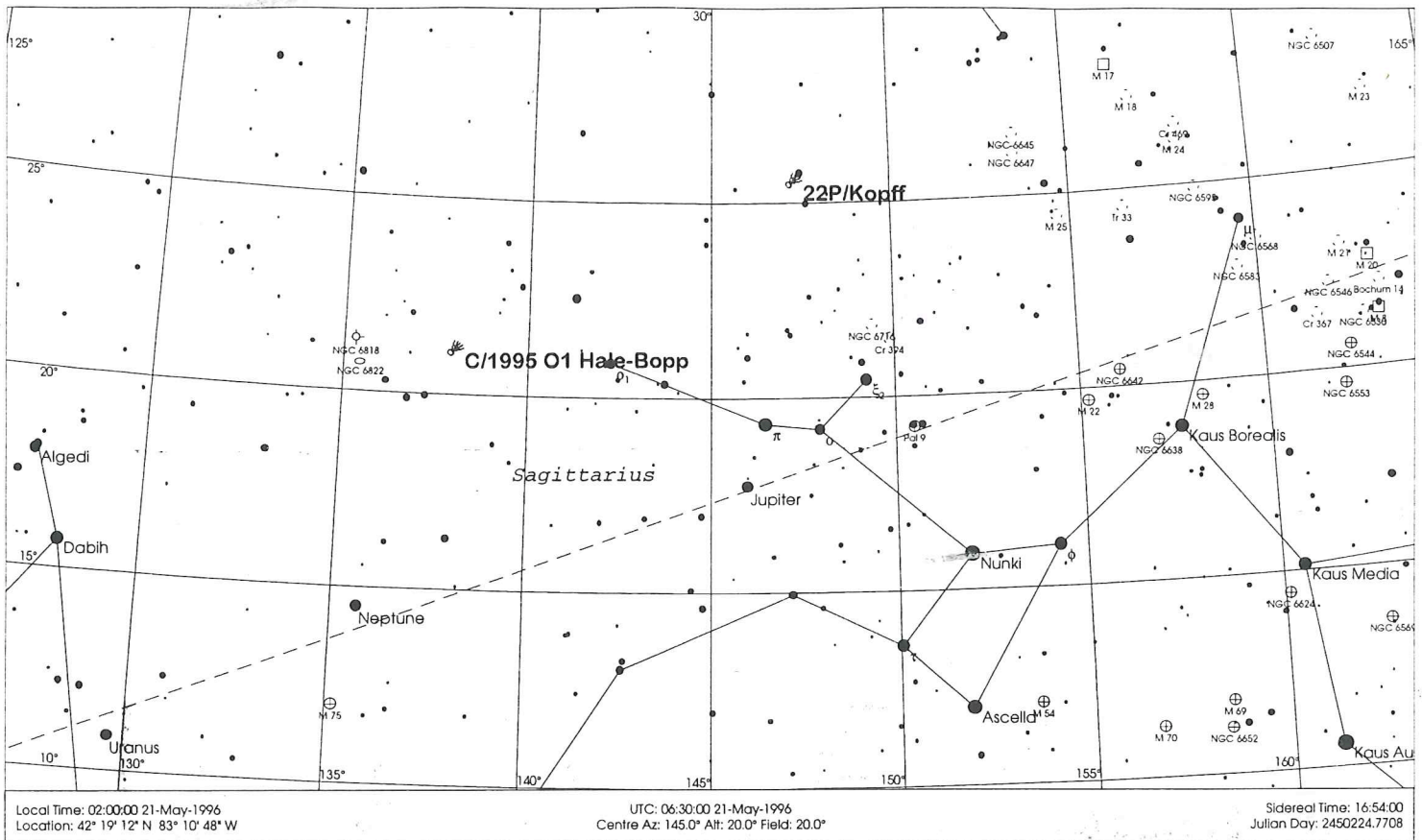
(continued from page 8)

Appendix: One data point.

I have seen a large, faint, diffuse object — the Sculptor Dwarf Galaxy — be clearly visible (well, let's just make that "visible") in two different instruments — 10x70 binocular and 14x130 refractor (no typo, we had a 55 mm Plossl in an early 130mm f/6 Starfire, and yes, the 9 mm exit pupils certainly exceeded the pupil size of any eyes present), yet disappear when we reduced the exit pupil size in one instrument to 5.33 mm (32 mm Erle in the Starfire). This effect was repeatable as we switched eyepieces back and forth. Both observers likely had about 6 to 7 mm pupils at the time. All eyepieces were fully multi-coated. I have only some speculations about what was going on.

Star Stuff

FINDING COMET HALE-BOPP AND COMET KOPFF



Ford Amateur Astronomy Club
 Star Stuff Newsletter
 P.O. Box 7527
 Dearborn, MI 48121

