Star Stuff

THE FORD AMATEUR ASTRONOMY CLUB NEWSLETTER

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HALE-BOPP STUDIED FROM BOTH ENDS OF THE SPECTRUM

New Information about Hale-Bopp Surprises Astronomers
From: Emil Venere, Johns Hopkins University, Office of News and Information

Story: A team of scientists, led by Johns Hopkins astrophysicist Harold Weaver, detail new findings about comet Hale-Bopp in a paper published in the journal Science on March 28. The findings are based on an unprecedented year-long series of cometary observations with the Hubble Space Telescope.

Findings: After studying the comet in detail as it got closer and closer to the sun, astronomers found that components in the frozen nucleus may be arranged in a more complicated manner than previously thought. Some models for a comet's nucleus suggest that trace components, such as carbon disulfide ice, are contained inside of the most abundant ice, frozen water. Therefore, as water sublimates, or turns directly from a frozen solid into a gas, trace components and dust should be released at similar rates. But, to their surprise, astronomers found that water ice sublimated at a different rate than the trace ices, implying that those components are not contained within the water. The astronomers also observed that the amount of dust leaving the nucleus was much different than the sublimation rate of water, providing further support for the finding.

In September 1996, astronomers unexpectedly caught the comet going through a sudden brief outburst; in little more than an hour the amount of dust being spewed from the nucleus increased at least eight-fold. "The surface of Hale-Bopp's nucleus must be an incredibly dynamic place, with 'vents' being turned on and off as new patches of icy material are rotated into sunlight for the first time," Weaver said. The comet's nucleus is apparently huge. By studying Hubble images, the astronomers have estimated that its nucleus may be about 19-25 miles in diameter. In comparison, the average comet is thought to have a nucleus of about 3 miles in diameter.

Background: Astronomers observed ultraviolet light from Hale-Bopp, using the Hubble telescope and the International Ultraviolet Explorer satellite over a one-year period beginning late August 1995, when Hale-Bopp was about 633 million miles from the sun. Because Hale-Bopp was unusually bright when it was still a great distance away, well outside the orbit of Jupiter, it has given scientists their best view ever of the changes in a comet's nucleus as it gets closer to, and is progressively heated by, the sun. Those changes, in turn, provide information about the composition and structure of comets, which are believed to be remnants from the formation of the solar system, about 4.6 billion years ago. Therefore, learning more about comets can provide important information about the materials and processes that formed the solar system.

The astronomers were surprised by the way in which the comet would suddenly grow brighter and then return to its usual brightness within an hour or so. Also surprising is the way in which various types of ices are being vaporized. Well-accepted models suggest that dust particles and various chemical compounds, such as carbon dioxide and carbon disulfide, are all contained inside frozen water. As the comet nears the sun, it heats up, vaporizing the water ice and releasing other material and dust particles that are contained in the ice. The dust is driven off in a huge tail extending millions of miles, reflecting sunlight and brightening the comet. But their observations have astronomers wondering about a certain aspect of that picture. They found that various chemicals have been vaporizing independently of water. If the model were correct, water, dust and the other components should be released at the same relative rates. The new information suggests the components are contained in separate regions of the nucleus. "Hale-Bopp will probably provide the most revealing portrait of the workings of a cometary nucleus since the spacecraft missions to comet Halley" in 1986, Weaver said. ☆

Comet Hale-Bopp Yields Secrets in the Infrared
From: Larry Bernard, Cornell News Service, Cornell University

Infrared measurements of Comet Hale-Bopp by Cornell University and NASA investigators are yielding valuable clues about the makeup of the celestial visitor and, perhaps, the origins of the solar system. Using a combination infrared spectrometer and camera designed and built by Cornell researchers and attached to the 200-inch telescope at Palomar Observatory, Cornell and NASA scientists have made ground-based measurements in an effort to learn what kind of stuff the comet is sloughing off as it approaches perihelion.

In a paper published in the journal Science on March 28, Thomas L. Hayward, Cornell senior research associate in astronomy at the Center for Radiophysics and Space Research, and Martha S. Hanner, a senior research scientist at NASA's Jet Propulsion Laboratory, report results of their infrared observations at 8-13 micron wavelengths. The spectra show that Hale-Bopp has an abundance of sub-micrometer silicate grains. Some of these grains are crystalline, in contrast to the more amorphous structure of the rest. This means that the grains were subjected to strong heating sometime in their history, before they were incorporated into the frozen comet nucleus about 4.5 billion years ago.

"Did the heating occur in the solar nebula, or did it occur in an interstellar cloud prior to the formation of the solar nebula? We can't say," Hayward said. It is known that comets formed in the cold outer region of the solar nebula where intact interstellar grains could have been incorporated. "But we were surprised to see such grains even when the comet was over four astronomical units from the sun. We thought the grains would be icy at that distance." Most comets can be studied only when they are within 1 or 2 astonomical units, when dust grains are warm. But Hale-Bopp was unusually active and could be detected easily in the infrared when it was still far from the sun. The researchers made their observations of Comet Hale-Bopp from June through September last year, when the comet was still beyond the orbit of Mars.

The researchers used an instrument dubbed SpectroCam-10, mounted on the 200-inch telescope at Mount Palomar. The instrument detects thermal radiation emitted by the warm dust grains. "As the comet gets closer to the sun, we can see the underlying (infrared) emissions gradually change shape. We can see the grains getting warmer," Hayward said. The brightness indicates how much dust is being blown off, while the warmth is related to the size of the grains.

Their measurements also showed that the comet has periods of outbursts. "There was a lot of variability in the comet's day-to-day brightness," Hayward said, "caused by an unusually active area on the comet's nucleus that emits a burst of material when it rotates into sunlight." Since January, amateur and professional astronomers alike have observed a jet periodically shooting out from this active area. The solar radiation hits the dust grains emitted in these outbursts and pushes them away from the sun, giving the comet the tail most familiar to viewers on Earth. These outbursts and jets, sometimes increasing the comet's general brightness by a factor of two to four, are similar to short-term brightness increases observed in Halley's Comet, the researchers said.

The information gives astronomers a basis for comparison to other comets that, taken together, could yield clues to the origins of the solar system. It is thought that comets may be remnants of the processes that formed the sun, planets and satellites. "Our hope is that these dust grains, from under the surface of the comet's nucleus, represents what the nucleus was like billions of years ago when it was formed," Hayward said. "That could help tell us what the solar system was like as it was forming. This is just another piece of the puzzle." ☆

HST CHECK-OUT RESULTS

From: Ron Baalke (baalke@kelvin.jpl.nasa.gov), JPL

The Servicing Mission Observatory Verification (SMOV) for NASA's Hubble Space Telescope (HST), currently about halfway through its detailed check-out prior to returning to scientific operations, has found Hubble in overall excellent health, with seven of the eight components replaced or installed during the servicing mission functioning very well to date. However, a few concerns with one of the science instruments are being evaluated.

"The Hubble Space Telescope is checking out extremely well overall, and the few anomalies we see give us no reason to believe we will not be able to meet all our scientific goals," said Dr. Ed Weiler, HST Program Scientist, NASA Headquarters, Washington, DC. "I'm very impressed that in just the few weeks since the servicing mission, we've already seen Hubble take the best images of Mars ever obtained from Earth's distance. Every observatory commissioning encounters some problems, but we're on track to clear up all our remaining concerns. That's good news for the many, many astronomers who are lined up for observing time on Hubble."

Earlier this month science observations with the Wide Field and Planetary Camera-2 resumed, and on March 10 the science team obtained images of Mars. Also, further optimization and alignment of the mirrors in the new Fine Guidance Sensor (FGS), installed during the servicing mission, were completed with excellent results following its first star observation. Project management officials say it's clearly the best FGS aboard HST. Commissioning of the new Space Telescope Imaging Spectrograph (STIS) has proceeded very well, according to project officials. In the coming two weeks team members will test the instrument's ability to acquire targets in the narrow slits. Once this is demonstrated, the instrument will be ready to begin science operations.

Checkout of the Near Infrared Camera and Multi-Object Spectrometer (NICMOS), installed during the second servicing mission, has provided both excellent results and some areas of concern. The NICMOS, designed to observe the universe in near-infrared light, contains three cameras and a set of highly advanced light sensors which must be maintained at a very cold temperature — nominally 58 degrees Kelvin (-355 degrees Fahrenheit). These sensors, along with filters and other components, are housed in a large cryogenic dewar (a high-technology insulated bottle filled with about 225 lbs of solid nitrogen embedded in aluminum foam).

The NICMOS Principal Investigator, Dr. Rodger Thompson, University of Arizona, said NICMOS high resolution cameras 1 and 2 have shown excellent images in preliminary focus tests. However, these tests also show that camera 3 focus is currently beyond the range of the NICMOS internal mechanical adjustment capability. Analysis indicates the situation may be due to unexpected thermal contact in the dewar, which results in a slightly warmer cryogen temperature and a subsequent reduction of dewar lifetime.

The most likely explanation is that as the solid nitrogen warms up it expands, and exerts pressure on the internal structure of the dewar. This expansion resulted in an unwanted physical contact between two internal structural components of the dewar, providing a pathway for excess heat to travel from the warmer outer structure of the dewar to its colder internal parts, warming the solid nitrogen to a higher than desired operating temperature. This expansion also is affecting the performance of Camera 3. The analysis team expects that the thermal contact might release in the future, returning NICMOS to its nominal state. Under these conditions, analysts predict that camera 3 should move back into the instrument's range of focus. Rearrangement of the NICMOS observing schedule could allow the full implementation of the NICMOS science program.

It will take several weeks or months for team engineers to be able to determine for certain the amount of reduction in the lifetime of the cryogen; however, the reduction can be compensated for by rearrangement of observing schedules. Current plans call for SMOV activities to continue for the next few weeks with results of the Early Release Observation program available in early May.

During the STS-82 HST Second Servicing Mission in February, astronauts aboard the Space Shuttle Discovery replaced two older science instruments aboard Hubble with STIS and NICMOS, and also replaced a Fine Guidance Sensor, a Reaction Wheel Assembly, a Data Interface Unit, a Solar Array Drive Electronics package, an Engineering/Science Tape Recorder, and a Solid State Recorder. In addition, the astronauts performed other maintenance on the observatory, including patching of some insulation and installing covers on the Magnetic Sensing System. ☆

STAR STUFF

Monthly Publication of the Ford Amateur Astronomy Club

Star Stuff Newsletter
P.O. Box 7527
Dearborn, Michigan 48121-7527

1997 CLUB OFFICERS

President:	Bob MacFarland	33-79754
Vice President:	George Korody	810-349-1930
Secretary:	Harry Kindt	313-835-1631
Treasurer:	Ray Fowler	313-8292182 (pager)

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.

WWW PAGE

Computers inside the Ford network or on the Internet can access the F.A.A.C. web page at one of the following addresses:

Ford Intranet: http://pt0106.pto.ford.com/faac/
Internet: http://kode.net/~dougbock/faac/

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

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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. Subscriptions are free to other astronomy clubs wishing to participate in a newsletter exchange.

APRIL 1997

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	24 FAAC Meeting	25	26
27	28	29 	30			

Apr 01 Comet Hale-Bopp Perihelion (0.914 AU)
Apr 01 Venus at Opposition
Apr 02 Asteroid 306 Unitas Occults PPM 721049 (9.5 Magnitude Star)
Apr 05 Mercury At Its Greatest Eastern Elongation (19 Degrees)
Apr 07 New Moon (7:04 am)
Apr 07 Moon Occults Saturn
Apr 07 Moon Occults Venus
Apr 07 Asteroid 14 Irene Occults 13.6 Magnitude Star
Apr 10 Moon Occults Aldebaran
Apr 11 Asteroid 7 Iris at Opposition (9.5 Magnitude)
Apr 14 First Quarter Moon (1:01 pm)
Apr 15 Asteroid 13 Egeria Occults 11.8 Magnitude Star
Apr 15 Asteroid 29 Amphitrite at Opposition (9.2 Magnitude)
Apr 16 Asteroid 13 Egeria at Opposition (10.0 Magnitude)
Apr 16 Asteroid 324 Bamberga Occults SAO 79765 (9.3 Magnitude Star)
Apr 17 Comet Boethin Perihelion (1.158 AU)
Apr 18 Asteroid 139 Juewa Occults PPM 127356 (9.4 Magnitude Star)
Apr 20 Lyrids Meteor Shower Peak
Apr 20 Comet 1997 C1 Gehrels Perihelion (2.1705 AU)
Apr 22 Full Moon (4:36 pm)
Apr 22 Mercury Passes 2.7 Degrees from Venus
Apr 25 Asteroid 13 Egeria Occults 10.2 Magnitude Star
Apr 29 Last Quarter Moon (10:37 pm)
Apr 29 Asteroid 139 Juewa Occults PPM 127386 (7.5 Magnitude Star) ☆

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, April 24, at 5:00 pm.**

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. ☆

DUES ARE DUE!

Just a reminder that your annual membership dues are due at the beginning of each year (regardless of what time of year you initially joined). Please send your money to the club's treasurer, Ray Fowler, at one of the following addresses:

Ford Mail: Ray Fowler, MD6B, Livonia Transmission Plant

US Mail: P.O. Box 7527, Dearborn, Michigan 48121-7527

For more information, you can contact Ray Fowler at RFOWLER4 (profs) or 313-8292182 (pager). It should also be noted that Patti Forton is now handling the magazine subscriptions. Patti can be reached at PFORTON (profs) or 313-84-51740. ☆

1997 FAAC CALENDAR OF EVENTS

Apr 24 General Membership Meeting - FMCC Building, Dearborn
Apr 25-26 Joint Southeastern Michigan Astronomy Clubs
Comet Hale-Bopp/Star Party (5pm to midnight)
Kensington Metropark (I-96 at the Kent Lake Road exit)
Observing site at Martindale Beech
Vehicle permit required ($3 Friday, $4 Saturday)
May 1-3 Third Huron County Star Party
Duggan's Family Campground, Port Austin, MI
Contact Barry Craig at 810-547-1299
May 22 General Membership Meeting - FMCC Building, Dearborn
Jun 6-8 14th Annual Summer Solstice Star Party
Northern Cross Observatories, Fenton, MI
Cost is $3 per person or $5 per family
Contact Doug Bock at 810-750-0273 or dougbock@kode.net
Jun 26 General Membership Meeting - FMCC Building, Dearborn
Jul 24 General Membership Meeting - FMCC Building, Dearborn
Jul 30 - Aug 2 SMURFS
TBD Lake Hudson Dark Sky Party - (Lenewau Club Schedule)
Aug 28 General Membership Meeting - FMCC Building, Dearborn
Sep 6 5th Annual Island Lake Star Party
Sep 25 General Membership Meeting - FMCC Building, Dearborn
Oct 3-5 NCO Wilderness Campout/Star Party
Oct 23 General Membership Meeting - FMCC Building, Dearborn
Dec 4 General Membership Meeting - FMCC Building, Dearborn

Check for updates on the FAAC Hotline: 313-390-5456, or at either of the web sites listed on page 2. ☆

ASTRONOMY ON TV

Channel 56 (PBS) is airing a show on Mondays in April called "Mysteries of Deep Space." It will be shown April 14, April 21 and April 28 at 8:00 pm. The show combines live-action sequences, state of the art computer animation and spectacular images from the Hubble Space Telescope. ☆

APRIL SPACE HISTORY

The following April events come from the 02/25/97 edition of "Space Calendar." This calendar is compiled and maintained by Ron Baalke (baalke@kelvin.jpl.nasa.gov).

Apr 16 25th Anniversary (1972), Apollo 16 Launch (Manned Moon Landing)
Apr 17 30th Anniversary (1967), Surveyor 3 Launch (Moon Lander)
Apr 19 15th Anniversary (1982), Salyut 7 Space Station Launch (USSR)
Apr 24 30th Anniversary (1967), Soyuz 1 Accident, Cosmonaut Killed
Apr 26 35th Anniversary (1962), Ariel 1 Launch (1st UK Satellite)
Apr 26 30th Anniversary (1967), San Marco 2 Launch ☆

APRIL 1997 SPACE EVENTS

The following April 1997 events come from the 02/25/97 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.

Apr ?? SWAS Pegasus XL Launch
Apr ?? Iridium-1 Delta 2 Launch
Apr ?? Iridium-3 Launch
Apr ?? Apstar-2R Long March Launch
Apr ?? Tempo-1 Proton Launch
Apr ?? Early Bird Cosmos Launch (USA/Russia)
Apr ?? Lewis LMLV-1 Launch
Apr 02 DMSP Titan 2 Launch
Apr 03 STS-83 Launch, Columbia, Materials Science Lab-1 (MSL-1)
Apr 04 Galileo, Europa Observations (Orbit 7)
Apr 04 Thaicom-3/BSAT-1A Ariane 4 Launch (ESA/Japan)
Apr 05 Galileo, 3rd Ganymede Flyby (Orbit 7)
Apr 07 Galileo, Orbital Trim Maneuver #24 (OTM-24)
Apr 21 Galileo, Orbital Trim Maneuver #25 (OTM-25)
Apr 21 Mars Global Surveyor, Trajectory Correction Maneuver #3
Apr 24 GOES-K Atlas Launch
Apr 29 Panamsat-6 Ariane 4 Launch ☆

HOW TO PHOTOGRAPH A COMET

By Chuck Boren (CBOREN; cboren@delphi.com)

Comets are the most interesting objects in the evening or morning sky to photograph. Long multi veil tails and dusty comas with multiple jets offer the novice an opportunity to capture the beautiful detail with in. From ancient Kings to twenty first century scientist, all have pondered these cosmic wayfarers. Comets today still hold enigmatic surprises that take the most curious minds to answer. Their empyrean message has mesmerized the ancient Astrologer (I promise not to use that word again) to the common man. Each comet aberration is different. From the last to the next so much that, you will never find photographing them unexciting.

The first place to start is with the film selection. Should you use color print film, color slide film, or Black and White print film. Well, what do you want to have as your end product. Show slides to a large audience? Sell Photographs as fine art prints? First decide where you want to go then make your pick. The films today are many times better than they were years ago. The fastest films then were quite slow compared today's films. Those old films were grainier, lacking in sharpness, had odd color shifts if pushed (pushing is a method of making the film speed faster by overdeveloping.) and were not the kind of film you really wanted to use for astrophotograpy. But today's fast films are better. Even the ultra fast films like ISO 1600 and 3200 are much improved. The type of high speed film you may want to use will be depended on your shooting situation.

If all you have is a tripod and camera then you may want to work with the ultra fast films. ISO 1600 and 3200 speeds are available in both color or black and white print and color slide films. The so called one hour photo lab may not be set up for the Black and White high speed films and, as I have found out, they may not be able to print the high speed professional films properly. But there are custom labs that can handle anything, so beware.

If you want to photograph from a tripod you will need a lot of film speed because the Earth rotates 1 degree for every 4 minutes of time. This will mean star trailing if the shutter on the camera has to remain open for a long time. The ultra fast films don't need the same amount of time to photograph a comet like the slower films. This is a blessing as a camera trapped on a tripod with a 50mm f1.4 lenses can photograph a bright comet like Hale-Bopp (HB-1) in 5 to 10 seconds. For a start try these settings for comets that have magnitudes between 0 & 1:

ISO	EXPOSURE TIME	FSTOP
800	15 SECONDS	1.4
1600	10 SECONDS	1.4
3200	5 SECONDS	1.4

You should bracket your exposures around these settings due to various amounts of light pollution, star magnitude and actual fstop used. Bracketing is a method of doubling the amount of time for each consecutive exposure. Also some of the longer lenses like 300 mm will have smaller fstops so extrapolation for starting values is recommend.

I would like to mention that star magnitudes are incremented as 2.5 times dimmer when the numbers get larger (0,1,2...) and 2.5 times brighter when the numbers get smaller (0,-1,-2...). Our Sun is at -27 and our moon is at -17. Venus will very between -3 and -5 depending on how close we get to it and where it is in it's orbit around the Sun. For example a comet like Hale-Bopp is between magnitude 1 & 0 but as it moves away from the earth and towards the Sun it might get brighter so it's magnitude could be between -1 and -2. This would mean Hale-Bopp's brightness changes by 3 magnitudes or 2.5*2.5*2.5 (2.5^3) which equals 15.625 times brighter. Translate this to fstops and the answer is about 4 fstops of exposure difference between now and then. Selecting the type of film is a matter of ; the object you are trying to photograph, personal preference, some experimentation, and the equipment you have to use.

If you have the luxury of a telescope with a clock drive you can "piggy back" your camera on the scope to track the stars. This method allows the camera to follow the stars for short periods of time and you can use slower film speeds like 400 to 800. A clock drive elements star trails such that more detail can be recorded on the film for longer exposure times. Telescopes that have clock drives usually need a source of AC current to operate which means that you can't stray to far from civilization. There are some scopes that have the option to use direct current like a 12 volt battery but you are limited to the life of the battery as far as operating the scope at a dark sky site.

Lens selection is up to you. I will use a 50 mm f1.4 with or with out a 2x teleconverter and a 300 mm f4.0. Try to select just a few lenses to work with. This will help cut down on the frantic searches you will experience at a dark sky site looking for each lens. I like to use the 50mm f1.4 to capture some environment in the astro photos I've made. There's nothing in the rule book the states that you have to shoot just the sky. Interesting foreground in your shots can add a new dimension to the photograph. Also a 50mm is great for capturing constellations. The 2x teleconverter will double the focal length of the 50mm to yield a 100mm f2.8 lens. This lens now captures one or two celestial objects together like stars clusters and a comet. Or on the 26 of March use that lens when Hale-Bopp passes north of the Andromeda Galaxy. If we get clear skies it should be a beautiful site. A 300mm f4 is great for detail in the comet itself. Depending on how close a comet gets a 300 mm lens can capture just the head like Hyakutake's perigee distance, or head and tail like Hale-Bopp's perigee. A fast lens is a must if your camera is on a tripod and if that is all you have to use try these exposure settings with ISO 1600 film:

50mm @ f1.4	15 to 30 seconds
100mm @ f2.8	15 to 45 seconds
300mm @ f4.0	20 seconds (there will be some star trails)

If you can't get to a dark sky site you will have to deal with some light pollution. If you are using color print film, an odd color balance will result from the city lighting. This can be filtered out during the printing of the negative. If you want to use color slide film you will need to filter this light pollution out before it gets to your film. Try using color (CC filters) printing filters. They can be bought from any good camera store that sells color printing paper and chemistry. The density of each filter is stated as 0.1 units. You can try 2 - 0.3 Cyan and 1- 0.3 Magenta colored filters. These three filters when sandwiched together can do a surprising amount of good for the odd color balance. You do have to handle them carefully because they scratch very easily and that will cause the image to soften a bit.

Any camera that has a B setting will do. However the today's cameras are electronic which means that as long as the shutter is open you are using electrical power from the batteries. Keep a few fresh sets of batteries handy just in case the ones in the camera dies. You will also need a cable release to trip the shutter. One that has a locking feature on it to keep the shutter open during the exposure. The cable release is important in that you can not touch the camera during the exposure. A cable release can take the place of your finger on the shutter release and reduce the potential for vibration.

So now you have tripod or a Telescope, camera, film, filters (optional), cable release, and lenses. What else do you need? Allot of good luck, waiting for clear skies! ☆

COMET OBSERVING REPORT

by Paul Mrozek (PMROZEK; pmrozek@pt0106.pto.ford.com)

The following was taken from my article in the May 1996 StarStuff newsletter about observing comet Hyakutake:

> ... 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 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. I knew I needed to get to a darker site ... [so] I headed out to the Stoney Creek Metropark entrance at 26 mile and Shelby road ... 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.

Well, it's almost a year later, comet Hale-Bopp is putting on an even better performance, and I am still discouraging people from looking at the comet. Yes, it is possible to observe the comet from light polluted skies, but this is like introducing somebody to classical music by taking them to the recital of an elementary school band. I talked with several people who have only observed the comet from within a city and their reaction always seems to have a hint of false enthusiasm, like someone who has just won wicker furniture on The Price is Right. After forcing some of these people to come with me to Stoney Creek, their reaction is usually more genuine. Sometimes pictures are to blame. Most people know that what you are served in a restaurant will not look like the photo in the menu. However, some people are not ware of the difference between quick daytime exposures and long nighttime exposures. Please remind people that you get on film is not what you see with your eye. ☆

STATISTICALLY SPEAKING

Location (Dearborn, MI): 42°19'12" N, 83°10'48" W, 180 meters elevation
Local Time = Universal Time - 4 hours (Eastern Daylight Savings 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 April 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 SR: 7:15 SS: 19:59 MR: 3:15 MS: 13:28	2 SR: 7:13 SS: 20:00 MR: 4:03 MS: 14:34	3 SR: 7:12 SS: 20:01 MR: 4:47 MS: 15:45	4 SR: 7:10 SS: 20:02 MR: 5:28 MS: 16:57	5 SR: 7:08 SS: 20:03 MR: 6:06 MS: 18:10
6 SR: 7:07 SS: 20:04 MR: 6:43 MS: 19:23	7 SR: 7:05 SS: 20:05 MR: 7:19 MS: 20:35	8 SR: 7:03 SS: 20:07 MR: 7:57 MS: 21:45	9 SR: 7:02 SS: 20:08 MR: 8:37 MS: 22:52	10 SR: 7:00 SS: 20:09 MR: 9:20 MS: 23:55	11 SR: 6:58 SS: 20:10 MR: 10:06 MS: None	12 SR: 6:57 SS: 20:11 MR: 10:56 MS: 0:52
13 SR: 6:55 SS: 20:12 MR: 11:48 MS: 1:44	14 SR: 6:53 SS: 20:13 MR: 12:42 MS: 2:29	15 SR: 6:52 SS: 20:14 MR: 13:37 MS: 3:09	16 SR: 6:50 SS: 20:16 MR: 14:33 MS: 3:45	17 SR: 6:49 SS: 20:17 MR: 15:29 MS: 4:18	18 SR: 6:47 SS: 20:18 MR: 16:26 MS: 4:48	19 SR: 6:45 SS: 20:19 MR: 17:23 MS: 5:17
20 SR: 6:44 SS: 20:20 MR: 18:21 MS: 5:46	21 SR: 6:42 SS: 20:21 MR: 19:21 MS: 6:15	22 SR: 6:41 SS: 20:22 MR: 20:21 MS: 6:46	23 SR: 6:39 SS: 20:23 MR: 21:22 MS: 7:20	24 SR: 6:38 SS: 20:25 MR: 22:23 MS: 7:57	25 SR: 6:36 SS: 20:26 MR: 23:23 MS: 8:39	26 SR: 6:35 SS: 20:27 MR: None MS: 9:27
27 SR: 6:33 SS: 20:28 MR: 0:20 MS: 10:21	28 SR: 6:32 SS: 20:29 MR: 1:13 MS: 11:20	29 SR: 6:31 SS: 20:30 MR: 2:02 MS: 12:25	30 SR: 6:29 SS: 20:31 MR: 2:46 MS: 13:32		Lunar Events: April 7 NM: 7:04 April 14 FQ:13:01 April 22 FM:16:36 April 29 LQ:22:37	

Planet View Info Report for April 1997

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
Mercury							
4/ 8/1997	7:35	21:48	2h14m45s	16°33'41"	19°00'56"	0.335	0.83236
4/15/1997	7:13	21:31	2h24m58s	17°34'03"	14°52'57"	0.128	0.68257
4/22/1997	6:44	20:46	2h17m32s	15°55'57"	5°53'31"	0.015	0.59013
4/29/1997	6:15	19:50	2h02m24s	12°40'37"	5°50'24"	0.013	0.56401
Venus							
4/ 8/1997	7:14	20:11	1h14m08s	6°34'53"	1°49'16"	1.000	1.72514
4/15/1997	7:06	20:29	1h46m29s	9°55'53"	3°20'54"	0.998	1.72328
4/22/1997	6:59	20:47	2h19m23s	13°05'33"	5°04'30"	0.996	1.71889
4/29/1997	6:54	21:04	2h53m02s	15°59'41"	6°51'52"	0.993	1.71193
Mars							
4/ 8/1997	17:19	6:20	11h25m17s	6°59'57"	150°55'15"	0.978	0.69388
4/15/1997	16:45	5:47	11h19m21s	7°18'02"	142°38'03"	0.964	0.72312
4/22/1997	16:14	5:17	11h15m45s	7°20'40"	134°59'29"	0.950	0.75907
4/29/1997	15:47	4:47	11h14m31s	7°08'46"	127°59'42"	0.936	0.80031
Jupiter							
4/ 8/1997	4:41	14:42	21h15m38s	-16°27'20"	61°55'04"	0.992	5.49204
4/15/1997	4:17	14:20	21h20m07s	-16°08'14"	67°40'00"	0.992	5.39146
4/22/1997	3:52	13:57	21h24m11s	-15°50'44"	73°29'07"	0.991	5.28680
4/29/1997	3:27	13:35	21h27m49s	-15°35'03"	79°23'10"	0.990	5.17906
Saturn							
4/ 8/1997	6:58	19:19	0h43m32s	2°17'55"	7°37'02"	1.000	10.44963
4/15/1997	6:32	18:56	0h46m44s	2°37'54"	13°28'31"	1.000	10.42870
4/22/1997	6:07	18:33	0h49m54s	2°57'21"	19°24'15"	1.000	10.39597
4/29/1997	5:41	18:10	0h52m59s	3°16'09"	25°21'09"	0.999	10.35187
Uranus							
4/ 8/1997	4:18	13:59	20h43m01s	-18°47'39"	70°02'04"	0.999	20.13082
4/15/1997	3:51	13:32	20h43m45s	-18°45'04"	76°43'24"	0.999	20.01852
4/22/1997	3:24	13:05	20h44m20s	-18°43'05"	83°25'13"	0.999	19.90310
4/29/1997	2:57	12:38	20h44m45s	-18°41'43"	90°07'50"	0.999	19.78611
Neptune							
4/ 8/1997	3:47	13:19	20h07m33s	-19°46'36"	78°23'54"	1.000	30.33831
4/15/1997	3:20	12:52	20h07m52s	-19°45'35"	85°11'21"	1.000	30.22025
4/22/1997	2:52	12:25	20h08m05s	-19°44'54"	91°58'35"	1.000	30.10108
4/29/1997	2:25	11:57	20h08m11s	-19°44'34"	98°45'52"	1.000	29.98240
Pluto							
4/ 8/1997	23:14	10:20	16h22m54s	-8°30'17"	131°32'20"	1.000	29.29524
4/15/1997	22:46	9:52	16h22m26s	-8°27'29"	138°10'05"	1.000	29.21512
4/22/1997	22:18	9:24	16h21m54s	-8°24'46"	144°40'33"	1.000	29.14590
4/29/1997	21:49	8:56	16h21m18s	-8°22'11"	150°59'18"	1.000	29.08851

Planet Conjunction/Opposition Report for April 1997

4/ 2/1997	Venus @ Superior Conjunction	Hour = 20
4/25/1997	Mercury @ Inferior Conjunction	Hour = 6

Moon Apsides Report for April 1997

Date	Hour	Apsis	Distance (km)	Diameter
4/ 5/1997	13	Perigee	361489	0.5509°
4/17/1997	11	Apogee	405026	0.4917°

Meteor Showers Report for April 1997

Date	Meteor Shower	ZHR	RA	DEC	Illum. Frac.	Longitude
4/11/1997	Virginids	5	14h04m	-9°	0.23	22°
4/21/1997	Lyrids	12	18h08m	32°	0.99	32°
4/27/1997	alpha-Scorpiids	5	16h32m	-24°	0.75	38°

Twilight Report for April 1997

Date	Sun Rise	Sun Set	Astronomical Begin	Astronomical End	Nautical Begin	Nautical End	Civil Begin	Civil End
4/ 1/1997	7:15	19:59	5:34	21:40	6:09	21:05	6:42	20:32
4/ 8/1997	7:03	20:07	5:20	21:50	5:56	21:14	6:30	20:40
4/15/1997	6:52	20:14	5:06	22:00	5:43	21:23	6:18	20:48
4/22/1997	6:41	20:22	4:52	22:11	5:30	21:33	6:06	20:57
4/29/1997	6:31	20:30	4:38	22:23	5:18	21:42	5:55	21:05

SKY & TELESCOPE NEWS BULLETINS

from the editors of Sky & Telescope magazine

DOES 51 PEG's PLANET REALLY EXIST?

According to David Gray, an astronomer at the University of Western Ontario, the planet-sized companion to the star 51 Pegasi does not exist! This is the star that started the current rush of extrasolar-planet discoveries in 1995. Astronomers Michel Mayor and Didier Queloz then claimed that subtle shifts in the star's spectrum showed that the star was nodding back and forth relative to Earth, the effect of an object with at least half Jupiter's mass circling nearby every 4.2 days. But Gray, who is an expert on stellar spectroscopy, believes that 51 Pegasi is causing the effect itself. He found that the shape of an absorption line was tilting one way, then the other, in lock step with the putative planet's orbit. Orbital motions can't change the shape of a spectral line, only its position. "Therefore," Gray wrote in *Nature* for February 27th, "the planet hypothesis is no longer an adequate interpretation of the data." Instead, says Gray, 51 Pegasi seems to undergo complex pulsations that somehow tilt the lines back and forth. However, planet-hunters are rising to 51 Peg's defense, arguing that the pulsations Gray envisions can't become strong enough to reproduce the observed behavior. The outcome of this debate will affect the viability of planets presumed to circle three other stars too.

NO HIT IN HONDURAS

An international team of meteorite specialists have found no evidence for a 50-meter-wide impact crater in Honduras, despite local reports to the contrary following a spectacular bolide last November 22nd (March issue, page 12). According to astronomer Maria Cristina Pineda de Carias of the National Autonomous University of Honduras in Tegucigalpa, the fireball remained luminous down to an altitude of 14 kilometers and had an apparent magnitude of -15 to -20 — many times brighter than the full Moon. Any meteorites from this event probably fell in rugged, inaccessible terrain near the Honduras-Guatemala border, though none have been recovered yet.

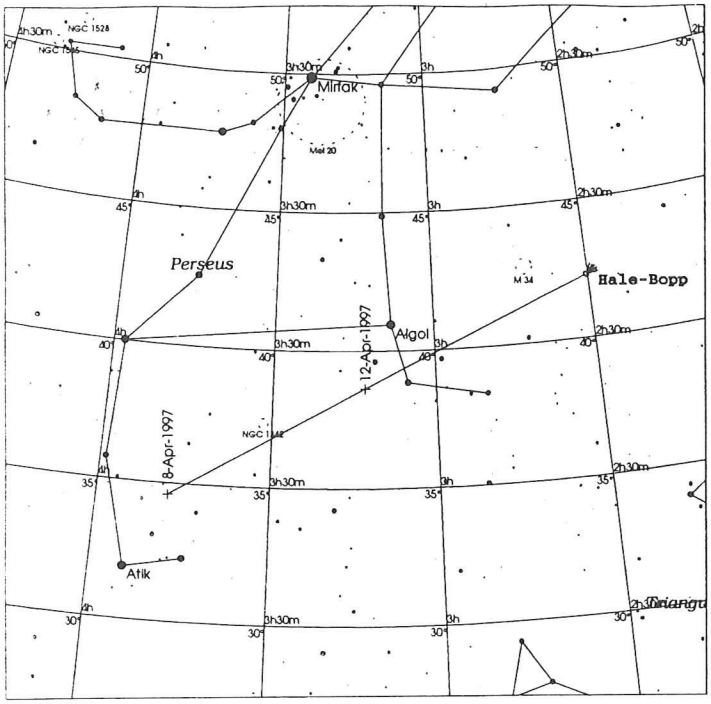
LIFE ON MARS REVISITED

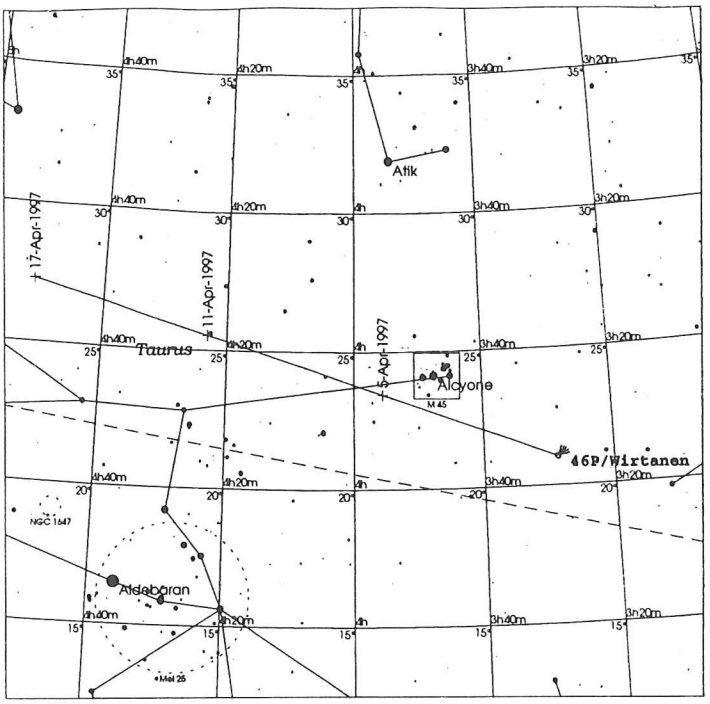
Planetary scientists gathered in Houston, Texas, in March to debate the likelihood that life existed on Mars billions of years ago. The focus of their attention was a Martian meteorite designated ALH 84001. Last August, scientists from NASA and Stanford University built a case for microscopic fossils within the 4-pound stone, and at the Houston meeting more that 30 papers detailed new studies of the rock. The life hypothesis hinges in part on the origin of bits of carbonate minerals within which the putative fossils were found. Several presenters maintained that the carbonates formed slowly at temperatures below the boiling point of water. But others argued that the minerals came together while at several hundred degrees — much too hot to sustain any known organisms. Meanwhile, several research teams have searched for chemical fingerprints of life, and whether ultramicroscopic structures are fossilized microbes or just flecks of mineral. As NASA scientist Doug Blanchard summed up, "It's still too early to conclude about life on Mars — no one knows the truth just yet." NASA and the National Science Foundation plan to distribute more samples of the unique meteorite next month, to begin a new round of tests by scores of scientific teams worldwide.

A BINARY'S DUST DISK

Using a coronagraphic camera on Mauna Kea, astronomers have found what may be a gigantic disk of dust, some 2 trillion kilometers in diameter, surrounding BD +31 643, an 8th-magnitude binary star 1,100 light-years distant in the constellation Perseus. Dust disks or shells have been indirectly discerned around dozens of stars via infrared spectral measurements. But, until now, astronomers had only managed to "photograph" such a feature around one main-sequence star, Beta Pictoris. In Nature for March 6th, Paul Kalas (Max-Planck Institute for Astronomy) and David Jewitt (University of Hawaii) surmise that the newfound disk would require a Jupiter's worth of planetesimals, which create dust by smashing into one another, to sustain itself. If each of these putative colliders were a typical large rocky asteroid, 100 km across, at least a billion such objects must swarm around the binary's two B-type stars. Kalas's upcoming Hubble Space Telescope observations will inspect the enigmatic disk with 10 times better resolution than the discovery image. ☆

FINDING COMET HALE-BOPP AND COMET WIRTANEN





STARS	SOLAR SYSTEM								NOTES
<0 • 5 1 · 6 2 >7 3 4	☿ Mercury ♀ Venus ♂ Mars ♃ Jupiter ♄ Saturn	♅ Uranus ♆ Neptune ♇ Pluto ☄ Comet ⚳ Asteroid	⬭ Galaxy ⊕ Globular Cluster ⁛ Open Cluster ✧ Planetary Nebula □ Diffuse Nebula ○ Other Object	Created with SkyMap Software by Chris Marriott (www.skymap.com)					
Local Time: 20:00:00 5-Apr-1997 Location: 42° 19' 12" N 83° 10' 48" W			UTC: 00:00:00 6-Apr-1997 RA: 3h15m00s Dec: +40° 00' Field: 25.0°				Sidereal Time: 07:24:33 Julian Day: 2450544.5000		

STARS	SOLAR SYSTEM								NOTES
<0 • 5 1 · 6 2 >7 3 4	☿ Mercury ♀ Venus ♂ Mars ♃ Jupiter ♄ Saturn	♅ Uranus ♆ Neptune ♇ Pluto ☄ Comet ⚳ Asteroid	⬭ Galaxy ⊕ Globular Cluster ⁛ Open Cluster ✧ Planetary Nebula □ Diffuse Nebula ○ Other Object	Created with SkyMap Software by Chris Marriott (www.skymap.com)					
Local Time: 20:00:00 29-Mar-1997 Location: 42° 19' 12" N 83° 10' 48" W			UTC: 00:00:00 30-Mar-1997 RA: 4h00m00s Dec: +25° 00' Field: 25.0°				Sidereal Time: 06:56.57 Julian Day: 2450537.5000		

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