Star Stuff

FERA
Ford Employees Recreation Association

THE FORD AMATEUR ASTRONOMY CLUB NEWSLETTER

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HST & KECK DISCOVER MOST DISTANT GALAXY

From: Space Telescope Science Institute, Baltimore, MD 21218
Press Release No.: STScI-PR97-25

WORLD'S MOST POWERFUL TELESCOPES TEAM UP WITH A LENS IN NATURE TO DISCOVER FARTHEST GALAXY IN THE UNIVERSE

An international team of astronomers has discovered the most distant galaxy found in the universe to date, by combining the unique sharpness of the images from NASA's Hubble Space Telescope with the light-collecting power of the W. M. Keck Telescopes — with an added boost from a gravitational lens in space.

The results show the young galaxy is as far as 13 billion light-years from us, based on an estimated age for the universe of approximately 14 billion years. This would place the galaxy far back in time during the "formative years" of galaxy birth and evolution, less than a billion years after the birth of the universe in the Big Bang.

The detailed image shows that bright dense knots of massive stars power this object. Due to the firestorm of starbirth within it, the galaxy is intrinsically one of the brightest young galaxies in the universe, blazing with the brilliance of more than ten times our own Milky Way.

"We are fascinated to be witnessing the very early stages of the construction of what could well become a massive galaxy like our own Milky Way," says Garth Illingworth of the University of California, Santa Cruz. "This object is a pathfinder for deciphering what is happening in young galaxies, and offers a rare glimpse of the powerful events that transpired during the formation of galaxies."

"We were excited by the possibility that we may have found a unique example of a galaxy in formation at the time of the earliest quasars," said Marijn Franx of the University of Groningen in the Netherlands.

> *"This object is a pathfinder for deciphering what is happening in young galaxies"*
> Garth Illingworth

Predicted by Einstein's theory of general relativity, gravitational lenses are collections of matter (such as clusters of galaxies) that are so massive they warp space in their vicinity, allowing the light of even more-distant objects to curve around the central lens-mass and be seen from Earth as greatly magnified.

The object is so far away, observing it in such detail would tax the capabilities of both Hubble and Keck without the magnification of the gravitational lens, provided by a foreground cluster of galaxies that is much closer to us at five billion light-years.

Due to a rare and fortunate alignment of the young galaxy behind the foreground cluster, astronomers gain a magnified view that is five to ten times better than Hubble alone can yield for an object at such a great distance. A telltale sign of the lensing is the smearing of the remote galaxy's image into an arc-shape by the gravitational influence of the intervening galaxy cluster.

The smeared image of the galaxy stood out because of its unusual reddish color. "Such magnified galaxies had been observed before, but never with such a color. The special color of the galaxy in the arc is due to absorption by the matter in the universe between us and the galaxy, and suggested to us that it was at a great distance," says Franx.

The suspected remoteness of the lensed object was confirmed when the team of astronomers made spectroscopic observations with one of the twin 10-meter Keck telescopes on Mauna Kea, HI, to measure its redshift, and therefore its distance, based on the shifting of its light towards the red end of the visible light spectrum. The resulting high redshift (z=4.92) corresponds to a very early era when the universe was just beginning to form galaxies.

Though candidates for still more distant objects have been proposed, they have not been confirmed spectroscopically. The previous most-distant known object was the quasar PC1247+34 (z=4.90).

"Based on this image we can begin to make some conclusions about the early growth of galaxies," says Illingworth. "The knots show that starbirth happens in very tiny regions compared with the size of the final galaxy." This helps clarify the astronomer's view of the formation of galaxies as occurring within a cauldron of hot gas, with knots of intense star formation, strong winds, and "mergers" — collisions of the dense star-forming knots.

Using Keck's spectroscopic capabilities, the astronomers have also, for the first time, been able to measure the motions of the gas within such a distant galaxy. The observations reveal gas flowing at nearly 500,000 miles per hour (200 km/sec), presumably accelerated by energy from supernova explosions going off like a string of firecrackers.

"The strong winds that we observe suggest that galaxies may lose a lot of material when they are young and thereby enrich the empty space around them," says Franx. "Many astronomers had speculated about the existence of such winds in such distant galaxies, and we now have an object where we can see them directly. It is striking that the most distant galaxy found to date is also the one that provides us the most detailed picture of events in such distant galaxies."

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc. (AURA) for NASA, under contract with the Goddard Space Flight Center, Greenbelt, MD.

The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency (ESA).

The W.M. Keck observatory is operated by the University of California, the California Institute of Technology and NASA. ☆

STAR TRAILS

Garbage In = Garbage Out

This Spring and Summer has been flying right on by. My work workload has finally tapered off, the front yard shrubs have all been replaced, my son's graduation and related celebration are now past. Until recently, my available time for astronomy has been limited to administrative tasks for the most part. However, I did get out to Island Lake a few weeks ago and to the lake Hudson Dark Sky party last weekend. The former outing turned out to be quite beneficial.

With great intentions to get into astrophotography, I bought a wedge for my computerized LX last year. After nearly three years of ownership, I had always aligned in the Alt-Az mode by using the simple two star method. Now, I had to learn to use the polar alignment method which relies on close longitude and latitude input settings and a sequence of alignment and computer entry steps.

I had tried several times to follow the LX's polar alignment instructions without success. Each time in the final step where it should slew towards a near zenith bright star, all the scope wanted to do was to point off at some acute angle. The computer seemed to want to place me on some far off land. I was sure something was wrong with the computer. Fortunately, I had the benefit of **George Korody's** vast experience to pull me out of this dilemma. After a couple of attempts at it, he had the problem nailed. I had reversed the longitude and latitude input settings. Sure enough (By George!). The computer had me placed on the northern tip of Greenland!

Star Parties - Star Parties

I want to thank all of the individuals, clubs, and vendors who contributed in big and small ways to make the Hale-Bopp Star Party a reality. A special Thank You goes out to Kensington Metropark's **Dick Schaffer** and **Pat Carleson**. Without Dick, Pat and their staff bending over backwards to accommodate all of our needs, this event would have never happened. It was a star party planner's dream come true. Eight southeastern Michigan clubs brought out over 70 & 100 scopes on Friday and Saturday nights respectively. All of the clubs and the park gave public astronomy presentations on one subject or another. The weather was fantastic. Big Boy's concession stand sold out of stock on the first night. **Rider's Hobbies** and **The Nature Company** were just delighted by the traffic at their tables. The public just couldn't seem to get over the fact that they could actually go up to any telescope and take a look. The park estimated that some 4800 people showed up over the two nights. We will be meeting with the park in a couple of weeks to see about doing something similar next year. By the way, if you comet hunters out there could bring in another star player like Hale-Bopp, it would be appreciated.

Plans for our **5th Annual Island Lake Star Party on September 6th** are falling nicely in place. Both **Rider's Hobbies** and **The Nature Company** will attend and will give away 60mm refractor telescopes and other door prizes at the party. In addition, **The Nature Company** will hand out raffle forms for a Meade ETX which they will give away two weeks later. We have split the cost of a tent so we will have even more presentation room in the pavilion. Since we will have excellent weather (we couldn't possibly get another hurricane could we?), our scale model of the universe will lead visitors in from the entrance and we'll able to put on our interactive Sky Tour activity.

Some of your help is needed for the set up, registration table shifts and the Sky Tour activity. Please contact one of the officers if you can participate. Additionally, and probably more critically, we need help with advertising this event. Inside this newsletter is a flyer for the event with all of the basic details. I'd like you to make copies and get the word out to anyone and everyone who might want to attend. If each of our members could just get to one Scout troop, one science teacher or any other individuals or organizations, we would go a long way towards our goal to promote astronomy awareness with this event. See you there!

Bob MacFarland ☆

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	313-33-79754
Vice President:	George Korody	248-349-1930
Secretary:	Harry Kindt	313-835-1831
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 P.M. Meetings are held in conference room 100 in the Ford Worldwide Web & Internet Applications (WWW&IA) building, at 555 Republic Drive in the Fairlane Business Park in Dearborn.

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

Editor:	Paul Mrozek (313-33-73619)
Inter-company Mail:	MD 57, POEE.
E-mail:	pmrozek; pmrozek@pt0106.pto.ford.com pmrozek@ford.com (outside of Ford)

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.

AUGUST 1997

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

Aug 01 Alpha Capricornids Meteor Shower Peak
Aug 03 Mercury at Greatest Eastern Elongation (27 Degrees)
Aug 03 New Moon (4:16 am)
Aug 04 Asteroid 2 Pallas Occults SAO 104597 (7.5 Magnitude Star)
Aug 04 Asteroid 306 Unitas at Opposition (10.7 Magnitude)
Aug 05 Moon Occults Mercury
Aug 05 Asteroid 67 Asia at Opposition (10.0 Magnitude)
Aug 06 Southern Iota Aquarids Meteor Shower Peak
Aug 07 Comet Gehrels 2 Perihelion (2.000 AU)
Aug 09 Jupiter at Opposition
Aug 11 First Quarter Moon (8:44 am)
Aug 12 Perseids Meteor Shower Peak
Aug 12 Asteroid 19 Fortuna Occults PPM 206231 (8.9 Magnitude Star)
Aug 15 Comet Haneda-Campos Perihelion (1.267 AU)
Aug 15 Possible Mars Occultation of SAO 158218 (8.6 Magnitude Star)
Aug 16 Possible Mars Occultation of SAO 158243 (9.2 Magnitude Star)
Aug 18 Full Moon (6:58 am)
Aug 21 Moon Passes 0.008 Degress South of Saturn
Aug 22 Moon Occults Saturn
Aug 22 Asteroid 5 Astraea at Opposition (11.0 Magnitude)
Aug 23 Asteroid 19 Fortuna at Opposition (9.4 Magnitude)
Aug 24 Last Quarter Moon (10:26 pm)
Aug 24 Asteroid 138 Tolosa at Opposition (10.6 Magnitude)
Aug 25 Northern Iota Aquarids Meteor Shower Peak
Aug 28 Asteroid 1986 PA Near-Earth Flyby (0.2061 AU)
Aug 30 Comet Grigg-Skjellerup Perihelion (0.997 AU) ☆

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, August 28, at 5:00 pm.**

The FAAC meets in conference room 100 in the Ford WorldWide Web & Internet Applications (WWW&IA) building, at 555 Republic Drive in the Fairlane Business Park in Dearborn. The find the building take the Southfield Freeway to Rotunda Drive. Go east on Rotunda and take the first right into the Fairlane Business Park (there is a sign). The WWW&IA building is the first building on the left. Park on the south or east side of the building and come to the south door (there is a big "425" over the door). The WWW&IA building is secured with a card entry system. If no one is at the door to let you in, then dial 18388 on the lobby phone and we will send someone. When you enter the building, turn left and follow along the windows to the conference room. ☆

7/24/97 FAAC MEETING MINUTES

by Don Klaser

The meeting was called to order by club Vice-President George Korody at 5:05 pm. There were 20 members and guests present. Ray Fowler gave the treasurers report — shirt sales are doing good, and another order will be placed next month.

Several people talked about the upcoming S.M.U.R.F.S. gathering from July 30 to August 2. George also reminded everyone about the Dark Sky stargaze at Lake Hudson State Park on July 26.

Special reports were then given by George, Ray, Patti Forton, and Don Klaser about the plans for our upcoming Star Party at Island Lake on September 6. Jack Kennedy volunteered to supervise the tent set-up, and Don Klaser and Gary Kissel volunteered to set-up the solar system display. Greg Burnett will handle getting the food vouchers printed.

During the pizza and pop break, the members introduced themselves and talked about their recent viewing adventures, if any. Our featured speaker for the evening was Jack Kennedy, who gave and excellent presentation on his trip to Lowell Observatory, Kitt Peak National Observatory, and the surrounding area in Arizona and New Mexico. ☆

1997 FAAC CALENDAR OF EVENTS

Aug 28 General Membership Meeting - WWW&IA Building, Dearborn
Sep 6 5th Annual Island Lake Star Party, 6:00PM - ???
Swap 5:00 - 7:00 PM. Presentations starting at 7:00 PM. Admission is FREE and children are welcome. ($4 State Park vehicle permit required unless you have annual pass) This event will be held whether clear, cloudy or rainy skies.
Sep 25 General Membership Meeting - WWW&IA Building, Dearborn
Sep 27 NCO Fall Fenton Star Party
Oct 3-5 NCO Wilderness Campout/Star Party
Oct 23 General Membership Meeting - WWW&IA Building, Dearborn
Dec 4 General Membership Meeting - WWW&IA Building, Dearborn

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

AUGUST SPACE HISTORY

The following August events come from the 06/28/97 edition of "Space Calendar." This calendar is compiled and maintained by Ron Baalke (baalke@kelvin.jpl.nasa.gov).

Aug 01 30th Anniversary (1967), Lunar Orbiter 5 Launch
Aug 08 20th Anniversary (1977), Burnup of Salyut 5 Space Station
Aug 10 5th Anniversary (1992), TOPEX/Poseidon Launch
Aug 10 5th Anniversary (1992), Kitsat A Launch, 1st Korean Satellite
Aug 11 35th Anniversary (1962), Vostok 3 Launch
Aug 11 120th Anniversary (1877), A. Hall's Discovery of Mars Moon Deimos
Aug 12 20th Anniversary (1977), HEAO-1 Launch (X-Ray Observatory)
Aug 12 35th Anniversary (1962), Vostok 4 Launch
Aug 13 150th Anniversary (1847), Hind's Discovery of Asteroid 7 Iris
Aug 17 120th Anniversary (1877), A. Hall's Discovery of Mars Moon Phobos
Aug 19 15th Anniversary (1982), Soyuz T-7 Launch (USSR)
Aug 20 20th Anniversary (1977), Voyager 2 Launch
Aug 27 35th Anniversary (1962), Mariner 2 Launch (Venus Flyby Mission)
Aug 30 5th Anniversary (1992), Discovery of 1992 QB1 by David Jewitt and Jane Luu, First Kuiper Belt Object ☆

AUGUST 1997 SPACE EVENTS

The following August 1997 events come from the 06/28/97 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.

Aug ?? Apstar-2R Long March Launch
Aug ?? Sinosat-1 Long March 3B Launch
Aug ?? Astra-1G Proton Launch
Aug 01 Terriers/Mubicom Pegasus XL Launch
Aug 04 Mars Pathfinder, End of Primary Mission
Aug 05 Soyuz TM-26 Launch (Russia)
Aug 05 US Air Force Titan 4A Launch
Aug 07 STS-85 Launch, Discovery, CRISTA-SPAS 2
Aug 07 Panamsat-6 Ariane 4 Launch
Aug 08 Galileo, Jupiter Magnetotail Exploration
Aug 08 Galileo,Orbital Trim Maneuver #31 (OTM-31)
Aug 13 NEAR, Trajectory Correction Maneuver #9 (TCM-9)
Aug 14 Iridium-3 Launch
Aug 17 Comets-1 H-II Launch (Japan)
Aug 21 ACE Delta-2 Launch
Aug 21 Forte Pegasus XL Launch
Aug 25 Mars Global Surveyor, Trajectory Correction Maneuver #4
Aug 27 GE-3 Atlas IIAS Launch (Maiden Launch of the Atlas IIAS)
Aug 28 Progress M-37 Launch (Russia)
Aug 29 Hot Bird-3/Indostar-1 Ariane 4 Launch ☆

EVOLUTIONARY BIG BANG

From Caltech Office of Media Relations

Scientists discover that "evolutionary big bang" may have been caused by Earth losing its balance half a billion years ago

PASADENA — Researchers at the California Institute of Technology think they have solved part of the mystery of the "evolutionary big bang" that occurred half a billion years ago. At that time, life on Earth underwent a profound diversification that saw the first appearance in the fossil record of virtually all animal phyla living today. With relative evolutionary rates of more than 20 times normal, nothing like it has occurred since. In a paper published in the July 25th issue of Science, the Caltech group reports that this evolutionary burst coincides with another apparently unique event in earth history — a 90-degree change in the direction of Earth's spin axis relative to the continents. Dr. Joseph Kirschvink, a geologist at Caltech and lead author of the study, speculates that a major reorganization of tectonic plates during latest Precambrian time changed the balance of mass within the Earth, triggering the reorientation. Thus, the regions that were previously at the north and south poles were relocated to the equator, and two antipodal points near the equator became the new poles.

"Life diversified like crazy about half a billion years ago," says Kirschvink, "and nobody really knows why. It began about 530 million years ago, and was over about 15 million years later. It is one of the outstanding mysteries of the biosphere. "The geophysical evidence that we've collected from rocks deposited before, during, and after this event demonstrate that all of the major continents experienced a burst of motion during the same interval of time."

David Evans, a co-author on the paper and graduate student at Caltech, notes that it is very difficult to make large continents travel at speeds exceeding several feet per year; typical rates today are only a few inches per year.

"Earth has followed a 'plate-tectonic speed limit' for the past 200 million years or so, with nothing approaching the rates needed for this early Cambrian reorganization." Evans said. "Some other tectonic process must have been operating that would not require the continents to slide so rapidly over the upper part of Earth's mantle."

In fact, geophysicists have known for over half a century that the solid, elastic part of a planet can move rapidly with respect to its spin axis through a process known as "true polar wander." True polar wander, Kirschvink explains, is not the same as the more familiar plate motion that is responsible for earthquakes and volcanism. While the latter is driven by heat convection in Earth's mantle, true polar wander is caused by an imbalance in the mass distribution of the planet itself, which the laws of physics force to equalize in comparatively rapid time scales.

During this redistribution, the entire solid part of the planet moves together, avoiding the internal shearing effects which impose the speed limit on conventional plate motions. (While his happens, of course, the entire Earth maintains the original spin axis in relation to plane of the solar system.) Thus, true polar wander can result in land masses moving at rates hundreds of times faster than tectonic motion caused by convection.

An analogy of the effect can be seen by cementing lead weights at the antipodal (or opposite) ends of a basketball. If the ball is then set on a slick floor and spun with the weights along the equator, the ball will spin in a manner as one would normally expect, with the weights remaining on the equator. If the ball is spun on one of the lead weights, however, the axis of rotation will tend to migrate until the weights are again on the ball's equator. In this configuration, the spinning ball has aligned its maximum moment of inertia with the spin axis, as required by the laws of physics.

As for astronomical evidence that such a phenomenon can occur, the authors point to Mars. Along the equator of the Red Planet is a gigantic volcano known as Tharsis, which is known to be the largest gravity anomaly in the solar system. Tharsis could have formed on the equator, but more likely formed elsewhere on the planet and then migrated to the equator via true polar wander because of rotational torques on its excess mass.

Something similar must have happened to Earth, says Kirschvink. At about 550 million years ago, 20 million years before the evolutionary burst, one or more major subduction zones in the ancient oceans closed down during the final stages of assembly of the supercontinent of Gondwanaland, leading to a major reorganization of plate tectonic boundaries.

Geophysicists have known for many years that this type of reorganization could, in theory, yield a sharp burst of true polar wander. In particular, if Earth were slightly "football shaped," with a major and stable mass anomaly on the equator and a more equal distribution of mass elsewhere, only slight changes of the smaller masses would be needed to produce large motions. A burst of motion up to 90 degrees in magnitude could even be generated if the maximum moment of inertia (about which the planet spins) became less than the intermediate moment (which is always on the equator). The massive plate motions observed by the Kirschvink group fit the predictions of this "inertial interchange" event rather closely. Over the 15 million year duration of this true polar wander event, the existing life forms would be forced to cope with rapidly changing climatic conditions as tropical lands slid up to the cold polar regions, and cold lands became warm. "Ocean circulation patterns are sensitive to even slight changes in the location of the continents," says co-author Robert Ripperdan, a geochemist at the University of Puerto Rico and a Caltech alumnus. "A progressive shift of this magnitude could cause oceanic circulation patterns to become rather unpredictable, jumping from one semi-stable configuration to another on a million-year time scale. "Imagine the havoc which would result in Europe if the Gulf Stream were to disappear suddenly.

These jumps offer an explanation for yet another unique mystery of the Cambrian explosion, which is a series of nearly a dozen large swings in the marine record of carbon isotopes. "Repeated changes in global oceanic circulation patterns should ventilate organic carbon buried in the deep oceans, producing these carbon wiggles," Ripperdan says. "We used to think that they were somehow due to repeated expansion and contraction of the entire biosphere, but no one could think of a mechanism to do that. All of the evidence suddenly makes sense with this true polar wander model."

But what caused the evolutionary burst? Kirschvink notes that these global shifts in oceanic circulation will also act to disrupt regional ecosystems, breaking them down into smaller, more isolated communities. "Evolutionary innovations are much more likely to survive in a small, inbreeding population, rather than in large, freely interbreeding groups," he notes. "And the carbon cycles are telling us that major changes in ocean circulation happened about every million years or so. That is certainly enough time for natural selection to weed through the fragments left by the last disruption, and to form new, regional-scale ecosystems.

"Then, Wham! They're hit again and the process repeats itself. That is a great script for increasing diversity, particularly as it seems to have happened shortly after the evolution of major gene systems which regulate animal development." The end result was that evolution proceeded nearly 20 times faster than its normal rate, and the life of the planet diversified into many groups still living today.

Kirschvink and his collaborators base their conclusions on data collected from 20 years of work on numerous well-exposed sections of the Precambrian-Cambrian and Cambrian-Ordovician eras. By studying the weak fossil magnetism (paleomagnetism) left in many rocks as they form using ultrasensitive superconducting magnetometers, they can recover the direction of the ancient geomagnetic field. This provides information concerning the direction of ancient north, for the same reason that a small hand-held magnetic compass can be used to find the approximate north direction today.

This remanent magnetism can also provide an estimate of the ancient latitude in which the sediments were deposited, as the inclination or dip of the magnetic field changes smoothly with latitude — it points vertically at the poles and is horizontal (tangent to the earth's surface) on the equator. Therefore, the fact that magnetic materials are found pointing in other directions is evidence that the ground itself has moved in relation to Earth's magnetic North, which is locked over time to the spin axis.

Geological samples collected by the Caltech group in Australia (which has some of the best-preserved sediments of this age from all of Gondwanaland) demonstrate that this entire continent rotated counterclockwise by nearly 90 degrees, starting at about 534 million years ago (coincident with onset of the major radiation event in the Early Cambrian), and was finished sometime during Middle Cambrian time.

North America, on the other hand, moved rapidly from a latest Precambrian position deep in the southern hemisphere, and achieved a position straddling the equator before the beginning of the Middle Cambrian, about 518 million years ago. Even the type of marine rocks deposited on the various continents —carbonates in the tropics, and clays and clastics in high latitudes—agree with

(continued on page 6)

OBSERVATIONS

by Greg Burnett

Note: The opinions expressed here are solely those of the author.

I recently spent a couple of hours in the "International UFO Museum & Research Center" in Roswell, New Mexico (www.iufomrc.com). The exhibits at the "Research Center" are well done, given that the place operates exclusively on donations. In fact, the overall presentation proved to be much less strident and dogmatic than I had expected. The majority of the exhibits, naturally enough, document the 1947 "Roswell Incident." Other exhibits address UFO sightings throughout history, "crop circles," and such-like. And surprisingly, several exhibits are directed at acknowledged hoaxes or present skeptical opinions. (Incidentally, this place has the most far-out souvenir shop I have EVER seen: alien caps, alien T-shirts, alien coffee mugs, alien salt-n-pepper shakers, alien ashtrays;... you name it, it's there, with an alien countenance emblazoned on it!)

The many glassed-in displays documenting the "Roswell Incident" were arranged chronologically and covered almost the entire length of one wall of the building. (The "Roswell Incident," in case YOU have been living on another planet, is the alleged crash landing of an alien spaceship near Roswell, New Mexico in 1947, and the covert removal from the wreckage, by the government, of one or more alien bodies, which by some accounts are still under "government protection" at some secret location.) From all appearances, every newspaper article, every radio interview, every bit of publicity ever associated with the putative event is on display here. Testimony from almost anyone with anything to say about it is transcribed and posted for inspection, whether eye-witness account, hearsay, or idle speculation. Virtually all of the material dated from 1947 to no later than the early 50's. The incident has been in the news recently, on the occasion of its fiftieth anniversary.

A key piece of "evidence" from the Roswell Incident is the "I-beam," a replica of which is on display (the whereabouts of the original article is unknown). It is a narrow strip of plastic-like material, having a cross-section like that of a steel girder I-beam. It is perhaps twelve to fourteen inches long, about half an inch wide, and light purple in color. At about half-inch intervals along its length are inscribed a series of cryptic symbols, somewhat resembling runic characters or hieroglyphs. The I-beam supposedly represents a "close encounter of the second kind" (physical evidence). The caption of the display explains that this item was reconstructed based on a description from an alleged witness who claimed to have seen the original when he was eleven years old, but provided the description much later in his life. Thus, the inscribed symbols should be regarded, I suppose, as illustrative only.

Additional exhibits at the "research center" report on other alleged encounters and related phenomena. One exhibit displays a small piece copper- and silver-colored metal that was donated to the museum. The donor claimed to have collected the fragment at a "UFO encounter site." Alongside is a parallel display of scraps from a Japanese jewelry making process called "mokume gane" (literally "woodgrained metal"). The two samples of material appear identical in all respects. The accompanying text explains that indeed, it was discovered that the donor had at one time been involved in such jewelry making in the United States. Even though this exhibit is not explicitly labeled as a hoax, the connection between the two samples of material is obvious, and the intention of the exhibit seems clear.

There is also one display that gives a nod to several recognized skeptical organizations, including C.S.I.C.O.P., the Committee for Scientific Investigation of Claims of the Paranormal, publishers of the magazine "The Skeptical Inquirer." The caption write-up in this display seems at first very fair-minded, but ultimately comes to grief, once again making the well worn mistake of pointing to many observations that "science can't explain..." But the attempt at balance in the overall presentation is admirable.

So, what's this "UFO" stuff really all about, anyway? Sure, there are many observations that "science" can't explain. So what? "Science" cannot explain everything, and never claimed to. To turn the argument around, there have been millions and millions of things throughout history that "science" could not explain (starting with <u>everything</u>). However, NONE of them turned out, when eventually explicated, to be evidence of unnatural, supernatural, or paranormal phenomena, or of meddling by some extraterrestrial intelligence. None. Yet those explanations continue to be the favored hypotheses when something is not immediately understood: Sun comes up every morning, can't explain it, must be Ra in his charlot. Moon and stars shine every night, can't figure it out, must be crystal spheres propelled by angels. See something in the sky, don't recognize it, MUST be intelligent beings from another planet; no other explanation for it. Now, can you "scientists" <u>prove</u> it's not?! So there! That settles it!

The logic of such arguments is so convoluted as to barely be worthy of argument. Folks who "believe" in UFOs won't be swayed by legitimate logic anyway. The best we can hope for, I suppose, is to influence a few who have not yet made up their minds. So, with that in mind, here are some of the major arguments against the classical interpretation of UFOs as evidence of visitation by extraterrestrial intelligence . . .

1. An "unidentified object," flying or otherwise, is exactly that: unidentified. Its mere existence does not imply, certainly does not demand, an extraterrestrial or supernatural explanation.

2. The fact that "science" cannot immediately explain <u>everything</u> reported by <u>everybody</u>, likewise does not demand an extraterrestrial or supernatural explanation. Science is not obligated to explain claims of UFOs. To quote the late Carl Sagan, "Extraordinary claims demand extraordinary evidence." Such evidence must be supplied by the claimant. Neither does science's lack of immediate explanations imply a government cover-up. The government has never been able to keep anything secret very long anyway; certainly something like a genuine ET would remain secret, oh, about twenty minutes.

3. After all the reports of sightings, encounters, and abductions over the years there is still <u>not one piece</u> of credible physical evidence, and not even a clear, unmistakable photograph. There have even been reports of people gathering in numbers at predetermined locations to witness recurring appearances of UFOs. Where are the pictures? Did everyone conveniently forget their camera? Even $5.95 disposable cameras available at gas station qwik-marts produce surprisingly crisp, clear pictures of every-day subjects. Where are the UFO snapshots? What we see in the few photos that are proffered for inspection are blurry, indistinct blobs of light that could be anything at all. It reminds me of the report of a tour bus encountering the Loch Ness monster in Scotland. By all accounts some twenty-five people observed the monster, yet not a single photograph was produced. These people were supposedly on holiday, and no one had a camera?!? Personally, I must conclude that this incident, like many others, is a fabrication composed of more or less equal parts of rumor, legend, hearsay, imagination, and wishful thinking.

4. At best, the Universe is sparsely populated, by any conventional standards, and space travel is very difficult and expensive, even assuming technologies advanced beyond our own. Therefore, it seems extremely unlikely that intelligent beings would come all the way to Earth and then, even though they possessed technology superior to our own, continuously conceal themselves from us, successfully in every way, *except for a number of <u>obtrusive</u>, <u>blundering</u> appearances, often in broad daylight!*

5. Humanity <u>always</u> prefers the more fantastic, exciting, and romantic explanations of things not currently understood. It's much more fun! The tabloid newspapers owe their existence to this aspect of human nature.

In the vastness of our Universe, I think it is virtually impossible that we are truly alone. No matter how you believe life originated, it seems very unlikely that it did so only once. However, even with that said, I also think it very unlikely, for the reasons stated above, that we have been visited by extraterrestrials. I would be ecstatic to be proven wrong. Until then, I subscribe to the philosophy espoused by the late Jacques-Yves Cousteau, who said, on the subject of the Loch Ness Monster, "I don't believe in that bullshit."

<u>Editors' note:</u>
Hey, lately Burnett has been spoutin' off in this column on topics that some readers might find controversial. StarStuff welcomes your letters, and articles of your own authorship. Any length is OK, as long as it is in some way related to astronomy. Various means of contacting the newsletter are listed on the right side of page 2. ☆

STUDYING DISTANT GALAXIES

From New Mexico State University

Astronomers devise new tool for studying distant galaxies

Astronomers have a powerful new tool for studying the birthplaces of stars in distant galaxies, thanks to the work of two New Mexico State University astronomers.

David Thilker and Rene Walterbos, in collaboration with colleagues from the Netherlands and Ukraine, have developed a computer-based pattern recognition system for examining the interstellar medium of galaxies.

The technology behind the system is similar to the image processing used in medical techniques such as CAT scans. While medical imaging systems allow doctors to see details within a patient's body, this new system greatly enhances astronomers' ability to detect features within galaxies so far away it takes millions of years for light from their stars to reach the Earth.

"The interstellar medium is the gas from which stars form," said Walterbos, head of the NMSU astronomy department. Studying the activity in these vast fields of gas will help astronomers understand how stars are born and the way they feed energy back into the interstellar medium.

An important aspect of this stellar life cycle is the creation of what astronomers call "expanding HI shells" expanding, ring-shaped formations of neutral hydrogen gas. These are the structures the new system is designed to recognize.

In the past, the shells were seen as holes in the disk of gas that make up a galaxy's interstellar medium, said Thilker, a fourth-year doctoral student in astronomy at NMSU. Actually, they are more like geysers with two spouts, blowing gas out in opposite directions, he said.

The shells are huge structures, about 2,000 light years across. But detecting them can be difficult, because of the distance involved and the variety of angles at which the shells might appear when viewed from Earth. Imagine a small hole in a pane of glass: It might be easily recognizable when viewed straight on, but not when viewed from a sharp angle.

Thilker and Walterbos have taken advantage of the power of modern computers to create a highly sophisticated pattern recognition package that can detect expanding shells of gas at different angles and under various other circumstances.

Collaborating with them is Robert Braun of the Netherlands Foundation for Research in Astronomy, who has been using the Very Large Array radio telescope near Socorro to collect data on galaxies. More recently the project was joined by Sergey Mashchenko of the University of Kiev in Ukraine, who is refining the model calculations used in the automated object recognition package. The information this new method makes possible will help astronomers put together a more complete picture of the life cycles of stars and the evolution of galaxies.

"Star formation is a self-regulating process," Walterbos said. "Stars form from the interstellar medium and they put energy back into the interstellar medium. They emit energy and stellar winds."

Expanding shells of gas are formed in the interstellar medium as part of this cycle. By studying such structures, and the stars that exist now, astronomers can reach conclusions about stars that may have come and gone in the past.

The research project has received $350,000 in funding for three years from the National Science Foundation and NASA.

The research team plans to analyze 21 spiral and irregular galaxies as part of the study, Thilker said. The closest is about 150,000 light years from Earth, the most distant about 20 million light years away. A light year is the distance light travels in a year, moving at about 186,000 miles per second.

Typical galaxies have 100 or more expanding shells of gas, Thilker said. Most have gone unrecognized because astronomers had to rely on visual identification of the structures. With a computer-based detection method, astronomers will be able to catalog large numbers of shells and look for trends in the number, distribution and properties of shells. ☆

WATER ON SUN

From University of Waterloo (Release no. 115 — July 17, 1997)

Researchers confirm finding that water exists on sun

WATERLOO, Ont. — An international team of scientists, including a University of Waterloo chemistry professor, has conclusively demonstrated that water does exist on the sun, confirming a breakthrough finding made two years ago.

The team used an innovative method to calculate the water spectrum at sunspot temperatures. The method will be useful in modelling systems with an abundance of extremely hot water molecules, such as forest fires.

The team was led by Oleg Polyansky, a theoretician from Russia's Institute of Applied Physics; Nizhnil Novgorod, who works with co-researcher Jonathan Tennyson, a physicist at University College, London; and UW chemistry Prof. Peter Bernath, an expert in molecular astronomy. Other team members included Serena Viti, a physicist at University College, London; Nikolai Zobov, a physicist at University College, London; and Lloyd Wallace, an astronomer at Kitt Peak National Observatory, Tucson, Ariz.

In their 1995 study, the team recorded evidence of water — not in liquid form because the sun is too hot, but as vapor or steam — in dark sunspots. The scientists compared the laboratory infrared spectrum of hot water with that of a sunspot.

The water in the sunspots causes a sort of "stellar greenhouse effect" that affects the sunspot's energy output. Hot water molecules are also the most important absorbers of infrared radiation in the atmospheres of cool stars, such as "variable red giants."

In their follow-up study, to be published today in the journal Science, the scientists examined the spectrum of extremely hot water such as that found in sunspots and in the laboratory. Hot water has a complicated infrared spectrum characterized by a dense series of sharp absorption lines.

But the transitions that give rise to those lines were not known, until now. The research team carried out a simulation of the infrared spectrum based purely on theoretical calculations, allowing accurate assignments of the absorption lines. "The detailed interpretation of the infrared spectrum of hot water is one of the important unsolved problems in molecular spectroscopy," the researchers write in their Science article.

The spectroscopic data will be useful in modelling other systems that contain extremely hot water molecules, such as forest fires and rocket plumes. Spectral analysis captures the characteristic spectra, or wavelength patterns, emitted or absorbed by molecules. "Our research team solved the problem by doing something completely different," Bernath said. "Starting with a mathematical model that is progressively improved through perturbation theory doesn't work for hot water."

Instead, the team went directly to theory and used the calculated interaction energies of the atoms of water. By using sophisticated variational calculations of energy levels, the researchers predicted the position of transitions that give rise to absorption lines.

"The calculations were so good that they were close enough to the observations for us to make sense of the spectrum," said Bernath, who led the team that carried out the laboratory spectroscopy. Spectroscopy is the study of the interaction of light and matter. ☆

(continued from page 4)

these paleomagnetically-determined motions. The paleomagnetic directions are accurate within about 5 degrees, the authors write. Latitudes are quite reliable, but because the poles moved so rapidly, even the relative longitude between blocks can be determined. This true polar wander analysis predicts a unique "absolute" map of the major continental masses during this event, an animation of which can be viewed at http://www.gps.caltech.edu/~devans/litpw/science.html

"This hypothesis relating abrupt changes in polar wander to evolutionary innovations could be tested in many ways," notes Kirschvink, "as there are some interesting events in the paleontological record during the following 200 million years which might have been triggered by similar processes. "There's lots of work to do." ☆

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 August 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
31 SR: 6:57 SS: 20:08 MR: 5:39 MS: 19:26		Lunar Events: Aug 3 NM: 4:16 Aug 11 FQ: 8:44 Aug 18 FM: 6:58 Aug 24 LQ:22:26			1 SR: 6:25 SS: 20:52 MR: 4:56 MS: 19:37	2 SR: 6:26 SS: 20:51 MR: 5:52 MS: 20:17
3 SR: 6:27 SS: 20:50 MR: 6:48 MS: 20:52	4 SR: 6:29 SS: 20:48 MR: 7:45 MS: 21:24	5 SR: 6:30 SS: 20:47 MR: 8:42 MS: 21:54	6 SR: 6:31 SS: 20:46 MR: 9:39 MS: 22:23	7 SR: 6:32 SS: 20:45 MR: 10:35 MS: 22:51	8 SR: 6:33 SS: 20:43 MR: 11:32 MS: 23:19	9 SR: 6:34 SS: 20:42 MR: 12:29 MS: 23:49
10 SR: 6:35 SS: 20:41 MR: 13:28 MS: None	11 SR: 6:36 SS: 20:39 MR: 14:27 MS: 0:22	12 SR: 6:37 SS: 20:38 MR: 15:27 MS: 0:59	13 SR: 6:38 SS: 20:36 MR: 16:26 MS: 1:41	14 SR: 6:39 SS: 20:35 MR: 17:24 MS: 2:30	15 SR: 6:40 SS: 20:33 MR: 18:19 MS: 3:26	16 SR: 6:41 SS: 20:32 MR: 19:10 MS: 4:29
17 SR: 6:42 SS: 20:31 MR: 19:56 MS: 5:39	18 SR: 6:43 SS: 20:29 MR: 20:38 MS: 6:52	19 SR: 6:44 SS: 20:27 MR: 21:17 MS: 8:07	20 SR: 6:45 SS: 20:26 MR: 21:54 MS: 9:21	21 SR: 6:46 SS: 20:24 MR: 22:31 MS: 10:34	22 SR: 6:47 SS: 20:23 MR: 23:08 MS: 11:46	23 SR: 6:49 SS: 20:21 MR: 23:47 MS: 12:54
24 SR: 6:50 SS: 20:20 MR: None MS: 14:00	25 SR: 6:51 SS: 20:18 MR: 0:28 MS: 15:02	26 SR: 6:52 SS: 20:16 MR: 1:13 MS: 15:58	27 SR: 6:53 SS: 20:15 MR: 2:01 MS: 16:50	28 SR: 6:54 SS: 20:13 MR: 2:53 MS: 17:36	29 SR: 6:55 SS: 20:11 MR: 3:47 MS: 18:17	30 SR: 6:56 SS: 20:10 MR: 4:42 MS: 18:53

Planet View Info Report for August 1997

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
Mercury							
8/ 5/1997	8:56	21:45	10h43m08s	6°19'48"	27°17'45"	0.462	0.86647
8/12/1997	8:55	21:21	10h59m18s	3°13'18"	25°36'38"	0.342	0.76742
8/19/1997	8:35	20:50	11h02m37s	1°37'14"	20°30'51"	0.199	0.68109
8/26/1997	7:51	20:12	10h50m35s	2°22'54"	11°15'44"	0.061	0.62747
Venus							
8/ 5/1997	9:17	22:13	11h06m34s	7°04'47"	32°21'38"	0.830	1.33368
8/12/1997	9:33	22:02	11h37m06s	3°34'06"	34°00'34"	0.811	1.28975
8/19/1997	9:49	21:52	12h07m12s	-0°01'24"	35°36'34"	0.791	1.24430
8/26/1997	10:04	21:41	12h37m07s	-3°37'53"	37°09'07"	0.770	1.19755
Mars							
8/ 5/1997	12:41	23:32	13h29m31s	-9°52'17"	71°43'47"	0.886	1.48842
8/12/1997	12:35	23:14	13h45m20s	-11°29'08"	69°13'23"	0.889	1.53100
8/19/1997	12:30	22:57	14h01m45s	-13°04'48"	66°48'50"	0.892	1.57202
8/26/1997	12:26	22:40	14h18m47s	-14°38'21"	64°29'19"	0.895	1.61157
Jupiter							
8/ 5/1997	20:55	6:59	21h21m48s	-16°26'31"	174°50'35"	1.000	4.04790
8/12/1997	20:25	6:27	21h18m11s	-16°44'02"	177°15'43"	1.000	4.04451
8/19/1997	19:55	5:55	21h14m36s	-17°00'54"	169°46'10"	1.000	4.05565
8/26/1997	19:25	5:23	21h11m11s	-17°16'35"	162°11'18"	0.999	4.08103
Saturn							
8/ 5/1997	23:29	12:16	1h17m31s	5°24'23"	112°40'28"	0.998	8.98397
8/12/1997	23:01	11:48	1h17m14s	5°20'41"	119°27'51"	0.998	8.87969
8/19/1997	22:33	11:20	1h16m39s	5°15'13"	126°20'47"	0.998	8.78228
8/26/1997	22:05	10:51	1h15m47s	5°08'05"	133°19'23"	0.998	8.69316
Uranus							
8/ 5/1997	20:21	6:02	20h36m03s	-19°17'00"	173°47'20"	1.000	18.81776
8/12/1997	19:53	5:33	20h34m55s	-19°21'07"	166°49'16"	1.000	18.83947
8/19/1997	19:25	5:04	20h33m50s	-19°25'00"	159°50'20"	1.000	18.87526
8/26/1997	18:56	4:35	20h32m49s	-19°28'37"	152°51'04"	1.000	18.92461
Neptune							
8/ 5/1997	19:50	5:23	20h00m47s	-20°06'53"	165°32'39"	1.000	29.16599
8/12/1997	19:22	4:55	20h00m02s	-20°09'07"	158°39'24"	1.000	29.20310
8/19/1997	18:53	4:26	19h59m21s	-20°11'14"	151°45'58"	1.000	29.25357
8/26/1997	18:25	3:58	19h58m42s	-20°13'11"	144°52'13"	1.000	29.31665
Pluto							
8/ 5/1997	15:16	2:23	16h12m58s	-8°22'26"	109°42'48"	1.000	29.63757
8/12/1997	14:48	1:55	16h12m51s	-8°25'36"	103°09'44"	1.000	29.74958
8/19/1997	14:21	1:27	16h12m51s	-8°29'07"	96°36'46"	1.000	29.86475
8/26/1997	13:54	0:59	16h12m56s	-8°32'56"	90°03'52"	1.000	29.98157

Planet Apsides/Conjunction/Opposition Report for August 1997

8/ 5/1997 Mercury @ Aphelion Distance from Sun: 0.47 AU
8/ 9/1997 Jupiter @ Opposition Hour: 20
8/31/1997 Mercury @ Inferior Conjunction Hour: 20

Moon Apsides Report for August 1997

8/ 6/1997 Moon @ Apogee Hour: 10 Distance: 405934 km Diameter: 0.4906°
8/19/1997 Moon @ Perigee Hour: 1 Distance: 358026 km Diameter: 0.5563°

Meteor Showers Report for August 1997

Date	Meteor Shower	ZHR	RA	DEC	Illum. Frac.	Longitude
8/ 1/1997	alpha-Capricornids	5	20h36m	-10°	0.02	130°
8/ 5/1997	Iota-Aquarids	8	22h10m	-15°	0.06	134°
8/12/1997	Perseids	75	3h04m	58°	0.63	140°
8/20/1997	alpha-Cygnids	5	21h00m	48°	0.92	148°

Twilight Report for August 1997

Date	Sun Rise	Sun Set	Astronomical Begin	Astronomical End	Nautical Begin	Nautical End	Civil Begin	Civil End
8/ 5/1997	6:30	20:47	4:32	22:45	5:15	22:02	5:53	21:23
8/12/1997	6:37	20:38	4:44	22:31	5:24	21:50	6:02	21:13
8/19/1997	6:44	20:27	4:55	22:17	5:34	21:38	6:10	21:02
8/26/1997	6:52	20:16	5:05	22:03	5:43	21:25	6:18	20:50

SKY & TELESCOPE NEWS BULLETINS

from the editors of Sky & Telescope magazine

GALILEO REVISITS CALLISTO

These are busy times in the space biz, what with Mir involved in a serious collision and a Space Shuttle mission due for launch on July 1st. Almost lost in the shuffle was Galileo's flyby of the Jovian moon Callisto on June 26th. The orbiter skimmed by at a distance of just 415 km. The principal imaging target was a huge multiringed impact basin named Valhalla. Other instruments looked for signs of a tenuous atmosphere or magnetic field. Only two satellite encounters remain in Galileo's original mission plan: another Callisto pass in September, and Europa in November. After that the spacecraft begins an extended mission that will concentrate on studies of Europa.

ARECIBO UPGRADE

Astronomers and officials gathered on June 14th in the lush vegetation near Arecibo, Puerto Rico, to inaugurate the newly refurbished 305-meter (1,000-foot) Arecibo radio telescope. The five-year, $27 million upgrade includes a set of Gregorian reflectors to collect incoming signals, a powerful megawatt radar transmitter, and a 15-meter metal fence around the dish's perimeter to block stray transmissions from the Earth and thus improve sensitivity. This extensive upgrade will enable astronomers to study everything from the Earth's upper atmosphere to comets, asteroids, and exotic objects in the distant universe.

AMATEUR WINS FIRST BENSON PRIZE

Speaking of asteroids, in the middle of June James Benson of Space Development Corporation announced that he would award $500 to the first 10 amateur astronomers who discover minor planets whose orbits cross Earth's. And already we have a winner! Roy Tucker of Tucson, Arizona, picked up a fast-moving object in a sequence of CCD images made on the evenings of June 28th and 29th with his Celestron 14-inch telescope. Follow-up observations made over the next few nights by astronomers worldwide confirmed the 18th-magnitude blip to be a previously unknown minor planet. Designated 1997 MW1, it orbits the Sun every 0.91 year in an elongated path that brings it inside the orbits of the Earth and Venus. It is thus an Aten-type asteroid, only the 25th such object known. The Benson Prize was established to encourage amateurs to help locate the hundreds of Earth-crossers believed to inhabit the inner solar system. Space Development Corporation hopes to mine these asteroids for natural resources.

VLBI IN SPACE

The baseline in Very Long Baseline Interferometry just got even longer. VLBI combines the signals from widely separated radio telescopes to form images with ultrahigh angular resolution. But the best you could do until recently was to spread telescopes across the face of the Earth, as done with the International Very Long Baseline Array, or VLBA. Now, thanks to a Japanese satellite called HALCA (for Highly Advanced Laboratory for Communications and Astronomy), VLBI is being done with baselines nearly three Earth diameters long. This week scientists at the National Radio Astronomy Observatory released the first images produced when HALCA, the VLBA, and the Very Large Array in New Mexico combined forces. They show the radio emission from a galaxy and a quasar more clearly than any previous studies. Astronomers hope that further observations with HALCA will pave the way for a more advanced orbiting radio telescope in the 21st century.

ROYAL GREENWICH OBSERVATORY TO CLOSE?

July 4th was a joyous holiday here in the United States, but in Great Britain it was business as usual. John Battle, science minister for the United Kingdom, chose that day to approve a plan to consolidate the country's two Royal Observatories into a single site in Edinburgh, Scotland, to be called the UK Astronomy Technology Centre. The UK's astronomy budget has been squeezed of late by participation in the Gemini project, and the proposed consolidation should save about 2.4 million pounds ($4 million) each year in costs. But it would mean the end of the Royal Greenwich Observatory in Cambridge. The future does not look promising for the MERLIN radio interferometer either. Battle says the consolidation will take place over several years, and he urges the managing agency to explore "every possible avenue" to keep the historic RGO alive.

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COMET TABUR (C/1997 N1)
Australian amateur Vello Tabur discovered his second comet on July 2nd. It's a 10th-magnitude blip with a short tail in the southern constellation Eridanus. The comet is inbound, and perihelion occurs on August 15th at roughly Mercury's distance from the Sun. At that time Comet Tabur could brighten to perhaps magnitude 6, but unfortunately it will then be on the far side of the Sun and lost in twilight glare.

NEW ADAPTIVE-OPTICS SCOPE
The Air Force has unveiled a $150-million telescope built atop Mount Haleakala on the Hawaiian island of Maui. Called the Advanced Electro-Optical System, or AEOS, this instrument has an aperture of 3.7 meters (12 feet) and is equipped with state-of-the-art adaptive optics. Although designed to track and identify objects orbiting the Earth, AEOS can potentially serve a number of astronomical functions — including the study of near-Earth asteroids. One novel feature is the facility's shiny, retractable dome, which peels away and drops down prior to each observing session. The scope's first images are expected in September.

NEW LUNAR METEORITE
In July planetary geologists announced that a new lunar meteorite has been discovered. It's the 12th known fall of lunar material on Earth, but only the second outside Antarctica. Known as Dar al Gani 262, the egg-sized, 513-g rock was discovered in the Libyan part of the Sahara Desert on March 23rd. Initial analysis suggests that it's a fusion of mixed rock fragments from somewhere in the heavily cratered lunar highlands.

COMET TILBROOK (C/1997 O1)
Australian amateur Justin Tilbrook found himself a comet on July 22nd. It's a 10th-magnitude blur in northeast Corvus that's headed north in the sky, but toward the Sun. Those in the Southern Hemisphere have the best shot at seeing Comet Tilbrook before it fades from view (it reached perihelion, 1.4 a.u. from the Sun, on July 16th).

COOL STARS
Astronomers from around the world gathered recently in Sky & Telescope's home town of Cambridge, Massachusetts, to discuss the latest findings on low-mass stars, substellar brown dwarfs, and extrasolar planets. It was at this same "Cool Stars" meeting two years ago that Swiss astronomers announced their discovery of a planet orbiting the star 51 Pegasi. No comparable bombshells were dropped this year, but astronomers enthused over the latest results on brown dwarfs, objects the size of Jupiter — but 10 to 75 times more massive — that can't quite maintain nuclear fusion. The existence of these long-postulated objects was confirmed less than two years ago, and only a handful of robust candidates exists. But astronomers using the Keck Observatory announced that they've confirmed the brown-dwarf nature of two more candidates, and a deep-red survey of a tiny patch of the Pleiades being conducted from the Canary Islands has turned up half a dozen more. This suggests that brown dwarfs may be as common as bonafide stars.

GENE SHOEMAKER, 1928 - 1997
The world has lost one of its most renowned scientists with the death of Eugene Shoemaker at age 69. On the afternoon of July 18th, Gene and his wife, Carolyn, were involved in a car accident in central Australia. He was fatally injured; Carolyn suffered broken ribs but is expected to recover. The pair had arrived in Australia just six days before to study some of the continent's numerous impact craters — an annual trek Down Under that they'd made a habit in recent years.

Best known for his pioneering work in elucidating the mechanics of impacts and in the discovery of Earth-crossing bodies, Gene gained worldwide fame in March 1993 for his discovery, with Carolyn and colleague David Levy, of a comet that would strike Jupiter 16 months later. Comet Shoemaker-Levy 9 was just one of the finds that made this husband-wife team the leading comet discoverers of this century. They are also credited with discovering more than 800 asteroids. But the one research interest he never tired of was Meteor Crater, the kilometer-wide pit east of Flagstaff, Arizona.

While still in his teens, Gene realized that someday astronauts would walk on the Moon, and from that point forward his whole professional life would be directed toward becoming one of them. But a medical condition prevented him from ever being selected for the Apollo program. "Not going to the Moon and banging on it with my own hammer has been the biggest disappointment in life," he said last year. "But then, I probably wouldn't have gone to Palomar Observatory to take some 25,000 films of the night sky with Carolyn — she scanned them all — and we wouldn't have had the thrills of finding those funny things that go bump in the night." ☆

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