SPRING QUARTER / MARCH 2000

MOUNT WILSON OBSERVATORY ASSOCIATION

REFLECTIONS

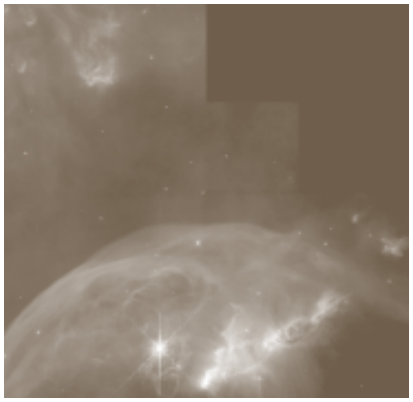
MWOA Public Lecture Series

Jastrow Elucidates the Anthropic Principle

Robert Jastrow, Director of the Mount Wilson Institute, is our featured speaker for the **Sunday, March 26** MWOA lecture/meeting at the Altadena Library. Dr. Jastrow will discuss new evidence on the Anthropic Principle — the view that scientific facts prove that the Universe was designed to produce life as we know it.

According to this principle, any small change in the basic forces and parameters of the young Universe would produce a perfectly good Universe from a physicist's point of view, but one in which no physicists or other living creatures could exist. Dr. Jastrow will comment on the philosophical and theological implications in this reading of the evidence.

Dr. Jastrow is the author of several popular astronomy books, including *Red Giants and White Dwarfs* and the recently republished *God and the Astronomers*. The free lecture begins at 2:30 P.M. Refreshments will be served beginning at 2:00 P.M. As usual, we will meet in the Altadena Library's community room.



"...GLORIOUS STARRY FIRMAMENT...."

— JOHN MUIR

The Bubble Nebula, 7,100 light-years from Earth in Cassiopeia, as imaged by the Hubble Space Telescope. The bubble marks the boundary between an intense stream of particles from the central star and the more quiescent interior of the nebula. The nebula has a diameter of 6 light-years. The nebula's central star — 40 times more massive than our Sun — ejects a stellar wind that moves at about 4 million miles per hour, propelling particles off the star's surface. The bubble is the leading edge of this stellar wind. The dense clumps of molecular gas seen at the top of the picture are glowing with ultraviolet illumination from the central star. Hubble Space Telescope images may be found on the Space Telescope Science Institute Web site — http://oposite.stsci.edu/

CALENDAR

Sunday, March 26
MWOA Public Lecture

Altadena Library, 600 E. Mariposa St., Altadena

★ *The Anthropic Principle* Robert Jastrow, Director, Mount Wilson Institute. The Library is at the corner of Mariposa Street and Santa Rosa Avenue.

Saturday, April 29
Sustaining Members' Night on the 60-inch Telescope

★ To reserve, call Don Nicholson at (310) 476-4413. See page 2 for information on how to become a Sustaining Member.

MWOA Public Lectures
All Welcome — Free

★ Altadena Library (Sundays at 2:30 P.M.; refreshments at 2:00 P.M.): March 26, April 30, June 25 (no lecture in May). Lectures July–October will be at the Museum Auditorium at Mount Wilson.

MWOA Board Meetings
First Tuesday of Each Month at 7:00 P.M.

★ April 4, May 2, June 6. All members welcome — call Don Nicholson at 310/476-4413 for meeting location.

ABOUT MWOA

The Mount Wilson Observatory Association (MWOA) is a support group made up of friends of the Mount Wilson Observatory. MWOA is a nonprofit California corporation, independent of the Mount Wilson Observatory and the Mount Wilson Institute, which operates the Observatory. MWOA's goals include increased public awareness of the Observatory's unique history and continuing scientific contributions, as well as improvement of the quality of public access at Mount Wilson.

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REFLECTIONS

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For the use of historical photographs of Mount Wilson, MWOA thanks the Observatories of the Carnegie Institution of Washington, the Huntington Library, and Don Nicholson.

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PAGE ONE BANNER PHOTOGRAPH

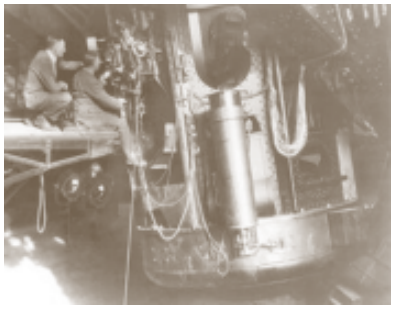
Edwin Hubble at the Newtonian focus of the 100-inch telescope, circa 1922.

MWOA Notes

Star-Studded Music on Father's Day at Mount Wilson — Free Concert

The Sierra Chamber Players will present a public concert in the Mount Wilson Auditorium at 2:00 P.M. on Sunday, June 18. The afternoon of chamber music will feature Wolfgang Amadeus Mozart's "Eine Kleine Nachtmusik," "Duo for the Stars" (accordion and cello) by Nick Ariondo, a selection from Gustav Holst's "The Planets" arranged by Shelly Cohen, "Tango Indo-Serene" for string quartet and accordion by Nick Ariondo, and Arnold Schoenberg's "Transfigured Night" for string sextet. Dr. Janice Foy is the founder and cellist of the California-based Sierra Chamber Players. Dr. Foy is a cello/strings instructor at Azusa Pacific University and a California Council for the Humanities lecturer. The concert is sponsored by the Los Angeles County Arts Commission and the Recording Industries' Music Performance Trust Funds through the Professional Musicians Union Local 47. MWOA docents will lead tours of the Observatory before the concert (12:00 P.M.) and after the concert (4:00 P.M.). Pack a picnic for your family and treat Dad to a wonderful afternoon of chamber music on the mountain.

New Pasadena Museums Will Feature Mount Wilson



Plans are underway for two new Pasadena-area museums to devote significant space to Mount Wilson Observatory exhibits. The Pasadena Historical Museum (formerly the Pasadena Historical Society) is preparing a wing with exhibits devoted to Pasadena-area scientific achievements. Featured will be Mount Wilson, Caltech, JPL, and Pasadena industrial firms with a space/astronomy and science focus. The exhibits will be the initial stage in a longer-range plan — spearheaded by Dr. William Pickering, former director of JPL — to build a public state-of-the-art science center in the Pasadena area with a strong emphasis on the city's contributions to science, space exploration, and astronomy.

Information Please...

Will the individual who spoke to Don Nicholson at our February lecture about the possibility of the Observatory obtaining a small-scale vacuum system please call Don at (310) 476-4413.

A membership form may be found on page 8.

MWOA Membership Benefits

Associate, $20 — Includes newsletters (*Reflections* and *OverView*) plus participation in MWOA member events such as tours, star parties at Mount Wilson, and lectures.

Family, $30 — Permits family members in your household to participate in MWOA events.

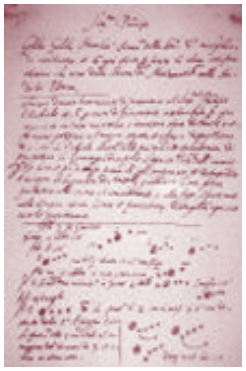
Sustaining, $100 — Includes all of the above, plus invitations to participate in special events, including observing nights on the 60-inch telescope.

Historical Astronomy

GALILEO'S DISCOVERY OF THE FOUR LARGE SATELLITES OF JUPITER

RON BAALKE

Probably the most significant contribution that Galileo Galilei made to science was the discovery of the four satellites of Jupiter that are now named in his honor. Galileo first observed the moons of Jupiter on January 7, 1610, through a homemade telescope. He originally thought he saw three stars near Jupiter, strung out in a line through the planet. The next evening, these stars seemed to have moved the wrong way. Galileo continued to observe the stars and Jupiter for the next week. On January 11, a fourth star (which would later turn out to be Ganymede) appeared. After a week, Galileo had observed that the four stars never left the vicinity of Jupiter and appeared to be carried along with the planet, and that they changed their position with respect to each other and Jupiter. Finally, Galileo determined that what he was observing were not stars, but planetary bodies that were in orbit around Jupiter. This discovery provided evidence in support of the Copernican system and showed that everything did not revolve around Earth.



Galileo's letter to the Prince of Venice (see page 4 for a partial translation). In the letter, Galileo emphasized the use of the telescope for maritime purposes, but the drawings he included were of Jupiter and its "stars."

Galileo published his observations in *Sidereus Nuncius* in March 1610: "...On the 7th day of January in the present year, 1610, in the first hour of the following night, when I was viewing the constellations of the heavens through a telescope, the planet Jupiter presented itself to my view, and ...I noticed ...that three little stars, small but very bright, were near the planet; ... they seemed to be arranged exactly in a straight line, parallel to the ecliptic, and to be brighter than the rest of the stars, equal to them in magnitude. ....on January 8th, ... I found a very different state of things, for there were three little stars all west of Jupiter, and nearer together than on the previous night. I therefore concluded... that there are three stars in the heavens moving about Jupiter, as Venus and Mercury around the Sun...."

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THE VIEW FROM MOUNT WILSON

ROBERT JASTROW
DIRECTOR,
MOUNT WILSON INSTITUTE

THE IMPORTANCE OF BEING *Juno*

Several dozen planets have been reported in the last two years to be circling other stars in the neighborhood of the Sun. Could these extrasolar planets be inhabited? No question in planetary science is more interesting. Unfortunately, the newly discovered planets do not resemble Earth, but appear to be giant bodies similar to Jupiter and offering an alien environment hostile to life as we know it. But are there other *earthlike* planets in the Universe — planets on whose surface the biological evolution of life might commence?

In our solar system, Jupiter is accompanied by three roughly earthlike planets, and it seems reasonable to assume that the newly detected Jupiters in other solar systems are also accompanied by Earths like ours. *But this is an assumption; Jupiters may be common in the Universe but Earths may be exceedingly rare.*

How can we estimate the number of earthlike planets — potential incubators of life — on the stars around us? We would have a good start on the answer to that question if we understood how earthlike planets are formed. According to current thinking, the earthlike planets in our solar system came into existence as the end-products of a process that started with small bits of rocky substance and iron circling the young Sun. The bits of matter collided under the attractive force of gravity to form bodies up to a few kilometers in diameter. Collisions among these kilometer-sized objects fused them into still larger bodies until, during the course of a million years, the larger bodies had swept up most of the smaller debris in the solar system and grown into bodies some hundreds of kilometers in diameter — bodies the size of large asteroids like Juno.

According to calculations by George Wetherill of the Carnegie Institution of Washington, the Juno-sized bodies played a critical role in the formation of Earth — and if Earths are common in other solar systems, asteroids will probably play the same role in the formation of those Earths as well. Wetherill's findings indicate that earthlike planets grew by repeated collisions of the Juno-sized objects with the planetary debris circling the Sun in neighboring orbits. Eventually all the debris had been swept up into three or four bodies the size of the Earth, Mars, and Venus. Thus, the Juno-sized asteroids were the nuclei of the earthlike planets.

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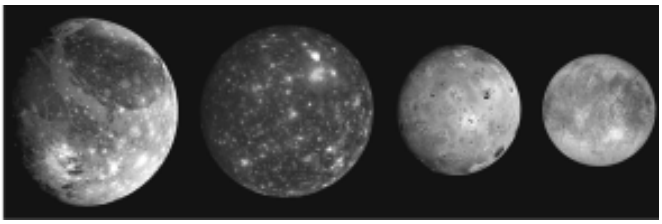
GALILEAN SATELLITES — FROM PAGE 3



NASA/JPL

The Galilean satellites, photographed by the Galileo spacecraft. Left to right: Ganymede, Callisto, Io, and Europa.

Simon Marius claimed to have observed Jupiter's moons in late November 1609 (about five weeks prior to Galileo) and had begun recording his observations in January 1610 at about the same time Galileo was first making his observations. However, since Marius did not publish his observations right away as Galileo had done, his claims were impossible to verify. Since Galileo's work was more reliable and extensive, he is generally given the credit for discovering the moons of Jupiter. In 1614, Marius did provide the names for Jupiter's large moons that we are familiar with today, based on a suggestion by Johannes Kepler.

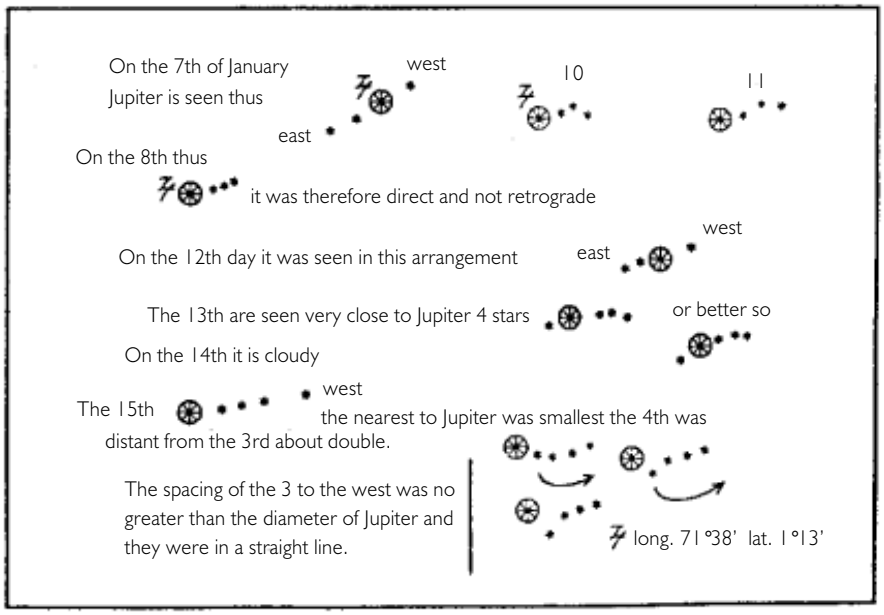
Galileo called the Jupiter's moons the "Medicean planets," after the Medici family, and referred to the individual moons numerically as I, II, III, and IV.

Galileo's naming system was used for a couple of centuries. It wasn't until the mid-1800s that the names of the Galilean moons — Io, Europa, Ganymede and Callisto — would be officially adopted, and only after it became very apparent that naming moons by number would be very confusing as additional moons were being discovered.

This description of the discovery of the Galilean satellites appears on the JPL Galileo project Web site at: http://www.jpl.nasa.gov/galileo/ganymede/discovery.html/. MWOA Vice President Mike Simmons contacted Ron Baalke at JPL, who gave permission to print it as an article in Reflections.

In an article in the December 1999 Reflections, *Don Nicholson described how his father, Seth Nicholson, joined Galileo as a discoverer of four satellites of Jupiter (9th through 12th). The December 1999 issue is posted on the MWOA Web site in PDF format.*

Translation of Galileo's notes on his drawings in his letter to the Prince of Venice.



VIEW FROM MOUNT WILSON — FROM PAGE 3

Note that there are no special assumptions in this scenario — no circumstances that would not occur in all newly forming solar systems. If collisions with Juno-sized bodies are the key to the formation of Earth, every solar system should have Earths as well as Jupiters.

Recent Mount Wilson observations of Juno have provided support for Wetherill's picture of earthlike planets formed by collisions. High-resolution images — taken at four different wavelengths and in the infrared with the adaptive optics system on the 100-inch telescope — show clear evidence for a collision between Juno and a smaller asteroid. The impact crater can be seen clearly, as well as the mineralogical evidence for a collision. The Mount Wilson results on Juno lend support to Wetherill's theory and to the idea that Earth-sized planets commonly form in a young solar system. With more than a million trillion sunlike stars in the observable Universe, that means trillions of earthlike planets are circling these stars. While it is still possible to believe that our Earth is the only one of these trillions that has life, with odds like this that does not seem likely — unless, of course, the probability of life evolving in a friendly environment is so small as to be essentially a miracle.

That leads to the final question: How many of these trillions of earthlike planets are inhabited? What is the probability of life arising out of inanimate matter? The Mount Wilson telescope cannot answer that question. The answer will come if and only if NASA spacecraft discover life or the remains of life on another planet in our solar system. If life has evolved independently on two planets out of nine in our solar system, that sets the *a priori* probability of the emergence of life at roughly two-ninths. That would imply that trillions of inhabited earthlike planets exist in the known Universe — and the majority of those inhabited planets could bear life billions of years older, and possibly more advanced and more intelligent , than Homo sapiens.

RJ

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A Really BIG Lens

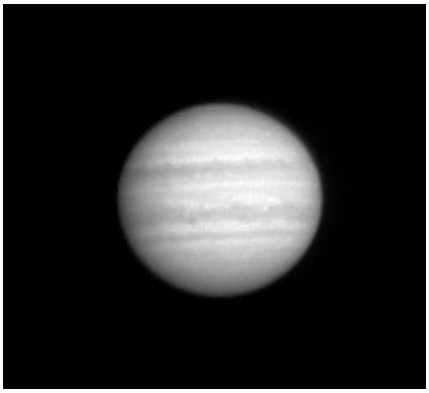
DIGITAL ASTRO-PHOTOGRAPHY ON THE 60-INCH TELESCOPE

COLLEEN GINO
SCOTT W. TEARE

Currently, the 60-inch telescope at Mount Wilson Observatory is primarily used for group visual observing sessions. With the first observing season of the "new millennium" about to begin, we would like to encourage those of you who attend these observing sessions to try your hand at a new twist on an old standard — digital astrophotography.

Certainly, astrophotography on the 60-inch is nothing new. The first photographs were taken on December 20, 1908, only 12 days after the telescope saw its first light. Moreover, glass-plate photography occupied a large portion of the scientific program in the early years of the telescope's operation. Among these images was the first to resolve individual stars in galaxies other than our own. Photographs taken on the 60-inch over the years adorn the pages of many scientific and popular publications, including Burnham's three-volume *Celestial Handbook*.

While glass-plate photography has fallen by the wayside, a certain amount of film photography continues today. Many regular observers use single-lens reflex (SLR) cameras to take astrophotos. With the eyepiece of the telescope removed, the camera body is attached directly to the telescope with a special adapter, turning the 60-inch into a huge camera lens. Planetary images obtained in this fashion by MWOA member Anthony Obra have appeared in the magazine *Astronomy*.



Jupiter image taken by the authors using a Sony Mavica FD-91 camera through the 4" 100mm eyepiece on the 60-inch telescope.

Nor is digital photography unknown to the 60-inch telescope. Various programs have used charge-coupled device (CCD) cameras to acquire scientific data. For example, the 1990s saw the operation of the Atmospheric Compensation Experiment (ACE), an instrument developed by Lincoln Laboratories and the Itek Corporation, then loaned to Mount Wilson Observatory for use on the 60-inch. ACE, which provided Mount Wilson with an early testbed for adaptive optics, relied upon digital CCD cameras.

Most recently, the 60-inch has been used for the Selective Image Reconstruction (SIR) method developed by Ron Dantowitz and Marek Kozubal of the Museum of Science, Boston, and Scott Teare of the University of Illinois. SIR combines the use of a video-frame rate (or higher speed) CCD camera and computerized frame selection and alignment programs to produce high-resolution images of celestial objects. It is common when using the SIR technique to record hundreds of thousands of data frames and then select only a few hundred images that meet the requirements for the recombination process. While this may seem inefficient, the SIR technique produces images that are comparable to those from much more sophisticated imaging techniques at a fraction of the cost and complication.

SIR images taken using the 60-inch telescope have appeared in many popular astronomy publications, and the first scientific articles have been accepted for publication.

While digital imaging with either a CCD or video camera may yield impressive results, neither method is feasible for use during a group observing session. The time needed to attach such complicated systems to the telescope would certainly produce a long line of disgruntled observers! Therefore, we propose a more straightforward approach — astrophotography using a digital camera.

Digital cameras are becoming ubiquitous; many of you may already own one. Those of you who don't own one have likely considered purchasing one. The quality of these cameras continues to improve while the price continues to drop. It is common knowledge that digital cameras provide a simple and inexpensive way to take snapshots. But don't overlook their ability to be used for astro-imaging.

The method we employ is extremely simple. As the typical digital camera does not have a removable lens, afocal projection is used. First, focus the image

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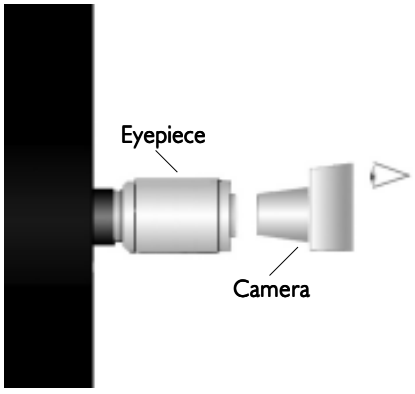


A simple method of using a digital camera with the telescope's eyepiece.

DIGITAL ASTROPHOTOGRAPHY — FROM PAGE 5

in the telescope's eyepiece as you would for visual observation. We have found that the 4-inch 100mm eyepiece works the best for this application. Next, manually set the focus on the camera to infinity. Then simply handhold the camera to the telescope's eyepiece, adjusting the alignment and distance of the camera from the eyepiece, until the image appears in the camera's viewfinder (see the diagram on page 5). When you have the object focused and framed to your satisfaction, take the image. We suggest taking a variety of images with different exposure settings if your camera allows.

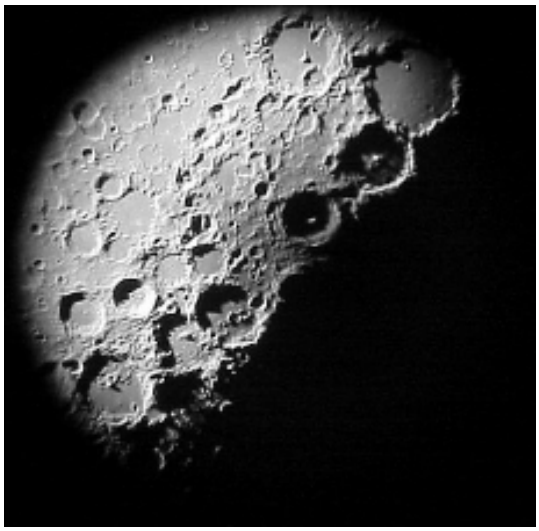
The benefits of this type of photography are many, most notably the savings in film and development costs. Without this concern, one feels free to take unlimited exposures and experiment with different camera settings. Also, the image can be viewed immediately in the LCD screen of the camera. Finally, since no special adapters are needed to attach the camera to the telescope, one can acquire images quickly, a definite advantage when observing with a large group.

Admittedly, there are a few drawbacks as well. The higher-quality cameras capable of producing high-resolution images are not inexpensive, ranging in price from about $500–$1000 or more. In addition, with few exceptions, digital cameras are not able to take exposures longer than a fraction of a second. Therefore, the objects suitable for this type of photography are limited in number. We have obtained excellent results with the Moon, the planets, and double stars. We have had some success with bright globular clusters and bright, compact objects such as planetary nebulae. Faint, diffuse objects cannot be captured satisfactorily in this manner.

Digital cameras provide a quick and simple way to augment your visual observing experience and to see astrophotography continue on the 60-inch telescope. So when you are packing your bag for your next observing session, don't forget to include your digital camera!

Colleen Gino is a Solar Observer at the 150-foot solar tower operated by UCLA. Dr. Scott Teare is an astronomer with the University of Illinois developing the laser guide star adaptive optics system on the 100-inch telescope.

The authors collaborated on a previous article, "Visual Observing on the 60-inch Telescope," for the December 1999 issue of Reflections.



Another example of digital astrophotography by the authors: the Moon, captured by a Sony Mavica FD-91 camera through the 4" 100mm eyepiece on the 60-inch telescope.

To view more images taken on the 60-inch telescope with a digital camera, visit this Web site: http://www.astrophys-assist.com/wilobs

Mount Wilson Historical Calendar for 2000 Still Available!

As in the past, the calendar contains 12 historic photos related to astronomy on Mount Wilson, plus historical dates of interest and astronomical events for the year. To order, make your check payable to Mount Wilson Institute (not MWOA) for $12 per calendar. The price includes shipping, and $8 is tax-deductible as a contribution to the Mount Wilson Observatory. Mail your check for the 2000 Mount Wilson Historical Calendar to: Mount Wilson Institute, Hale Solar Laboratory, 740 Holladay Road, Pasadena, CA 91106.

Mount Wilson Helps The Futures Channel Set Its Sights on the Stars

The Futures Channel, a new Internet-based, digital-content service for educators, will produce and distribute multimedia educational resources featuring Mount Wilson Observatory. The agreement will enable students and teachers to share in observations from Mount Wilson instruments, including the 100-inch Hooker telescope and the new CHARA interferometer.

"Our partnership with The Futures Channel gives us a way to allow students in America and around the world to share in the Observatory's discoveries," said Sallie Baliunas, Mount Wilson Institute Deputy Director. The Futures Channel currently has over 1,000 hours of award-winning media assets to provide teachers with digital video content they can use to connect math, science, technology and the arts to the real world of careers and achievement. Visit the Web site at: http://www.thefutureschannel.com/

BULLETINS

PROGRAMS AND EVENTS OF GENERAL INTEREST ACROSS THE SCIENCE SPECTRUM

★ Compiled by Laura Eklund

LECTURES

• Thu., Mar. 16, 7:00 P.M., JPL von Kármán Auditorium (repeats Fri., Mar. 17, 7:00 P.M. at The Forum, Pasadena City College): panel discussion of "Mars in the Mind of Man." Free. Info: (818) 354-5011.

• Fri., Mar. 17 or 31, 8:00 P.M., Santa Monica College: "Surf's Up: Wild Water in the Solar System" in John Drescher Planetarium, Rm. 223, Technology Bldg. $4. (Preceded at 7:00 P.M. by "The Night Sky Show," $4 or $7 for both shows.) Speaker: Jon Hodge (SMC Planetarium Director). Info: (310) 434-4223.

• Sat., Mar. 18, 7:00 P.M., The Local Group Astronomy Club of Santa Clarita Valley: Mona Delitsky (of JPL) on "Space Missions to the Planets." Placerita Canyon Nature Center. Take Placerita Canyon Road 1-1/2 miles east from State Rte. 14 (Antelope Valley Fwy.). Free. Info: (818) 895-1983.

• Fri., Mar. 24, 8:00 P.M., Santa Monica College: Costas Synolakis (USC Tsunami Center) on "The Tsunami Threat" right here in Southern California. SMC Concert Hall. $4. (Preceded at 7:00 P.M. by "The Night Sky Show" in John Drescher Planetarium, Technology Bldg., Rm. 223, by SMC Planetarium Director Jon Hodge, $4 or $7 for both shows.) Info: (310) 434-4223.

• Fri., Apr. 7, 7:30 P.M., South Bay Astronomical Society: Gary Peterson (SDSU) on geology of the Martian Desert, El Camino College Planetarium, Manhattan Beach Blvd., one block west of Crenshaw Blvd., Torrance. Free. Info: (310) 377-9834.

STAR PARTIES

• Through Mar. 29: Astrofest 2000 branch programs (star parties around Los Angeles at branch libraries of LAPL). Info: Dana Eklund at (323) 263-6902.

• Sat., Apr. 8, 2:00 P.M.–11:00 P.M., Griffith Observatory lawn. Info: (323) 664-1191.

CLASSES

• Wed., Apr. 5–Jun. 21, 7:00–10:00 P.M., UCLA Extension class: "God and Nature — Religion and Science from Copernicus to Darwinism: Selected Topics in History of Science" taught by Amir R. Alexander. 3150 Bunche Hall. Fee: $315 (4 units credit) or $195 (noncredit). Info: (310) 825-9971.

• Thu., Apr. 6–Jun. 22, 7:00-10:00 P.M., UCLA Extension class: "Astronomy: Nature of the Universe" taught by Simon Balm. 5273 Boelter Hall. Fee: $315 (4 units). Info: (310) 825-9971.

THEATER

• Through Apr. 9 (Wed.–Sat. 8:00 P.M.; Sun. 7:00 P.M.; matinee Sun., Mar. 26, 2:00 P.M.), Odyssey Theatre Ensemble (2055 S. Sepulveda Blvd., Los Angeles) presents "Night Sky" (brilliant female astronomer injures head and begins to experience reality in a new way). Tickets: $18.50–$22.50. Info: (310) 477-2055.

TELEVISION (ONGOING, EVERY WEEK)

• Bill Nye the Science Guy — KABC (Ch. 7): Sat. 6:00–6:30 A.M.

• Universe: The Infinite Frontier — KOCE (Ch. 50): Sat. 8:00–9:00 A.M.; KVCR (Ch. 24): Fri. 5:00–6:00 P.M. (repeats Mon. 6:00–7:00 A.M.).

• Jack Horkheimer: Stargazer — KVCR (Ch. 24): Sat. 9:55–10:00 A.M. (repeats Sun. 11:30–11:35 P.M.).

• Beakman's World — KCAL (Ch. 9): Mon.–Fri. 8:30–9:00 A.M.

• Real Science — KLCS (Ch. 58): Mon. 11:30 A.M.–noon.

• Newton's Apple — KLCS (Ch. 58): Tue. 2:30–3:00 P.M.

• 3-2-1 Classroom Contact — KLCS (Ch. 58): Wed. 9:45–10:00 A.M. and Fri. 4:45–5:00 P.M.

• Inquiring Minds — KLCS (Ch. 58): Thu. 4:20–4:30 P.M.

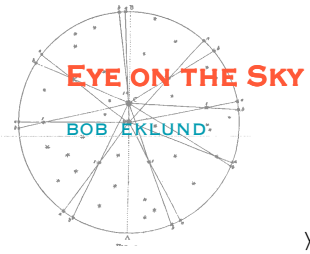
RADIO (ONGOING, EVERY WEEK)

• Stardate — KPCC (89.3-FM): weekdays 9:04–9:06 A.M., weekends 8:58–9:00 A.M.; KNX (1070-AM): 8:54–8:56 P.M.

• Exploration — KPFK (90.7-FM): Thu. 2:00–2:30 P.M. (first half), Sun. 6:00–7:00 P.M. (entirety).

• Talk of the Nation: Science Friday — KPCC (89.3-FM): Fri. 11:00 A.M.–1:00 P.M.

• Hour 25 — KPFK (90.7-FM): Fri. 11:00 P.M.–midnight.



ARC TO ARCTURUS Every year at this time, my favorite star returns to the evening sky — Arcturus, whose name, derived from the Greek, means "bear-guard" or "guardian of the bear." Arcturus is the fourth-brightest star, after Sirius, Canopus, and Alpha Centuri. To find it, start from the Big Dipper's handle and continue its curve in an arc, southward for a distance about twice the handle's length. The first bright star you come to will be Arcturus. This star has the distinction of being mentioned in the Bible (Job 38:32, King James version) and was also the first star to be observed in broad daylight (in 1635). In May 1933, the Yerkes Observatory's 40-inch refractor was pointed at Arcturus and its light, shining on a photocell, tripped the light-switch to open the "Century of Progress" World's Fair in Chicago. At that time, this red giant star was thought to be 40 light-years from Earth, and the idea was to open the 1933 fair with starlight that had left Arcturus exactly when the previous Chicago fair — the 1893 Columbia Exposition — had closed. It was a great idea, even though more exact parallax measurements now show Arcturus' distance to be 36, not 40, light-years.

Mount Wilson Observatory Association
P. O. Box 70076
Pasadena, CA 91117

First-Class Mail

DIRECTIONS TO MOUNT WILSON

From the 210 freeway, follow the Angeles Crest Highway (State Highway 2 north) out of La Cañada/Flintridge for 14 miles to Red Box–Mount Wilson Road; turn right, and go another 5 miles to the Observatory gate, marked Skyline Park. Walk in on the Observatory access road (far left side of parking lot) about 1/4 mile to the Observatory area. The Museum is opposite the 150-foot solar tower. The Skyline Park–Observatory area is open to the public only on weekends. The U.S. Forest Service requires those parking within the Angeles National Forest to carry a "Forest Adventure Pass." It can be purchased for $5 (one day) or $30 (season) at Clear Creek Ranger Station or Red Box Ranger Station, or at major sporting goods outlets such as Sports Chalet.

Membership Benefits – see page 2

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