FALL QUARTER / SEPTEMBER 2001

MOUNT WILSON OBSERVATORY ASSOCIATION

REFLECTIONS

MWOA Public Lecture Series at Mount Wilson

THE SUN: BENIGN NUCLEAR POWER FOR HUMANS AND NATURE

Inventor and visionary **Paul B. MacCready**, founder and Chairman of the Board of AeroVironment in Monrovia, California, will be MWOA's featured speaker on **Saturday, September 22**, at the Mount Wilson Museum Auditorium. The free talk begins at 1:30 P.M., with refreshments served at 1:00 P.M. in the Museum. Observatory grounds are open from 10 A.M. to 4 P.M. on weekends. There is a map to Mount Wilson on page 8.

Paul MacCready began building model airplanes as a youngster, won soaring championships in the post-war years, and worked on sailplane and glider technology. He earned a B.A. in physics from Yale, and an M.A. in physics and a Ph.D. in aeronautics from Caltech. In 1971, he started AeroVironment, which provides products in the fields of alternative energy, energy-efficient vehicles, and unmanned aerial vehicles. In the 1970s, his "Gossamer Squadron" successfully built and flew the human-powered aircraft Gossamer Condor and Gossamer Albatross (see page 5 for more on human-powered flight).

NICK GALANTE/PMRF

AeroVironment's solar-powered Helios Prototype flying wing on July 14, 2001, over the Pacific Ocean on its first test flight. The 18-hour flight from the U.S. Navy's Pacific Missile Range Facility, Kauai, Hawaii, was in preparation for the attempt to reach sustained flight at 100,000 feet altitude. On August 13, 2001, Helios flew to more than 96,500 feet, achieving status as the highest-flying nonrocket-powered aircraft in the world. The true airspeed was about 21 mph during take-off, reaching about 170 mph at peak altitude.

Renewable, nonpolluting energy sources are a long-term interest. In an article in the Fall 1987 issue of Caltech's *Engineering and Science* magazine, MacCready wrote that "In the end, technology does not exist by itself. Rather, it fits into a global, ethical framework, where serious, complex questions and concerns arise related to the survival of

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Saturday, September 22, 1:30 P.M.
MWOA Public Lecture

Mt. Wilson Museum Auditorium

★ **Paul MacCready**

His team's solar-powered aircraft, *Helios,* recently broke a world altitude record. Join us for light refreshments at 1:00 P.M.

MWOA Observing Nights on the 60-inch Telescope

★ **Saturdays: October 13 and November 10**

Call Don Nicholson at (310) 476-4413 to reserve. You must be a MWOA Sustaining Member; see page 2.

Saturdays, 1:30 P.M.
MWOA Public Lectures

Mt. Wilson Museum Auditorium

★ **September 22, October 27**

Free talks start at 1:30 P.M., with refreshments at 1:00 P.M.

CALENDAR

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.

PAGE ONE BANNER PHOTOGRAPH

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

MWOA Notes

CUREA Students Provide Program for MWOA Lecture

On August 25, the students taking part in this year's CUREA (Consortium for Undergraduate Research and Education in Astronomy) program discussed projects they worked on during their stay at Mount Wilson. The two-week live-in educational session had three students instead of the usual six, but a very good time was had by all, according to Mike Simmons, MWOA Vice President and a member of the CUREA faculty. The session was also taught by Joe Snider (who founded the CUREA program in 1990) and Michael Faison, the program's new Director. For their study and research projects, the students used the historic Snow solar telescope, the 60-inch reflector, and the new 16-inch Meade Schmidt-Cassegrain telescope equipped with a SBIG SBS spectrograph and CCD camera. The session also included field trips to JPL, Caltech, the Hale Solar Lab, and Palomar.

This year's students were Jennifer Dahlberg, who is transferring this fall from El Camino College to begin her junior year with the UCLA Astronomy Department; John Potapenko, who is beginning his senior year as a physics major at the University of California–Berkeley; and Greg Ryshen, who just completed his undergraduate degree in physics at Kent State University in Ohio and is beginning graduate work at Ball State University in Indiana.

Mike Simmons and Michael Faison kicked off the August 25 presentations with background and highlights of the CUREA program, after which John presented his work on measuring magnitude vs. temperature (color) in stellar clusters, and Jennifer described her photography of the solar spectrum with the Snow telescope and 3-color CCD stellar imaging with the 16-inch. Greg, who had to fly east to begin school before the August 25 event, gave a video presentation in absentia about his work with spectroscopic binaries.

For more information on CUREA, see their web site: http://curea1.mtwilson.edu

The Other Things Greg Smith Has Been Up To

In our August *OverView*, we announced the new book by MWOA Treasurer Greg Smith, *Practical Computer-Aided Lens Design*, published by Willman-Bell, Inc. What we didn't know when we said that Greg has been "holed up at home writing a book" is that he has two additional books in the works (with co-author Richard Berry, former Editor of *Astronomy* magazine) — one on lens design for telescopes and the other on camera lenses. In addition, Greg has set up an optical design consulting business, with JPL as a client. During the past year, he designed all the camera lenses for JPL's next Mars rovers, scheduled to be launched in 2003 on NASA's MER (Mars Exploration Rover) mission.

ARTIST'S CONCEPT OF MARS EXPLORATION ROVER — NASA/JPL

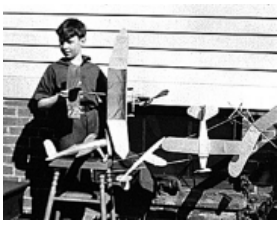
MWOA Membership Benefits

A membership form may be found on page 8.

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, such as observing nights on the 60-inch telescope.



Paul MacCready, 1937: "I somehow got especially interested in a large variety of models." He went on to design human-powered and solar-powered aircraft.

humankind, nature, and civilization." MacCready's interest in technology and its uses led him to experimentation in alternative energy sources, and in particular, use of the Sun. As he notes, sunlight has been the dominant source of energy for mobile and stationary life on Earth. Direct heating, photosynthesis of vegetation on which the food chain is built, and the weather's wind and hydro cycles all derive from this inexhaustible energy source. Civilization has become increasingly dependent on fossil fuels — oil, gas, and coal — that represent the stored energy of the sunlight of millions of years ago. These fossil fuels are not renewable on a human time scale, and introduce environmental, political, and resource limitation pressures. Priority is rising on using energy much more efficiently so much less is needed, and on making renewable energies more economical and available.

Electricity from local photovoltaic cells is proving to be an especially attractive energy source. Examples will be given of present photovoltaic-powered stationary systems (such as battery charging, radio relay links, and water pumping), and flying devices (including AeroVironment's 247-foot wingspan *Helios* airplane that recently flew to an altitude of 96,500 feet). You won't want to miss this fascinating talk.

Paul MacCready and the solar-powered Sunraycer, AeroVironment's first land vehicle, built for GM and Hughes Aircraft. The goal was to advance transportation technology that makes fewer demands on Earth's resources and environment. The Sunraycer won a 1,867-mile race across Australia in November 1987, averaging 42.6 mph, 50 percent faster than the second-place vehicle. According to Engineering and Science *magazine (Fall 1987), the Sunraycer scored the lowest drag coefficient ever recorded in Caltech's 10-foot wind tunnel.*

Sun Power at Mount Wilson: C.G. Abbot's Solar Cooker

Mount Wilson Observatory's original name, from December 1904 until completion of the 100-inch Hooker telescope, was the Mount Wilson Solar Observatory. Indeed, our Sun was the major preoccupation of the Observatory's founder and Director George Ellery Hale throughout his early career, culminating in his discovery of solar magnetic fields in sunspots with the 60-foot tower telescope in June 1908, and solar research remained his first love for the rest of his life.

None of Hale's early associates shared his enthusiasm for the Sun more fully than Charles G. Abbot, Director of the Smithsonian Astrophysical Observatory. Abbot was possessed with the desire to measure the exact amount of energy the Sun put out — called the "solar constant" — and to determine whether the Sun's energy fluctuated over time. He first came to Mount Wilson on a Smithsonian expedition shortly after the Observatory's founding, and for many years he was to return each summer to the laboratory he had set up, on the south ridge of the mountain just below the "Monastery," to conduct his classic experiments on the determination of the solar constant.

Here, too, Abbot worked on his "solar cooker," which he felt sure would revolutionize methods of cooking and heating. Abbot describes the cooker in his 1925 book, *The Earth and the Stars*: "The whole cooking operations of a small family, including baking, boiling, stewing, and preserving, were done regularly with the solar cooker. A cylindrical mirror focused the sun's rays upon a blackened tube, parallel to the earth's axis, and containing engine cylinder oil. A simple clockwork kept the mirror facing the sun all day long. The oil, becoming hot, expanded, and thus maintained a gravity circulation through a reservoir above the level of the mirror. Two ovens inserted in this reservoir were bathed by the hot oil, and reached temperatures high enough to bake bread. Being well protected from loss of heat, the ovens kept hot over night, so that cooking could go on at any time, despite occasional clouds. This device was interesting and worked well, but was too expensive for general use without modification."

In an earlier book (*The Sun*, 1911), Abbot points out that solar water heating from rooftop heaters was at that time "much used in Southern California, and doubtless elsewhere, as a means of providing warm water. Such devices ordinarily furnish a considerable supply of water too hot to bear the naked hand in, and save the discomfort of fire in warm weather." Abbot also notes that a solar machine, patented by A. G. Eneas, was in use for a few years after 1901 at the Cawston Ostrich Farm in South Pasadena for pumping water.

Finally, Abbot points out that solar cooking is not exactly a new idea. In 1837, during astronomer Sir John Herschel's sojourn at the Cape of Good Hope, Herschel performed numerous experiments with a "hot box" — a small mahogany box blackened inside, covered with window glass, exposed perpendicularly to the sun's rays and insulated with sand heaped around the box, which reached an interior temperature as high as 248 degrees Fahrenheit. Herschel is quoted as follows: "As those temperatures far surpass those of boiling water, some amusing experiments were made by exposing eggs, fruit, meat, etc., in the same manner, all of which, after a moderate length of exposure, were found perfectly cooked — the eggs being rendered hard and powdery in the center; and on one occasion a very respectable stew of meat and vegetables was prepared and eaten with no small relish by the entertained bystanders."

— Bob Eklund

Book Review

MWOA member Donald Osterbrock's latest book, a biography of the noted Mount Wilson astronomer Walter Baade, will be available in October from Princeton University Press. In view of the great importance of Baade in the history of the Observatory, we are providing this prepublication review.

Walter Baade: A Life in Astrophysics

Donald E. Osterbrock

Although less well known than Edwin Hubble, Walter Baade was arguably the most influential observational astronomer of the 20th century. Written by a fellow astronomer deeply familiar with Baade and his work, this is the first biography of this major figure in American astronomy. The author suggests that Baade's greatest contribution to astrophysics was not, as is often contended, his revision of Hubble's distance and age scales for the universe. Rather, it was his discovery of two distinct stellar populations: old and young stars. This discovery opened wide the previously marginal fields of stellar and galactic evolution research that would be among the most fertile and exciting in astrophysics for decades to come.

Baade was born, educated, and gained his early research experience in Germany. He came to the United States in 1931 as a staff member of Mount Wilson Observatory, which housed the world's largest telescope. There, he pioneered research on supernovae. With the 100-inch telescope, he studied globular clusters and the structure of the Milky Way, every step leading him closer to the population concept he discovered during the wartime years, when the skies of southern California were briefly darkened. Most Mount Wilson astronomers were working on weapons-development crash programs devoted to bringing Baade's native country to its knees, while he, formally an enemy alien in their midst, was confined to Los Angeles County but had almost unlimited use of the most powerful telescope in the world.

After his great discovery, Baade continued his research with the new 200-inch telescope at Palomar. Always respected and well liked, he became even more famous among astronomers as they shifted their research to the fields he had opened. Publicity-shy and seemingly unconcerned with publication, however, Baade's celebrity remained largely within the field. This accomplished biography at last introduces Baade and his important work to a wider public, including the newest generation of skywatchers.

Donald E. Osterbrock is Professor Emeritus of Astronomy and Astrophysics at the University of California, Santa Cruz, and former Director of the Lick Observatory. He is the author or coauthor of *Yerkes Observatory, 1892–1950: The Birth, Near Death, and Resurrection of a Scientific Research Institution; Pauper & Prince: Ritchey, Hale, & Big American Telescopes; Astrophysics of Gaseous Nebulae and Active Galactic Nuclei;* and *Eye on the Sky: Lick Observatory's First Century.* He coedited *Origins and Extinctions.*

George Ellery Hale Accepts the 100-inch Mirror Blank

March 4, 1913

M. Delloye, Director General
French Plate Glass Companies
No. 1 Place des Saussaies, Paris

Dear Sir:

After a long series of tests, in which difficulties not experienced with any previous disks of glass have been encountered, we have at last found that the 100-inch disk can be used in the telescope, if a special form of edge-support is provided. In all of the tests of this disk made prior to a recent date, the figure was found to be materially changed when the disk was rotated 90 [degrees]. The edge-support was of the type used for our 5-foot disk, and there was every reason to suppose that no difficulty could enter from this source. It was finally found, however, that this particular disk of glass is extremely sensitive when supported on the edge, and that exceptional care must be taken to make the point of support lie at a certain distance, determined by experiment, between the front and back surfaces of the disk. When supported in this plane, the disk exhibits the same figure in both positions used for testing.

In view of the extreme difficulty and expense of securing a more homogenous disk, I feel that it will be probably safe to use this one, provided that unusual care is taken in the matter of the edge-support. We are therefore proceeding with the optical work on the disk, and within a few days I will send you our draft for $5000., the sum for which you offered to sell it.

While I wish that it had been possible to manufacture a disk free from all internal flaws, I want to express our hearty appreciation of the continued interest you have taken in a difficult undertaking of no commercial advantage to your company. I feel that your attitude has been due to your interest in the problem as a contribution to science, and beg to thank you in the name of the Observatory for the repeated efforts your company has been willing to make, at great expense, in the attempt to secure perfection.

Believe me, with sincere regards,

Yours very faithfully,

[George Ellery Hale]

Director.

An Aviation First

BRYAN ALLEN — ON GOSSAMER WINGS

BOB EKLUND

This photo of the Gossamer Condor was taken by Judy MacCready during the first turn of the August 23, 1977, Kremer Prize–winning flight.

Bryan Allen has a rare distinction among humans. Like Icarus and Daedalus, he has flown like a bird — under his own power — but unlike those daredevils of Greek mythology, Allen lived to tell the tale.

He had the honor — and the extremely hard job — of pedaling Paul B. MacCready's Gossamer Condor on the first sustained human-powered flight, and later taking the Condor's successor, the Gossamer Albatross, on an incredibly difficult first flight across the English Channel.

The Gossamer Condor's historic flight was 24 years ago — August 23, 1977 — and today, from the relative stability of an office at JPL, Allen designs software interfaces so that the robotic rovers of NASA's 2003 Mars Exploration Rover mission may make it safely to Mars.

Flight of the Condor

Dr. MacCready conceived the idea of building a human-powered aircraft in July 1976. Back in 1959, the British industrialist Henry Kremer had established the Kremer Prize to be awarded to the first person to achieve sustained, controlled human-powered flight. The prize was originally set at £10,000, but as the years passed with no winners the value increased periodically for added incentive until, by 1977, it had reached £50,000.

MacCready took a radically different approach to design than previous contenders for the prize. Whereas others had generally started with a conventional airplane and tried to make it lighter, he decided to start from a hang glider, keep its weight about the same but scale the wingspread up to the point where a human could keep it in flight. This approach was natural to MacCready, as he was experienced at flying hang gliders and sailplanes (he was the country's first World Champion sailplane pilot).

Allen's involvement with the project was a case of being in the right place at the right time. Born and raised in California's Central Valley, he went to college in Bakersfield, took up both hang gliding and bicycle racing, and then found himself temporarily unemployed. Meanwhile, the Gossamer Condor was being test-flown at an airfield nearby, and Allen began dropping by to watch whenever he could. MacCready learned of Allen's qualifications and hired him for the job of lead pilot. "There were other contenders for the job who were stronger cyclists, but I had the advantage of also being an experienced hang glider pilot," Allen points out.

The Gossamer Condor — now on display at the Smithsonian Air and Space Museum along with Lindbergh's Spirit of St. Louis and other pioneering aircraft — is made of thin aluminum tubes covered with mylar plastic and braced with stainless steel wires. The leading edges are made of corrugated cardboard and styrene foam. One advantage of the Gossamer Condor over previous attempts at human-powered flight was the ease with which it could be modified or repaired. After a crash, it could be returned to flying condition within 24 hours, enabling the aircraft to be tested extensively and easily modified. The pilot sat in a semi-reclining position, with both hands free for the controls. One hand held a handle that controlled both vertical and lateral movement. For turns, the other hand moved a lever that controlled wires to twist the wing.

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Standing behind a wing of the Gossamer Condor, from left: Vern Oldershaw (chief builder), Bryan Allen (chief pilot; builder), Parker MacCready (backup test pilot), Jim Burke (builder; former manager of JPL Ranger program), Paul MacCready (designer, project leader, and builder). Photo by Don Monroe, summer 1977.

GOSSAMER CONDOR — FROM PAGE 5

"Flying this aircraft was an interesting feeling," Allen recalls. "The first few times you try it, it's a complete information overload because you have this very big aircraft — as large as a medium-sized airliner — that you're controlling. You have to do several things at once: You have to fly at a very precise speed, within 1/2 mph of the ideal speed of 10 mph. And because you're flying so slowly, if the aircraft starts to turn in any way, you have to make the control input many, many seconds before you can expect a response. You're typically flying only two or three feet off the ground, so you have to watch your altitude and pedal rapidly but very smoothly — and do all these things at once. It's about like trying to rub your stomach and pat yourself on the head at the same time!"

The Kremer Prize–winning flight, at Shafter Airport, Shafter, California, lasted 7 minutes, 27.5 seconds. The official circuit, a figure-8 course around pylons 1/2 mile apart with a 10-foot hurdle at the beginning and end, covered 1.15 miles. The Condor's flight speed was between 10 and 11 mph, with Allen developing 1/3 horsepower.

Pedaling to France

Shortly after the Condor's prize-winning flight, a new Kremer Prize of £100,000 was established — for the first human-powered flight across the English Channel. MacCready felt that with a more efficient design and better materials, he could create an airplane capable of the 22-mile crossing.

The Condor seen at its highest altitude ever flown — 20–25 feet above ground level. Typical altitude was about 4 feet. Photo by Ted Ancona, summer 1977.

"We came up with an airplane that was definitely more efficient and had lower power requirements," says Allen. The Gossamer Albatross, as the new craft was called, was completed in less than two years, with the help of DuPont sponsorship. Three airplanes were made — to allow backup in case of a water ditching — and shipped to the U.K.

At dawn on June 12, 1979, Allen took off from Folkstone, England, headed for France. At first the flight went well, with little wind or waves, and Allen was able to maintain an altitude of 4 feet off the water to take advantage of "ground effect" for the greatest efficiency. Midway through the flight, however, a headwind sprang up, raising waves, slowing the plane, and forcing Allen to fly several feet higher.

"This was the most physically grueling thing I've ever done in my life, and midway through the flight I decided I would never do it again under any circumstances," he recalls. "The flight had been expected to take two hours, and after that our instrumentation began to fail, the two-way radio failed, and — even worse — my water gave out at the end of the second hour." As it turned out, the flight took close to three hours. Physically exhausted long before reaching the French coast, Allen somehow managed to keep the Albatross airborne to reach the beach at Cap Gris Nez. "I was totally useless at the end of the flight," says Allen. "I had just enough energy to get the plane over the beach, stop pedaling, and glide to a landing. They had to help me out of the airplane."

Bryan Allen in summer 1977, standing next to the fuselage of the Gossamer Condor. A previous Condor wing and fuselage can be seen in the background. Photo by Don Monroe.

Bryan today, during a mountain bike ride in Death Valley, April 2000. Photo by Bryan Allen, self-timer.

All photos courtesy of Bryan Allen.

For more information on the Gossamer Condor, the Gossamer Albatross, and other interesting vehicles, see Paul MacCready's web site: http://members.aol.com/maccready/

An account of the Condor and Albatross flights may be found in the book *Gossamer Odyssey: The Triumph of Human-Powered Flight* by Morton Grosser (Houghton Mifflin, 1981).

ELSEWHERE

NON-MWOA EVENTS OF GENERAL INTEREST ACROSS THE SCIENCE SPECTRUM

★ Compiled by Laura Woodard Eklund

LECTURES

• Fri., Sep. 7, 7:30 P.M., monthly meeting of South Bay Astronomical Society: Steve Lindsay, Dan Trimble, and Joe Fierstein present "Astrophotography: A Learning Experience" at El Camino College Planetarium, the round building on the south side of Manhattan Beach Blvd. about a block west of Crenshaw Blvd. in Torrance. Free. Info: www.meteorite.com/sbas or (310) 377-9834.

• Fri., Sep. 7, 7:30 P.M., monthly meeting of Orange County Astronomers: Chris Butler on "Our Little Corner of the Galaxy" in Hashinger Hall, Chapman University, Orange. Free. Info: http://ocastronomers.org or (714) 751-6867.

• Fri., Sep. 7 or 14 or 21, 8:00 P.M., Santa Monica College planetarium show: "Strange Stars" in John Drescher Planetarium, Room 223, Technology Bldg. Admission: $4. (Preceded at 7:00 P.M. by "The Night Sky Show." Admission: $4, or $7 for both shows.) Speaker: SMC Planetarium Director Jon Hodge. Info: http://events.smc.edu/planetarium.html or (310) 434-4223.

• Sat., Sep. 8, 7:00 P.M. (not 8:00 P.M. as stated in August *OverView*), monthly meeting of "The Local Group" Astronomy Club of Santa Clarita Valley: Roy Mayhugh of Mayhugh Travel presents video of June 21 total solar eclipse in Zambia. Placerita Canyon Nature Center (from the 14 Freeway, take Placerita Canyon Road east about 1.5 miles to the park entrance on your right). Free. Info: www.lgscv.org or (661) 297-2612.

• Sat., Sep. 8, 7:30 P.M., monthly meeting of Riverside Astronomical Society: Gary Peterson of SDSU on "Why Is Mars Red?" in Cossentine Hall, La Sierra University, Riverside. Free. Info: www.rivastro.org or 909-342-2389.

• Sun., Sep. 9, 7:00 P.M., monthly meeting of the Los Angeles Valley College Astronomy Club: Rob Landis of JPL talks on the International Space Station in LAVC Planetarium, 5800 Fulton Ave., Van Nuys. Free. Info: (818) 947-2335.

• Mon., Sep. 10, 7:45 P.M., monthly meeting of Los Angeles Astronomical Society: Luisa Rebull speaks on observing variable stars. Planetarium theater, Griffith Observatory. Free. Info: www.laas.org or (213) 673-7355.

• Fri., Sep. 14, 7:30 P.M., monthly meeting of Santa Monica Amateur Astronomy Club: Brian Crandall on "Matter and Anti-matter in the Universe" in the community room, Herb Alpert Campus, west entrance of New Roads School, 3131 Olympic Blvd., Santa Monica. Free. Info: (310) 490-7727.

• Thu., Sep. 20, 7:00–8:30 P.M., Theodore von Kármán 2001 Lecture Series in von Kármán Auditorium, JPL (repeats Fri., Sep. 21, 7:00–8:30 P.M. at The Forum, Pasadena City College): Claudia Alexander of JPL on "Exploring and Writing about Life in the Universe" (what we know about extrasolar planets and what we can extrapolate about extraterrestrial life). Free (but $1 to park at PCC). Info: www.jpl.nasa.gov/lecture or (818) 354-0112.

• Fri., Sep. 21, 7:30 P.M., monthly meeting of Ventura County Astronomical Society: Dave Holland on "Astrophotography without a Telescope" in the Forum at Moorpark College, Moorpark. Free. Info: www.vcas.org.

• Fri., Sep. 21, 8:00 P.M., Los Angeles Valley College planetarium show: "The Fall Sky" in LAVC Planetarium, 5800 Fulton Ave., Van Nuys. Tickets ($2–$3.50) go on sale at 7:30 P.M. (no children under 8). Info: (818) 947-2335.

• Fri., Sep. 28, 8:00 P.M., Santa Monica College lecture: Michael Schwartz of SMC on "Using the Keck" (telescope in Hawaii to search for brown dwarfs) in Room 140, Science Bldg. Admission: $4. (Preceded by "The Night Sky Show" at 7:00 P.M. in John Drescher Planetarium, Room 223, Technology Bldg., by SMC Planetarium Director Jon Hodge. Admission $4, or $7 for both shows.) Info: http://events.smc.edu/planetarium.html or (310) 434-4223.

• Mon., Oct. 8, 7:45 P.M., monthly meeting of Los Angeles Astronomical Society: Daniel Winterhalter speaks on solar wind and space weather. Planetarium theater, Griffith Observatory. Free. Info: www.laas.org or (213) 673-7355.

• Through Dec. 9, Griffith Observatory planetarium show: "Oceans of Mars." Admission: $2–$4. Info: www.griffithobs.org or (323) 664-1191.

• Through Jan. 1, Griffith Observatory planetarium show for children (grades 1–3): "Voyage to the Planets."Admission: $0–$4. Info: www.griffithobs.org or (323) 664-1191.

CLASSES

• Mon., Sep. 10, 7:00–9:00 P.M., orientation for UCLA Extension travel study tour to India (Oct. 7–25): "Lunar Mansions, Sun Shrines, and Cosmic Mountains: Astronomy and Cosmovision in Ancient India" led by E.C. Krupp (Griffith Observatory Director). 204 Extension Lindbrook Center. Fee: $260 (3 units) plus $6 to park at UCLA plus $5,945 for travel and tour. Info: uclaextension.org or (310) 825-9971.

• Tue., Sep. 11–Oct. 16 (or Oct. 23–Nov. 27), 7:00–9:00 P.M., Palos Verdes Peninsula Unified School District Adult Education class: "Astronomy for City Dwellers" taught by Mike Mayerchak at Ridgecrest School. Fee: $65. Info: www.pvpusd.k12.ca.us or (310) 791-4698, ext. 298.

• Wed., Oct. 3–Dec. 12, 7:00–10:00 P.M., UCLA Extension class, Astronomy XL3: "Astronomy: Nature of the Universe" taught by Kevin Grazier of JPL in 5252 Boelter Hall. Fee: $340 (4 units) plus $6/day to park. Info: uclaextension.org or (310) 825-9971.

• Tue., Oct. 9–Nov. 6, 7:00–8:30 P.M., West Los Angeles College Extension class: "What's Up, Stargazers?" taught by Shelley R. Bonus of TIE. Fee: $59 (plus material fees of $12–$49). Info: www.wlac.cc.ca.us/westside/index.htm or (310) 287-4475.

STAR PARTIES & TELESCOPES

• Sep. 14–16: 9th Annual Nightfall (autumn dark-sky observing session sponsored by the Riverside Telescope Makers Conference) at Palm Canyon Resort in Borrego Springs. Fee: $5–$170. Info: www.rtmc-inc.org/2001nightfall.html or (909) 948-2205 or resort (800) 242-0044.

• Sat., Sep. 22, 2:00–10:00 P.M., Griffith Observatory: Public star party on the lawn. Info: (323) 664-1191.

• Daily except Mondays, dark–9:45 P.M., Griffith Observatory: 12-inch Zeiss refracting telescope open for viewing on clear nights. Free. Info: www.griffithobs.org or (323) 664-1191.

• Wednesdays, 7:30 P.M.: Los Angeles Astronomical Society hosts public star party at Garvey Ranch Observatory, Garvey Ranch Park, Orange Avenue, Monterey Park. Free. Info: www.laas.org or (213) 673-7355.

EXHIBITS

• Opening Sep. 21: "Explore the Universe" exhibition at Smithsonian's National Air and Space Museum, Washington, D.C. Includes Newtonian cage for 100-inch telescope on loan from MWO. Free. Info: www.nasm.si.edu or (202) 357-2700.

• Ongoing: "No One May Ever Have the Same Knowledge Again: Letters to Mount Wilson Observatory, 1915–1935" at the Museum of Jurassic Technology, 9341 Venice Blvd, Culver City. Hours: Thu. 2:00–8:00 P.M. and Fri.–Sun. noon–6:00 P.M. Donation: $0–$4. Info: www.mjt.org or (310) 836-6131.

Mount Wilson Observatory Association
P. O. Box 70076
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First-Class Mail

PAUL MACCREADY ON "THE SUN: BENIGN NUCLEAR POWER FOR HUMANS AND NATURE" MWOA LECTURE, SEPTEMBER 22

MWOA LECTURES AT MOUNT WILSON

The monthly MWOA free public lectures will be given at the Mount Wilson Museum Auditorium on September 22 and October 27.

WEEKEND OBSERVATORY TOURS

Continuing throughout Daylight Saving Time, MWOA docents will conduct tours of the Observatory each Saturday and Sunday. Tours begin at 1:00 P.M. at the Pavilion.

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 from 10:00 A.M. to 4:00 P.M. 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

JOIN THE MOUNT WILSON OBSERVATORY ASSOCIATION

Has Your Membership Expired?

Please check your mailing label! It shows the year and month your MWOA membership expires.

To Renew or Begin a New Membership —

Detach and mail this form with your check (payable to MWOA) in the amount for an Associate, Family, or Sustaining membership.

Name _____ Telephone _____

Address (Street/City/State/Zip) _____

Type of Membership (check one) ◯ Associate ($20) ◯ Family ($30) ◯ Sustaining ($100)

Make your check payable to MWOA, and mail to MWOA, P. O. Box 70076, Pasadena, CA 91117.