



the Webfooted Astronomer

Seattle Astronomical Society • August 2003

August Meeting

Speaker: Dr. Jackie Alan Giuliano

Take it Outside! Innovative
Astronomy Education Strategies

Wednesday, August 20
7:30 p.m.

Physics-Astronomy Building
Room A102
University of Washington
Seattle

Come early at 7 p.m. for coffee
and snacks and to visit with your
fellow members!

August Meeting: Innovative Approaches to Astronomy Education

Jackie Giuliano, Ph.D., is the commentary columnist for the Environment News Service and he has written over 200 commentaries on environmental issues and space exploration that are read internationally. Currently on the faculty at Antioch University, and the University of Phoenix at Washington campus, Dr. Giuliano has been teaching adults returning to school since 1989 and has designed and taught a variety of innovative courses in astronomy and the environmental sciences. Before coming to Seattle, he spent nearly

20 years working in the space program for NASA at Caltech's Jet Propulsion Laboratory as a team chief and mission planner for robotic space exploration programs such as Voyager, Galileo, Mars Observer, and the Space Station. Later, he was the Educational Outreach Manager for the Outer Planets/Solar Probe Project, missions to send spacecraft to the planet Pluto, Jupiter's moon Europa, and the Sun, where he developed space science training programs for teachers at all levels.

Dr. Giuliano will discuss the innovative approaches he has used to bring astronomy education to those unfamiliar with our universe. He considers astronomy education a vital tool for reconnecting people to the natural world in order to foster a greater appreciation for what is the most important planet in our Solar System — Earth.

Dr. Giuliano maintains a comprehensive website of his teachings (<http://www.deepteaching.com>) and complete archives of his weekly commentaries (<http://www.healingourworld.com>).

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From the President's Desk...

by Stephen Van Rompaey

I hope that everyone has been taking advantage of the clear weather this summer to get out and observe, especially putting in some sleep-deprived days at work in order to view Mars. Conditions in western Washington have been particularly favorable for observing Mars and we can all hope that this continues for the next two months. For me personally, this has been my first opportunity to observe Mars seriously since I began pursuing my interest in amateur astronomy more actively. It's been amazing to hear from other club members that these are the best seeing conditions they've experienced in the past 20 years or past 40 years of observing Mars. I've personally had some great views of Mars this summer and I feel very grateful that excellent seeing in the northwest has coincided with its close approach.

I've personally had some great views of Mars this summer and I feel very grateful that excellent seeing in the northwest has coincided with its close approach.

Beyond merely taking out my telescope and looking at Mars, I've been thinking about how best to observe this planet. I've gone out on the web to read observation reports, studied the articles in *Astronomy* and *Sky & Telescope*, and asked for help from my fellow club members. For me, the challenge of observing Mars is one of those humbling experiences you have where you realize that there are many subtle issues and techniques that may affect how well you identify features on the planet's surface. You can use the

drawings in these magazines to help identify what you see, but I find it especially helpful to have an idea of what's supposed to be there before I go out to observe. I have downloaded a program from the *Sky & Telescope* website called "Mars Previewer II." It can be found at http://skyandtelescope.com/resources/software/article_328_1.asp. It is important to know that there have been reports that versions of this program on other websites have been infected with a virus, but *Sky & Telescope* certifies that their version of this program is virus-free.

I have also learned during the past month that when viewing Mars you can view surface features best if you use a filter to contrast a feature with

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surrounding areas. I have tried every filter that I own, including a nebula filter, and compared my views with reports by other amateurs. I posted a message of the WebFtWeb asking for comments and suggestions about which filters to use on Mars, and I received a different answer from everyone who responded. Like many things, the best result is in the eye of the beholder, but **so far I've found the most pleasing view by using the orange #21 filter.** It's quite possible that by the end of the Mars viewing

season I will have reached a different conclusion.

In one of the responses about viewing Mars at Table Mountain this year, Jim Bielaga wrote that he had "stopped down" his 13-inch Dob to around 5 inches. Stopped down? What's that? So, off to the web again to learn about aperture masks and about "unobstructed systems." Somewhat coincidentally, at the last Board meeting, we discussed how to present more amateur topics to the club during regular meetings.

The Board is currently in the process of putting together a list of topics on observing or equipment that we hope to integrate into monthly meetings in the coming months.

This Spring it would have been great to have had even a short presentation on various techniques for observing Mars. We would like

to plan for a 10 to 15 minute presentation at the beginning of the meeting before the main speaker. If you have any observing topics you would like to have presented, please let me know and we will add them to our list.

The most critical issue though is who will make these presentations. Our current plan is to approach some of our most sagacious members and ask them to volunteer, but we hope to cast our net more broadly in the future. To get started, **at the August meeting we will devote 10 to 15 minutes for reports about the Table Mountain Star Party.**

If you have any observing topics you would like to have presented during an SAS meeting, please let me know and we will add them to our list.

Notes on Filters for Viewing Mars

by John Angell

#8 Yellow — Improves Martian maria by reducing scattered light from blue areas while allowing passage of more green light for studying yellowish clouds.

#12 Deep yellow, #15 Deep yellow, #21 Orange, #23A Lt red — Reduces light from the blue and green areas which darkens the maria, oases, and canal markings while lightening the orangeish desert regions. Also sharpens the boundaries of yellow dust clouds.

#25 Red — Ideal for observation of the polar ice caps and features on the Martian surface. Also sharpens boundaries of yellow dust clouds.

#38A Blue — Useful during the violet clearing and for studying surface features. Also helpful in studying localized clouds and ice fogs.

#47 Violet — Useful for detecting high clouds and haze over Martian polar caps. Very useful for violet clearing.

#56 Lt Green, #58 Green — Excellent for increased contrast of Martian polar caps, low clouds, and yellowish dust storms.

#80A Lt blue, #82A Pale blue — Very useful for violet clearing. Helpful in the study of surface features and polar caps.

Telescope for Sale



Celestron C5 Plus with Eyepiece

Schmidt-Cassegrain optical system, 5 inch mirror, fork mounted. Built-in R.A. control, added-on DEC; Excellent for astrophotography. Convenient size, all controls

within easy reach, weighs only 17 lb. No assembly or takedown necessary; you simply mount it on tripod, level it, polar-align it and it's ready to go. \$750.00 or make an offer: **Pat Lewis, (206) 524-2006, joagreen@aol.com.**

From the Belly of an Airplane: Galaxies

by Dr. Tony Phillips

On April 28 a NASA spacecraft named GALEX left Earth. Its mission: to learn how galaxies are born, how they grow, and how they die.

“GALEX — short for Galaxy Evolution Explorer — is like a time machine,” says Caltech astronomer Peter Friedman. It can see galaxies as far away as 10 billion light years, which is like looking 10 billion years into the past. The key to the mission is GALEX’s ultraviolet (UV) telescope. UV rays are a telltale sign of hot young stars, newly formed, and also of galaxies crashing together. **By studying the ultraviolet light emitted by galaxies, Friedman and colleagues hope to trace their evolution spanning billions of years.**

This kind of work can’t be done from the ground because Earth’s atmosphere absorbs the most energetic UV rays. GALEX would have to go to space. To get it there, mission planners turned to Orbital Science Corporation’s Pegasus rocket.



L-1011 “Stargazer” takes off to carry Pegasus rocket on the first 39,000 feet of its climb to deliver a spacecraft to orbit.

“Pegasus rockets are unusual because of the way they’re launched — from the belly of an airplane,” says GALEX Project Engineer Frank Surber of JPL.

GALEX is like a time machine. It can see galaxies as far away as 10 billion light years, which is like looking 10 billion years into the past.

It works like this: a modified L-1011 airliner nicknamed Stargazer carries the rocket to an altitude of 39,000 feet. The pilot pushes a button and the Pegasus drops free. For 5 seconds it plunges toward Earth, unpowered, which gives the Stargazer time to get away. Then the rocket ignites its engines and surges skyward. The travel time to space: only 11 minutes.

“The aircraft eliminates the need for a large first stage on the rocket,” explains Surber. “Because Stargazer can be used for many missions, it becomes a reusable first stage and makes the launch system cheaper in the long run.” (To take advantage of this inexpensive launch system, GALEX designers had to make their spacecraft weigh less than 1000 lbs — the most a Pegasus can carry.)

A Pegasus has three stages — not counting the aircraft. “Its three solid rocket engines are similar to the black powder rockets used by amateurs. The main difference is that the fuel is cast into a solid chunk called a ‘grain’ — about the consistency of tire rubber. Like black powder rockets, once the grain is lit it burns to completion. There’s no turning back.”

In this case, turning back was not required. **The rocket carried GALEX to Earth orbit and deployed the spacecraft flawlessly.** On May 22, the UV telescope opened its cover and began observing galaxies — “first light” for GALEX and another success story for Pegasus.

For adults, find out more about the GALEX mission at <http://www.galex.caltech.edu/>. Kids can read and see a video about Pegasus at <http://spaceplace.nasa.gov/galex/pegasus.html>.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



August 2003

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2 Green Lake & Paramount Park Star Parties
3	4		5 UW Public Viewing Night 9 p.m.	6	7	8 9 Amateur Telescope Makers SIG Meeting 6:30 p.m.
10	11		12	13	14	15 16
17	18	19	20 Monthly SAS Meeting UW Room A102 7:30 UW Public Viewing Night 9 p.m.	21	22	23
24	25 SAS Board Meeting 7 p.m.	26	27 	28	29	30 Tiger Mountain Star Party 9:30 p.m.
31						



September 2003

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	 3 UW Public Viewing Night 9 p.m.	4	5	6 Green Lake & Paramount Park Star Parties
7	8	9	 10	11	12	13 Amateur Telescope Makers SIG Meeting 6:30 p.m.
14 Astrophotography/Imaging SIG Meeting 2 p.m.	15	16	Monthly 17 SAS Meeting UW Room A102 7:30 UW Public Viewing Night 9 p.m.	 18	19	20
21	22 SAS Board Meeting 7 p.m.	23	24	25 Orion Nebula Star Party (Table Mountain) begins	 26	27 Tiger Mountain Star Party 9:30 p.m.
Orion Nebula Star Party • Sept 25-28						
28	29	30				
Orion Neb. Star Party Sept 25-28						



July Minutes

Chandra X-Ray Observatory

by Thomas Vaughan

Speaker: Dr. Lee Homer, Chandra X-Ray Observatory

Announcements

The meeting began with the following announcements:

- ★ The Tiger Mountain Star Party is still scheduled for July 26. Hope to see you there!
- ★ There will be a Martian Party at the UW Astronomy Department on September 3, at around dusk. SAS members are welcome to attend, but the dress code is mandatory: you have to dress like a martian. Also, feel free to bring telescopes and hope for clear skies.
- ★ Mike Langley is looking for volunteers for a star party at Camp Long on August 23. Contact Mike at mlangley123@aol.com.
- ★ SAS members are encouraged to attend the Green Lake Star Party on August 2. There will be several Astronomy students from Antioch College present.
- ★ Project AstroBio still needs science partner volunteers. If you are interested, contact Linda Khandro at lindak@astro.washington.edu.

Talk: Chandra X-Ray Observatory and Nearby Globular Clusters

Dr. Homer is a post-doc at the University of Washington. He is using x-ray and optical studies to characterize globular clusters in and around the Milky Way. Recent advances in x-ray and optical imaging, especially high-resolution imaging from the Hubble Space Telescope and Chandra X-Ray Observatory, have led to breakthroughs in the study of these objects.

Dr. Homer first asked: Why study globular clusters? There are a number of reasons. They are good laboratories for studying stars, since all the stars in the cluster tend to be the same age. Also, since the cluster is fairly localized, we know the positions of the stars to around 2% accuracy.

There are still some mysteries surrounding globular clusters. For one thing, most models predict that the clusters should collapse under their own gravity. One theory is that interaction between binaries helps to redistribute kinetic energy, preventing the cluster from collapsing. But more observations are necessary.

Globular clusters are difficult to study in the visible spectrum, since their core is so dense. This is where x-ray observation is useful: there are fewer x-ray sources in the cluster, so even in the dense core, individual x-ray sources can be identified.

Dr. Homer broke x-ray sources in globular clusters into four broad families:

- ★ **Low-Mass X-Ray Binaries (LMXBs)** These are very bright x-ray sources. These are a normal star and a neutron star in a tight binary. Some orbital periods are on the order of 10 to 20 minutes! These are two stars orbiting at roughly the Earth-moon distance.
- ★ **Cataclysmic Variables (CVs)** These are similar to LMXBs, but instead of a neutron star, the compact partner is a white dwarf. They are less energetic than LMXBs, but still fairly bright.
- ★ **Active Binaries** These are main sequence stars whose magnetic fields interact to produce x-rays. These are fairly dim in the x-ray spectrum.
- ★ **Millisecond Pulsars** These are fast-spinning pulsars. Much of the energy is in the radio spectrum, but there are also x-rays emitted.

Dr. Homer provided a few details on the Chandra X-Ray Satellite. It has a long focal length (~10 meters). X-rays are difficult to reflect, so they use a series of concentric focusing mirrors that reflect at grazing angles.

Chandra uses CCDs for imaging. In the x-ray spectrum, CCDs are fantastic — they have close to 100% quantum efficiency. In fact, they are so efficient that there are sometimes problems with “pileup,” with too many x-rays hitting a given pixel at once.

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Chandra uses CCDs for imaging. In the x-ray spectrum, CCDs are fantastic — they have close to 100% quantum efficiency. In fact, they are so efficient that there are sometimes problems with “pileup,” with too many x-rays hitting a given pixel at once. They also have to switch off and cover the detectors when Chandra enters the Earth’s magnetic field (the detectors are so sensitive that they can be damaged otherwise).

Using Chandra, they are able to get very detailed x-ray images of globular clusters. Using false colors to represent different intensities and energies in the x-ray spectrum, they get clear pictures of the different sources of x-rays in the core.

Dr. Homer described a two-phase procedure for identifying and characterizing the x-ray sources in a globular cluster:

- ★ **X-Ray Measurements** X-ray sources in the cluster are identified and analyzed for intensity and x-ray spectrum.
- ★ **Optical Measurements** The X-ray sources are then overlaid on an optical image of the cluster. The comparison of x-ray and optical sources helps determine exactly what each x-ray source really is (LMXB, CV, or just a quiet neutron star).

**What most surprises
Dr. Homer about the
survey so far is the
large number of
Cataclysmic Variables
(CVs).**

Dr. Homer’s team has only studied a few clusters in-depth. However, there are already some clear patterns starting to emerge. For instance, they see a strong correlation with the number of x-ray sources and the “stellar encounter rate” within a cluster. Basically, the more the stars in a cluster interact, the more x-ray sources are produced. The observations are matching

binary-encounter models, helping to prove that binary interactions also keep the cluster from collapsing.

They have also plotted the various x-ray sources to come up with a “main sequence” diagram for x-ray sources. Many of the x-ray objects fit the expected distribution for cooling neutron stars.

There are two groups working on x-ray studies of globular clusters. One team is going to perform a “deep” study of a particular cluster (47

Tucanae). This cluster is a good candidate because it is nearby, and because it was recently surveyed by the Hubble for more than eight days, providing excellent optical data.

The other group is doing a wide survey of clusters. They expect to discover a large number of interesting x-ray sources; however, getting Hubble time is difficult (and in fact, Hubble time is the main challenge for that project).

Also, in the next few years increasingly sophisticated computer models of globular clusters are expected to come online. These should help with analysis of observations.

I asked Dr. Homer what he thought was the most surprising result of the survey so far. He said there had been a number of surprises, but what most surprised him was the large number of CVs. They don't know yet why there are so many, but it is probably tied to the dynamics of clusters.

Dr. Homer also talked a bit about the recent discovery of a planet around an x-ray binary. A team had used x-ray observations of the x-ray partner (a neutron star) and optical observations of the bright optical partner (a main sequence star) to detect minute wiggles in the orbits of the two stars. From these wiggles comes strong evidence for a planet of 2.5 Jupiter masses orbiting the binary.

SAS Logo Shirts Now Available!

After numerous requests, we are again offering the SAS logo shirts for sale!

Contact Mary Ingersoll by email or phone (see listings on page two) if you would like to purchase a sweatshirt or a t-shirt (or even a golf shirt like Loren Busch's). The logo is white on dark shirts, or black on light shirts.

Many colors are available, and sweatshirts come with or without hoods and front pockets. See Mary at the August meeting to place your order. She will have a sweatshirt sample with her.

Prices: sweatshirts	\$20
t-shirts	\$12
golf shirts	\$17



A portion of the sales of these shirts goes to support club activities.

UW Astronomy Professor Emeritus Theodor Jacobsen Dies at 102

Retired Professor of Astronomy Emeritus Theodor Jacobsen died July 17 at the Ida Culver Home where he had been residing for a number of years.

He was born February 6, 1901, in Nyborg, Denmark, and came to the U.S. with his parents in 1917, in the middle of World War I. He graduated from Stanford University in 1922 as the only astronomy major in his class, and in 1926 earned his doctorate at the University of California, Berkeley.

After two years as an assistant at the Lick Observatory he joined the faculty at the UW as Assistant Professor of Astronomy and Mathematics. In 1952 he became Professor of Astronomy and headed a one-person department until 1965. He retired in 1971 and has since held the title of Professor

Emeritus. He has held visiting positions at Stanford, The Dominion Astrophysical Observatory, and at the Mt. Wilson and Palomar Observatories. Starting in 1922, he conducted research on the pulsation of variable stars of the Cepheid variety, publishing his last paper on the subject in 1992. In 1999, at the age of 98, he authored a history of the view of the solar system from the ancient Greeks through Kepler, which was published by the UW Press.

In 1999, at the age of 98, he authored a history of the view of the solar system from the ancient Greeks through Kepler.

Both he and his late wife, Evelyn Brandt, were accomplished pianists, and until recent months he could be heard playing his favorite Schubert selections on his grand piano for the enjoyment of others at the Ida Culver Home. He is survived by numerous cousins and nephews.

Sky & Telescope Magazine Increasing Subscription Rates

Sky & Telescope is **increasing its subscription rates beginning with all expiration dates that fall in the year 2004.** The one-year U.S. retail rate will be \$42.95 and our club rate will be \$33.00, an increase of \$3.00.



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