

SIDEREAL TIMES

The Official Publication of the
Amateur Astronomers Association of Princeton

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From the Director

AAAP Regular Meeting March 9 (8:00 PM).

The next scientific lecture hosted by the AAAP features Louis Lanzerotti of NJIT. Dr Lanzerotti is an expert in solar and planetary geophysics and space plasma physics, and will be speaking about research using the NASA/ESA spacecraft Ulysses. Currently the Ulysses spacecraft is in the proximity of Jupiter, creating an opportunity for remote-sensing observations. For **more information please turn to Program Chair Mark Lopez's section** in this issue.

Spring Observing Opportunities. The Ulysses researchers are not the only ones studying Jupiter at this time, as it is very well positioned for those of us using ground-based telescopes (rises around 6:00 PM and transits around midnight). I took advantage of the recent clear nights (and warmer temperatures) to record the image below using my CCD camera and 5 inch refractor from my backyard.

On Feb 27, several Observatory Keyholder team leaders (Gene, Brian, Ron, Mark, Vic, and me) held a refresher at AAAP's Washington Crossing Observatory. As the night wore on, Brian and I set up our CCD cameras on the Celestron C14 and the Hastings 6.25 refractor. The C14 is now tracking very accurately on the new Paramount (thanks to Bill, Brian, Ron and others for polar alignment) and is ready for CCD imaging as well as great visual observing. Brian collected some good images of M51 and other deep sky objects using the C14. However, I was unable to balance the 6.25 refractor with my CCD camera attached, and concluded that this is strictly a visual instrument unless a very lightweight camera is used (such as a web-cam). Nonetheless, visually Jupiter seen through the 6.25 looks spectacular, as does Saturn, and many interesting double stars well positioned this month (such as gamma Leonis). And March-April are perfect times to increase your personal count of Messier Objects observed. We encourage all members to make plans to come out to the observatory to see

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Saturn with a Web-Cam (Image by Brian VanLiew)

Planetary Imaging Web-Cam Style

The weather this winter especially the cold has slowed down my observing. In mid February I did get out and tried out some imaging with my web-cam that I had so much luck with on Mars last year. I had gotten home a little earlier than normal and according to the clear sky clock for our area it was going to be a clear night. I took out my big scope and set it up in just about the only place I have to catch the planets before they go into the trees from about 25 degrees above the horizon to zenith in the east. I had everything ready to go before the sunset.

I came out when it was dark but the sky was still unstable. I set up my web-cam and adjusted the pointing and focus on the laptop screen. I set the camera to capture 5 frames/second for 1 minute. After the final tweaking was done to the scope I grabbed several files with some minor tweaks in between. The later files seemed to have the best results. Maybe I got better at hitting the sweet spot

(Web-Cam, continued on page 2)

Simpson Observatory (609) 737-2575

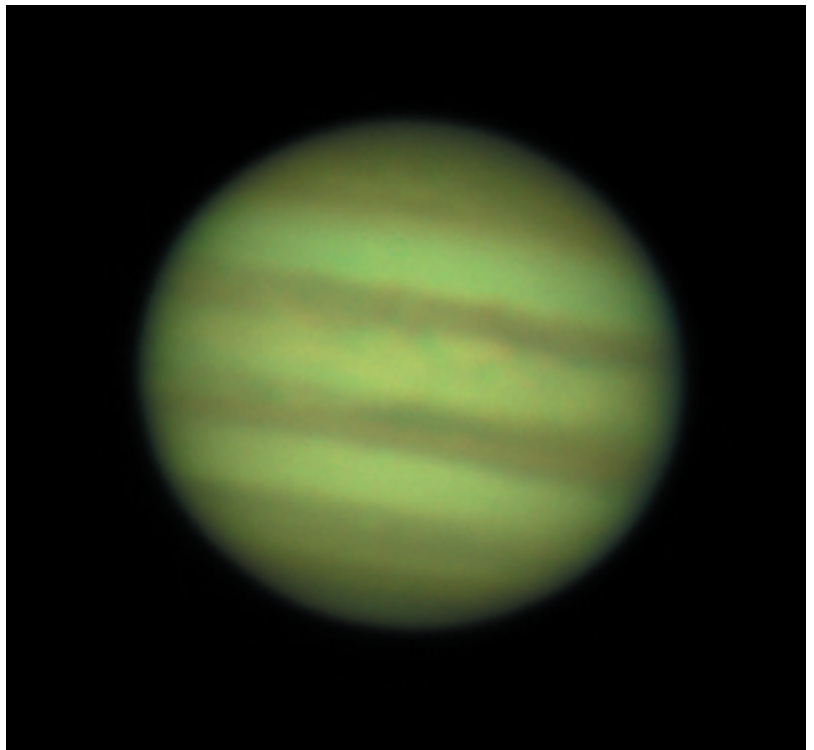
(Director, continued from page 1)

with your own eyes what all the excitement is about. Also note that the public nights schedule for 2004 is posted on the AAAP website.

Who would believe that so small a space could contain all the images of the universe? – Leonardo da Vinci, on the eye

NEAF 2004 April 17, 18 The largest astronomy forum and astronomy equipment show in the Northeast, hosted by the Rockland (NY) Astronomy Club and Sky & Telescope, will take place in Suffern NY (about 2 hr drive from Princeton). See the website <http://www.rocklandastronomy.com/neaf>. Among the many enticements, our friend and esteemed solar enthusiast Barlow Bob will be spearheading the “1st Annual Solar Star Party (“A Test Drive for the Transit of Venus”). Featuring world-class Coronado Hydrogen-alpha filter instrumentation and Televue refractors, this will be a great chance to see solar prominences and have a hands-on tutorial on observing the sun. And NEAF is one of the best places to see the hardware you are thinking about buying, and negotiate the best price!

Opportunities for AAAP Members The AAAP has a three-fold mission of supporting hands-on astronomical observing and imaging, cutting-edge lectures by professional astronomers and physicists, and public outreach and education in astronomy. To reach our potential requires energy, effort, and commitment of the membership. To facilitate this, we have evolved a structure to develop and coordinate the activities in the club (**see Table in the January Sidereal Times**). We are



Jupiter on 2-28-04 (*Tak FS-128, Losmandy G-11, SBIG ST-10XME w RGB filters (image by RAP)*)

seeking input and participation in all facets of the club’s activities. Please think about how you can “give back” to the AAAP, your peers, and to amateur astronomy by contacting me or any Board member or committee chair to help build on our foundation.

Dark Skies! -- Rex

(Web-Cam, continued from page 1)

in the focussing. The final image was processed inside after I put everything away for the night. I tried my luck on Jupiter but it was just too low and I couldn’t wait for it to get higher.

Inside, I ran the aligning and stacking software. Depending on the quality of the images in the file the final image took about two thirds or 200 out of 300 frames to create it. I used Photoshop LE to adjust the curves and balance settings for the final picture (see attached).

Jupiter will be next. Although I believe it will be a more difficult target since the details on it depend so much on the atmosphere, which around here is usually poor at best. I’ll take my chances.

Brian Van Liew

From the Treasurer

The treasury balance is \$XXXX after paying the club insurance of \$1640.00. There are 124 paid members. New Members are Tammy Duffy of Hamilton, NJ, Simon Lee of Plainsboro, NJ, and Gregory Newton of Jamesburg, NJ.

Note: Please do not contact Sky and Telescope subscriptions department for a club discount. This arrangement will start in August 2004. If you want to renew your subscription now please contact me. I have been contacted by Sky and Tel on several occasions about members calling for club discounted subscriptions

now. Sky and Tel cannot verify your membership without a current membership roster. Sky and Tel has extended the exemption of letting us renew our subscriptions at club rates without going through the club, but like I said, this will not be happening until August. Let us not abuse this.

Also in August, will be suspending the club subscription for Astronomy magazine. If you want to renew or extend your subscription at the club rate do it before August.

Michele, our publisher, will continue putting the dues renewal date on the upper right corner of each Sidereal Times address label. This is the date that your renewal membership is due with the AAAP. Those with club magazine subscriptions to Astronomy or Sky and Telescope or both will want their subscriptions renewed about three months prior to the date of your club renewal. Please act accordingly, for if you wait until your club dues are due to pay for your magazine subscription you may miss one or two issues.

I am not going to send out renewal notices to members who get magazines; they get enough notices from their respective publishers. If I don’t receive your renewal on the date indicated on your address label you will be dropped from the roster. If you are a keyholder, the respective observatory chairman will be notified and you will be asked to return the key.

Note! Starting in April, dues will be \$20 until June. The dues structure is as follows: \$30 basic membership. \$60 for membership

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and subscription to Astronomy magazine. *\$63 for membership and subscription to Sky and Telescope magazine. \$93 if both magazines are desired with membership. *Recent Increase of Sky and Telescope magazine.

If you have a Sky and Tel subscription please send the subscription notice and the postage paid envelope when renewing your membership.

You may send the dues directly to me at: Ron Mittelstaedt-Treasurer, 149 Palmer Lane, Ewing, NJ 08618-3207

Ron Mittelstaedt

From The Program Chairman

Like most of you, whenever I go out in the evening, the first thing I do is look up into the night sky. For some time now, the first object I see during the walk to my car is the planet Jupiter. I mention Jupiter because, as you are reading this copy of Sidereal Times, the Ulysses Spacecraft is once again visiting the realm of this beautiful and fascinating planet. Why, you might ask, am I writing about Jupiter and the Ulysses Spacecraft? Well, the answer is obvious to you, I am sure. Our guest speaker this month, Dr. Louis Lanzerotti, is one of the Principal Investigators for the Ulysses Spacecraft Program. Dr. Lanzerotti is going to speak to us about the valuable and groundbreaking research the Ulysses Spacecraft is presently performing as it rendezvous with Jupiter. He will also discuss the work the spacecraft has previously done on the Sun's heliosphere. In addition to his role of Principal Investigator, our guest speaker is also a Distinguished Research Professor at the Center for Solar-Terrestrial Research and he is a member of the Physics Department of the New Jersey Institute of Technology.

Dr. Lanzerotti received his undergraduate training at the University of Illinois and he earned both his M.A. and Ph. D. in Physics from Harvard University. Besides the Ulysses Program, our guest's research interests also include studies in geophysics and space plasma physics as related to planetary magnetospheres, energetic particles emitted by the sun, and the engineering impacts of natural and artificial space phenomena on space and terrestrial technologies. Dr. Lanzerotti is a member of the National Academy of Engineering and the International Academy of Astronautics. He is a Fellow of the American Physical Society, the American Association for the Advancement of Science, the American Institute of Aeronautics and Astronautics, the Institute of Electrical and Electronics Engineering, and the American Geophysical Union. He was awarded the NASA Scientific Achievement Medal, the NASA Distinguished Public Service Medal, and the Antarctic Service Medal. Of all the awards and honors I have just mentioned, the coolest thing I discovered about Dr. Lanzerotti is that he has a minor planet named after him (Minor Planet 5504 Lanzerotti) and there is a mountain in Antarctica that also bears his name (Mount Lanzerotti, Antarctica 74°50'S, 70°33'W). Truly fascinating!

The following paragraphs are a summary of the mission of the Ulysses Spacecraft. They were taken verbatim from the NASA/JPL Ulysses website and the European Space Agency website respectively. I hope they will provide some useful information as to the mission of the Ulysses Spacecraft. If you would like to know more detail, just surf on over to the club's website at www.princeofastronomy.org

or you can also go to the NASA/JPL website at <http://ulysses.jpl.nasa.gov>

Ulysses is a joint NASA and European Space Agency (ESA) mission to study the sun at all latitudes. ESA provided the spacecraft, NASA provided the Radioisotope Thermoelectric Generator (RTG), the launch vehicle, The Inertial Upper Stage (IUS), and the Payload Assist Module (PAM-S), and is providing data reception via the Deep Space Network.

The primary mission of the Ulysses spacecraft was to characterize the heliosphere as a function of solar latitude. The heliosphere is the vast region of interplanetary space occupied by the Sun's atmosphere and dominated by the outflow of the solar wind. The periods of primary scientific interest is when Ulysses was at or higher than 70 degrees latitude at both the Sun's south and north poles. On 26 June 1994, Ulysses reached 70 degrees south. There it began a four-month observation from high latitudes of the complex forces at work in the Sun's outer atmosphere-the corona.

Scientists have long studied the Sun from Earth using Earth-based sensors. More recently, solar studies have been conducted from space-borne platforms; however, these investigations have been mostly from the ecliptic plane (the plane in which most of the planets travel around the Sun) and no previous spacecraft have reached solar latitudes higher than 32 degrees. Now that Ulysses high latitude data is available, scientists from the joint NASA and ESA mission are obtaining new and better understanding of the processes going on at high solar latitudes.

Ulysses and Jupiter - Second Rendezvous 29 Jan 2004 Over the next few weeks, scientists on the joint ESA-NASA Ulysses mission will be turning their attention away from the Sun, and looking at Jupiter instead. In early February, the European-built Ulysses spacecraft will approach the giant planet for a second time. The first encounter, 12 years ago almost to the day, had dramatic consequences for the 350 kg space probe. Like a giant slingshot, Jupiter's immense gravity field propelled Ulysses out of the ecliptic plane, sending it on its way to fly over the poles of the Sun.

"That was exactly the way the ESA and NASA flight engineers planned it", said Richard Marsden, ESA's Mission Manager for Ulysses. *"From its unique, high-inclination orbit, Ulysses has made groundbreaking discoveries that have changed the way we think about the Sun's environment, the heliosphere".* February's rendezvous will be much more benign, however. The closest distance between spacecraft and planet will be some 280 times greater than in 1992, so that the orbit of Ulysses will not be changed. Nevertheless, the encounter geometry will enable the instrument teams to make measurements that have not been possible up to now. *"Ulysses will approach Jupiter from high northern latitudes, opening a window on previously unexplored parts of the giant planet's magnetosphere",* said Marsden. This is of particular interest to scientists studying Jupiter's natural radio emission, since a distinctive type of radio signal is believed to originate in the high-latitude auroral zones of Jupiter.

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Back in 1992, the radio and plasma wave experiment on board Ulysses detected radio signals from Jupiter's southern hemisphere that had a strikingly repetitive behavior. Like a slowly revolving lighthouse, the source of these signals sent out bursts of radio waves approximately every 40 minutes. Unlike a lighthouse, however, the Jovian source was not present continuously. Typically, these so-called "Quasi-periodic", or QP-40 bursts were present for several hours, only to fade away and reappear a number of hours later. In concert with the radio signals, other experiments on Ulysses measured quasi-periodic bursts of energetic electrons. More recently, NASA's Chandra X-ray observatory detected similar QP-40 pulsations in X-rays emitted in hot spots in Jupiter's northern polar regions. Although not fully understood, all of these phenomena seem to be triggered by streams of high-speed solar wind hitting Jupiter's magnetosphere.

Based on the Chandra results, the Ulysses radio and plasma wave team were keen to search for QP-40 radio signals coming from Jupiter's northern hemisphere when Ulysses once again approached the planet. Sure enough, by October last year, repetitive bursts were being detected on a regular basis. *"The signals have become even clearer in recent weeks. As well as the QP40 bursts, we are also seeing similar short-duration bursts occurring every few minutes."*, said Dr. Robert MacDowall, Principal Investigator for the Unified Radio and Plasma Wave (URAP) experiment on Ulysses. The relatively large distance between Ulysses and Jupiter, while not a problem for the radio signals, makes it less likely that 40-minute bursts of energetic electrons will be seen this time around. Nevertheless, the experiment teams are keeping watch.

Another Jupiter-related investigation is concentrating on a search for streams of dust particles coming from the direction of the planet. Dust streams from Jupiter were discovered by Ulysses in 1992, and seen again more recently by similar instruments on NASA's Galileo and Cassini spacecraft. The dust grains are no bigger than smoke particles, and are believed to originate from Jupiter's volcanic moon, Io. Electromagnetic forces within Jupiter's magnetosphere then propel the particles out of the Jovian system and into interplanetary space, where they appear as streams of dust.

Even though Ulysses does not carry an imager in the conventional sense, one of its on-board experiments is capable of producing images. The GAS instrument on Ulysses works like a pinhole camera. Instead of collecting visible light, however, it collects neutral atoms and UV photons. *"The main task of the GAS instrument, which it is doing very successfully, is to detect neutral helium atoms that enter the heliosphere from the surrounding interstellar space"*, said Richard Marsden. As an added extra, GAS was also able to make images of energetic neutral particles (atoms) escaping from Io's plasma cloud during the first fly-by in 1992. *"We'll be tracking Jupiter during the second encounter"*, said Dr. Manfred Witte, who heads the GAS experiment team. Even though the distance is much greater than in 1992, Witte hopes to make at least one "snapshot".

Because Ulysses' wanderings take it far from the Sun, the onboard power needed to operate the spacecraft's systems and the scientific instruments cannot be obtained using solar cells. Instead, Ulysses carries a Radioisotope Thermoelectric Generator, or RTG, that converts the heat produced by radioactive decay of its plutonium

fuel into electricity. The robustness of the spacecraft, coupled with the mission's great success, has allowed Ulysses to operate long past the originally foreseen 5-year lifetime.

Over the years, the RTG output has gradually diminished as the fuel decayed. As a consequence, the spacecraft operations team has had to adopt power-saving measures. *"Not only do we have to have enough power to operate the spacecraft and the experiments, we also have to make sure the spacecraft doesn't get too cold"*, said Nigel Angold, ESA's Spacecraft Operations Manager. Ulysses uses hydrazine thrusters to keep its high-gain antenna pointing towards the Earth. *"If we get too cold, the hydrazine could freeze!"* said Angold. *"So we need to be very careful how we distribute power throughout the spacecraft. Every instrument on board is now considered as a heater as well as a scientific experiment!"* Part of the power-saving measures involves operating several of the experiments on a time-sharing basis. Power should not be a problem during the Jupiter encounter period, however. *"We've switched off the on-board tape recorders to save power"*, said Angold. *"That will allow us to switch on as many instruments as possible."* NASA's Deep Space Network is scheduled to track the spacecraft 24 hours per day between now and mid-March so that the science teams won't have to miss any of the exciting data from Ulysses' second rendezvous with Jupiter.

I hope that by providing some biographical information about Dr. Lanzerotti and by also furnishing a brief description of the mission of the Ulysses Spacecraft, I have persuaded you to attend the next meeting. We are once again fortunate to have a brilliant guest speaker who will inform us about the most recent discoveries in the field of astronomy and astrophysics. Combine this with an opportunity to dine with him and your fellow AAAP members and you have the formula for one outstanding evening. So please try to attend the next meeting and try, if you can, to attend the pre-meeting dinner. If you do not receive an email notice about the dinner, please contact me by email or telephone if you would like to join your fellow members for dinner (609-303-2565 or mal455@earthlink.net). See you all soon.

The April meeting is member's night. Doug Braun will talk about the beautiful telescope he built and John Miller will speak about his recent visit to the Palomar Observatory.

Mark Lopez

2004 Events

Compiled by Bob Godfrey

- Apr. 14 – 18 Delmarva Star Party
Tuckahoe State Park, Maryland
[Http://Www.Delmarvastargazers.Org](http://www.Delmarvastargazers.Org)
- Apr. 17 – 18 Neaf
Suffern, New York
[Http://Www.Rocklandastronomy.Com/Neaf/](http://www.Rocklandastronomy.Com/Neaf/)
- Apr. 24 Astronomy Day
Boston Museum Of Science
[Http://Www.Mos.Org/](http://www.Mos.Org/)

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Jun. 5 Starconn
Wesleyan University, Middletown, Ct
[Www.Asgh.Org](http://www.asgh.org)

Jun. 18 – 20 Jersey Starquest Star Party
Hope, New Jersey
[Http://Www.Princetonastronomy.Org](http://www.princetonastronomy.org)

July 9 – 18 Rockland Summer Star Party
Savoy, Massachusetts
[Http://Www.Rocklandastronomy.Com/](http://www.rocklandastronomy.com/)

Jul. 16 – 18 The Conjunction
Northfield, Ma
[Http://Www.Pilharrington.Net/Astroconjunction/](http://www.philharrington.net/astroconjunction/)

Jul. 16 – 18 Rochestar Fest
Rochester, New York
[Http://Www.Rochesterastronomy.Com](http://www.rochesterastronomy.com)

Aug. 13 – 14 Stellafane
Vermont
[Http://Www.Stellafane.Com](http://www.stellafane.com)

Sep. 10 – 12 Black Forest Star Party
Cherry Springs State Park, Pennsylvania
[Http://Www.Bfsp.Org/Starparty/Index.Cfm](http://www.bfsp.org/starparty/index.cfm)

Sep. 10 – 12 Connecticut Star Party
Colbrook, Connecticut
[Http://Www.Asnh.Org/](http://www.asnh.org/)

Sep. 15 – 19 Delmarva Star Party
Tuckahoe State Park, Maryland
[Http://Www.Delmarvastargazers.Org](http://www.delmarvastargazers.org)

Sep. 17 – 19 Arunah Hill Days
Cummington, Ma
[Http://Www.Arunah.Org/Events/Calendar.Pdf](http://www.arunah.org/events/calendar.pdf)

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