

The Spectrogram

Newsletter for the Society of Telescopes, Astronomy, and Radio

December 2005

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December's Meeting

The next meeting of S*T*A*R will be Thursday December, 1st. Our program will be "Ringed Basins on the Moon" by STAR's Charlie Byrne.

There will also be a special auction of an 8" f/8 mirror made and generously donated to the club by Ken Legal.

The meeting will begin promptly at 8:00pm at the King of Kings Lutheran Church, 250 Harmony Road, Middletown.

Please Pay Your Annual

Dues at December's

Meeting

Membership fees for 2005-6 of \$25 per individual and \$35 per family were due in September. Please make payments to Paul Nadolny at the December meeting. If you can't make the meeting, please mail a check made payable to STAR Astronomy Society Inc to:

STAR Astronomy Society
P.O. Box 863
Red Bank, NJ 07701

A Big Thank You!

Thanks to everybody who sent in articles for the Spectrogram this month – Frank Loso, Randy Walton, Steve Walters, Steve Fedor. The Spectrogram has been a little thin lately so thanks for answering my plea for contributions!

The deadline for the next edition of the Spectrogram is Friday December 30th. Please email any contributions to gwarnes1@comcast.net.

Calendar

Sep 1, 2005 – "*The Art and Science of Early Printed Star Atlases*" - Ray Harris, LVAAS

Oct 6, 2005 – "*Searching for Earth-Like Planets: NASA's Terrestrial Planet Finder Space Telescope*" by Dr. Robert Vanderbei, Princeton University

Nov 3, 2005 – "*How does Pluto fit into the scale of the Solar System*" by Jerry Vinski, RVCC Planetarium Director

Dec 1, 2005 - "*Ringed Basins on the Moon*" by Charlie Byrne, S*T*A*R

Jan 6, 2006 – "*Chandra's X-Ray View of Supernova Remnants*" by Dr. John Hughes, Rutgers University

Feb 2, 2006 - "*Science and Art as Viewed Through the Lens of Astronomy*" by Nick Lordi, S*T*A*R

Mar 2, 2006 - "*An Empirical Determination of the Effect of Atmospheric Drag on Orbital Decay*" by Daniel Handlin, S*T*A*R

Apr 6, 2006 – "*Cosmology*" by Dr. Joanna Dunkley, Princeton/Oxford

May 4, 2006 – TBA

Jun 1, 2006 – AGM

S*T*A*R
P.O. Box 863
Red Bank, NJ 07701
On the web at:
<http://www.starastronomy.org>

President's Corner

By Steve Walters

I hope you're all weren't too stuffed with turkey to get out observing this last month! We had some very clear nights, I hope you took advantage of them. Mars was such a fabulous site! Although Mars will be past its prime, December is always a good month for astronomy, our skies are clearer, so dress warmly, get your scope out and get out there to do some observing. And the Milky Way is gorgeous, even from our light polluted skies.

Speaking of Light Pollution, the Board has agreed to launch a new interest group on Light Pollution Abatement (LPA). John Batinsey will be the sponsor of this activity and will be soliciting for your participation at our December meeting. Among other things, we can be more active in writing officials to prevent glare, light trespass and other forms of LP. I also hope we will construct sky glow measuring devices with the ATM group and make systematic measurements at our observing sites and around Monmouth County.

During November, I attended the Advanced Imaging Conference in San Jose, CA. It was an excellent event, full of very useful and well-delivered talks. Some of the "really big" names in amateur imaging gave presentations Rob Gendler, Russ Croman, Ron Wodaski, John Smith, Don Goldman and many others. These guys disclosed techniques they use to acquire their images and how they're processing. I got some really useful tips there.

If you haven't paid your dues yet, please get them in. Your S*T*A*R membership has just evaporated and you no longer have voting rights. In January, we'll remove you from our active membership list! We don't want this to happen to you! We have a great club so get involved, become a QO and use the 25", come to the ATM or Imaging groups and continue to advance your knowledge of astronomy. So if you're one of our members who has not yet paid your dues, please send us your check or see Paul Nadolny at the December meeting. Thanks!

Steve

November Meeting Notes

By Steve Fedor

The November 6, 2005 meeting of S*T*A*R Astronomy began at 8:08 pm. The meeting was attended by approximately 33 members and non-members. Pres. Steve Walters began by welcoming 2 first time attendees and announcing that Treasurer Paul Nadolny would be collecting the annual dues.

The evening's lecture "How Does Pluto fit into the Scale of the Solar System" was presented by Jerry Vinski, Director of the RVCC Planetarium. The focus of the lecture was the relative size of Pluto compared to other objects in the solar system. This stirred a lively debate as to whether Pluto should be considered a planet. The talk concluded at 9:03.

S*T*A*R members John Batinsky and Dave Nelson then presented an update of their efforts in the battle against light pollution. John discussed numerous persuasion techniques he has used during meetings with local and state governments including the use of a glaring light. Dave noted the NJ towns that have adopted lighting ordinances. Both urged all members to write to mayors, town councils, N.J.D.O.T, N.J.B.P.U. and our Governor. Examples of these letters shall be made available to the membership via downloads on the discussion board.

At 9:26 the meeting was recessed for coffee break and "Scope and Tell."

John Batinsky and Dave Nelson handed out an article outlining the basics of light pollution and good lighting practices.

Dan Pontone had numerous small reflectors and refractors for sale as well as mounts, books, and star charts.

The meeting resumed at 9:47.

Steve Walters again stressed the need for all members to pay their dues as soon as possible. Steve also indicated there were copies of the permission letters required for our observing sites.

Announcements:

- V.P. Dennis O'Leary announced that Ken Legal has generously donated his 8 inch, f/8, 1/5th wave mirror to the club for auction at the December meeting. Ken ground and figured this mirror at the Monday night ATM sessions at Gordon Waite's shop. Come place your bids in December!!!
- Randy Walton announced he has the calendars and Observer's Handbooks that were purchased as a group purchase for A.S.T.R.A.
- Dave Nelson announced a star party on 11/7 at the Green Brook Middle School.
- Larry Campbell announced a star party on Feb 6th at the Village School in Holmdel.

Object of the Month:

Nancy McGuire presented this month. The objects discussed were Albiero- a double star in the Northern Cross, Fortuna- an asteroid, Mars, the Taurid meteor shower, Mercury and the Leonid meteor shower.

S.I.G. Reports

ATM – Gordon Waite announced he has acquired additional equipment including a lathe, milling machine and band saw. Gordon invited everyone to join in the fun of building a telescope, grinding a mirror or working on any astronomy related project at his shop.

Observing. – No Report. Steve Walters encouraged the club to be more active in casual observing night at Burke Rd and Fairhaven Fields.

Imaging – Steve Walters announced the group met and discussed Photoshop techniques for luminance and color. Ken Legal has started to do imaging. Jay Boyarsky is experimenting with a barn door mount.

Beginner's – Nancy McGuire indicated she would like to conduct a beginner's night, possibly at Burke Rd on 11/26. She also asked for assistance with the beginner's S.I.G since she has a busy travel schedule.

Outreach: - There is no manager for this S.I.G at this time. Gavin Warnes indicated many of the previously conducted outings, such as the Turkey Swamp event, will be held again in 2006. Gavin also agreed to organize the distribution of flyers in local libraries on the discussion board.

The 50/50 was drawn for prize of \$12.00. The meeting was adjourned. Afterwards observing took place through Gavin's 15 inch obsession and Charles Kirby's Oberwerk 100mm binoculars.

The 2005 Advanced Imaging Conference

By Steve Walters

AIC2005 was held on Nov 11-13 at San Jose CA. It was attended by 180 imagers from all around the world. The "greats" who were there included Rob Gendler, Russ Croman, Johannes Schedler, and Adam Block (formerly from Kitt Peak Observatory). The conference consisted of presentations, free time to socialize and chat, vendor exhibits and nighttime operation of a robotic observatory at New Mexico Skies. Here's Steve Mandel opening the conference.



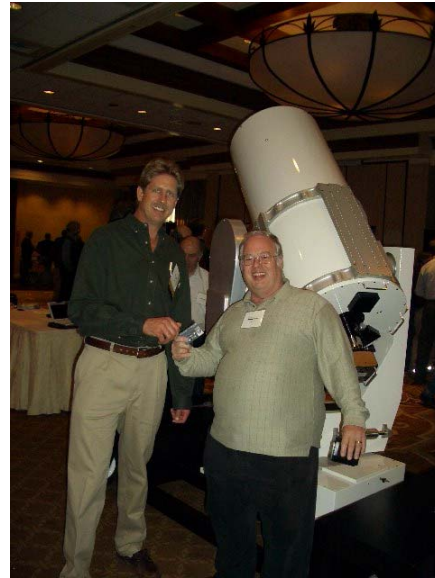
Here's the agenda and a brief description of each session.

Friday night – Reception and check-in. I chatted with Russ Croman and Adam Block, Herb and Ray York (Anacortes Telescope), Brad Ehrhorn (R-C Optical), Steve Mandel (conference chairman) and others. I got filled in on the past wanderings of my BRC-250 by Tom who bought it from me and Richard who bought it from him. My buddy Kirk Rogers from Maine was there also.



Also on Friday night, CCDWare held a hospitality suite and announced two new products – CCD Inspector and CCD Stacker. Inspector analyzes images from your system and displays best-worst-average FWHM of the images, the collimation error, the field curvature and illumination across the frame. CCD Stacker aligns, combines and processes images including L-R deconvolution, gradient removal, a new dark frame calibration method and other functions.

We had a full day of talks on Saturday with lunch and dinner provided. There was also a vendor area with some goodies to look at. Here's a shot of the vendor area and Steve Bisque with a Paramount ME.



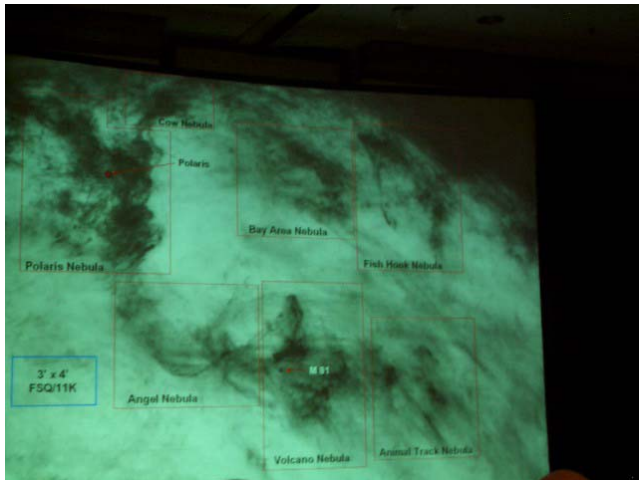
R-C Optical was displaying a 25" R-C telescope they are delivering to the US Air Force. Here's a photo of Kirk and I with it and one of me trying to buy it with my VISA card from Brad Erhorn of RCOS. It cost \$250,000 - wait until my wife finds out!



The talks were really interesting. On Saturday, we heard:

The Hybrid Image: Optimizing Your Data to the Object - Rob Gendler. Rob discussed various methods he is now using which involve a mix of wide and narrow field images that he then combines either as overlays or mosaics. He also spent some time explaining how he mixes H-alpha frames with the normal LRGB mix.

The Unexplored Nebulae Project - Steve Mandel. By accidentally overstretching some images of M81/M82, Steve discovered some faint "stuff" that was not on any catalog he consulted. After a long search and contacting many professional observatories, he learned that he had captured parts of the molecular cloud that surrounds our Milky Way galaxy. These clouds are illuminated by the light of the Milky Way and are blue reflection nebulae so they are very faint. The LBN and LDN catalogs have these clouds listed but they are enormous and nobody has bothered to examine the various knots and features of them. Many are interesting. Steve showed several of these objects and encouraged others to begin exploring these regions. Here's a shot of one of the clouds and some areas of interest.



Processing Hubble and Major Observatory Images – Lisa Frattare, Zoltan Levay and Travis Rector. These three professional astronomers create the photos we see in the Hubble Heritage gallery. They explained how they process these images. This turns out to be a lot of work because the Hubble has a very narrow field-of-view and often only images small regions of a larger object. They have to fill in the gaps with data from ground based telescopes and create mosaics to fully cover the field. I chatted with Lisa during the break and she promised to give me an “insider” tour of the Space Telescope Science Institute in Baltimore.

Understanding Seeing and How It Works – Ron Wodaski. Ron explained the various technical aspects of how our atmosphere creates the lousy seeing we experience. He also went into what can be done about it. It turns out that the majority of seeing effects occur near the ground. This includes effects at the mirror (add a fan) and being close to the warm earth (elevating the observatory by 30’ will remove more than 1/2 of the effects of seeing).



What’s New from the Sponsors – Michael Barber of SBIG discussed the various new products they expect to introduce during 2006, these include the AO for the large format STL cameras, a meteor camera, a seeing monitor, 8 position filter

wheel for the STL cameras. The seeing monitor watches Polaris constantly and measures seeing.

Processing STL11000 Images - Johannes Schedler. Johannes is one of Europe’s top imagers (Austria) and he explained many of the methods he uses in Photoshop to process his STL11000 frames. He uses G2V calibration but he does it manually in Photoshop. He does the RGB combine with background correction in MaxImDL and likes ImagesPlus for DDP. In Photoshop, he uses “shadow highlights” to adjust and smooth backgrounds.

Narrow Band Imaging Techniques – John Gleason and Russ Croman. By using narrowband filters in H-alpha, Sulphur-II and Oxygen-III wavelengths, John and Russ have created some spectacular images. A key advantage of this method is that you can acquire images in very light polluted skies, even during the full moon. The resulting frames are false-color mapped to create composites. They choose the mapping colors to either create an attractive image or to show temperature variations. The bad news is that these images require many many hours (think “Days”) of acquisition time and the filters are very expensive.

Robotic Observing from New Mexico Skies – Mike Rice. Mike owns and operates New Mexico Skies and has recently acquired a 25” R-C telescope. He operated it from San Jose over the Internet and we were able to see the various software applications he used to control it on a large screen projection system.

On Sunday, the conference continued.

Best Practices in Image Acquisition – Rick Bennion. Rick discussed methods of improving results by careful acquisition methods. He believes when seeing is reasonable, we can achieve 2” to 2.5” FWHM during a session by having good focus, collimation, tracking and guiding. He uses long autoguider exposures to minimize the effect of seeing on guiding including a graph showing that FWHM went from 2.07” to 2.25” when autoguider exposure went from .2 sec to 5 sec. He also demonstrated CCD Inspector which can measure the FWHM of images, the curvature and collimation of the telescope/camera system.

Processing Tips from the Pros – Ken Crawford and Don Goldman. These guys, besides being top imagers in their own right, have collected tips from the imagers at the conference and described their techniques. These included avoiding clipping, using masks when blurring or sharpening to isolate the region being processed, an improved HPF method for sharpening to enhance both small and large features. Also how to remove background posterization using gamma controls and magic wand selection in Photoshop.

Quicker Pictures – Adam Block. Adam worked at Kitt Peak in their outreach program where people would register

for a night of imaging on a 20" R-C at the peak. Adam would help them acquire and process their images in a single night. He had very little time to do the processing and did not always have all the material to do everything "right". Over the years, he developed a set of schemes to quickly create a "decent" image. Some tips he described included running median filter on dark frames to see if there are gradients or uneven illumination, always doing levels before curves in Photoshop, and increasing saturation after non-linear stretches to avoid losing color. He would duplicate the image in a new layer, run curves on it and then blend using "multiply" with opacity adjustments to stretch/sharpen an image.

The conference ended on noon Sunday with the drawing of door prizes. These included an SBIG 402XT camera/guider system, a \$1500 discount from R-C Optical, an M31 print by Rob Gendler and many other prizes. Naturally I didn't win anything.... ☹

All in all, this was a very enjoyable conference. I picked up a lot of new ideas, mostly on Photoshop processing methods. This was my second year at AIC, I expect I'll come back next year. There is consideration of having an East Coast event, possibly in conjunction with NEAF, but the organizers wouldn't say what they are going to do on this yet.

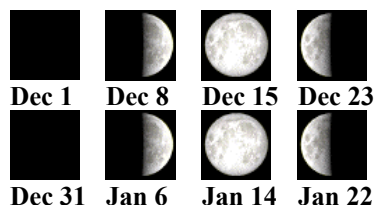
Clear Skies!

Steve Walters...

www.StarryNights.us

Astrophoto@comcast.net

Moon Phases



		19:30	Venus Sets
		21:00	Saturn Rises
Thu	8	04:36	First Quarter Moon
		12:38	Moon Rise
Sat	10	03:55	Jupiter Rises
		04:00	Mars Sets
		05:23	Mercury Rises
		07:11	Sunrise
		13:24	Moon Rise
		16:35	Sunset
		19:25	Venus Sets
		20:30	Saturn Rises
Mon	12	01:00	Mars 1 deg. S of the Moon
		04:06	Moon Set
		05:20	Mercury Rises
Tue	13	14:51	Moon Rise
		23:00	Geminid meteors peak, ZHR 120
Thu	15	11:15	Full Moon
		16:19	Moon Rise
Wed	21	13:35	Winter Solstice
Thu	22	08:00	Ursid meteors peak, ZHR 10
Fri	23	11:56	Moon Set
		14:36	Last Quarter Moon
Sat	24	03:10	Jupiter Rises, Mars Sets
		05:50	Mercury Rises
		07:20	Sunrise
		12:15	Moon Set
		16:40	Sunset
		18:55	Venus Sets
		19:30	Saturn Rises
Fri	30	16:00	Moon Set
		22:12	New Moon
Sat	31	02:50	Jupiter Rises, Mars Sets
		16:45	Sunset
		17:13	Moon Set
		18:30	Venus Sets
		19:00	Saturn Rises

December Celestial Events

By J. Randolph Walton (Randy)

Day	Date	Time (LMT)	Event
Thu	1	10:01	New Moon
		16:20	Moon Set
Sat	3	04:20	Jupiter Rises
		04:30	Mars Sets
		05:35	Mercury Rises
		07:05	Sunrise
		16:35	Sunset
		18:21	Moon Set

Astronomy: Pushing the Envelope

By Frank Loso

Last month, the U.S. Postal Service issued the set of four stamps depicting prominent constellations shown below. Stamps such as these are referred to as “commemoratives” since they are issued to commemorate events, places, persons or topics that are noteworthy or of special importance. The constellation stamps were issued as a promotion for National Stamp Collecting Month with the theme, “Be a stargazer: Let the stars be your guide to becoming a stamp collector.”



While these stamps are obviously intended to appeal to the general population’s fascination with the stars, they should also have a special attraction to amateur astronomers. They provide us with an easy opportunity to show our interest in astronomy and to promote our hobby by using them on our mail instead of more mundane stamps such as the flag “definitives” (stamps printed in mass quantities that are available long term) that we’re most likely to pick up at the post office. The constellation stamps are currently available for sale in most post offices and from the Postal Service web site at www.usps.com. Since commemorative stamps are printed in relatively limited quantities, it would be advisable to pick some up now.

On the issuing theme for these stamps and the title of this article, stamps can be of more value than just pushing mail through the postal system. The constellation stamp set opens the door between two hobbies, astronomy and stamp collecting, which while not obviously related, can actually be quite complimentary. As it were, there is a surprisingly large amount of astronomically related stamps and related material that is both fun and educational to collect, and which can provide astronomical enjoyment that is not dependent on clear skies.

While the most serious areas of stamp collecting involve concentrating on particular countries of interest, topical collecting which involves collecting stamps based on a particular subject has been growing in popularity for some time. People collect stamps on topics ranging from airplanes to zoology, with everything in between. One of the most popular topics to collect is space exploration, for which an amazing amount of material exists. There is quite a bit of overlap between space and astronomy, but in its own right, astronomy collecting also includes material in subtopics ranging from astronomers to celestial objects, telescopes and the zodiac.

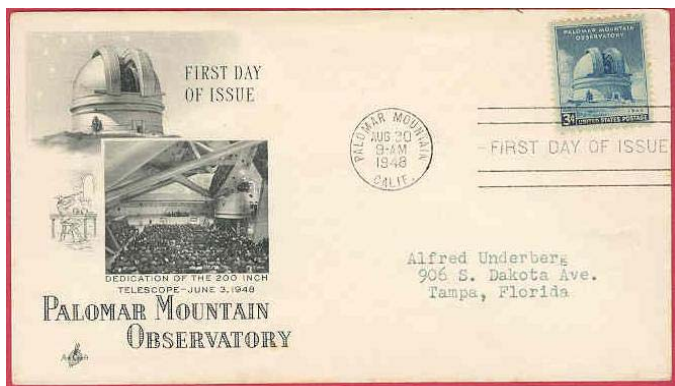
I started collecting astronomy stamps around 1979, inspired by an article on the subject in *Sky and Telescope*. I had been collecting stamps since my early childhood, and had concentrated mainly on stamps of the United States, but the article planted the seed that it was possible to combine my stamp hobby with my astronomy hobby. There were already several stamps in my U.S. collection that fit the topic, so I was off to a quick start.

The first astronomically related stamp issued by the U.S. showcases the Mount Palomar Observatory in California. Shown on the left, this stamp was released in August 1948 to commemorate the dedication of the



observatory two months earlier. Home of the 200 inch Hale telescope, Palomar would remain the world’s premier astronomical observatory until 1993 when the 10 meter Keck telescope became operational on Hawaii’s Mauna Kea. Shown below is another philatelic item related to this issue known as a First Day Cover. Stamps are generally issued with a ceremony held at a location connected with the subject matter, in this case Mount Palomar. On the first day of

sale, the stamps are available only in this issuing city. Postal usage of the stamp on this day is indicated by a “first day of issue” cancellation. First Day Covers are popular collectables and often include colorful or elaborately engraved designs, or “cachets” on the



envelope. There are several companies that produce these cached covers, but FDCs range from plain addressed envelopes prepared by collectors, to those with hand drawn or painted designs.

The next U.S. stamp with an astronomical theme was issued in 1958 to commemorate America’s participation in the International Geophysical Year (IGY), a coordinated international scientific study of the earth as a planet. As described in more detail in my article on the history of S*T*A*R in the February 2005 Spectrogram, IGY activities included studies of aurora and airglow, cosmic rays, geomagnetism, glaciology, gravity, ionospheric physics, longitude and latitude determination, meteorology, oceanography, rocketry, seismology, and solar activity.



The U.S. IGY stamp, shown above, depicts the hands of God and Adam, from Michelangelo’s masterpiece, The Creation of Adam, over the surface of an occulted sun, alive with prominences. Since the IGY was an international effort, several other countries issued similar stamps. A few examples of these are also shown. Included are three stamps from an IGY set issued by the Soviet Union; one showing an aurora, one showing a view of the sky from inside an observatory, and a third showing a meteor streaking across the sky.

The fourth stamp is a Hungarian issue showing an aurora over an icy polar scene.



Although most would agree that the space age began with the IGY and the launch of Sputnik in 1957, the U.S. manned space program began in 1961 with Project Mercury. The first manned orbital flight, of John Glenn, is depicted in the Project Mercury stamp shown below. This stamp began a series of space stamps that chronicle important space achievements by the United States. Several of these, including the



Project Mercury stamp, also have an astronomical flavor. The Project Mercury stamp, for example, shows Glenn’s Friendship 7 illuminated from

below by the sun while orbiting Earth, its thin atmosphere glowing against a star filled sky. An aspect of this stamp that makes it particularly interesting is that it was a surprise issue, which while planned in advance, was not released until Glenn was successfully in orbit.



Some additional stamps with astronomical crossover appeal that have been issued by the U.S. are also shown. These include the six cent Apollo 8 issue which shows the first photograph of Earth taken from lunar orbit and includes the beginning of the quote from Genesis that was read by astronauts William Anders, James Lovell and Frank Borman as part of the crew's live television broadcast from lunar orbit on Christmas Eve 1968. The ten cent "First Man on the Moon" airmail stamp shows Neil Armstrong's first steps on the moon, with the earth rising in the background. The eight cent "Decade of (Space) Achievement" stamp is a se-tenant issue (joined stamps with different designs) showing David Scott and James Irwin riding in the lunar rover near Hadley Rille with a stylized Earth and Sun in the background during the Apollo 15 mission.

Leaving space exploration and considering stamps with a purely astronomical theme, there are many subtopics of interest. For example, stamps have been issued which depict astronomers, observatories, planetaria, astronomical objects and special events such as eclipses and comet apparitions. The best known astronomers such as Galileo and Copernicus are very well represented on stamps – enough to form mini collections of their own.

Several Galileo stamps are shown below. The set of four beautiful and surprisingly modern looking stamps was issued by his native Italy in 1942 to commemorate 300th anniversary of the astronomer's death. The orange 10c shows Galileo teaching at the University of Padua, where he was appointed professor of mathematics in 1592 and remained for 18 years; the green 25c shows Galileo demonstrating his new

telescope at Venice in 1609; the purple 50c shows Galileo in portrait, telescope in hand; and the blue 1.24 lire shows a Galileo at his villa in Arcetri, where he was kept under house arrest by the Inquisition from 1633 until he died.



Below, a 1964 issue from the Soviet Union marks the 400th anniversary of Galileo's birth, showing his portrait over images of him observing through his telescope and of the sun with sunspots, of which he is credited with discovery. Also shown are a 1964



Hungarian stamp and an interesting 1933 "pneumatic" post stamp issued by Italy.

A few stamps depicting Copernicus are shown below. These include a 480th birthday issue by his native Poland showing a famous portrait of the astronomer by the Polish historical artist, Jan Matejko. As might be expected, Poland has been a prolific issuer of stamps honoring Copernicus. The second stamp, issued by France in 1974 for the Copernicus' 500th birthday, shows him in portrait next to a diagram of his sun centered solar system. The U.S. issue on the right, also issued for Copernicus' 500th birthday, shows a portrait of him holding a model of his sun centered solar system.



Many lesser known astronomers have also been honored with stamps. Among these are the examples shown below. The first of these, issued by Croatia in 1943, honors Roger Boscovic, the 18th century Croatian astronomer and mathematician who first developed a method of computing an orbit from three position measurements, and who first recommend the use of compound optics to overcome chromatic aberration in refractors. Also shown is a Polish stamp honoring Jan Hevelius, the 17th century astronomer

Interestingly, Copernicus is the first astronomer to be depicted on a stamp, not surprisingly by Poland, in 1923. The dual issue is shown below.



Other astronomers depicted on stamps include most of the obvious all-

stars. Among these are Hipparcus, who in the 2nd century B.C. compiled a star catalog, devised the stellar magnitude system still used today, and determined the distance to the moon using parallax. Similarly honored is Tycho Brahe, the greatest observer of the pre-telescopic era. His painstakingly accurate stellar position measurements were later used by Johannes Kepler to derive his laws of planetary motion. These greats are shown on stamps from Greece, Denmark and East Germany below.

from Danzig (now Gdansk) who is known for his lunar cartography and for his Uranographia star atlas, based on his own star catalog and published posthumously by his wife in 1690. Another lesser-known astronomer honored with a stamp is the Russian meteorologist Leonard Kulik who led several expeditions to the Tunguska region of Siberia to investigate the colossal explosion caused by what is now known to have been a powerful meteorite impact. Kulik is shown on the

Soviet stamp issued at the 50th anniversary of the Tunguska impact and the 75th anniversary of his birth.

In the theme of the Kulik issue, transient phenomena such as meteors, eclipses and comets are all popular topics for stamps. Several examples can be seen below. The first of these, from New Zealand, marks the 200th anniversary of James Cook's expedition of the ship Discovery to Tahiti and the South Pacific to explore the region and observe the 1769 Transit of Venus. The second stamp, a Philippine issue from 1988, marks the total solar eclipse visible there that year. Eclipse stamps are another subcategory that is quite popular. Finally, the last stamp in this group, from Belgium, shows comet Arend-Roland. This comet was discovered in November 1957 by Belgian astronomers Silvain Arend and Georges Roland. Arend-Roland was the brightest comet visible since Comet Halley in 1910, reaching a maximum brightness of magnitude -1 and developing a 30 degree long tail and a prominent antitail.



The Comet Arend-Roland stamp provides a convenient segue to what is without a doubt the single celestial event yielding the largest number of stamp issues, covers, and special cancellations ever - the 1986 apparition of Halley's Comet. Although the visibility of Halley didn't come close to that of its 1910 apparition, or any of several other 20th century comets such as Arend-Roland, Ikeya-Seki, Bennett or West, this celestial event seemed to have touched the world's imagination like no other. The fact that apparitions of Halley's Comet occur at intervals of 76 years, making it a once in a lifetime event for most people, is

undoubtedly a contributing factor to its mystique and popularity. From a philatelic standpoint, a complete collection of Halley's Comet stamps, covers and special cancellations would number close to 1000 items!

A few examples of the many Halley's Comet stamps are shown below. First is a set of four issued by Halley's native Great Britain in February 1986. This fanciful set was designed by British cartoonist Ralph Steadman. The 17 pence stamp shows a rendition of the comet with Halley's face as its head and his hair as its tail, with the text "Dr. Edmond Halley, 1656-1742." The 22 p stamp commemorates the encounter of the European Space Agency's Giotto probe with the comet. The 31 p stamp shows two images of the comet with the text "Maybe twice in a lifetime," while the 34 p stamp shows the comet rounding the sun during its orbit.

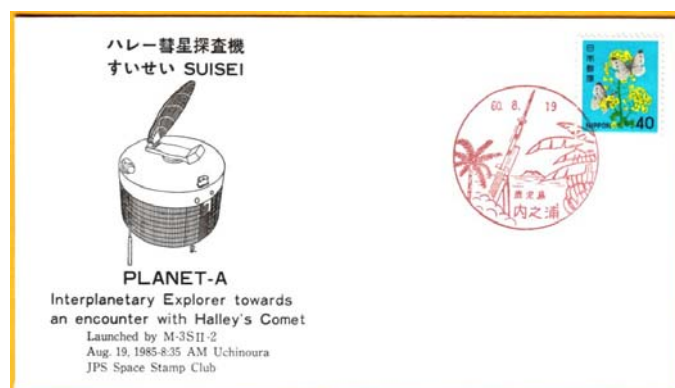


A more conventional looking set of three stamps was also issued by the British Channel Island of Jersey. These are shown on the next page. Each stamp includes a caption "Years of the Comet" and depicts two comet apparitions. The 10p stamp, covering the apparitions of 912 and 1066, shows King Harold, William of Normandy and the Comet, as depicted on the famous Bayeux Tapestry. The 22p stamp covers the apparitions of 1301 and 1682, weaving together a somewhat convoluted story. The stamp shows Lady Elizabeth Carteret, the widow of Sir George Carteret who left Jersey to become governor of New Jersey. The map of the Atlantic Ocean in the background of the design symbolizes the Jersey/New Jersey connection. It is an apparent connection between Lady Carteret and Edmond Halley, however that warrants her appearance on the stamp, along side

Halley who is depicted observing the comet in 1682. The image of the comet above them on the stamp is based on the painting, Adoration of the Maji, by the Italian artist Giotto di Bondone, believed to be inspired by the appearance of the comet in 1301. The third stamp covers the apparitions of 1910 and 1986, showing the comet as seen in 1910 being visited by the European Space Agency's (ESA) Giotto probe in 1986 above a television screen with images contrasting the technological advancements between 1910 and 1986.



Having mentioned the ESA's Giotto mission to Comet Halley, some additional stamps related to the space based study of the comet during the 1986 apparition are shown on the right. The first stamp, from West Germany in which the ESA is headquartered, shows the Giotto probe next to the comet. The second stamp, issued by the Soviet Union, depicts the orbital path of their two Vega probes to Comet Halley. Known formally as Venera-Halley 1 and 2, these probes used an orbital slingshot past Venus where they dropped entry probes before heading outward for their flyby rendezvous with Comet Halley. Another pair of flyby probes was sent to Halley by Japan. These were named Suisei (Planet-A) and Sakigake (Pioneer). Suisei is shown on the cacheted cover below, which is cancelled on the date of the probe's launch.



And so, with Halley's Comet leaving the vicinity of the solar system for another 76 years, I will wrap up this article. My intent was to provide a glimpse of the universe of astronomy as depicted on stamps. The examples I have shown are just a small sampling of the wealth of material available to collectors. Starting such a collection is a great way to have fun and, with a little research, learn more about both the science and history of astronomy.

None of the stamps shown in this article are particularly valuable or expensive. Most can be found for no more than a couple of dollars. As far as locating material, today it is relatively easy to find stamps on the internet. Websites such as ebay and zillionsofstamps.com are handy resources for connecting buyers and sellers. A general web search on "astronomy stamps" will also result in links to stamp dealers as well as other collecting resources. I will end with a word to the wise. As with most hobbies involving collectables it is advisable to keep in mind that purchasing with the intent of investment is always a gamble, so a "fair" price is whatever price you are willing to pay for the enjoyment of owning the item. Values listed in Scott's Stamp Catalog, which

can be found in most libraries, give a general idea of stamp prices, but actual prices will vary based on stamp condition, demand, etc. With that in mind, a lot of enjoyment can be found through stamps for surprisingly little monetary investment. Starting a collection is as simple as a trip to your local post office.

Voices from the Cacophony

By Trudy E. Bell and Dr. Tony Phillips

Around 2015, NASA and the European Space Agency plan to launch one of the biggest and most exacting space experiments ever flown: LISA, the Laser Interferometer Space Antenna.

LISA will consist of three spacecraft flying in a triangular formation behind Earth. Each spacecraft will beam a laser at the other two, continuously measuring their mutual separation. The spacecraft will be a mind-boggling 5 million kilometers apart (12 times the Earth-Moon distance) yet they will monitor their mutual separation to one billionth of a centimeter, smaller than an atom's diameter.

LISA's mission is to detect gravitational waves—ripples in space-time caused by the Universe's most violent events: galaxies colliding with other galaxies, supermassive black holes gobbling each other, and even echoes still ricocheting from the Big Bang that created the Universe. By studying the shape, frequency, and timing of gravitational waves, astronomers believe they can learn what's happening deep inside these acts of celestial violence.

The problem is, no one has ever directly detected gravitational waves: they're still a theoretical prediction. So no one truly knows what they "sound" like.

Furthermore, theorists expect the Universe to be booming with thousands of sources of gravitational waves. Unlike a regular telescope that can point to one part of the sky at a time, LISA receives gravitational waves from many directions at once. It's a cacophony. Astronomers must figure how to distinguish one signal from another. An outburst is detected! Was it caused by two neutron stars colliding over here or a pair of supermassive black holes tearing each other apart in colliding galaxies over there?

"It's a profound data-analysis problem that ground-based astronomers don't encounter," says E. Sterl Phinney, professor of theoretical physics at the California Institute of Technology in Pasadena.

Profound, but not hopeless: "We have lots of good ideas and plans that work—in theory," he says. "The goal now is to

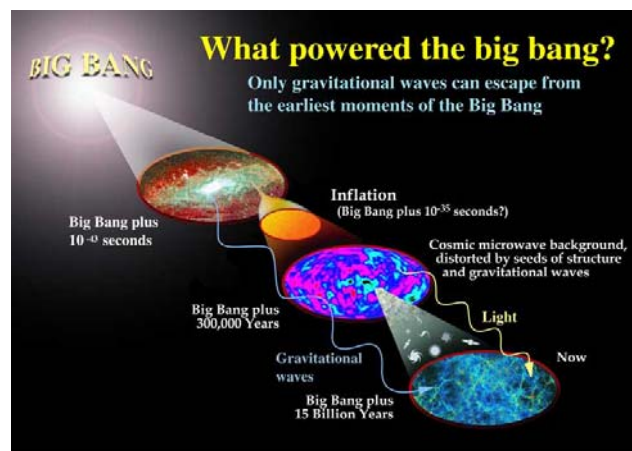
prove that they actually work under real conditions, and to make sure we haven't forgotten something."

To that end, theorists and instrument-designers have been spending time together brainstorming, testing ideas, scrutinizing plans, figuring out how they'll pluck individual voices from the cacophony. And they're making progress on computer codes to do the job.

Says Bonny Schumaker, a member of the LISA team at the Jet Propulsion Laboratory: "It's a challenge more than a problem, and in fact, when overcome, a gift of information from the universe."

For more info about LISA, see lisa.nasa.gov. Kids can learn about black holes and play the new "Black Hole Rescue!" game on The Space Place Web site at <http://spaceplace.nasa.gov/en/kids/blackhole/>.

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



LISA will be able to detect gravitational waves from as far back as 10⁻³⁶ second after the Big Bang, far earlier than any telescope can detect.

Are you a S*T*A*R Member?

S*T*A*R is a member of United Astronomy Clubs of New Jersey (UACNJ) and the International Dark Sky Association (IDA). Meetings are the first Thursday of each month, except July and August, at 8:00 PM at the King of Kings Lutheran Church, 250 Harmony Rd. in Middletown . Meeting generally consist of lectures and discussion by members or guest speakers on a variety of interesting astronomical topics.

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In the Eyepiece

Here is a list of objects for this month. This is reproduced from www.skyhound.com with the kind permission of its creator and author of SkyTools Greg Crinklaw.

Object(s)	Class	Con	RA	Dec	Mag
NGC 1501	Planetary Nebula	Camelopardus	04h06m59.4s	+60°55'14"	13.3
Cleopatra's Eye	Planetary Nebula	Eridanus	04h14m15.8s	-12°44'21"	9.6
The California Nebula	Diffuse Nebula	Perseus	04h03m12.0s	+36°22'00"	5.0
NGC 1664	Open Cluster	Auriga	04h51m04.4s	+43°42'04"	7.2
MSH 04-12	Quasar	Eridanus	04h07m48.4s	-12°11'36"	14.8
NGC 1360	Planetary Nebula	Fornax	03h33m14.6s	-25°52'18"	9.6
Crystal Ball	Planetary Nebula	Taurus	04h09m17.0s	+30°46'33"	10.0
Palomar 2	Globular Cluster	Auriga	04h46m06.0s	+31°22'54"	13.0
K 2-1	Planetary Nebula	Auriga	05h07m07.1s	+30°49'18"	13.8
NGC 1624	Open Cluster	Perseus	04h40m25.4s	+50°26'49"	11.8