

# Desert Skies

Tucson Amateur Astronomy Association

Observing our Desert Skies since 1954

Spring 2015

Volume LXI, Issue 1

## Inside this issue:

President's  
Letter 2

Outreach 3, 5

New RideShare  
Program 7

Observing &  
Imaging 8 - 11

Featured  
Articles 12, 14

Classifieds 7

Sponsors 7

Contacts 15

## Astronomy Festival

Sunday, April 26

Noon—9pm

Brandi Fenton Memorial Park

## Take Note!

- ◆ Science Fair and Book Festival Reports
- ◆ TAAA RideShare Program Announced
- ◆ Jupiter Opposition 2015 Report
- ◆ Constellation of the Season—Centaurus
- ◆ New Items in the Classifieds

## The Tadpoles in IC410



*TAAA member Howard Bower photographed IC 410 which is found in Auriga using a Telescope Engineering Company TEC 140 ED apochromat refractor with a field flattener resulting in f/7.4. This is a narrow band image with 34 exposures in Hydrogen Alpha (30 minutes each), 34 exposures in Oxygen III (binned 2x2 at 15 minutes each), and 34 exposures in Sulphur II (binned 2x2 at 15 minutes each). IC410 is a faint emission nebula surrounding the star cluster NGC 1893. At the top left of the nebula are two objects known as "The Tadpoles". These are likely areas of stellar formation. Each tadpole is about 10 light years long. This object is at a distance of about 12,000 light years. © 2013 Howard Bower. Used by permission.*



Our mission is to provide opportunities for members and the public to share the joy and excitement of astronomy through observing, education and fun. We fulfill this by providing Astronomy Services to schools, church groups, scout troops, and convention organizers. We support many organizations in the Tucson area that are involved in Science, Technology, Engineering and Mathematics (STEM) programs. Our members enjoy observing the night sky under the dark skies that our observing sites offer. We are an all-volunteer, tax-exempt, non-profit, 501(c)(3) organization.

#### Frequency

*Desert Skies* is published quarterly by the Tucson Amateur Astronomy Association, PO Box 41254, Tucson, AZ 85717.

© 2014 by Tucson Amateur Astronomy Association. All rights reserved. No part of this document may be reproduced or used in any manner whatsoever without the express written permission of the Tucson Amateur Astronomy Association.

#### Publishing Guidelines

*Desert Skies* is published quarterly, near the dates of solstice and equinox. The deadlines for publication are March 1st, June 1st, Sept 1st, and Dec 1st. Submissions should be emailed to the editor at [taaa-newsletter\[at\]tucsonastronomy.org](mailto:taaa-newsletter[at]tucsonastronomy.org). Submissions should be in the form of a text or Microsoft Word compatible file. Photos and artwork are encouraged. Please send these as separate attachments with resolution of at least 200 dpi (higher is preferred). Submissions are retained by the editor unless prior arrangements have been made. Copyrighted materials will not be accepted unless permission to use is clearly stated. We will not publish slanderous or libelous material. All copyrights retained by Tucson Amateur Astronomy Association, Inc. or the original author.

#### Contacting the TAAA

Editor: [taaa-newsletter\[at\]tucsonastronomy.org](mailto:taaa-newsletter[at]tucsonastronomy.org)

TAAA Board of Directors:

[taaabod\[at\]tucsonastronomy.org](mailto:taaabod[at]tucsonastronomy.org)

[www.tucsonastronomy.org](http://www.tucsonastronomy.org)

520-792-6414

PO Box 41254, Tucson AZ 85717



## From Our President

As I reviewed the March Bulletin it was really heartwarming to see all of the activities in which we are involved. It takes a lot of dedication and hard work to put this all together and make it work... and the individuals involved get a lot of satisfaction! If you haven't read the bulletin, please dig it out... you won't be disappointed. If you would like to participate in any of these activities, please let me or one of our group leaders know.

In addition, we are moving ahead on several fronts:

- We are testing out live streaming of our general meetings. I will keep you posted as to our progress.
- We have a new Assistant Web Master – Diane Neufeldt. She will assist Tim Van Devender in the maintenance of our website and assist our leaders in updating the information on their web pages as well as helping improve the layout and effectiveness of our website.
- Diane has also taken on the task of setting up a ride share program for those who need help in order to attend our events. She has set up a link on our website for carpooling to meetings or carpooling/caravanning to our dark sites. She has worked hard on this site and it is very impressive. Please check it out, and if you can offer a member a ride from your area, that would be greatly appreciated.
- If you haven't noticed, we now have a "chatroom" on our website. This allows for private conversations as well as a group chat. To check it out, you will need to log in as a member. If you need help contact Tim, Diane, or me.
- I hope you are using the link for Astronomy Magazine to order your subscription to receive the magazine at the club rate. I am still trying to get Sky & Telescope to set up a link for our webpage. I will keep you posted.
- We are looking to expand our partnership with other science and astronomy organizations. Recently, thanks to the efforts of Jim Knoll and our outreach group Starry Messengers we have an official agreement with Catalina State Park. They host 3 major events a year and we are to host star parties at these events. Also, we are in negotiation with Arizona Science and Astronomy Expo to assume a greater role in their yearly extravaganza. We would like to see more non-profit science and astronomy outreach events.

As you can see, we have ambitious programs and events planned. It takes a lot of planning and organizing to implement a successful event. A lot of hard work by a lot of dedicated members makes this possible. However, we do need help in all areas: Telescope operators; hands-on activity volunteers; refreshment coordinator; teachers for astronomy topics; other coordinators (we need several) and support persons for our many projects. There are so many ways in which you can help and make a difference. You might be surprised with the level of enjoyment and satisfaction you get from personal involvement.

Mark the date of May 1st on your calendar – this is a very important date. It is the date of the General Meeting where you, the members, will elect your next board of directors. The Nominating Committee consists of John Kalas, John Mead and Howard Weatherhead. You will have already been contacted at least once to give you the opportunity to serve on the governing board of Tucson Amateur Astronomy Association. Please take inventory of your abilities and skills and consider how you can use them to further the goals of your organization.

(Continued on page 4)



# ★ **Community Involvement & Outreach**

## *TAAA Honors Science Fair Exhibitors*

Text by Brian O'Connell (boc7[at]inbox.com)

Photos by Terri Lappin (terrilappin[at]tucsonastronomy.org)

On March 10, TAAA members Molly Hancock, Terri Lappin, and Brian O'Connell served as sponsored award judges at the Southern Arizona Regional Science and Engineering Fair (SARSEF). Each year the TAAA presents awards to elementary, middle, and high school students in the content category of astronomy.

The SARSEF expanded to include yet more schools this year, as depicted by the photo showing aisles upon aisles of projects displayed by grade level. Recent award winners have come from areas outside of Tucson. Recognizing this, the TAAA Starry Messengers group decided to award cash prizes rather than gift certificates to local observatory programs or astronomy retailers. Indeed this year, our high school award again goes to a student from Yuma, Arizona.

In addition to the cash awards, each awardee receives a framed Certificate of Achievement and an invitation to enjoy a complementary one year membership in the TAAA.

Over the past few years, it seems that the light-pollution theme is increasingly represented among astronomy-related projects. Perhaps the outreach efforts of the TAAA, the IDA, and the media are leaving an impression with teachers, parents, and students. Among the 1906 projects submitted, we reviewed twelve astronomy-related entries, including 3 high school projects. Judges are instructed to assess each project's research question, data collection and presentation, creativity, and poster clarity.



Poster presentations of the over 1900 entries into the 2015 Southern Arizona Research, Science and Engineering Fair including grades K through 12. Held in the same location as the Arizona Science and Astronomy Expo, it took up nearly three times as much space.



A little silliness by our judges (Terri Lappin on left, Molly Hancock on right), photographed with cardboard cutouts of astronaut Sally Ride and astronomer Neil deGrasse Tyson. Photo taken by Brian O'Connell.

Our high school award of \$100 went to Luis of San Luis High School for his project "A Justification of the Existence of Primordial Black Holes Based on Hawking Radiation and General Relativity". In our interview with Luis he referenced mathematical relationships supporting the idea that small black holes

(Continued on page 4)



High school student Luis received \$100 for his project *A Justification of the Existence of Primordial Black Holes Based on Hawking Radiation and General Relativity*. Luis, who commented on the beauty of the mathematical equations that describe black holes, discusses his project with TAAA members Molly Hancock and Brian O'Connell.

(Continued from page 2, President's Message)

If you are not in a position to serve on the board of directors, please consider serving on one of our many committees or volunteering for some of our astronomy events. We need you!

We are continuing to move forward... and with your help we will be a World-Class Organization.

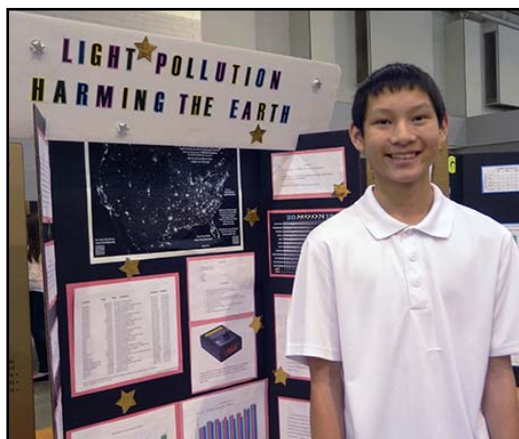
Remember, through understanding, cooperation, enthusiasm and dedication we can accomplish great things.

**Bob Gúroy**

(Continued from page 3, Science Fair)

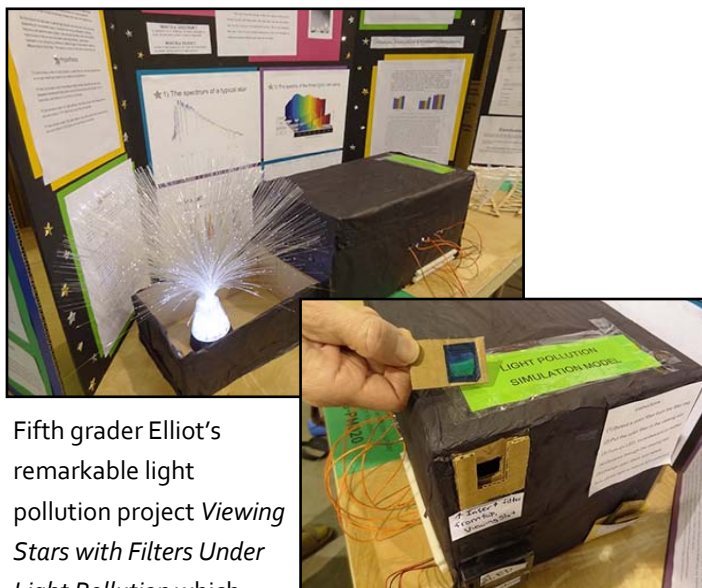
may have formed when the "cosmic web" structure of the universe first manifested matter and voids.

The \$80 award went to 7th-grader Andy of Doolen Middle School. His project "Light Pollution: Harming the Earth" compared sky brightness measurements made with a Sky Quality Meter. He included data on time of night, moon phase and sky brightness while charting measurements over a two-month period from many locations, including Southern California while on vacation.



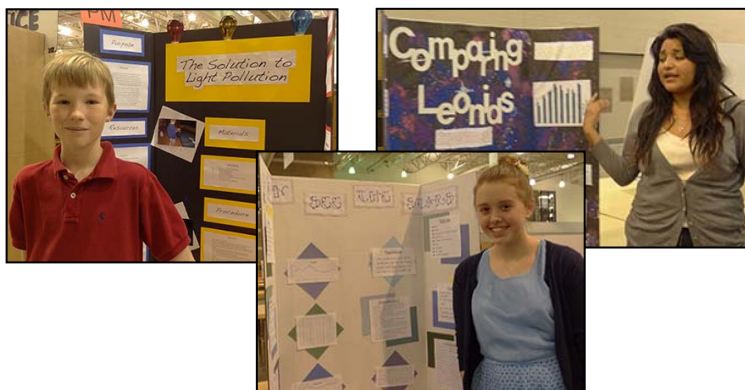
7th-grader Andy of Doolen Middle School received \$80 for his project *Light Pollution Harming the Earth*. He showed dedication to his project by including observations while on travels in California with his family.

Our 5th grade award winner, Elliot of Manzanita Elementary School, submitted a Light Pollution Simulation Model as part of "Viewing Stars with Filters Under Light Pollution". LED fiber optic "stars" are counted while viewing through different color filters inserted at the light box viewing hole. A switch allows the viewer to turn on two different light sources – such as a good porch light vs. a bad porch light. This was a highly effective demonstration project on the level of Night Sky Network toolkits. We awarded Elliot with \$60.



Fifth grader Elliot's remarkable light pollution project *Viewing Stars with Filters Under Light Pollution* which considered the colors of stars when viewed through colored filters he used. Elliot was awarded \$60 for this project.

Our judges interviewed other young scientists and recognized that all had elements worthy for consideration of an award. Left: Sean, a 6th grader at Tanque Verde Elementary School, *The Solution to Light Pollution*; Center: Madeline, an 8th grader at Copper Basin K-8, *I Can See the Stars*; Right: Isabella, a student at the Tohono O'odham High School, *Comparing Leonids*. It was a difficult decision to not award these young people.





## **Community Involvement & Outreach**

### *TAAA Brings the Sun to Earth at Tucson Festival of Books*

Text by Karen Liptak (kmliptak[at]comcast.net)

Photos by Terri Lappin (terrilappin[at]tucsonastronomy.org)

The seventh annual Tucson Festival of Books held on March 14th and 15th brought over 130,000 visitors to one of the city's most exciting events. And TAAA volunteers played a valuable role, introducing visitors in Science City to astronomy and to our club.

This year we combined solar telescope observing with exhibits that focused on the Sun. Telescope volunteers gave visitors a chance to look at the Sun through white light and H-alpha filters. And at TAAA's booth, we entertained and educated attendees with fun facts and hands-on displays. In all, we interacted with over 5100 visitors from Tucson and around the country!

Our booth was situated in a great spot, with one table facing a busy walkway between food booths and other Science City exhibits. When people stopped by, we shared information about the Sun: what could be seen through the solar telescopes; the Sun-Earth connection; how magnetic fields work; the Sun's age, its size compared with other stars and how we learn about the Sun through direct imaging and through spectroscopy.

Activities at the booth included games with visitors to illustrate that all energy on Earth originates in the Sun. We also simulated solar storms and let visitors feel for themselves the attraction and repulsion of magnetic fields of force. I especially liked how whole families got involved, with parents and children learning about the Sun together.

Literacy is the primary reason for the Tucson Festival of Books. To fulfill the literature requirement, we featured seven authors from among our membership.

On both days we gave away a Vixen Sky Eye 50M beginner telescope, which had been donated to the TAAA. Both telescopes were won by

children. And we gave out our own Sun Fact Sheets and Quizzes, Fact Sheets to accompany solar viewing, THE SUN \* OUR STAR tattoos (right), and information about TAAA.

Fourteen TAAA volunteers and a group of Boy Scouts led by TAAA member Joe Statkevics gladly shared their knowledge and enthusiasm. In return, we had some great encounters. Joe Statkevics was especially impressed by the four-year-old he met who had science books under his arm and started teaching *him* about the Sun. I most remember a ten year-old girl interested in physics, who was eager to learn how the Sun

(Continued on page 6)



The two telescope winners (the girl in top photo and boy in lower photo). Look at those smiles!



Over four thousand visitors took advantage of the solar telescopes provided by both the TAAA and the UA Science: Mount Lemmon SkyCenter.



### TAAA AUTHORS FEATURE AT OUR EXHIBIT (NOT JUST ASTRONOMY BOOKS)

- CathySue Anderson: *Through Grandmother's Window*
- Stephen Buchmann: *The Reason for Flowers*
- Erich Karkoschka: *The Observer's Sky Atlas*
- Chris Lancaster: *Under Dark Skies—A Guide to the Constellations*
- David Levy: *Skywatching (The Nature Company Guides)*
- Karen Liptak: *Out in the Night*
- Thomas Watson: *Mr. Olcott's Skies An Old Book and a Youthful Obsession*

(Continued from page 5)

'works.' And it is always wonderful to see how our efforts help awaken interest in learning more, especially in children.

We signed up about 23 visitors interested in learning more about the TAAA.

Despite a windier weekend than we'd have preferred, our outreach helped thousands of people begin to understand why solar activity is so fascinating and important to monitor. And we had fun. Good, exhausting fun!

TAAA's next outreach activity is Astronomy Day on April 26th. Once again we'll combine solar scopes with Sun exhibits. If you are interested in volunteering at this event, please contact Terri Lappin, whose dedicated leadership of TAAA's Starry Messengers makes these events possible. Also, a special thank you to Brian O'Connell, who organized our booth's set up, and helped Terri run things smoothly.

***"We had fun. Good, exhausting fun!"***



Visitors to the TAAA exhibit learned many interesting and fun facts about the sun. TAAA members Peter Morse (blue shirt) and Ed Foley (red shirt).

## THANK YOU!

Cathy Anderson  
Paul Anderson  
Stephanie Cortes Delgado  
Ed Foley  
Christopher Green  
Chuck Hendricks  
Terri Lappin

Karen Liptak  
Peter Morse  
Brian O'Connell  
Jim O'Connor  
Marlene Riley  
Kyle Slagle  
Joe Statkevics



Jim O'Connor (green shirt) explained the activity on the sun to visitors during both days of the event.



## ASTRONOMY DAY 2015

Join us at Brandi Fenton Memorial Park on Sunday, April 26th for our second annual Astronomy Festival, a celebration of Astronomy Day. Events start at Noon.

There will be solar and night sky observing, solar exhibits, prizes (including a telescope) and more!



# Program

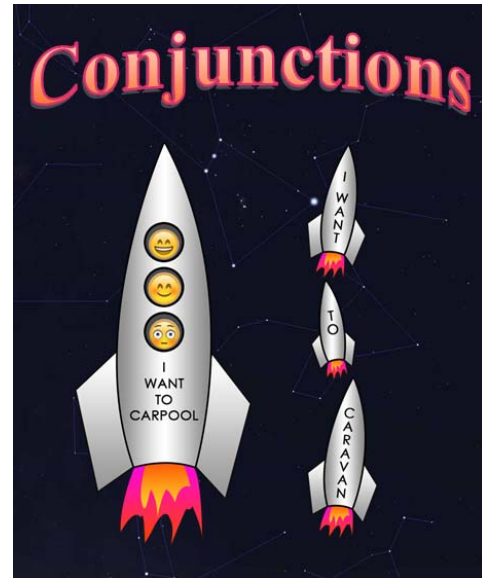
## Need a Ride? Share a Ride? "Conjunctions" RideShare Started

Contributed by Bob Gilroy, TAAA President (president[at]tucsonastronomy.org)

The TAAA recently launched "*Conjunctions*" which is a carpool and caravan service for its members. This will afford rides to members who want to participate in member star parties at the two observing sites: the Chiricahua Astronomy Complex southeast of Tucson in Cochise County and the Tucson International ModelPlex Association a few miles beyond the Arizona-Sonora Desert Museum west of Tucson. The service can also be used by members attending the monthly General Meetings on the first Friday of the month.

In addition to carpooling, members can take advantage of Conjunctions' caravan service. The caravan service is expected to be of interest to those who've not ventured out to the observing sites.

Currently, the carpool service has more riders than drivers, but it is hoped this will change as members become more aware of the service. Both drivers and riders can access *Conjunctions* through the TAAA website. Membership login is required.



## Classifieds

**For Sale: Tele Vue Radian 10mm eyepiece** \$125. **Meade "Super Wide Angle" 24.5mm eyepiece** \$125. **Meade Nebula Filter** \$50. **Celestron HD Wedge adapter** for Astrophotography with select older Celestron telescopes, i.e. Ultima 2000, etc. \$95. Contact Jim at 520-744-3858 or 520-401-6769

**For Sale: Orion EQ-1 Mount w/EQ-1M Motor Drive & Hand Controller.** Suitable for small scopes and DSLR astrophotography. Partially assembled. Manuals included. \$125. Contact Jim at 520-744-3858 or 520-401-6769.

**For Sale: Meade LX200 10" Schmidt-Cassegrain.** Tripod with equatorial wedge, controls, finderscope. Includes a scope box, battery box, shield tube, and Owners Manual. One owner. Collimated, excellent. Takes 2" eyepieces or adapter. \$300. Contact Keith at 520-730-7080.

**For Sale: Jim's Mobile (JMI) Universal Medium Wheeley Bars** with Standard Wheels used to easily roll mount around. Purchased from Starizona about 1.5 years ago for use with a CGE-1100 mount but no longer needed. Visit JMI website for list of scopes this works with, maximum load 100 pounds. \$75 for the set. Contact Carl at 520 638-5599 or silverpixel@att.net.

## We thank our supporters

Since 1986  
**Stellar-Vision Astronomy Shop**  
 3721 E. 37th Street  
 Tucson, AZ 85713  
 (520) 571-0877  
 Credit Cards Accepted  
[www.stellarsvisiontucson.com](http://www.stellarsvisiontucson.com)

**STARIZONA**  
 ADVENTURES IN ASTRONOMY AND NATURE  
 5757 N. Oracle Rd. www.starizona.com  
 Tucson, AZ 85704 292-5010

**Astronomy Labs LLC**  
 See Deep Sky Objects in Real Time and In Color!  
 Visit our webpage to learn more about the  
 StarSplitter Video Astronomy Solution  
[www.astronomylabs.com](http://www.astronomylabs.com)  
 based in Tucson, AZ

**Vixen Optics**

Star Guy Brian V Deis  
[www.mrstarguy.com](http://www.mrstarguy.com)

**Astronomy**  
 magazine®

**ORION**  
 TELESCOPES & BINOCULARS

# **Observing and Imaging**

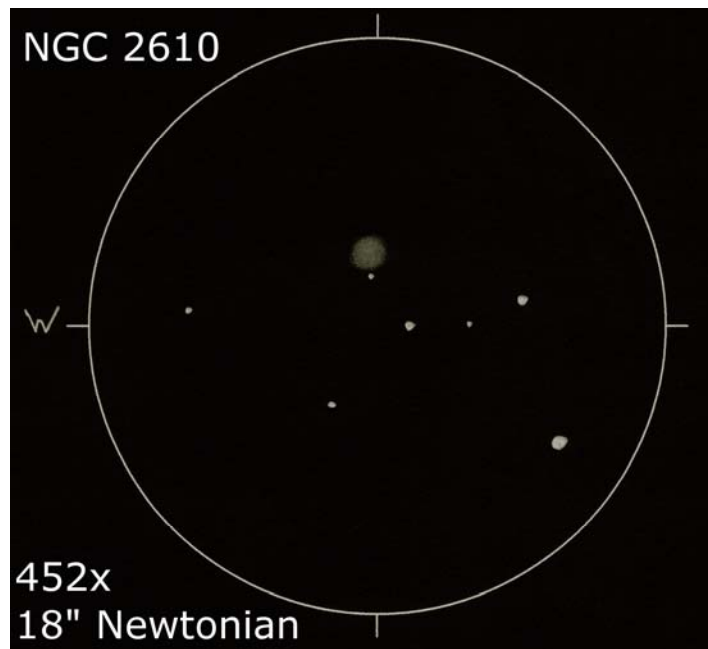
## Planetary Nebulae of the Quarter – Spring 2015

Text and Drawings by Christian Weis (weis[at]astroweis.de)

Planetary nebulae (PN) are fascinating objects which come in numerous forms or appearances. Besides the well-known grand four Messiers (M27, M57, M76 and M97), there are hundreds more to explore. This article suggests two PNs, a pretty bright and easy-to-observe one, and a harder one for the more ambitious observer who is equipped with a bigger scope.

When it comes to size, Hydra, the water snake, is the biggest constellation on the sky. It spans more than 100 degrees, roughly 5 times the expanse of the Big Dipper asterism. While the constellation itself is the opposite of what one would call an eyecatcher, there are quite a number of interesting and bright objects to be found within its boundaries, some of which are the barred spiral galaxy M 83, the globular cluster M 68 and the planetary nebula NGC 3242 (see March 2012 issue of *Desert Skies* for the later one). There is a second NGC-planetary in Hydra: NGC 2610. This object was discovered by William Herschel in 1785. With a brightness of close to 13m, a 10" telescope should be able to show it. However, the 6m6 star Hip 41992 interferes quite a lot, so it's best to keep it outside the FOV. I observed NGC 2610 in March 2011 in Austria having good sky conditions and noted: Medium in brightness, close-by 6m6 star disturbs observation, central star suspected some 10% of the time (making it a rather unsecure observation), good response to [OIII], no structures, nice star field; 452x, fst 6m7 (UMa).

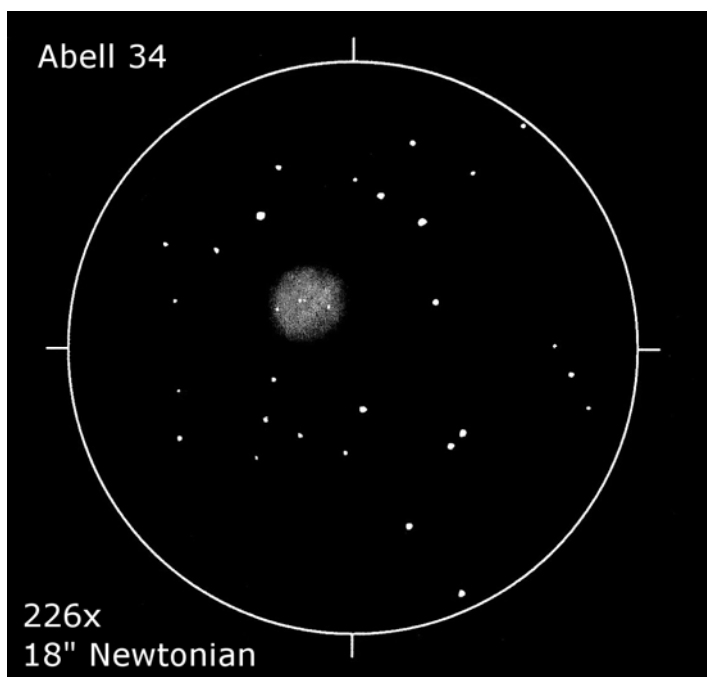
<b>NGC 2610</b>
RA: 8h 33.4min
Dec: -16° 9'
Constellation: Hydra
Brightness: 12m8
Central star: 15m5
Size: 50 arcsec
Distance: 5,500 ly



There is another nice planetary nebula, that can be found in Hydra, a mere 6.5 degrees from the constellation's brightest star Alphard. It is PK 248+29.1, which is better known as Abell 34. Interestingly, the planetary nebula Abell 33 (see Spring 2014 issue of *Desert Skies*) is also located in Hydra and some 6.5 degrees apart from Alphard.

George Abell published the discovery of Abell 34 in 1955 and also listed it in his famous 1966 paper. The object is rather dim, so you will need some dark skies and at least a medium sized telescope with an aperture of some 10" or more. Compare Abell 34 with NGC 2610 which is almost equal in brightness but a lot smaller. Can you see the difference? From my point of view, a filter (UHC or [OIII]) seems mandatory if you want to have a chance. I observed this planetary nebula in February 2011 in Austria having mediocre conditions, but was equipped with an 18"

Dobsonian. My notes are: Faint but definitely seen, no structures, extension determined with field-sweeping, maybe the star close to the center is the central star? [it is not...], no chance without a filter, two foreground stars are embedded, black cloth covering my head helps a lot; 226x, fst 6m3 (Gem).



<b>PK 248+29.1 (=Abell 34)</b>
RA: 9h 45.6min
Dec: -13°10'
Constellation: Hydra
Brightness: 12m9
Central star: 16m3
Size: 4.5 arcmin
Distance: no data



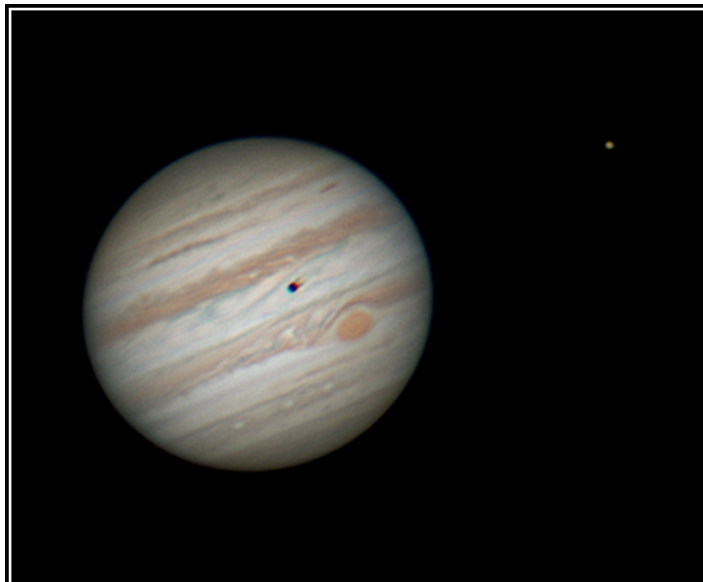
# **Observing and Imaging**

## *Imaging Jupiter at Opposition, February 2015*

Text and images by Paul Delligatti (pauldelligatti[at]gmail.com)

On the night of our monthly TAA General Meeting, February 6, 2015 Jupiter reached opposition. And, it just so happened, Tucson and southern Arizona were having a high pressure system which gave us a break in the cloudy winter weather. Although clear on that Friday night, seeing conditions were not optimal, and the dew point was quite high. So, it was fortunate that I didn't ditch the meeting early to get started imaging Jupiter because we were treated to great presentations about comets.

Saturday night, skies were similar but a little better. After setting up and doing some fine tuning, I began collecting videos of Jupiter. With high dew point and relative humidity, it didn't take long for dew to fog up the telescope corrector plate. But, a few waves with a hair dryer fixed that in fifteen seconds; and on to more video collection. But, it wasn't until Jupiter was approaching the zenith that I was able to collect data with improved seeing conditions. Corrector plate repeatedly fogged up.



**Jupiter, Io and Europa**

**2015-02-09 0414UT**

**Tucson, Arizona**

Image captured using a planetary video camera on an 11 inch Schmidt Cassegrain telescope. Io and its shadow are in transit with the Great Red Spot while Europa is approaching occultation by Jupiter. The skies were clear and calm and the temperature was in the upper 50s and no moon.

Paul Delligatti 2015©



**Jupiter**

**2015-02-09 0654 UT**

**Tucson, Arizona**

This image was obtained with a planetary video camera through an 11 inch carbon fiber Schmidt Cassegrain telescope. The skies were calm and clear with the temperature in the upper 40s and no moon.

Paul Delligatti 2015©

### **Paul Delligatti's Equipment and Resources for these images**

*Telescope:* Schmidt-Cassegrain, 11-inch f/10, carbon fiber tube

*Camera:* DMK21AU 618

*Barlow:* Powermate 2.5x

*Filter wheel:* Nautilus Electronic

*Filters:* Orion RGB & Baader IR Pass

*Processing:* Align & Stack with AutoStakkert2; Wavelets & Sharpening with Registax6; De-rotation & RGB Combine with WINJUPOS; Final editing in Photoshop

Sunday night, conditions improved, and dew fogging of the corrector was less of a problem. While Jupiter was still below 40 degrees altitude, I was able to collect nice video of Io and its shadow in transit with the Great Red Spot, while Europa was approaching occultation. Of course, as Jupiter neared the meridian, seeing conditions were much better and the quality of the video quite good.

The telescope I used is a carbon fiber 11-inch Schmidt-Cassegrain with a focal ratio of f/10. To image, I used a monochrome planetary video camera with a filter wheel and 2.5x imaging Barlow. The camera was set at 60 frames per second, 1/60th second shutter speed, and I

(Continued on page 11)

# **Observing and Imaging**

## **Constellation of the Season: Centaurus—The Centaur**

Text and artwork provided by Chris Lancaster

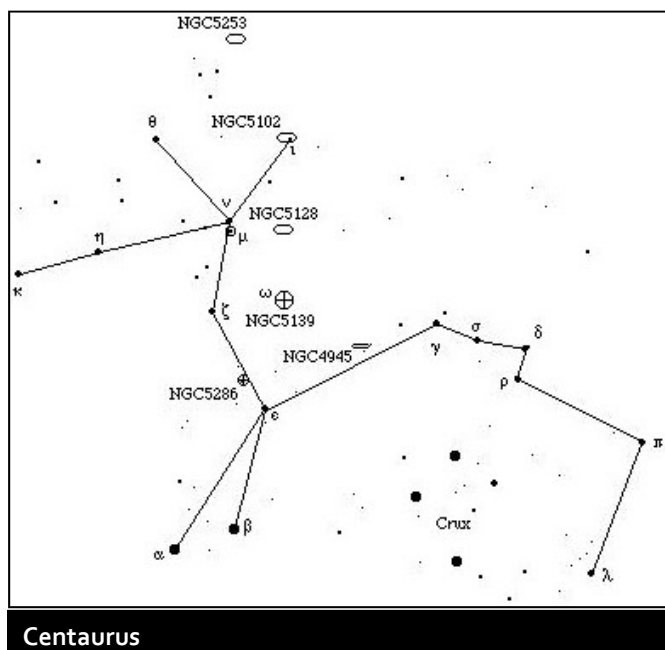
*The Constellation of the Season was written by Chris Lancaster and is the basis of his book, "Under Dark Skies - A Guide to the Constellations, Trafford Publishing (<http://bookstore.trafford.com/Products/SKU-000158114/Under-Dark-Skies.aspx>). While the information was accurate at the time of the original writing, the reader should be aware that the sky does change over time. In particular, separation and position angles of double stars may have increased or decreased. This article is presented as originally written. Consult current observing resources for correct separations and position angles. ©2008 Used by permission.*

There are two centaurs (half man, half horse) in the sky--Sagittarius and Centaurus. The former gets most of the attention because it sits at a much higher declination and is immersed in the best part of the Milky Way which is visible from the Northern Hemisphere. Centaurus, on the other hand, is at least half obscured by the horizon from most locations in North America, and contains only a few interesting objects.

From mythology we get the story of Chiron, the smartest and wisest of the centaurs. He was a skillful artist, hunter, and physician and passed some of his great knowledge to mankind, including his knowledge of the sky. Chiron met his demise when he was accidentally wounded by one of Heracles' poisonous arrows. Since Chiron was immortal, he didn't die, but was in continuous pain. He pleaded with the gods to release him from his misery and allow him to die, finally having to offer his own life for the release of Prometheus, who had been imprisoned for the crime of stealing fire from the gods and giving it to mortal man. Zeus placed Chiron in the sky, but since the northern sky was already filled with constellations, the only place for Chiron was far in the south. We have to wait until Centaurus is on the meridian before we can see most of the constellation. Look below Spica, the bright, blue-white star of Virgo, and below the tail of Hydra. The upper body of Centaurus is formed from second and third magnitude stars scattered from the horizon to an altitude of about 25 degrees and is centered on the meridian at 11:00pm on April 15th.

One of the unique aspects of Centaurus is that it is one of only two constellations that have two 1st magnitude stars. The problem is that these two stars (Alpha and Beta Centauri) are only visible if you are south of 29 degrees north latitude. Alpha Centauri, of course, is noted for its proximity to Earth (4.3 light years) and the fact that it is a strikingly bright double star which is slowly widening from its current separation of about 3 arc seconds.

Most of Centaurus's deep sky wonders are below the horizon for those of us confined to high northern latitudes, but there are a few magnificent ones that rise high enough to view. Near the northern edge of Centaurus is NGC5253, an 11.1 magnitude galaxy of an oval shape spanning 5' x 1.9'. It shows little structure but a gradual increase of brightness toward the center. It's a little hard to find in an empty area of sky 6.5 degrees northeast of Iota Centauri, or RA 13h 39m 56s Dec -31d 38' 41".



Going back to Iota Centauri, we'll see a galaxy, NGC5102, just 17 arc minutes east northeast of this 2.7 magnitude star. It measures a sizable 8.8' x 2.9' and shows a bright core contrasting with the fuzzy edges. Zoom in to RA 13h 21m 58s Dec -36d 37' 47" to see this magnitude 10 galaxy.

Barely above the horizon is NGC4945, a wonderful galaxy of magnitude 9.2 and a large size of 19' x 3.8'. Through the eyepiece, which will be filled from edge to edge at moderately high power, it will appear as a soft spear of light with strong mottling to one side through large instruments. Look to RA 13h 5m 24s Dec -49d 29' 06", or 4 degrees east of Gamma Centauri between Xi 1 and Xi 2 Centauri.

Rounding out our collection of bright galaxies is a favorite of galaxy hunters, NGC5128, or Centaurus A. Using Iota Centauri again as our starting point, slide your scope south 6.4 degrees. This galaxy is famous for being a bright radio source, presumably from an active black hole at its center. In a telescope, NGC5128 appears as a very large, round galaxy occupying 25' x 20' and shining brightly at magnitude 7.2. Most

(Continued on page 11)



(Continued from page 9, Jupiter)

collected 50 second videos through each filter – red, green, blue and near infrared.

To process the video into still frames, I used an aligning and stacking program. Then, to assemble the red, green and blue filter images, I used a program that de-rotates and compiles these into a color image. Then, the image was taken into a photo editing and finishing program. De-rotation is a recent tool available to planetary imaging which allows for longer video collection and the ability to mitigate the smearing caused by the planet's rapid rotation.

Because Jupiter is at its equinox, we have been treated to a number of interesting mutual phenomena of Jupiter's moons. During Sunday night's session, I was able to collect nice near infrared images of Io occulting Europa. Noteworthy, some planetary imagers have been able to record the shadow of one moon crossing the disc of another moon.

This apparition, Jupiter has put on quite a show and I hope many folks have been able to observe or capture some of the events. If you would like to know more about my techniques, feel free to contact me through my e-mail address.

(Continued from page 10, Constellation of the Season)

telescopes will show its most prominent feature, which is a vast lane of dust crossing its center. Large instruments in the range of 12 to 14 inches and larger will reveal that the dust band is made of two thick strands with intervening dust mottling the middle. Its location is RA 13h 25m 29s Dec -43d 1' 00".

Besides galaxies, Centaurus is home to two bright, large globular clusters. Let's start with the lesser of the two, NGC5286. Here we have a magnitude 7.6 cluster measuring 9.1' in diameter that is very easy to find. (For comparison, the well known Hercules cluster, M13, is of magnitude 6 and a size of 16'.) Start at magnitude 2.3 Epsilon Centauri and move 2.3 degrees northeast to the next brightest star (M Centauri) that you will see which is at magnitude 4.6. NGC5286 is only 4 arc minutes northwest of this star (RA 13h 46m 24s Dec -51d 22' 00"). NGC5286 will be impressive in any scope.

Now we come to the most impressive globular cluster in the heavens, NGC5139. Only 47 Tucanae in the far southern sky can compare with it. So bright is this cluster that it's easily visible with the naked eye, and before it was proven to be a cluster with telescopic observations, it was given the Bayer designation of Omega Centauri as if it were a star. Spanning a huge area of 36' (bigger than the full moon) and shining at magnitude 3.7, Omega Centauri evokes various interjections from the first time or occasional observer. Look just under 5 degrees west of 2.5 magnitude Zeta Centauri or RA 13h 26m 48s Dec -47d 29' 00". It doesn't take a scope of much size to begin to resolve the stars in Omega

Centauri, and if you are working with large aperture, the swarm of a million stars inside this cluster is truly dizzying. No doubt those with strong imaginations will see patterns, shapes, and streamers within the cluster, including two areas of lower star densities which form darker patches resembling two wide eyes looking back at the observer.

It is true that many of the objects in Centaurus suffer a bit from their low declinations. Observers closer to the equator are more fortunate to have the constellation higher in the sky. But don't hesitate to take advantage of some clear spring skies and seek out the wonders of Centaurus that are nevertheless visible in our Arizona skies.

Get all the Constellation articles in one book!

## Under Dark Skies - A Guide to the Constellations

By Chris Lancaster

Available online for \$14.99 <http://bookstore.trafford.com/Products/SKU-000158114/Under-Dark-Skies.aspx>

or directly from Chris for \$10  
ctlancaster[at]msn.com  
(while supplies last)



## 2015 Globe at Night Campaigns

**April 9 - 18**

**August 5 - 14**

**May 9 - 18**

**September 3 - 12**

**June 8 - 17**

**October 3 - 12**

**July 7 - 16**

**November 2 - 11**

<http://www.globeatnight.org/>

## Community News

### *Astronomical: Photographs of Our Solar System and Beyond*

Text and images provided by Andrew Kensett (akensett[at]email.arizona.edu, INFOCUS Curatorial Intern, Center for Creative Photography and Phoenix Art Museum and Joshua Chuang: chuangj@ccp.arizona.edu

The Center for Creative Photography (CCP) at the University of Arizona presents *Astronomical: Photographs of Our Solar System and Beyond*, a major exhibition that surveys the conjoined histories of astronomy and photography from the mid-nineteenth century to the present day. Opening January 31 and on view through May 17, 2015 in the CCP's galleries, the exhibition brings together a striking array of rare photographic objects, books, and artifacts drawn from University collections as well as from local and international private collections. Many objects in *Astronomical*, which has been supported in part by the University's College of Science, are on public view for the first time.

"We wanted not only to showcase some of the most extraordinary examples of objects from collections that are right here on the University of Arizona campus," says Joshua Chuang, the Center's Chief Curator, "but also to elucidate the University's central role in propelling the field of astrophotography forward." Chuang organized the exhibition with

Andrew Kensett, curatorial assistant, and Stephen Strom, photographer and former associate director of the National Optical Astronomy



#### *UA Center for Creative Photography Events*

April 9th (Thurs) 5:30 to 7:00pm

"Desert Moon" Special Screening

The Center will screen "Desert Moon," a film that chronicles the UA's role in putting the first astronauts on the Moon. After the screening director Jason Davis will lead a conversation with four UA planetary scientists: Ewen Whitaker and Robert Strom, both of whom were involved in NASA's lunar program of the 1960s; and Alfred McEwen and Kristin Block, respectively the Principal Investigator and Targeting Specialist for the UA-led Mars HiRISE project.

April 23rd (Thurs) 5:30 to 6:30pm

Astrophotography Today: That's Sick! Is it Real?

Leading astrophotographer and founder of the UA Science Mt. Lemmon SkyCenter stargazing programs, Adam Block, will speak about how modern images of the cosmos are made, how they influence the field of photography, and just what makes them so compelling.

Observatory, who has contributed extended texts offering greater insight into the astronomical phenomena seen in the pictures.

Since the announcement of photography's invention in 1839, the medium has have evolved alongside the field of astronomy. Several of photography's early pioneers, including Sir John Herschel, were astronomers who sought to apply the precise recording abilities of photography to their work, and it is through analyzing photographic images that astronomers today continue to make many of their discoveries. The ambitions of scientists have likewise been instrumental in driving photographic innovation, spurring the development of

(Continued on page 13)





(Continued from page 12 CCP Astronomical Photography)

technologies including the shutter, the motion picture, and the digital camera.

Without the aid of photography, for example, Neil Armstrong's first steps on the Moon in 1969 would not have been possible. Before he and his fellow Apollo astronauts could successfully carry out their historic mission, the lunar surface had to be surveyed by teams of earthbound



scientists and robotic spacecraft with photographic eyes. Original prints of images from the Ranger, Lunar Orbiter, Apollo, and Surveyor missions to the Moon, drawn from the comprehensive holdings of the Lunar and Planetary Laboratory's Space Imagery Center, are among those featured in the exhibition. Also included will be a selection of unprecedented high-resolution images of the surface of Mars from the HiRISE camera, one of several cutting-edge astronomical imaging systems that UA scientists have helped to design over the years.

Other highlights of the exhibition include an extensive display of Johann Palisa and Max Wolf's *Photographische sternkarten*, 1900-1908, the first photographically-illustrated star atlas; photographs by Ansel Adams, Richard Misrach, and Andreas Feininger from the CCP's permanent



## Astronomical: Photographs of Our Solar System and Beyond

Exhibit through May 17, 2015

University of Arizona's Center for Creative Photography  
1030 North Olive Road  
Tucson AZ

holdings; a private collection of mostly-anonymous vintage photographs of solar eclipses dating from the first three decades of the twentieth century; and *Solarium*, an immersive installation developed by multimedia artists in conjunction with NASA's Solar Dynamics Observatory that depicts the activity on the Sun's surface with breath-taking intimacy.

The capacity of photography to record light has done more than expand our visual reach; it has enabled scientists to observe ancient celestial events and break down the composition of astral



bodies element by element. The exhibition demonstrates that by allowing us to probe the materials, structure, and history of the cosmos, photography has fundamentally changed the nature of our questions and shaped our understanding of the expanding universe.

The Center for Creative Photography gallery is located at 1030 North Olive Road in Tucson, Arizona and is open to the public Monday to Friday from 9:00 a.m. to 5:00 p.m., and Saturday and Sunday from 1:00 to 4:00 p.m. Admission is free. For additional information, contact the CCP at 520-621-7968.

### About the Center for Creative Photography

Founded in 1975 by Ansel Adams and University of Arizona President Dr. John P. Schaefer, the Center for Creative Photography (CCP) is a museum and research center that houses the archives of some the most accomplished artists in the history of photography. For more information and updates on future programs, visit [creativephotography.org](http://creativephotography.org), find us on [facebook.com/CCP.UA](https://www.facebook.com/CCP.UA), or subscribe to [Focal Point](http://FocalPoint), the Center's monthly newsletter.

# Classroom of 11,000 Awaits UA Professor

University Relations - Communications | February 4, 2015

*This article was originally posted to the University of Arizona UANews website. UANews is a service of the Office of University Relations, Communications. Used by permission.*

It makes sense to have an astronomy professor teach a class that is expected to be attended by thousands.

No one knows the meaning of "vast" quite like someone who studies outer space, right?

The free, six-week class is "Astronomy: Exploring Time and Space" and the instructor is **Chris Impey**, a University Distinguished Professor who is no newcomer to online teaching. For the past two years, he has taught "Astronomy: State of the Art," the University of Arizona's first massive open online course, or MOOC. That course, delivered online through video lectures, PowerPoint slides, discussion and live Q&A sessions, has been offered via the training platform Udemy.

The new class is the University's first with Coursera, an educational technology company that has been partnering with U.S. colleges and universities since its launch three years ago. Impey expects enrollment to hit 11,000 by the time the class launches at midnight on Feb. 15.

UANews asked Impey about the class and his preparations.

**What has been the biggest challenge in pulling this together? How did you go about it?**

It was a long road to get here, not counting creating the course. I first approached Daphne Koller and Andrew Ng at Coursera in April 2012 with the idea of the UA joining the partnership, but they said they were a small company with limited capacity. In January 2013, I got the green light from Koller to start the negotiations and it took nearly two years to get us signed on. When I saw that the deal was going to happen, I started working on my course, shooting video to make a greatly enhanced version of my testbed course on Udemy. Coursera has a far superior data environment to Udemy, so it's much easier to track and motivate student engagement. And many lessons have been learned by their large instructor community.

**Who do you think will be attracted to the course?**

It's well known that most of Coursera's clientele is older students with bachelor's degrees, rather than 18- or 19-year-old first-time students, so I expect a mature and motivated audience. The word of mouth among amateur astronomers will lead many of them to sign up. Pre-enrollment right now shows that half are outside the U.S., with 150 countries represented. The ability (of MOOCs) to serve worldwide audiences with high-quality content is one of their greatest strengths.

**How will you teach to 11,000 students? What do you hope they will take away?**

The core material is video lectures and online quizzes. Completing and doing well on the quizzes is required for a completion certificate. I also have three outside projects and three



University Distinguished Professor of Astronomy Chris Impey says his new online course will have students representing 150 countries. Credit: University Relations – Communications

peer-reviewed writing activities that they will do. I'm intrigued to see how peer review of written work by that many students will work! We'll be using live sessions, the course discussion threads and social media — Facebook, Twitter — to keep an active presence in the course. I hope the students take away the extraordinary progress being made in astronomy on a wide spectrum of topics — exoplanets, black holes, star birth, distant galaxies, dark matter — and see how the complexity of the universe is underpinned by a small set of physical laws.

**How will this be different from the Udemy course?**

The Coursera course has about 18 hours of video, almost twice as much as used for Udemy. The Udemy class has no quizzes or activities or other assignments, so it is much more basic. I can get much richer data from Coursera and intend to publish research on what aspects of course design facilitate greater engagement and higher completion rates. The Udemy course is continuing and has 23,500 enrolled, so my online total will be approaching 35,000.

**What do you see as the benefit to the University?**

The benefit to the UA is partnership in a vibrant community of online instructors and peer universities learning important lessons about how to teach online. My course is the first, but there will be others. I view the Coursera experiment as a transition to a fully featured online course that could eventually be taken for a fee, with transferable college credit earned.

**Contacts**

Chris Impey  
520-621-6522  
cimpey[t]as.arizona.edu

**Extra Info**

For information about "Astronomy: Exploring Time and Space," the UA's first online course via Coursera, taught by Chris Impey: <https://www.coursera.org/course/astro>

*Editor's Note: This course has ended, but you can get on Coursera's Watch List at the above website.*



Desert Skies Staff: Editor: Terri Lappin; Assistant Editor: Louise Good; Proof Readers: Eric Allen, Twila Peck, Richard Schulze

## Board of Directors

Office/Position	Name	Phone	E-mail Address
President	Bob Gilroy	520-743-0021	president[at]tucsonastronomy.org
Vice President	Ben Bailey	520-903-7925	vice-president[at]tucsonastronomy.org
Secretary	Chuck Hendricks	520-247-3815	secretary[at]tucsonastronomy.org
Treasurer	Dr Ed Foley	520-777-9218	treasurer[at]tucsonastronomy.org
Member-at-Large	Paul Anderson	520-625-5035	mal1[at]tucsonastronomy.org
Member-at-Large	Bill Lofquist	520-297-6653	mal2[at]tucsonastronomy.org
Member-at-Large	Mae Smith	520-850-7137	mal3[at]tucsonastronomy.org

## Appointed Leaders

Office/Position	Name	Phone	E-mail Address
Membership Coordinator	Vern Dunlap	520-326-1964	membership[at]tucsonastronomy.org
Community Event Coordinator	Jim Knoll	520-241-3113	school-star-party[at]tucsonastronomy.org
Volunteer Coordinator	<b>OPEN</b>		volunteer-coordinator[at]tucsonastronomy.org
Welcome Coordinator	Cathy Anderson	520-625-5035	welcome-coordinator[at]tucsonastronomy.org
Chiricahua Astronomy Complex Director	John Kalas	520-405-3798	cac-director[at]tucsonastronomy.org
TIMPA Manager & Key Card Controller	Dennis McMacken	520-638-8178	timpa[at]tucsonastronomy.org
Strategic Planning Chairman	Bill Lofquist	520-297-6653	cac-strategy[at]tucsonastronomy.org
Publications Editor	Terri Lappin	520-977-1290	taaa-newsletter[at]tucsonastronomy.org
Web Director	Tim Van Devender	520-495-0694	webmaster[at]tucsonastronomy.org
Publicist	Liz Kalas	520-405-7892	publicist[at]tucsonastronomy.org
Conjunctions/RideShare Coordinator	Diane	For Information, visit <a href="http://www.taaa-conjunctions.com">http://www.taaa-conjunctions.com</a>	
Door Prize Coordinator	CKelli		door-prize-coordinator[at]tucsonastronomy.org
Refreshments Coordinator	<b>OPEN</b>		refreshments-coordinator[at]tucsonastronomy.org
Astronomy Services Coordinator	John Kalas	520-405-3798	astronomy-services[at]tucsonastronomy.org
Family Astronomy Program	Jim Miller		family[at]tucsonastronomy.org
Apparel Sales Coordinator	Mae Smith	520-850-7137	taaa-sales[at]tucsonastronomy.org
Boy Scout Liaison	<b>OPEN</b>		boyscout-liaison[at]tucsonastronomy.org
Equipment Loan Coordinator	<b>OPEN</b>		elc[at]tucsonastronomy.org
Librarian	Hunter Bailey		librarian[at]tucsonastronomy.org
Grand Canyon Star Party Coordinator	Jim O'Connor	520-546-2961	gcsp[at]tucsonastronomy.org
Astronomy Essentials Lecture Scheduler	Al Anzaldua	520-409-5797	introductory-lecture-scheduler[at]tucsonastronomy.org
Invited Speaker Scheduler	Terri Lappin	520-977-1290	Terrilappin[at]tucsonastronomy.org
Calendar Designer	Susan O'Connor	520-780-0136	calendar-designer[at]tucsonastronomy.org
AL Correspondent (ALCOR)	Paul Anderson	520-625-5035	alcor[at]tucsonastronomy.org
Chief Observer	Dr. Mary Turner	520-743-3437	chief-observer[at]tucsonastronomy.org
Astro-Imaging Special Interest Group (SIG)	Larry Phillips	520-777-8027	astro-photo[at]tucsonastronomy.org
Astronomy Fundamentals SIG	Dennis McMacken	520-638-8178	fundamentals[at]tucsonastronomy.org
Starry Messenger SIG	Terri Lappin	520-977-1290	smsig[at]tucsonastronomy.org
General Information	Bob Gilroy	520-743-0021	taaa-info[at]tucsonastronomy.org