

August 2009

The **Sidereal Times**

The Official Newsletter of **The Albuquerque Astronomical Society**

P.O. Box 50581, Albuquerque, New Mexico 87181-0581 www.taas.org

 505/254-TAAS (8227)

New Objects Approaching TAAS



SEPTEMBER will be an exciting time for TAAS with several new programs to benefit club members being presented at the September 5 General Meeting.

The Membership Action Team has been busy designing new features for membership services. These include name tags, membership information materials, and a greater presence at all TAAS events.

Other TAAS members are organizing a Mentor Program and a series of Astronomy 101 classes with all levels of astronomy activities for interested TAAS members. Persons interested in participating as a mentor or as a student are welcome.

A series of binoculars-only observing events is being planned for the final quarter of the year.

All of these activities will be presented in greater detail at the September meeting. Questions, suggestions, and comments should be directed to TAAS@taas.org.

General Meeting News

Space Weather and Situational Awareness

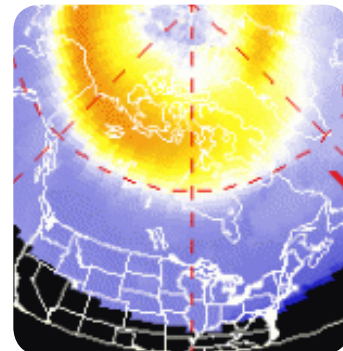
THE AUGUST 1, 2009, general meeting will feature Mark E. Reverse, Chief Engineer for the Air Force Research Laboratory's Space Vehicles Directorate at Kirtland Air Force Base.

His presentation provides a look into research in Space Situational Awareness (SSA), in particular space weather as a key component in terms of understanding space effects and in forecasting them.

Mr. Reverse will focus on the driving force for space weather within the solar system: the Sun. He will discuss the components necessary for space weather forecasting, which include data collection both from the ground and in space. He will also touch on other issues involved in SSA.

Mark Reverse has 23 years' experience with the Air Force in the area of developmental engineering, mainly of space-related systems. Scoring the highest grade in his freshman astronomy class of 400, he once considered astronomy as a career.

The meeting will begin at 7:00 p.m. at Regener Hall at UNM (map on back page). Meeting details are available on the TAAS Web site, www.taas.org.



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President's Message

Dee Friesen

Miss or Ms. Dark Matter

FOR ALL OF MY LIFE I have had to cope with the fact that my first name is a common female name: Dee. When I first started to receive junk mail, it would be addressed to Miss Dee, now it is Ms. Dee. When I arrived at college as a freshman many years ago, for a very brief time I was assigned to the women's dormitory. Often when my wife Ruth and I encounter acquaintances, they will direct a friendly greeting to her, "Hi, Dee," and then turn to me with a very blank look.

Even though I am not female, I look forward to a special female event in August. It is the International Year of Astronomy's cornerstone event "She Is An Astronomer." Under the very capable leadership of TAAS members Karen Keese and Judy Stanley, hundreds of young ladies have been invited to participate in a series of science activities that will spark their interest in learning about the natural world. The instructors at this event will all be female astronomers. Details of this event are described in another article in this newsletter.

While serving as an instructor pilot in the Air Force, I told my students that the airplane did not know if you were male or female, big or small, young or old: it will fly the same. Astronomy also knows no gender. It is a bit presumptuous on our part to assume that even though we do not know what dark matter is, it would matter what gender we are as we attempt to understand it.

THE HISTORY OF ASTRONOMY shows too many instances of bright young minds restricted to bookkeeping duties and their ideas ignored because of their gender. Fortunately, we have become familiar with many names that defied the rule of that day: [Caroline Herschel](#), [Maria Mitchell](#), [Annie Cannon](#), [Henrietta S. Leavitt](#), and [Jocelyn Bell Burnell](#), to mention a few.

So, why do a female event? My immediate response is, "Why not?" In the past, too many of the activities in astronomy have been dominated by the males. With the future of our planet firmly dependent upon our species working together, we need all the good minds we can produce to solve our future problems. "She Is An Astronomer" will help produce scientists who will provide us the means to establish a safe future for this planet.

Then, in the year 2100 TAAS will still be able to

OBSERVE – EDUCATE – HAVE FUN.

dee

The Value of Reaching Out

Karen Keese

IF YOU'VE EVER wondered why you should haul your equipment and/or yourself to any of TAAS's public outreach events, here's the answer, in a recent correspondence from a New Mexico Tech student:

Even though I grew up in a modern time, there were times when I came across a teacher or two who implied that women were not geared towards grasping math as easily as men. Of course, I never experienced that in college, because more educated people tend to know better. But since it came from the middle school and high school teachers, that kind of thought impacted me as an adolescent. I always doubted whether I was good enough to go into physics.

Another teacher of mine in high school, though, directed me toward an outreach program for women in science/engineering. He was

aware of some of the veiled comments other teachers were saying, and told me that these programs were proof that women could make it - and even succeed - in science. I don't quite remember the name of the program, but I do remember that it gave me the confidence to pursue whatever it was I wanted to do. Before then, I was debating whether I should become a lawyer (because women could write

better) or go into astrophysics. After, I applied to New Mexico Tech as a physics major.

I don't know if you've ever gotten any feedback from young girls who attend these outreach programs. But I want you to know, and anyone else who's involved in the "She Is An Astronomer" event, that these programs work.

I was actually a member of TAAS when I was in high school, and that was one of the places where I learned that astrophysics was the coolest subject in science (to me, anyway).

Thanks,
Stephanie Moats

WOMEN OF TAAS, we still have unfilled volunteer opportunities for the "She Is An Astronomer" outreach event on Sunday, August 9, from 1 to 6 p.m. at the Open Space Visitor Center. We need help with activities, assisting the featured female scientists, loading people into the planetarium, greeting, staffing one of our easy-to-use solar telescopes, etc. You don't have to be a seasoned observer or an astronomy expert. You just have to love astronomy and want to share that interest with others. There is, after all, no substitute for passion! So join us on August 9, and help inspire a future female astronomer or scientist. For details and directions, as well a list of the awesome female astronomers and scientists you can meet at this event, visit www.astronomyworkshops.org/siaa.html. To volunteer, contact Judy Stanley at 505-515-5780 or jstanley@nrao.edu.

Be there when astronomy meets girl power in New Mexico!



SHE IS AN ASTRONOMER

+ + +

WE FINALLY had a break in our long string of observing events impacted by weather with fairly good conditions and a nice turnout for our New Moon chance on June 20. Gordon Pegue opened the facility, and Bill Wallace was the Isengard host. As the evening progressed, Bill was assisted by Larry Cash and Gordon. Conditions were breezy and cloudy in early evening, but about an hour after sunset, winds dropped and clouds dissipated. Ten telescopes and several pairs of binoculars were in action, and we had approximately 25 observers during the evening. Thanks to Carl Frisch, who used the road dragger to smooth the access road.

We observed solstice sunset, with the sun setting in a notch on the horizon located directly above a white post, while we stood on the second northernmost concrete pad. Eric Edwards had first dark light for his new homebuilt optical tube and took some impressive images with his digital SLR camera mounted at the focuser. Tom Davies hosted the first teacher-telescope recipient, who along with her husband enjoyed a successful evening using her school's new 6" Orion Dobsonian telescope. Steve Welch closed the facility around 3 a.m.

Our June 25th GNTO committee meeting had seven people in attendance: Ray Collins, Pete Eschman, Will Ferrell, Dee Friesen, Lance Hurt, Melissa Kirk, and Steve Welch. After reviewing previous events and getting duty assignments for new events, we reviewed maintenance needs. We plan to finish painting eaves of the main dome, replace a few shingles and the door lock on the Robert Ortega Building, and possibly add some more gravel to the grounds. I reviewed Jim Lawrence's progress rebuilding the GNTO binocular telescope. Jim hopes to complete it in September. Lance and Dee are creating a checklist to track tasks related to opening and closing the facility.

OUR SINGLE EVENT FOR JULY is a **New Moon** observing chance on **July 18**. The following month, our New Moon event

TAAS Events Coordinator Needs Oak Flat Owners

Larry Cash

BY THE TIME you read this, we will have completed three of the five Oak Flat Star Parties for this year. The first and second were clouded out, but we are hoping for a good one on July 25.

The August 15 and September 12 dates are open for owners. If you feel the urge, please contact me at 505-307-1880. I have the procedures that I will e-mail you, and the event is really easy to own.

is **August 22**. Be sure to mark your calendars now for these opportunities to visit your observatory and enjoy the relaxed company of fellow observers.

Steve Welch heads up our CCD imaging program. If you are interested in this program, contact him at 505-866-7668 to make arrangements. Steve can have our CCD imaging equipment ready in the 10-foot dome, so you can learn about imaging and take some images of your own.

We will have the Robert Ortega Building open and our Guest Trailer available for coffee, hot chocolate, and any snacks you might want to share. We've got a bunch of great equipment waiting for you at GNTO, so plan your trip to GNTO soon. Why wait?

GNTO committee meetings are open to any interested TAAS members, and they provide a great way to get more involved with your observatory. We meet every other month at 6:30 p.m. at JB's Restaurant on Eubank just north of I-40. Monday's newspaper reports that the location may become a Sadie's Restaurant soon. Our next committee meetings are **August 27** and **October 22**. If you have questions about GNTO, please contact me (Peter Eschman, gnto@taas.org, phone 873-1517).

I hope to see you soon at your observatory.

On the Event Horizon

Oak Flat Public Star Party	Saturday, July 25
Astrophotography Boot Camp, Oak Flat	Saturday, July 25
TAAS Board Meeting	Thursday, July 30
General Meeting	Saturday, August 1
ATM Meeting	Wednesday, August 5
She Is An Astronomer	Sunday, August 9
Oak Flat Public Star Party	Saturday, August 15
ATM Meeting	Wednesday, August 19
Sidereal Times Deadline	Friday, August 21
GNTO New Moon Observing	Saturday, August 22
GNTO Committee Meeting	Thursday, August 27



A Perseid meteor streaks to the right of the Milky Way. Photo: Mila Zinkova.

Astrophoto Ops for August

Becky Ramotowski

If you're still trying to capture that perfect image for the "No Rules Astrophoto Show" in November, here are a couple of ideas to make some show-stopping images during August.

First, August is Perseid meteor shower month! While the Moon will not be in the best place for Perseid watching August 12-13, we still can catch a few with our cameras if we are persistent.

For Perseids I recommend setting the camera on a tripod, aiming it towards Perseus, and leaving the shutter open for several minutes. Use a high ISO number—at least 800 or more—to capture the fleeting streak left behind by the meteor.

Make a few test shots to determine how long you can leave the shutter open before it "fogs" from either overexposure or light pollution. Set the camera in a protected area away from stray light sources and then bracket the exposures.

The stars will trail if you are using a simple tripod. They will remain

pinpoints if you use a tracking mount, but either way, the meteor will make a streak.

Repeat this until your card is filled or moonlight interferes. I have not had much success doing this, only capturing about one or two Perseids each session, but YOU might get lucky and snag some!

Next, we have a bright International Space Station pass August 16. It begins in the southwest at 5:25 a.m. The ISS will glide almost directly overhead to a neck-cracking spot two minutes later. The photogenic part of the pass comes at the end when it flies well above the Moon, Venus, and Mars.

You'll need a wide field for this shot. And since sunrise is at 6:26 a.m., you'll have enough dark sky to work with to get a long exposure and not entirely blow out the scene.

For more information on making photos during twilight go to <http://astrobeck.com/> and then read the article on "Bright Twilight Photo Tips" listed in the left column.

Good luck!

TAAS Reports & Notices

Donations to TAAS

General

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JERRY LOVE

UNITED WAY

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NORTH VALLEY ACADEMY



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Welcome to New and Returning TAAS Members

AMY GROCHOWSKI

MATT AND ERIN KOPPA

JOSHUA LACLAIR

KATHI PANAVALS

MARK RHODES

TAI YOUN

Note from Treasurer

Clarification of Member and Renewal Policy

Renewal notices will be mailed out one month before expiration date. Renewals and new members will be dated on the first of next month no matter when during the month they arrive. This will help with the database reports and queries.

There will also be no grace period for renewals. Please make sure that you send in renewal information and your check before the expiration date. Renewal of magazines and new subscriptions will be sent in twice a month. All checks are to be made out to "TAAS." Thank you for your attention to this important issue.

If you have any questions or special needs pertaining to membership and/or magazine subscriptions, contact the Treasurer, Dan Clark at treasurer@taas.org.

Editor's Note

The deadline for the next issue of The *Sidereal Times* is **Friday, August 21**.

Please e-mail text as an attachment, preferably in Microsoft Word or OpenOffice.org Writer. Please do not embed photos in text. Attach photos and illustrations separately. The e-mail address for the newsletter editor is editor@taas.org.

Location, Location, Location

• Chaco Canyon •
6185' elevation
Latitude Longitude
36° 01' 50"N 107° 54' 36"W

36.03° -107.91°
36° 1.83' -107° 54.60'

• Oak Flat •
7680' elevation
Latitude Longitude
34° 59' 48"N 106° 19' 17"W

34.99° -106.32°
34° 59.80' -106° 19.28'

• UNM Campus Observatory •
5180' elevation
Latitude Longitude
35° 5' 29"N 106° 37' 17"W

35.09° -106.62°
35° 5.48' -106° 37.29'

To convert from Degrees, Minutes, Seconds:

Divide seconds by 60, then add minutes, then divide by 60 again.

For security reasons, GNT0 location is available by request only, so please contact Pete Eschman for GNT0 information.

Courtesy Pete Eschman

Membership Services

for:

- Membership Inquiries
- Events Information
- Volunteer Opportunities

Contact Bill Firth at
membership@taas.org

for:

- Membership Dues
- Magazine Subscriptions
- Address/e-mail changes

Contact Dan Clark at
treasurer@taas.org

P.O. Box 50581 Albuquerque, NM 87181

Monthly Membership Report **July 2009**

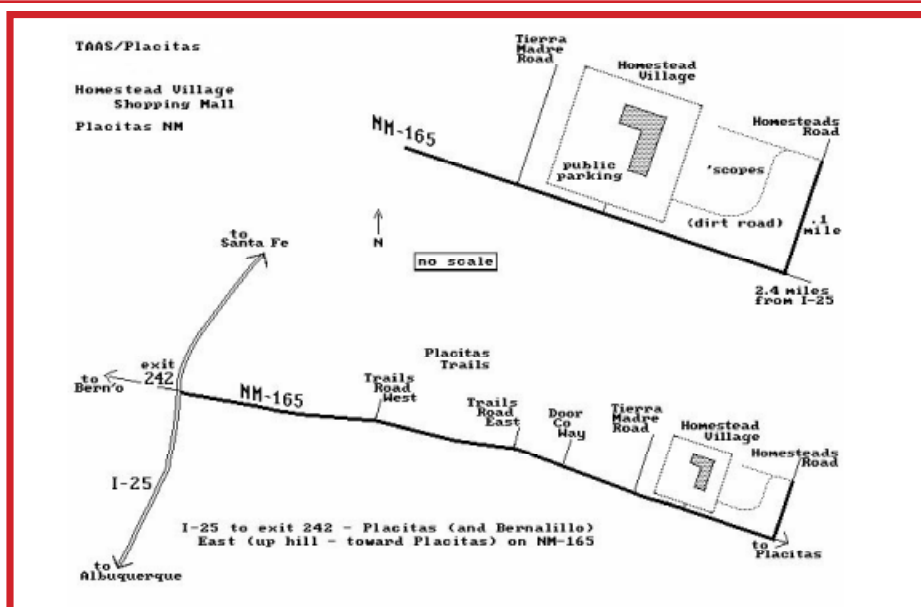
Membership	Current Month	Past Month	Change
Regular	189	185	4
Family	52	48	4
Educational	10	9	1
Total Paid	251	242	9
Honorary	7	7	0
Complimentary	36	36	0
Total Members	294	285	9

August 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 TAAS General Meeting
2	3	4	5 ATM SIG Meeting	6	7	8
9 She Is An Astronomer	10	11	12	13	14	15 Oak Flat Star Party, Astrophoto Boot Camp, Messier SIG
16	17	18	19 ATM SIG Meeting	20	21 <i>Sidereal Times</i> Deadline	22 GNT0: NM Observing
23	24	25	26	27 GNT0 Committee Meeting	28	29
30	31					




Annual Placitas Star Party Announced

On Saturday, October 24, TAAS and Las Placitas Association will co-host the annual star party to promote dark skies in the Placitas community. The party begins around sunset (6:22 p.m. MDT.) Plan to arrive closer to 5:45 p.m. for setup and, just like the last several years, the event will be at the Homestead Village Shopping Center (Merc) with telescopes set up along the dirt road immediately east of the public parking lot (see map). A waxing crescent moon will set around 11:26 p.m., and docents may want to show visitors the Apollo 11 landing area some forty years after the fact. Jupiter will be another showpiece object with Uranus, Neptune, and even the dwarf Pluto possibly being visible with enough aperture. Come ready to show off your favorite objects to those who want to see them—yourself and everyone else! For additional information, call Shannon Mann 771-0126.



Map courtesy Barry Gordon

September 2009

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2 ATM SIG Meeting	3 TAAS Board Meeting	4 	5 TAAS General Meeting
6 GNT0: Fall Cleanup	7	8 Ernie Pyle Middle School Star Party 	9	10	11	12 Oak Flat Star Party, Okie-Tex 
13	14	15	16 ATM SIG Meeting	17	18 <i>Sidereal Times</i> Deadline 	19 GNT0: NM Observing; Chaco Canyon
20	21	22	23	24	25	26 GNT0: Equinox Picnic, Training 
27	28	29	30			

TAAS General Meeting

Saturday, August 1

7:00 P.M.

Regener Hall

University of New Mexico

(See map, back page)

Space Situational Awareness and Space Weather

Mark Roverse

Chief Engineer, Space Vehicles Directorate,
Air Force Research Laboratory, Kirtland Air Force Base

Notes


TAAS = The Albuquerque Astronomical Society.
Hotline 254-TAAS (8227).

GNT0 = General Nathan Twining Observatory
GNT0 Training = GNT0 Observing and Training
GNT0 NM = New Moon Premium Observing Night

UNM = University of New Mexico Observatory.
Call the TAAS hotline @254-8227, or the UNM hotline @ 277-1446 to confirm, or unm_coordinator@taas.org.

ATM = Amateur Telescope Making. Call Michael Pendley for information @ 296-0549, or atm@taas.org.

P & A = UNM Physics and Astronomy Building, Corner of Lomas and Yale

 = School Star Party

SIG = Special Interest Group

TBA = to be announced

Blue Italics = Non-TAAS events

GUEST ARTICLE: The International Year of Astronomy's July theme is "Black Holes."

Shedding Light on Black Holes

July, 2009

By Tom Koonce

Antelope Valley Astronomy Club
Lancaster, California

BLACK HOLES... Just their name sounds like something out of science fiction. Maybe this is one reason why they have been the focus of misconceptions and misguided theories. This month, the theme of the International Year of Astronomy is centered on the objects that weigh heavily (pun intended) on the minds of theoretical physicists and leading astronomers... Black Holes.

First a bit of background on the subject.

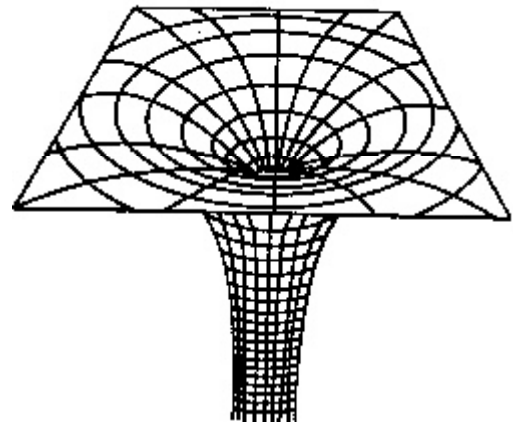
The gravitational force exhibited by a celestial body is proportional to its mass and inversely proportional to the square of the distance which the object is away from that mass. So how does a black hole generate its enormous gravity even though its mass is contained within an infinitesimal point?

Consider a star with the mass and radius of the red supergiant Betelgeuse. Under normal circumstances, an object could orbit the star at a distance outside of Betelgeuse's stellar atmosphere. But if the entire mass of Betelgeuse were compressed down to become a black hole, in the absence of Betelgeuse's stellar atmosphere, the object could pass much closer to the black hole's center of mass... so close, in fact, that the gravitational force would be incredibly high.

Another concept to realize is that if the Sun were to suddenly be replaced with a black hole of equal mass, the Earth would continue to orbit it in the exact same manner as it does today, except that the lack of sunlight would render the Earth incapable of sustaining life.

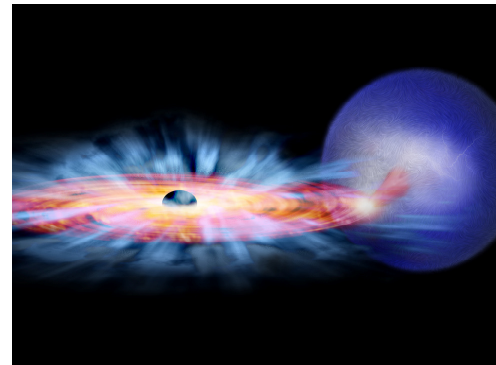
A COMMON QUESTION that comes up during casual conversation about this subject is, "If I went through a black hole, where would I go?" The straight-forward blunt answer? "To your death!" You literally would be torn to pieces by the gravitational tidal forces during your approach to the event horizon and then, with unerring certainty, what gelatinous mess remained would be squashed much, much flatter than a pancake as your remains fell deeper into the gravity well. Black holes are not a mode of transportation to another universe, but they are efficient "matter compactors," sweeping up all mass that passes too near. Of course they can't draw in matter from light years away, but as matter falls into a black hole it becomes (perhaps) infinitely compressed by the overwhelming gravitational force.

Imagine what a black hole looks like and you probably picture the graphic popularized by the media; a two dimensional plane with a funnel-shaped hole descending towards the black hole's singularity. This stylized perception of the three-dimensional nature of the object has misled many people to think of a black hole as a hole in space, like a hole in the backyard, or perhaps a tunnel in space-time leading to other parts of our own universe.



Since black holes are surrounded by an event horizon, a spherical region where not even light can escape the immense gravity, space artists have envisioned the object as a black blob against a field of distant stars. This black blob is surrounded by a fairly bright disk of material caught in the gravitational field. Why is it bright? As all of the dust and matter spirals in closer to the black hole it is rubbing against other matter, heating it up by friction until it gets to millions of degrees. It is this dust outside of the event horizon that is radiating light.

(This is an artist's representation of GRO J1655-40, a binary star system observed in April 2005 by Chandra. This binary consists of a black hole and a normal star shown in blue. Gas is being pulled away from the star and falling onto a red disk spinning around the black hole. Some of this gas spirals in towards the black hole, generating copious amounts of light along the way. Credit: NASA)



What would a glimpse below the event horizon look like? How important would it be to you to find out? It would be a one-way trip. Nothing, not even light, can escape from below the event horizon... but photons of light, since they are affected by gravity, could orbit within the event horizon if conditions are right. Since there are photons continuously falling into black holes, many must get trapped in this manner. We can't see the photons because they are orbiting and not radiating outward and striking our retinas. If we were somehow able to glimpse just below the event horizon, on that one way trip into gravitational flatness, I believe you would see bright light surrounding you; you would see photons instead of blackness. Your final view might be of some ancient photons that had been orbiting for millennia just waiting for you to observe them.

COURTESY TOM KOONCE AND THE *DESERT SKY OBSERVER*.

Zeroth Light

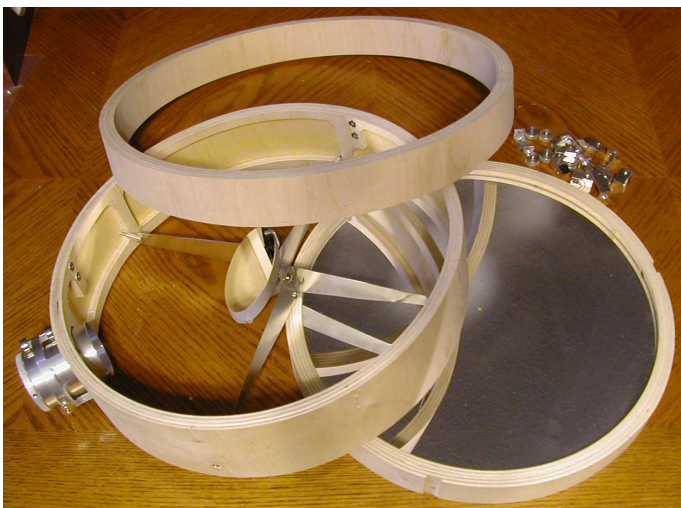
Barry Spletzer

FOR ANY telescope maker, First Light is a great moment. Whether your telescope is the fruit of days, months, or even years of work, this is the time you first take it out, point it at the sky, and – finally – get to take a look. However, for some of us, First Light is hard to define. Along the tortuous trial-and-error path of building a telescope, especially a unique one, there are many times your budding scope might gather starlight during testing even though it is not complete. So for me, First Light is pretty fuzzy, but I can



define Zeroth Light. Since zero comes before one, I figure Zeroth Light precedes First Light. Zeroth Light is the very first time I can see an image with the telescope optics.

So where is all this going? This evening, I had Zeroth Light on my new 13-inch portable scope. For my truss tube scopes, Zeroth Light is when I clamp the upper part of the scope to my basketball pole, put the mirror cell on the ground, and focus on whatever is overhead. I do this just to get a precise measure of the truss length, but it is Zeroth Light and that is a major milestone of scope construction. The suitably crude setup is shown here.



More to the point, I am pretty excited about building my 13-inch scope. I have been working on the design (on and off) for about 3 years. I even started building once and trashed the whole thing because that design was fatally flawed. I finally started building again last month and, so far, things are going well. The main purpose is to cram a 13-inch telescope into a suitcase suitable for air travel. So far, I have about 40 hours labor invested, and the results are shown here. Obviously, I have a long way to go. I expect the final telescope to weigh about 20 pounds in a 20" x 18" x 7" package compared to the original pickup-filling 100-pound Coulter scope that provided the primary mirror.

If my ambition holds out, I will have some follow-up reports on my progress in coming months. I intend to have the scope done by October, in time for my presentation on Telescope Engineering at this year's Enchanted Skies Start Party at Socorro. Perhaps this winter, it may even see First Southern Hemisphere Light.

Dark Sky SIG

David Penasa

IDA Statement on Energy Efficiency for Exterior Lighting

The International Dark-Sky Association (IDA) has circulated a statement of their recommendations to the U.S. House Energy and Commerce Committee as its members evaluated the Waxman-Markey Clean Energy Bill and will continue to advocate dark-sky-friendly technology when the bill is reviewed by the U.S. Senate. See IDA's statement:

<http://docs.darksky.org/PositionStatements/Statement-Energy%20Legislation.pdf>

IDA Congressional Briefings

The IDA has a second series of Congressional briefings scheduled for July 2009. Experts from an array of disciplines will present the latest information on outdoor lighting to legislators and policymakers. Discussion topics include energy efficiency, environmental impact, and sustainable outdoor lighting for urban areas.

<http://docs.darksky.org/PR/Congressional%20Briefings.pdf>

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New Web Site Coming

Enjoy TAAS Telescopes at No Charge

Yes, any TAAS member can borrow a TAAS telescope. You can choose from scopes with apertures ranging from 6" to 13". View the TAAS telescope collection at www.taas.org under "Programs."

Some restrictions apply. Offer valid for current TAAS members. Offer is first come first served. Latecomers will be put on a waiting list.

Neither TAAS nor the telescope curators will be held liable for any lost sleep or other problems arising from the use of TAAS scopes.

Borrowers are required to enjoy the telescopes.
E-mail telescope_loans@taas.org.

TAAS Help Wanted, August

TAAS NEEDS PEOPLE to assist with the following areas. If you are interested, contact Dee Friesen or any other TAAS BOD member. Contact information for all BOD members is on page 11 of this newsletter.

TAAS Mentor Program — Provide learning assistance to a newer member by sharing your astronomy knowledge and experience.

Contact Dee Friesen.

General Meeting Planning — Identify speakers, activities and events for the monthly TAAS meetings.

Contact Dick Fate.

Education — Participate in the TAAS Educational Outreach Program by attending school star parties.

Contact Bob Hufnagel.

GNTO Committee — Join the committee and receive training to become a GNTO Key Holder.

Contact Pete Eschman.

Membership — Assist with the conduct of the TAAS membership program. Help track membership, identify reasons for nonrenewal of membership, and promote TAAS membership.

Contact Dee Friesen.

Observing — Identify significant observing events for TAAS members and events to present to the public. Create observing contests and observing lists for members to complete to receive TAAS awards.

Contact Steve Welch.

TAAS Social Events — Assist with the planning and conduct of TAAS social events.

Contact Dick Fate.








TAAS Web Site — Assist with the the TAAS Web site including e-mail procedures and other electronic communications.

Contact Mike Fleenor.

International Year of Astronomy planning — Assist with the planning of TAAS events for the IYA.

Contact Dee Friesen.

2009 TAAS Board of Directors/Staff

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Archivist ATM Coordinator ATM Coordinator Dark Sky Coordinator Education Coordinator Grants Coordinator Librarian Loaner Scope Coordinator Membership Coordinator Newsletter Editor Public Relations Coordinator UNM Observatory Coordinator Web Master	Pat Appel Ray Collins Michael Pendley David Penasa Bob Hufnagel Barry Spletzer Bob Hufnagel Barry Spletzer Bill Firth Gary Cooper Melissa Kirk Robert Williams Bill Wallace	292-0463 (H) 344-9686 (H) 296-0549 (H) 277-1141 (W) 890-8122 (H) 228-4384 (C) 890-8122 (H) 228-4384 (C) 899-0950 321-5404 (C) 385-0113 270-5857 864-8212	archivist@taas.org atm@taas.org atm@taas.org darksky@taas.org education_coord@taas.org grants@taas.org librarian@taas.org telescope_loans@taas.org membership@taas.org editor@taas.org pr@taas.org unm_coord@taas.org webmaster@taas.org
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The Albuquerque Astronomical Society

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