This is the second half of the story of how the size of the solar system was determined. As I mentioned last time, by measuring the angles between the planets, it is relatively easy to draw a scale model of the solar system. What is difficult is determining actual size. Fortunately, if any one dimension between the planets can be determined, all the others can be readily figured. Last time, I talked about the efforts of the Greeks around 200 B.C. to figure the distance to the Sun. Through some brilliant insights, they managed to measure the size of the Earth, the size of the Moon, and the distance between them. When it came to determining the distance to the Sun, they made the first real effort to and were able to show that the distance must be many million miles but could not get a good answer.

Accurate determination of the distance had to wait until after the invention of the telescope and celestial mechanics. The telescope provided the means to make much more precise measurements in the sky and celestial mechanics allowed astronomers to predict important events such as the inner planets passing in front of the Sun (transits) and the positions of Jupiter’s moons. However, precise measurements were not enough. As with the Greeks, the more modern methods required significant ingenuity.

Even though there were telescopes, the images were pretty fuzzy. One of the ways to get some sort estimate to the size of the solar system was to measure the angular size of the planets. Unfortunately, the planetary images were so fuzzy that this was very difficult. Now that transits of Mercury and Venus could be predicted, it was much easier to measure the size of planets. By using just a pinhole projector, an image of the Sun could be projected and the size of a transiting planet can be measured relative to the size of the Sun. Pierre Gassendi first did this during a transit of mercury in 1631. Figure 1 is a close up of what he saw. The size of mercury against the Sun was almost unbelievably small. In addition,
What do you get for your TAAS membership? Potentially, the answers constitute quite a list of member services. Abstractly, there is the satisfaction of supporting a large and expanding enterprise that provides public educational outreach. It is an association that provides opportunities for personal growth and exploration in many areas of astronomy. There is the invitation to take advantage of the impressive facilities of GNTO in pursuing the study of the night sky. A first-rate newsletter and on-line resources; help with tuning up an old instrument or beginning a telescope project through the ATM group; a calendar quite replete with meetings, public star parties and sidewalk astronomy events – all these allow members to meet a mix of social and learning needs while we share with others our joy in things astronomical.

I guess my surprise (and dismay) in looking over the above list is that most members take so little advantage of most of what they could be enjoying as TAAS members. One could postulate that what is offered is not what most people want! Alternatively, the problem may be more one of “marketing”: TAAS members (and especially new members) find it difficult, for whatever reason, to come forward and attend meetings, join in at public events and “personalize” their membership. This is of real concern to the Board, and we will be making membership issues the central focus of our meetings during the months ahead.

In the past there have been questionnaires designed to give the Board direction in meeting member needs and wants, and these have been only partially successful. (I, for one, am very circumspect on the whole matter of questionnaires, and almost never respond voluntarily!) Let me instead invite you to communicate with me (taas@taas.org) any concerns, opinions about what we should be doing differently or ideas concerning opportunities we are missing. Please believe that this input will be valued as we work to make TAAS a more responsive organization.

With joy I announce that a most extraordinarily qualified organization. To keep things simple, we’ll discount Sirius B (the dimmer dwarf companion to Sirius A), Sirius would be about two dozen times hotter (and brighter) than our sun if seen at the same distance, owing to both its size and high surface temperature. But it is about 560,000 times further from us than our sun! The result is that the heat we receive from Sirius is about 0.00000000008 times (8 x 10^-11, or 8 one hundred billionths) the heat we receive from the sun. What matters far more (and the Romans missed this completely) is that our seasons vary with the sun’s angle to the earth’s surface (due to the tilt of the earth’s axis.) In July in the northern hemisphere, this angle is quite high, and we experience “dog days.”

(And you thought all I ever wrote about here was poetry and TAAS current events! But wait: there’s more Astronomy!) One curious factoid relating to Sirius: references to this brightest of stars go back some 5,000 years, but every account of it during the period 100 BC to 200 AD mentions that it was red in color. It is a distinctly white star, of course, and the evolutionary change of Sirius A cannot be invoked – a few thousand years is far too short a time period. Could an interstellar dust cloud have reddened Sirius’ appearance, and then drifted on? Was Sirius B a red giant (and the dominant star of the pair) 2000 years ago that since has completely blown off its outer layers in some unusually fast planetary nebula scenario? The answer is that we do not know the answer!

I have enjoyed some of the recent dog days down at GNTO, getting things ready for the long-anticipated project of replacing the roof decking. This work has been interesting, as the original construction sequence went logically from concrete block walls to roof framing to roof decking to dome support rollers to dome. Removing the dome (a few tons of steel!) – in some ways the logical first step in getting back to the level where restoration is needed – is not an option! The strategy has been to eliminate half of the rollers and locate the remaining (and upgraded) ones to places where they will interfere as little as possible with the upcoming steps of replacing the plywood decking. Now the weight of the dome is transmitted down into the building walls at the eight points where the circle (dome) and square (walls) intersect, and this should represent an overall design improvement, as the weight of the dome should no longer work to deform the roof structure.

(II look over the foregoing, and wonder if anyone could find this account anything but confusing. My confession: nobody could even begin to imagine how confusing it has been for this simple carpenter!)

SUMMER STARS
Bend low again, night of summer stars.
So near you are, sky of summer stars,
So near, a long arm man can pick off stars,
Pick off what he wants in the sky bowl,
So near you are, summer stars,
So near, strumming, strumming,
So lazy and hum-strumming.

– Carl Sandburg
On Saturday August 9th The Albuquerque Astronomical Society will present a public lecture which is the first of a two part series on an introduction to telescopes. If you are contemplating buying a telescope for yourself or another in the near future you should not miss these events. This first event is a lecture intended to serve as an introduction to telescopes while the second that will be scheduled for October will be a “show and tell” where several TAAS members will set up their various types of telescopes so that those unfamiliar with astronomical instruments can get a close-up look and hear some of the pros and cons of the different types of “scopes”.

TAAS member Barry Spletzer is giving this August lecture which is titled: How Did the Moon Get in My Telescope? To many of us, telescopes are nothing short of magic. They bring images of distant objects to earth and show us things impossible to see otherwise. In spite of this, only the most basic knowledge of light and optics, along with a little careful consideration, is needed to develop a sound understanding of how a telescope works. In my presentation, I will begin with basic principles and go on to explain how a telescope makes a magnified image, what determines how much you see, what makes a sharp image, and other properties. In doing this, I will carefully avoid equations and mathematical derivations since they just get in the way of real understanding. In the end, I hope to provide a solid intuitive understanding of this important topic.

Barry Spletzer is a Senior Engineer at Sandia National Laboratories. Barry is currently working in the area of robotics. Within TAAS he is an active member of the Amateur Telescope Makers Workshop and is the coordinator of the TAAS Loaner Scope Program. Anyone who has attended our Messier Marathon will also recognize Barry as the docent who always went on to explain how telescope stars are further divided into two groups, visual doubles and non-visual doubles. One of the best known sets of double stars serves as a good example for both the basic definition and the division between visual and non-visual doubles. Mizar in the constellation Ursa Major (in the handle of the Big Dipper) is a group of four stars that are gravitationally bound. The group has been known for many years as a visual double in that they appear as two stars in even small telescopes and binoculars but recently new techniques for splitting close doubles indicates that each of the two “stars” in the double are actually each very close doubles.

The study of doubles is important for several reasons. First, one of the most interesting questions in astronomy is whether or not the universe is expanding and, if it is, will it continue to expand? It has been known for some time that galaxies behave as though they have more mass than the apparent number of stars they contain. By developing a better estimate of the number of non-visual doubles, the actual number of stars in the universe can be better estimated and therefore a better estimate of the total mass can be made. Another important reason for the study of doubles is that there is chemical interaction present in doubles that does not occur in single stars. Another reason for the study of doubles is that the search for extraterrestrial planets relies to a great extent on measuring the wobble of stars. The wobble caused by a massive object orbiting a star can be caused by a planet or could be caused by an orbiting non-visual second star. In order to discover new planets the possibility of the wobble being caused by being a double has to be eliminated.

One of the features of doubles that is studied is the mass of each star. The mass is usually determined by measuring the orbit of the stars around each other. This is often difficult to do for single stars. By studying the mass of star types that exist as doubles the mass of the same type of star that exists as a single can better be determined. Another interesting feature of double stars that is measured is the mass density of the stars.

An interesting aspect of doubles is that they exhibit variability but not always in the same way as single stars. Often changes in brightness witnessed are not due to one or more of the stars growing brighter or dimmer but is due to one of the stars passing in front of the other. Another interesting aspect of doubles is the difference in color of the stars in the group.

There are many measurements that can be made by amateurs regarding double stars. Data from amateurs on double stars is often welcome by professional astronomers because the larger working observatories cannot dedicate much time to this pursuit. In fact there is a “Neglected Doubles” list that is published to indicate where amateurs can contribute. One of the useful tools available to amateurs is a micrometer eyepiece for measuring separation. Keeping records of the period of the doubles orbit is also useful. The Navy is taking the lead in measuring doubles. Their research is driven by the desire of having very precise sky maps to allow for navigation by the stars in the case of an attack on the global position satellites by adversaries. One of the techniques used by the Navy is a speckle interferometer. These instruments can split very close doubles. One such instrument is located at the Lowell Observatory where the device is attached to a visual camera and the path of the beams are routed through evacuated (the air removed) tunnels. This arrangement has been used to split doubles with as little as one thousandth of an arcsecond of separation. Satellite based systems planned for orbit in the future will have even better resolution.

Rebecca Purvis is a neuropharmacological lab manager for UNM’s College of Pharmacy. She has worked in various labs since 1975, and has co-authored several papers. She is on the board of directors of The Albuquerque Astronomical Society and is well known for her public astronomy outreach work at the UNM Campus Observatory.
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#### Important Notice to All Members Concerning

**TAAS’s Sidereal Times Newsletter**

Did you know that $20 of your $30 membership dues is spent on annual printing and mailing costs for the TAAS Sidereal Times newsletter? That’s right, only $10 of your annual dues is left over to fund all of TAAS’s programs and other expenses, including the General Nathan Twining Observatory, Educational Outreach programs and Special Events, etc. Current TAAS expenses, including programs and printing costs, equal $38 per member per year. You can help reverse TAAS’s spending dilemma without impacting the newsletter or our important programs. By getting your monthly TAAS Sidereal Times Online, instead of in your mailbox, you can help keep TAAS funds where they belong: **In TAAS Programs.**

- Online newsletters are available many days before a printed version arrives in the mail.
- Online newsletters bring you beautiful high resolution color pictures and graphics.

**Page 4**

### STARDATE

**J.D. Palmer**

Albuquerque, NM-KUNM 89.9 FM airs STARDATE nightly @ 7 P.M. (weekends @ 6 P.M.). It is a 2 or 3 minute short radio piece about astronomy. Subjects include: that night’s sky; cosmology; astro-history; new astro-discoveries. Produced by the folks @ McDonald Observatory.

See: [http://www.stardate.org](http://www.stardate.org)
October 2003

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**Notes**

**GNTO** = General Nathan Twining. Observatory - premium observing night.
**GNTO Training** = GNTO observing and training.
**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.
**ACSA** = Albuquerque Coffee Shop Astronomers. Contact Sammy Lockwood for information or visit www.taas.org and select sidewalk astronomy.
**ATM** = Amateur Telescope Making. Call Michael Pendley for information @ 296-0549, or atm@taas.org.
**Panda** = UNM Physics and Astronomy. Corner of Lomas and Yale.
**SUN MON WED THU FRI SAT**

**AMATEUR TELESCOPE MAKING WORKSHOP**

Ray Collins/Mike Pendley atm@taas.org

The Amateur Telescope Making Workshop meets the first and third Wednesdays of each month at Valley High School, 1505 Candelaria—the north side of Candelaria, just west of 12th street. The meetings begin at 7 P.M. and are in Building E, Room #3.

**TAAS General Meeting**

Saturday, August 9, 2003

7:00 P.M.

Regener Hall, University of New Mexico

**Subject:**

How Did the Moon Get in My Telescope?

**Speaker:**

Barry Spletzer

**Planet Rise / Set (10/15/2003)**

Mercury 05:31/17:16 Saturn 22:18/12:34
Venus 07:22/18:13 Uranus 15:10/02:07
Mars 15:27/02:13 Neptune 14:07/00:30
Jupiter 02:50/15:43 Pluto 10:17/21:03
Meeting of the TAAS Board of Directors, July 10, 2003

Present: David Brown; Elizabeth Burki; Ray Collins; Pete Eschman; Shannon Mann; Becky Purvis; Barry Spletzer. Excused: Larry Cash; Dale Murray; Judy Stanley. Observers: Barry Gordon; Gordon Pegue

I. Corrections to last month’s minutes: none

II. Treasurer’s Report: David Brown presented a Board Summary report to be submitted along with the minutes of the meeting.
   a. Suggested that sub-funds, such as the long dormant Boy Scout fund, be combined into one. There was discussion as to the pros and cons of such an action, especially for earmarked monies and accounting for expenditures from those special funds.
   b. It was also proposed that the Treasurer’s Report be made available to the GNTO director to facilitate reconciliation of funds and expenditures prior to the General Board Meeting.
   c. We have already saved $100.00 a month utilizing the on-line newsletter. There is concern that if fewer than 200 people subscribe to the printed version that the bulk cost of the mailing may double. It was pointed out that for many members of TAAS the only connection to the organization is through the newsletter.

III. Correspondence:
   a. Jeremy Mitchell proposed that we list TAAS on a listing of astronomy clubs.
   b. There was also a request for information on Olde English constellations.
   c. We will list Clark Thomas’ astronomy links in the newsletter.
   d. Judy Stanley (by mail) proposed various family centered activities at GNTO and made suggestions for Astronomy Day 2004.

IV. Retrospect:
   b. Oak Flat. One of the best nights ever in terms of clear sky and turn-out of TAAS members and public. Many visitors cited the mountain newspaper as the source of notice of the event.
   c. GNTO: Another great sky night. Several guests wrote e-mails to Barry Gordon complimenting Pete Eschman as an outstanding host who made their evening at GNTO especially memorable.

V. Prospect:
   a. Next TAAS meeting presenter will be Becky Purvis.
   b. Still looking for an “owner” for the next Oak Flat event.
   c. GNTO: regular new moon observing session on July 26th, 2003. Training will be held on 08/02/03.
   d. There will be two TAAS sponsored “Mars Madness” events. The first will be at UNM on 8/22/03. The second will be at Oak Flat on 8/23/03. We will be asking for “owners” of these events at the next general meeting.

VI. Committee Reports:
   a. Membership: no report
   b. GNTO meeting: June work session:
      1. Roof, roller support system and Isengard mounts were upgraded.
      2. Pete proposed the need for a “master plan” of the GNTO site that will show all existing above and underground structures so that future improvements can be better planned out.
      3. There have been more than average numbers of rattlesnakes hanging out under the warming building. Shannon Mann suggested calling a herpetologist to try to clear the site.
      4. Mark Kroska, Dale Murray and Barry Spletzer repaired the Losmandy mount.
   c. Outreach:
      1. Judy Stanley and Karen Keese brought their “Space Chicks” (7-14 yr. old girls) to GNTO on 7/10/03. Mark Kroska and Dale Murray will host a Boy Scout outreach on 7/25/03.

   d. Grants/Income:
      1. Pete described the old Intel grant proposal.
      a. 36% of the grant money was spent on the Sefick equipment, plate and saddle for the AP mount.
      b. 5% of the grant was used to enhance a lap-top, computer donated by Dale Murray. It has been utilized in many outreach projects.
      c. 59% of the grant was spent on astro-video equipment for TAAS public star parties.
      e. Education:
         1. All loaner telescopes are being utilized and there is a waiting list for their use by others.

VII. Old Business:
   a. Mark Kroska has not yet brought together a task force for Youth Outreach efforts. Question: do we need guidelines for outreach and to develop an organized outreach plan? Gordon Pegue suggested that we have a children’s program scheduled early on the same evening as the general meeting to allow parents and willing children to attend the general meeting.
   b. There was discussion about the upcoming GNTO and Outreach grants and Barry Spletzer was tasked with writing them. Main funding sources would be investigated, including Sandia National Laboratory and Intel.

VIII. New Business:
   Pete Eschman presented a detailed description of Website operations. Pete discussed how changes in the server, which TAAS uses, may necessitate hardware and software changes with associated expenses. A major concern is that our website server must remain secure in order to continue to use a network connection at UNM.

IX. Meeting was adjourned at 9:15 P.M.
From the Belly of an Airplane: Galaxies

Dr. Tony Phillips

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

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

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

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

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

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

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

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

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

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.
Our GNTO “new moon” observing opportunity on June 28th saw around 30 people turn out to enjoy some fairly good conditions. A moderate amount of cloud cover discouraged a few from setting up their equipment, but many enjoyed sharing nice views through the Isengard 16-inch reflector. I heard that the last few observers packed up around 3:00 A.M. the following morning. At GNTO it is usually the case that we have a very enjoyable evening, even when sky conditions are less than perfect.

Our most recent GNTO committee meeting was held on July 3rd with Ray Collins, Mark Kroska, Dale Murray, Gordon Pegue and Peter Eschman attending. We discussed our need for additional equipment to implement our Astro-imaging program fully. We had used 64 percent ($1285) of the previous Intel grant to purchase the video equipment to be used at public star parties in and around Albuquerque. The equipment can also be used at GNTO for a variety of research projects. We decided to present a report on how the Intel grant had been used to our Board of Directors, and to ask the Board’s permission to seek additional funding to complete the project. Some of the needed equipment includes a deep cycle battery, battery charger, power and signal cables, upgraded laptop computer, and an equatorial platform large enough to handle do bsonian reflectors in the 8 to 16” size range. A presentation was made to the Board on July 10th, and the additional equipment is expected to cost between $1500 and $2000, once a funding source has been located.

We reviewed our progress on several areas of maintenance at GNTO, including the very successful work session we had on June 7th. We are evaluating some improvements to the Isengard mount, and hope to be ready to purchase new motors for the mount soon.

We discussed the need to create an overall site plan for GNTO, so that the location of current structures is well documented on the parcel, and we have a document that will serve for future site improvements. We plan to schedule a GNTO planning meeting, where TAAS members will be encouraged to share their vision for the future of our observing site.

We discussed concerns raised by the rattlesnake population at GNTO, and the need to warn observers about the need for caution. At last count there were two rattlesnakes spotted on the observatory grounds, so caution is urged when walking around in the dark. We are exploring several avenues of snake removal, and site improvements to help to minimize future snake problems.

The GNTO committee would like to thank Barry Spletzer for his help in machining larger clutch knobs and making minor repairs to the Losmandy mount. We would also like to thank James Lacey for his generous donation of a 12 to 18 volt step up power supply to use on the Losmandy system. The goto features of the Losmandy mount are used for our CCD imaging system at GNTO.

Karen Keese offered the following summary of the July 10th outreach at GNTO. On Thursday, July 10, Judy Stanley and Karen Keese hosted a private event at GNTO for the Space Chicks Camp sleepover. Five fourth- to seventh-grade girls, plus five adults, enjoyed a beautiful, balmy (but cloudy) summer evening at GNTO. The bunk beds in the Ortega Building as well as the lecture area were very popular with the girls for various forms of play. Fueled with a bottomless supply of sugary food and drink, the girls were wide-awake until about 3 a.m., which was fortunate, since Isengard viewing did not begin until midnight when the clouds finally parted somewhat. The girls were wowed by views of Mizar & Alcor (six stars in one!), M52, Mars, and the Moon. It was a very successful outing. Karen and Judy have scheduled a similar camp for kids at GNTO on August 30th.

On Friday, July 25th, we welcomed Boy Scout troop 444 to GNTO. Mark Kroska and Dale Murray took the lead in hosting this private event for 24 scout guests, which included 15 kids and 9 adults. The scouts set up their tents on the observing field, and everyone seemed to have a great time. Viewing conditions were fairly good, and we had the “loaner” scopes set up (the 6” and 16” do bsonians), along with the Isengard telescope. Pete Eschman, Larry Cash, Nancy Davis, and Gordon Pegue were also on hand to help out.

We were pleased to see that Ray Collins had completed replacing all of the main dome support rollers, as well as re-engineering the lateral guide rollers. Thanks to Ray, the dome is rotating on large rubber rollers, so it moves more easily and is much quieter when rotating. This work was a necessary prerequisite to replacing the dome decking and roofing material. We will issue a call for volunteers to help with future repairs to the main dome roof.

Our next “new moon” observing event was scheduled for August 30th. We plan to have a similar event for kids at GNTO on that date.
Donations to TAAS

TAAS General Fund: Mike Pendley, Michael Flores, Albert Brettner.

Membership Services

• Membership Inquiries
• Events Information

Contact Judy Stanley at membership@taas.org

• Membership Dues
• Magazine Subscriptions
• Address/E-mail Changes

Contact Dave Brown at treasurer@taas.org

PO Box 50581 Albuquerque, NM

Notice from NASA/JPL

I understand that many clubs would like to be able to have access to NASA videos to use as part of the club monthly program. In order to support the clubs who carry our column, we are now offering a video lending library. You can go to the following URL: http://spaceplace.nasa.gov/astro_clubs/videos/index.shtml and see brief descriptions of the videos we have to lend. You can make your selection online, and the video will be mailed to you within 24 hours — if we have it available at that time.

Please note that we have a limited number of each video — they are for loan only. If they are not returned promptly, we will not be able to continue this service. (So, please resist the temptation to lend it to those who missed the meeting — and just get it back to us so that others can borrow!) Thanks so much!

Nancy Leon

Definition of the Month

Micrometeorite - a meteorite less than 1 mm in diameter. Micrometeorite strikes are a major source of erosion on the moon, and of the production of the lunar surface (the regolith).

Welcome to New TAAS Members

Michael Flores
Paul Smith
Alexia Kniska
Richard Steffaier
David Thorman
Bill & Diana Wells

UNM Report

Jay Harden, UNM Campus Observatory coordinator
unm_coord@taas.org

Monthly Membership Report

(June, 2003)

Membership Current Past Change
Regular 233 232 1
Family 76 76 0
Educational 17 17 0
Total Paid 326 325 1
Honorary 4 4 0
Complimentary 10 11 -1
Total Members 340 340 0

20 June: Nice clear night. We had 5 viewers. Docents: Dale, Becky, Mike & Jay.
27 June: Nice clear night. We had 65 viewers. (Feast or famine). Docents: Ray, Dale, Becky, Mike & Jay.
4 July: Becky and I arrived around 8:00. We left at 9:30. No viewers. 11 July: Scattered clouds. We had 18 viewers. Docents: Dale, Becky, Brock, Mike & Jay.
18 July: Clear night. We had 16 viewers. Docents: Dale, Becky, Gordon, Mike & Jay.

NOTE: A great big GRACIAS to Becky for watching my post while I wasn’t feeling good.

The Official Newsletter of The Albuquerque Astronomical Society
On Saturday evening, June 28, I took two guests to visit GNTO: one, Moreau, is a neighbor of mine, who happens to be the daughter of Karl Jansky; the other, Joan, a guest of Moreau’s, is a middle school math and science teacher in Milwaukee WI. We arrived before dark, so that they could get a look at the place and meet a few of the people there. Among those they met were President Ray Collins, VP Dale Murray, Former GNTO Director Gordon Pegue, Board Member Larry Cash, and probably a few others whose names escape my increasingly failing memory. Each and every one was just as cordial and gracious as could be — all, that is, except GNTO Director Pete Eschman. Pete was way above and beyond mere cordial and gracious — he was absolutely the perfect host. For starters, he gave my guests a tour of the facility, with lucid explanations of what everything was and how it worked. Then he “fired up” the Isengard, again explaining each step as he went along. Finally, he treated them to great views, through the Isengard, of object after object — including Jupiter and several Globular Clusters and Spiral Galaxies.

My guests were utterly delighted, and I am certain it was an evening they will never forget. Thank you, Pete Eschman — thank you, all — but especially thank you, Pete. In my ten-plus years since joining, I have never been prouder or happier to be a member of TAAS.

Barry Gordon

Photo Contest Deadline Approaches

Karen Keese

If you’ve been procrastinating about getting your entries together for the second annual “Astro-Images of New Mexico: Portraits from the Foothills of Space” amateur astrophotography contest and exhibition, stop it!

August 13 is the fast approaching deadline, and you won’t want to miss this opportunity to astound and amaze the tens of thousands of museum visitors who will view your work as it hangs in the LodeStar Astronomy Center from September 2003 through February 2004. Up to 50 works will be selected for the exhibit.

You also won’t want to miss the opportunity to vie for one of the terrific gift certificate prizes that will be awarded to Best of Show, as well as First and Second Place in each of the four entry categories.

Along with Kurt’s Camera Corral, Camera & Darkroom, Albuquerque Color Lab, and APT Camera Repair, a fifth sponsor has joined in to bolster this effort: TJ’s Camera & 1 Hour Photo. We are most grateful for the generous support of these fine local companies.

A new judge has joined our panel of judges. Commercial photographer Tom Brahl had to bow out due to a work conflict, but we are very excited to report that fine art photographer Kirk Gittings has come on board. Mr. Gittings is one of the most widely published and exhibited architectural photographers in the Southwest. His book “Chaco Body” with poet V.B. Price has been critically acclaimed as a major contribution to regional art. Our other noteworthy judges are David Nelson Blair of TAAS, John Fleck of the Albuquerque Journal, Laurel Ladwig of LodeStar, and Gordon Pegue of TAAS.

Images submitted for the contest must have been taken in New Mexico. The four entry categories are Youth; Land & Sky; Plate/Film/Digital; and CCD. Don’t be put off, thinking that you need access to fancy CCD equipment in order to enter. Your old 35mm camera or your newfangled digital camera are all you need. And you don’t have to plumb the depths of deep space either. The “Land & Sky” category rules state that: Photographs must juxtapose a feature of New Mexico with a celestial feature. The terrestrial feature may be a person, place, or thing; artificial or natural; the “land” feature may even be atmospheric. So that great shot you’ve got of the moon rising over the Sandias…or of Venus shining behind a silhouetted yucca—those are contest material.

The exhibition opens to the public on Saturday, September 13. Contest winners will be announced that evening at the TAAS general meeting, to be held at LodeStar. Don’t miss it. Thanks to the efforts of TAAS members Derek Skinner and Judy Stanley, we will be presenting a lecture and slide show on Mars by Dr. Larry Crumpler. Dr. Crumpler is a planetary geologist for the New Mexico Museum of Natural History & Science, and a member of NASA’s science analysis team for the Mars Exploration Rover mission. We are very fortunate to have secured him as a speaker, as his Rover mission duties keep him very busy these days. Following the lecture will be the contest awards ceremony and a chance to hear from some of the photographers on their methods and experiences in capturing their images. The evening concludes with the obligatory and very popular social hour (aka schmoozing session).

Recognition, and our thanks, is due to TAAS members Neil Goldberg and David Nelson Blair, and LodeStar’s director David Beining, for all their past and on-going efforts to put this event on the map.

Anyone with questions about the contest should contact Karen Keese at pr@taas.org or 841-5972. To brush up on contest rules and to download an official entry form, go to www.taas.org/astroimages.html. And go there soon!

Dick Fate

Dan-Ray Collins suggested I send you a picture of me and my new 10” reflector on a Dobsonian mount. I named it “M-Ray” to honor Mike Pendley (the M) and Ray for their extensive help in making it. Mike spent many hours guiding me in my mirror grinding and measurements, and stuck by me when I got discouraged. Ray gave me extensive help on the mount - he’s a wonderful woodworker and a fascinating guy to spend time with. Anyhow, my thanks to them and my encouragement to any newcomer to go to their ATM classes - they’re terrific teachers.
he knew that the Sun was almost twice as far away as mercury so his view of Mercury relative to the Sun made it look
twice as big as it really was. It showed that the Sun was about 400 times the size of mercury. By simply assuming that
mercury was about the same size is Earth a distance to the Sun of around 400 million miles was estimated. This is not
intended to be an accurate measurement because it relied on a totally unsubstantiated guess as to the size of Mercury.
It did however give the first indication of how big the solar system must be.

Making an actual measurement of the size of the solar system was considerably more difficult. Until about 1930, all of
the measurement methods were based on the concept of parallax. Parallax is illustrated by the fact that what you see
depends on your point of view. By holding your thumb up at arms length, you can see an example of parallax. When
you close one eye then the other, your thumb jumps relative to the background. By knowing the distance between two
observation points (here, your two eyes) and measuring the shift of your thumb relative to the background, you can
figure the distance to your thumb. As the object gets farther away, the amount of shift becomes less so it is difficult to
measure distant objects. Since both observers are on Earth, the maximum distance between them is 8000 miles. This
is very small compared to the distance of the nearest planets. Even during the very close approach of Mars this month,
at only 34,000,000 miles, the amount of parallax for two earthbound observers is the same as you would see for
yourself by viewing your thumb from each eye from about 1000 feet away. Obviously, the change in view is very
small, but not imperceptible.

In the fall of 1672, there was a close approach of Mars similar the one this summer. Cassini chose this opportunity to
measure the distance between the Earth and Mars. All that he needed was for two widely separated observers to make
precise measurements of Mars relative to the background stars at the same time. In 1672, this was quite an undertaking.
Just sending and observing team halfway around the world was enormously difficult. Even worse was the problem of
trying to make the measurements at the same time. Since there were no clocks anywhere nearly accurate enough to
synchronize the time, Cassini needed another approach. He used the moons of Jupiter as a clock. By observing when
Jupiter’s inner moon Io began to emerge from behind the planet, two widely separated observers can synchronize
their measurements to within a few minutes. This approach is nothing short of genius. Cassini stayed in Paris and
sent a team to Cayenne in French Guiana to make the other set of measurements. The measurements made consisted
of accurately determining the angular separation between Mars and numerous background stars at the same time.
Figure 2 shows the view from Paris and Cayenne. To say the least, the difference is slight. His Cayenne observers did
opportunity at GNTO is on August 30th. This event is 3 days after the new moon, so viewing opportunities should be very good. We have some great equipment on hand for you to use, so I hope you can join us. The 6” and 16” dobson telescopes are available for any one to use, so you just need to take advantage of the opportunity.

Our next training sessions are scheduled for August 2nd and October 18th. Training will cover all of the equipment used at GNTO, from the Isengard 16” reflector to our computers and the C-11/ST-9E CCD camera imaging system. We will also provide an introduction to other telescopes that are available at GNTO. The CCD imaging training session will go as far into the evening as students are willing to listen, learn, and take their own images.

Training is structured in three sessions, where Level 1 is the basic training on the use of the Isengard telescope, Level 2 involves use of the computers and computer software, and Level 3 centers on CCD imaging. You can take as much or as little of the training as you like. Level 1 training will begin about 1/2 hour before sundown, which is at 8:09 P.M. on August 2nd. If time permits, we will offer an introduction to our new Stellacam EX astro-video equipment, which will be used primarily for public outreach at in-town TAAS events.

Our TAAS screensaver had its rollout debut at the general meeting at Lodestar on April 12th, and copies were available for sale at our general meetings. This very professional product is now available for purchase at a very reasonable cost of $20, so please check our web site and elsewhere in this newsletter for more details. Proceeds of the sale of the screen saver go to TAAS, and TAAS members contributed all the images.

GNTO committee meetings are open to all interested TAAS members and our next scheduled meetings are July 31st and September 4th. As usual, these meetings are on Thursday, 9 days before the TAAS general meeting. We meet at 6:30 P.M. at JB’s Restaurant on the southeast corner of San Mateo and Montgomery. If you have questions about access and availability of GNTO, please contact me (Peter Eschman, gnto@taas.org, home phone: 873-1517, work phone: 277-0020.) I hope to see you soon at our observatory.

The second half of the pair of Venus transits was in 1769. Because of better preparation, better techniques, and better weather, a significant improvement in accuracy resulted. The distance was determined to be between 92 and 96 million miles (less than 3% error) the next transits of Venus were in 1874 and 1882. After these transits the distance to the Sun was determined to be between 92.57 and 93 million miles. For my money, this was success.

The final chapters in the story were made possible by the accuracy of modern instruments and new technologies. In March of 1931 the asteroid Eros passed within 17,000,000 miles of Earth. Since the measurement to any body orbiting the Sun gives the needed unification, and asteroid works as well as a planet. Following a major international effort, the distance to the Sun was determined to an accuracy of about 1000 miles. Today the measurement is routine. Using radar and knowing the speed of light, it is almost a trivial task to measure the time of flight for a radar beam to reach Venus and return, thus giving a precision on the order of a few miles.

So just remember, as Mars approaches Earth this month and you read that it will come within 34,649,589 miles of Earth, each of those digits in that distance are hard won, spanning over 2000 years of efforts by the finest astronomical minds throughout history.

From the Ivory Basement con’t from page 11

not return to Paris until August of 1673. Cassini set to work and calculated that the Sun must be 87,000,000,000 miles away (only 7% short of the real value). This was the first actual measure of the solar distance.

The next important step was made by Edmund Halley. His “step” started in 1677 and was not complete until 1761, 19 years after his death. Haley intended use a close approach of Venus to make his measurement. At its closest, Venus is about two-thirds as far away from Earth as Mars and so is the best planet for measuring parallax. Unfortunately, whenever one of the inner planets (Mars or Venus) approaches Earth, it passes between the Earth and the Sun making it impossible to see. Rarely, the inner planets pass directly in front of the Sun or transit. Transits of Venus are quite rare happening once for century in pairs about 8 years apart. In Haley’s time the next transit was in 1761. He realized that, just like Cassini’s observations of Mars, observing Venus in different locations would produce parallax. During a transit the position of Venus against the Sun would be slightly different and different locations. Unfortunately, during his day, there was no way to measure the position of Venus against the Sun precisely. Halley came up with what I consider one of the most brilliant ideas in the history of astronomy. He realized that, viewed from different locations, Venus passes across different portions of the Sun. Simply by timing how long it took for Venus to travel across Sun as viewed from these locations and doing the appropriate math, he could figure Venus’ position relative to the Sun. The observations were much simpler than those of Cassini and could be done at many different locations. Haley figured that the time to cross the Sun could vary by as much as 17 minutes during the five-hour transit. Timing a variation of 17 minutes in five hours is infinitely simpler than Cassini’s approach of trying to make very precise measurements at precisely the same time. By averaging together many observations Halley expected to get a very accurate determination of the distance to Venus and from that the distance to the Sun. Enormous effort was expanded by several countries to make observations of the transit of 1761. All in all observations were made and 70 different stations. Haley had predicted an error of only 0.2%. Several difficulties such as determining the exact position of the location and precisely determining when the transit started or ended caused large errors.

The GNTO News & Views con’t from page 8

September 2003

The Official Newsletter of The Albuquerque Astronomical Society
Please note that the deadline for the October 2003 issue of The Sidereal Times will be Friday, August 29th, as the finished manuscript must be at the printers on Monday, September 1st, so that you will receive it by e-mail that day or by snail mail the following Saturday. My e-mail address is editor@taas.org.

FREE Telescope Offer

What’s that? Did you say Free? That’s right FREE!

Any TAAS member can use this coupon to borrow a TAAS telescope.

Contact Barry Spletzer at telescope_loans@taas.org or 294-4601 and receive a loaner telescope absolutely free. You can choose from scopes with apertures ranging from 6” to 13”.

Some restrictions apply. Offer valid for current TAAS members. Offer is first come first served. Late comers 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.

SOCIETY STAFF

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TAAS Positions

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