The Sidereal Times
The Official Newsletter of The Albuquerque Astronomical Society
P.O. Box 50581, Albuquerque, New Mexico 87181-0581
www.taas.org
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November 2003

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OAK FLAT September 20, 2003

Photographs courtesy Karen Keese
I wish that my students could appreciate the lunar cycle – or any other celestial cycle. I ask, “Is the moon visible in the New Mexico sky at this moment? What is its phase? When will it next be full?” It is 7:45 am, and it appears they would rather be home, asleep. Or even in Economics.

We’re moving along in autumn now, and I find myself up on a roof, removing old tar and rotted plywood. This is GNTO, and it’s time for some renewal. But for me this is no more the first such roof than this is the first autumn.

In the North Valley at the Sargent’s Bed and Breakfast, I was brought in to create a roof to remedy a problem of still water that threatened this beautiful old terrona/adobe home, standing now some two centuries. A few years earlier they had started excavating a swimming pool close to the house, and almost at once uncovered the ruins of a pueblo that had been close to the banks of an earlier Rio Grande, some thousand years earlier and a half mile to the east of the current river. This hole was completed as an archeology field experience by Kit Sargent’s classes at UNM, then surmounted by a house addition, with stairs leading down into the dirt walled “basement”. I toiled to preserve a building, sixteen feet above the strata that told the tale of three incarnations of the pueblo, rebuilt twice after destruction by fire, and finally obliterated in a flood. Kit had guided my unpracticed eye somewhat lower, to a black layer that had been a hunter-gatherer fire pit, radiocarbon dated to the Folsom period.

The cycles of renewal are much slower in the night sky – those agrarian villagers and their wandering antecedent hunters would have seen patterns of stars scarcely different from what we have taken the trouble to name and memorize. I may despair that the 2nd law of thermodynamics has decreed that every roof I have ever worked on will have no more permanence than a line of contrasting particles on a carefully hewn section of earth. My solace, then, is that the vaulted dome we have celebrated at unnumbered star parties since our species became capable of wonder is a witness to us all.

ARTHURUS IN AUTUMN

When, in the gold October dusk, I saw you near to setting,
Arcturus, bringer of spring,
Lord of the summer nights, leaving us now in autumn,
Having no pity on our withering;

Oh, then I knew at last that my own autumn
was upon me,
I felt it in my blood,
Restless as dwindling streams that still remember
The music of their flood. There in the thickening dark a wind-bent tree above me

Loosed its last leaves in flight--
I saw you sink and vanish, pitiless Arcturus,
You will not stay to share our lengthening night.

Sara Teasdale, 1926

Ina says that when we go walking, I don’t settle down to the walk – or the talk – until I have satisfied myself that the stars (or moon or sun) are all in their appointed places. This must be so: she is a faithful chronicler of my little rituals. While my love of Astronomy lies in the order that equations bring to the business of celestial mechanics or neutron degeneracy or time dilation, my respect for that more tangible order that I see in the night sky certainly borders on love.

I will keep at my students. Later they may respect what I say about the satisfaction of internalizing cycles that lie so far beyond us, but theirs is not an age which is at all taken up with contentment: as is right, they look for happiness, and are the more pleased when, from time to time, joy takes its place. I think again of Wordsworth’s Intimations of Immortality – it was certainly time wasted (for me) when I was in high school:

Now, while the birds thus sing a joyous song,
And while the young lambs bound
As to the tabor’s sound,
To me alone there came a thought of grief:
A timely utterance gave that thought relief,
And I again am strong:
The cataracts blow their trumpets from the steep;
No more shall grief of mine the season wrong;

The child is father of he man. The roof I am working may be transitory, but it’s very transitoriness has an importance which goes along with the importance of the roof itself.

WHEN I HEARD THE LEARN’D ASTRONOMER

When I heard the learn’d astronomer,
When the proofs, the figures, were ranged in columns before me,
When I was shown the charts and diagrams, to add, divide, and measure them,
When I sitting heard the astronomer where he lectured with much applause in the lecture-
room,
How soon unaccountable I became tired, and sick,
Till rising and gliding out I wander’d off by myself,
In the mystical moist night-air, and from time to time,
Look’d up in perfect silence at the stars.

Walt Whitman, 1865
Meeting of the TAAS Board of Directors, September 11, 2003

Present: David Brown; Elizabeth Burki; Ray Collins; Pete Eschman; Shannon Mann; Becky Purvis; Barry Spletzer; Dale Murray. Observers: Barry Gordon; Dan Richey

I. Corrections to last month’s minutes: none

II. Treasurer’s Report:
   a. David Brown presented a Board Summary report to be submitted along with the minutes of the meeting.
   b. Alison Schuler made a $2,000 gift in the memory of Lyman Sandy.
   c. There are now 23 lapsed memberships
      1. The board discussed ways to encourage attendees at our public events to join TAAS
      2. Barry Gordon suggested that, at our special September meeting at Lodestar, Ray Collins make an announcement encouraging attendees to join.

III. Correspondence:
   a. A letter from Alison Schuler was received announcing the $2,000 gift in honor of Lyman Sandy
   b. Todd Bush, a guest at “Mars Madness” emailed Dale Murray and forwarded several interesting photographs he took at Oak Flats.
   c. As a result of the hordes of people coming to “Mars Madness” at the UNM observatory UNM Administration has changed the lighting and shielded the parking lot lights closest to the UNM Yale observatory area.

IV. Retrospect:
   a. Barry Spletzer’s presentation on telescopic optics was postponed due to a computer lock-up. His discussion will be scheduled for later in the year.
   b. Enormous crowds at the Yale observatory and Oak Flat “Marsed out” the many TASS members who generously shared their telescopes with the eager public.
   c. GNTO: 8/30/03. The 16-inch telescope was set out. Concern that there were many “guests” without complimentary “hosts”. Reminder that a TAAS member MUST accompany all guests.

V. Prospect:
   a. Ray Collins was unable to secure a positive venue (location and power supply) for us at the State Fair.
   b. Doctor Crumpler will be the guest speaker at our Lodestar event. He will present information regarding the upcoming landing of two Mars landers.
   c. Concern was voiced that the publicity for the photography contest contained no mention of TAAS, despite our co-sponsorship of the event.
   d. This month’s work party at GNTO will work to glue down shingles on the Ortega Building and other general site maintenance. Ray Collins will bring materials for dome maintenance. Dale Murray will swap-out eyepieces.
   e. Dale Murray has volunteered to be the “owner” of the October Oak Flat event.
   f. November meeting: Dale Murray and Karen Keese are trying to arrange another meeting at Lodestar. Barry Spletzer, will present his discussion on how telescopes work.

VI. Committee Reports:
   a. Membership: no report.
   b. GNTO:
      1. Dale Murray will tackle the shingle problem on the Ortega building on 9/27/03
      2. There have been difficulties in negotiating with the propane supplier to the GNTO site. The supplier has threatened to remove the largely full tank. The committee recommended that we spend $400 to purchase the tank and to have another supplier fill it completely. This will result in a $55/month in rental fees. Motion to purchase the tank was approved.
      3. Pete Eschman requested that the remaining monies formerly approved for the Isengard funds ($4,500) be spent on a “go-to” system for the Isengard and a plaque acknowledging Alison Schuler’s generous gift in memory of Lyman Sandy. Motion was passed.
      4. Pete Eschman is working with Neil Goldberg on the TAAS calendar
      5. Shannon Mann provided us with an ortho-photo of the GNTO site taken from a US Geological survey map. Shannon has also volunteered to provide us with a site plan.
      6. The “ride pool” request to members does not seem to have generated many requests.
   c. Printing task force: Barry Spletzer has purchased a printer. Bulk mail service obtained. The large number of requests for E-newsletters may result in a mailing of less than 200 pieces that will knock us out of bulk mail rates. Complimentary copies will be sent to astronomical organizations and individuals who are expected to make good use of them to make up the 200 copies. Dan Richey demonstrated the efficiency of an 11x17 “tabloid format” for printing the newsletters.
   d. Loaner scopes: Dale Murray made a donation of eyepieces for loaner scopes. Barry Spletzer will recall loaner scopes to better fit them with appropriate eyepieces.

VII. Old Business:
   a. La Semilla: we need a group of people to decide what we should have as a permanent exhibit. We will need to meet with the architects. Members are encouraged to submit ideas.

VIII. New Business:
   a. Suggestion made that we contact hotels to find out costs of renting a hall and providing food for our annual holiday potluck. Last holiday party at the church was a disappointing affair. Suggestion made that we present awards and have a guest speaker at the holiday event. Ray Collins is the event owner.
   b. Awards: Ray Collins will contact Linda Hickson, Steve Schneider and Neil Goldberg to serve on the awards committee.
   c. The Nominations Committee will convene to help select new candidates for the Board. The committee had not been selected yet. Volunteers are being sought.
The Celestial Gods smiled on us the night of the Chaco Star Party on September 20. The sky was cloudless, crystal clear and the seeing was perfect. Joan and I traveled to and camped out in style at Chaco in Judy Stanley’s Minnie Winnie (or is it the Winnie Minnie?). G. B Cornucopia greeted us when we arrived and made every effort to make us as comfortable as possible and to have a meaningful viewing experience that night. We enjoyed a buffet dinner with the Chaco volunteers before the viewing began.

As usual we set-up in the parking area close to the dome. G. B’s talk reviewed the archeoastronomy related to Chaco. There was the usual large enthusiastic crowd of interested visitors who thoroughly enjoyed his presentation and then seeing what was “up” that night through the telescopes provided by us and the big “resident” scopes in the dome and on the concrete pads outside the dome. Later, Mark Kroska hosted an Astronomy Jeopardy quiz for the visitors. Judy, Joan and I set-up our scopes next to Mark and Elaine. Later Mark Marx joined us. We had a great time helping each other find and identify Messier objects. My favorite that night was the Andromeda Galaxy (a first for me). Later, the Space Station flew over. We waved to the astronauts. I think I saw them wave back but the others disagreed. We went to bed at around midnight but I got up at 4a.m. to view the rise of Orion and to see its Nebula in all its glory in the wonderfully dark Chaco sky. By then it was very cold and since I had neglected to dress properly,. my shivering ruined the viewing. So I took the easy way out, went back into the cozy Minnie Winnie and went back to sleep.

**PLACITAS STAR PARTY Stephen L. Snider**

It’s time again for one of our favorite star parties. The Placitas Star Party will be held on Saturday, November 1, 2003 at the Homestead Shopping Center, Placitas, NM. This event usually draws 300-500 people from all over the northern Albuquerque region. A combination of crisp autumn air, easily accessible location, dark skies, and hopefully, good viewing weather, will be irresistible to the viewing public.

Please contact me at slsnider@rt66.com and let me know if you plan on attending. Also, please let me know what telescope you’re bringing. Thanks in advance for your participation.
**December 2003**

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**Notes**

GNTO = General Nathan Twining.
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.
P & A = UNM Physics and Astronomy. Corner of Lomas and Yale.
= School Star Party.

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**ATM 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, October 11, 2003

7:00 P.M.

**Speaker:**

TAAS Members

**Subject:**

Show and Tell

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**Sunrise & Sunset**

| December 1, 2003 | 06:37/16:30 |
| December 15, 2003 | 07:08/16:52 |
| December 31, 2003 | 07:15/17:05 |

**New Planet Rise & Set for December 15, 2003**

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Our most recent GNTO viewing event was on August 30th, when around 35 people showed up to take advantage of some fairly good conditions. Karen Keese opened up the facility, while Dale Murray, Gordon Pegue and I closed up later on. Gordon and Dale kept the Isengard busy for the evening, providing great views to many interested observers. I set up the GNTO Meade 16” dobsonian on the observing field and we star hopped to a number of good targets. There were at least 6 more telescopes in use by various TAAS members. We had several out of town guests, all of whom came away with some great impressions of our observatory. Conditions started out somewhat breezy, with some clouds later on. We did get some great views of Mars as the open cloud-free areas moved through the observatory area. Most of us wrapped up our evening observing around 1:00 A.M. when the clouds thickened. Of course, once we had stowed the Isengard, Mars popped back out again.

Our most recent GNTO committee meeting was held on September 4th at the Village Inn restaurant on San Mateo just north of Academy. Committee members at the meeting included Larry Cash, Ray Collins, Mark Kroska, Dale Murray and Peter Eschman. We decided to schedule a work session at GNTO for September 14th to take care of roof maintenance on both the Ortega Building and the main dome. We were concerned about loose shingles on the Ortega Building, and also needed to begin replacing the roof decking on the main dome roof.

I indicated that our current propane supplier wanted to remove the propane tank that we had been renting, because we had not been purchasing enough propane. We decided that the best approach was to purchase the tank, so that we would have full control over it. The purchase price for the tank is $490, which was approved at the subsequent Board meeting. We are now able to purchase propane from any supplier since we now own the tank. At present the tank is around 70 percent full, so we are ready to heat the Ortega Building when temperatures drop.

We discussed one area of concern, which involves guests that are invited to GNTO when their host does not attend the event. TAAS members are reminded that if you invite guests to GNTO, you need to be there to act as their host. It is unfair to expect others to spend time entertaining people that you have invited, so please be considerate of your fellow TAAS members.

Granvil Morgan and his sons Trey and Scott joined Dale Murray, Kay Collins, Larry Cash and me for a very productive work session on Sunday, September 14th. Our work started around 10:00 A.M. and ran through late afternoon. Dale and Trey concentrated on repairing shingles and applying adhesive to loose shingles on the Ortega Building roof. By the time they had everything glued down, we had used up 10 tubes of roofing sealer. Ray, Granvil and Scott made amazing progress on replacing three of the four corner sections of roof decking on the main dome. Once the corner sections are replaced, we will be able to renew the side sections without altering the support structure for the dome itself. When we have replaced all of the decking, we will be able to put down new roofing material to seal against leaks.

Larry and I began our work efforts by checking the battery bank that we use to store energy produced on-site by our photovoltaic modules. We found that the batteries were quite low on fluid, so we topped off the cells by adding about 6.5 gallons of distilled water. In the process of inspecting the cells, we found that the two batteries in series on the west-end of the string were running hot and very active. We decided it was best to disconnect the charge controller from the circuit, so that the battery bank could stabilize itself.

When I got back to town I checked with a local vendor for some advice. Dan Dutfield, of Direct Power and Water offered some suggestions. I later contacted Karen Keese, and she and Carl Frisch checked on the batteries on Tuesday afternoon. They found that the same two batteries were still cooking, so they disconnected them from the string and reconnected the charge controller. By this time, the battery bank voltage had dropped from 11.7 volts on Sunday afternoon to 10.1 volts on Tuesday. As they watched the charge rate, the voltage started to improve, so the system should be back to normal soon.

It appears that one or both of the west-end batteries have a bad cell, and this pair was experiencing a thermal runaway condition. This condition is the likely cause for low fluid levels. We will need to assess whether one or both of the batteries are bad before planning a replacement strategy. At this time we have 8 batteries connected in the battery bank, so we will need to see how well the remaining batteries will meet our future power needs. I’m really glad we caught the battery problem before it got any worse, and we were all very pleased with the amount of progress we made on the roof maintenance. All in all, it was a great work session.

Our next training session is scheduled for October 18th, which will be combined with our Fall Equinox GNTO open house and picnic. Training will cover much of the equipment used at GNTO, from the Isengard 16” reflector to our computer software. We will not be offering training on the C-11/S1-9E CCD camera imaging system for this training session, although we will cover this topic in future sessions. We will also provide an introduction to other telescopes that are available at GNTO, which include the 16” and 6” reflectors.

The Fall Equinox GNTO open house and picnic is a popular affair, and is a great time to visit GNTO for the first time, or to check to see what is new. The open house will start around 4:00 P.M., followed by a picnic potluck dinner at 5:30 P.M. The barbecue grill will be available for those who want to cook, and we usually use it to prepare hotdogs and hamburgers. Please mark this on your calendar, and plan to bring a dish to share. More details will be forthcoming in future email notices and at our next general meeting on October 11th.

Our next “new moon” viewing opportunity at GNTO is on October 25th, which is on 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” dobsonian telescopes are available for any one to use, so you just need to take advantage of the opportunity.

GNTO committee meetings are open to all interested TAAS members and our next scheduled meetings are October 2nd and October 30th. As usual, these meetings are on Thursday, 9 days before the TAAS general meeting. We meet at 6:30 P.M. at the Village Inn restaurant on San Mateo just north of Academy. If you have questions about access and availability of GNTO, please contact me (Peter Eschman, gnto@taas.org, home phone: 873-1317, work phone: 277-0020). I hope to see you soon at our observatory.
9/11/03 - South Mountain School - The unofficial kick-off of our season also marked the debut of a new partnership with Lodestar Outreach, as well as a new outdoor projection show. About 300 people attended this perfect night for a star party, with clear skies, cool temps, and no wind. TAAS docents on scopes included Brock Parker, Jay Harden, John Laning, Bob Hufnagel, Mike Flores, and Sammy Lockwood. Lodestar docents on indoor demonstrations included Judy Stanley, Andrea Tallbrother, Nic Wheeler and William Branson.

9/18/03 - Eisenhower Middle School - Our official Kick-off event was marked by a HUGE turnout, 9 scopes, binos, an outdoor projection show, and unfortunately, sprinklers. The school did a great job covering-up lights and providing a level, dark viewing field. 7th grade science teachers offered 50 points extra credit to students who attended and returned a TAAS Astronomy Question Page. Approximately 350+ folks attended, most with a page of questions. Docents included John Laning, Jay Harden, Sam and Sammy Lockwood, Brock Parker, Barry Gordon, Larry Cash, Dale Murray and Mark Kroska. In addition, there were two new faces: A new TAAS member and his son set up with us for the first time. Although I wrote your names down, I lost my notepad in the confusion of the sprinklers. Please drop me a line so that I can keep your names on our list.

9/20/03 - Starlab Workshop - 7 teachers from 2 schools attended this Starlab workshop held at Monte Vista Elem. by Sammy Lockwood.

9/25/03 - Wilson Middle School - About 250 kids and parents attended on this mostly clear, warm night. Telescope docents included Sam and Sammy Lockwood, Brock Parker, John Laning, Becky Purvis, Elaine Kroska, Horton and Joan Newsom, Barry Spletzer, James Brockway, and Chris Wilson. In addition, Mark Kroska ran sessions of Astronomy Jeopardy, while Lodestar Docents Andrea Tallbrother, Nic Wheeler and William Branson gave starlab shows.

Join us as TAAS Travels to the Rio Grande Nature Center on Monday, October 20, for a public star party. Viewing is scheduled to begin at 7P.M., with a speaker scheduled for 6P.M.

This October star party at Rio Grande Nature Center is a re-scheduled event, replacing the star party that was canceled their this summer because of the Bosque fire.

This event is sponsored by the NM State Parks, and TAAS Educational Outreach, who scheduled the Star Party for Tampa Preparatory School in Florida, who is sending about 65 students plus adults to NM for the week. Although this is a TAAS Educational Outreach Event, the public will be invited to attend as well. Our speaker for this event is Ralph Zotigh, a Kiowa Native American, and singer for the Great American Indian Dancers. Mr. Zotigh will speak on Native American tales of the sky. His talk will begin at 6P.M.

For details of this event, please contact Sammy Lockwood sammy@taas.org or at 275-0258, or visit our website at www.taas.org
Dial 254-TAAS for Updates

The TAAS hotline is now bigger and better! The hotline now offers updates on TAAS monthly meetings (press 1), TAAS special events (press 2), and TAAS school star parties (press 3). If you have a special TAAS event that you would like to announce on the hotline, e-mail your announcement to sammy@taas.org

UNM Report

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

26 Aug: UNM asked us to participate in Mars night. We had 2000 viewers.

29 Aug: Was cloudy but cleared up after sundown. We had 80 viewers. Docents: Mickey, Dan, Elaine and Mark, Brock, Mike, Becky, Bob, Ric & Jay.

5 Sept: Clear night for a change. We had 150 viewers. Docents: Ray, Judy and Mickey, Mike, Brock, Elaine and Mark & Jay.

12 Sept: Another clear night. We had at least 75 viewers. I think we have just about wore Mars out, however, the viewers are excited when they see it. Docents: Dale, Becky, Elaine and Mark, John, Brock, Mike & Jay.

19 Sept: Another clear night. We had 40 viewers. Docents: Dale, Becky, Elaine and Mark, John, Brock, Mike & Jay.

25 Sept: Another clear night. We had 40 viewers. Docents: Ray, Becky, Brock, Mickey and Judy, Tony & Jay. Tony is a member to be. He had a brand new home built scope that he was fine tuning. Almost forgot. Our VP Dale was there also.

Contact Shannon Mann at treasurer@taas.org
P.O. Box 50581 Albuquerque, NM

Welcome to New TAAS Members

Kathleen Bennett
Adam Griffith
Lance Hurt
George Iwaszek
John Leckie
Pat Martinez

Events Calendar Listings

I am in the process of compiling the 2004/2005 Events Calendar. Please send me events that you would like listed with accompany justification if this will be the first listing. The Board will finalize the calendar in a few months. All listing are subject to Board approval.

Neil M. Goldberg
Events Coordinator
798-1958/events_coord@taas.org

TAAS Reports & Notices

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Welcome to New TAAS Members

Kathleen Bennett
Adam Griffith
Lance Hurt
George Iwaszek
John Leckie
Pat Martinez

Events Calendar Listings

I am in the process of compiling the 2004/2005 Events Calendar. Please send me events that you would like listed with accompany justification if this will be the first listing. The Board will finalize the calendar in a few months. All listing are subject to Board approval.

Neil M. Goldberg
Events Coordinator
798-1958/events_coord@taas.org

Monthly Membership Report

(August 2003)

Membership | Current Month | Past Month | Change
---|---|---|---
Regular | 224 | 233 | -9
Family | 68 | 78 | -10
Educational | 18 | 17 | 1
Total Paid | 310 | 328 | -18
Honorary | 4 | 4 | 0
Complimentary | 10 | 10 | 0
Total Members | 324 | 342 | -18

Definition of the Month

Contact Binary - A binary star in which the two components are touching. Main-sequence contact binaries are call W Ursa Majoris (abbreviated as W UMa) and B Lyrae binaries, depending on the mass of the primary.

The Official Newsletter of The Albuquerque Astronomical Society

Location, Location, Location

- Chaco Canyon
  - 6185’ elevation
  - Latitude: 35˚ 01’ 50”N
  - Longitude: 107˚ 54’ 36”W
  - Location: 34˚ 59.80’
  - 35˚ 5.48’

- Oak Flat
  - 7680’ elevation
  - Latitude: 34˚ 59 48”N
  - Longitude: 106˚ 19’ 17”W
  - Location: 34˚ 59.80’
  - 35˚ 5.48’

To convert from Degrees, Minutes, Seconds:

Divide seconds by 60, then add minutes, then divide by 60 again. For security reasons, GNTO location is available by request only, so please contact Pete Eschman for GNTO information.

Courtesy Pete Eschman
The “fasten seatbelts” light turns off, and you get up to ask the stewardess for a pillow; it’s going to be a long flight. Only a kilometer ahead in the cloudless sky, a downward draft of sheering winds looms. When the plane hits these winds, the “turbulence” will shake the cabin violently and you could be seriously hurt.

You don’t know about those winds, of course, and neither does the pilot. Today’s weather satellites can’t see winds in clear skies: they rely on the motion of clouds to infer which way the winds are blowing.

“Believe it or not, their best indication of wind shear right now is warnings from aircraft that have gone through it ahead of them,” says Bill Smith of NASA’s Langley Research Center.

But a new satellite technology being pioneered by NASA and NOAA could improve this shaky situation. It’s called GIFTS, short for Geosynchronous Imaging Fourier Transform Spectrometer. GIFTS is an infra-red sensor that can detect winds in cloudless skies by watching the motions of atmospheric water vapor. Water vapor is mostly invisible to the human eye, but it reveals itself to GIFTS by the infra-red radiation it absorbs.

Smith is the lead scientist for EO-3, a satellite designed to test out this new technology. Slated for launch in 2005 or 2006, EO-3 will carry GIFTS to Earth orbit where it can produce 3-dimensional movies of winds in the atmosphere below.

These wind data will not only improve safety, but also help the airlines save money. Knowing the winds along a flight route allows airlines to adjust the plane’s fuel load accordingly, thus reducing the weight that the engines must lift. Saved fuel means saved money and less pollution.

GIFTS can help planes avoid another potentially lethal problem, too: Ice forming on their wings. If a cloud contains “supercooled” water droplets whose temperature is below freezing, these droplets will form ice on the wings of planes that pass through it. By looking at about 1700 different frequencies of the light coming from clouds, GIFTS can measure the temperature of the cloud top and determine whether it contains water droplets that could cause aircraft icing. With information from GIFTS in hand, pilots can simply avoid clouds that appear dangerous.

Once EO-3 demonstrates the accuracy of GIFTS, airlines will be able to capitalize on this potential to make flying a cheaper and safer experience.

Learn more about the GIFTS instrument and other advanced technologies being tested on the EO-3 mission at nmp.jpl.nasa.gov/ eo3. Kids can go to The Space Place to play a data compression game related to EO-3 at spaceplace.nasa.gov/eo3_compression.htm.
When I started thinking about writing an article on the connection between astronomy and time, my first impulse was to explain all the various modern measures of time (e.g., sidereal time, Greenwich mean time, etc.) that have been devised primarily for astronomical purposes. As I thought about the subject of little more, it occurred to me that the connection between time and astronomy is reversed between ancient times and now. The very first timekeepers were astronomers and time measurement was originally defined completely in astronomical terms. In modern times the trend is reversed where we devise many flavors of time primarily to assist in modern astronomical observations. In the end, I decided to write two installments, one on the historical perspective of time and how virtually every common time measurement is related to astronomy and a second one explaining the modern concept of time as it relates to astronomy.

It is hard to imagine any common everyday thing with stronger ties to astronomy than time. Emerging civilizations needed to measure time to determine planting time, animal migrations, and religious ceremonies. In a large part, astronomy was invented as a way to measure time. A prime example of this is in ancient Egypt where the rising of Sirius just before sunrise (called the heliacal rising) signaled the annual flooding of the Nile, essential for Egyptian agriculture. The fact that we have 24 hours in a day, 60 minutes in and hour, 60 seconds in a minute and a year composed of months of varying lengths is due to the astronomical roots of time measurement.

While prehistoric astronomers tracked solstices, equinoxes and other heavenly events, the Egyptians seem to be the first to divide time measurement finer than the natural and obvious measure of the day. I mentioned the heliacal rising of Sirius above. Throughout the progression of the year, stars near the equator will rise about 4 minutes earlier on each successive day. The helical rising refers to the first day in the year when a star is visible before sunrise. For a couple months before that time, the star is lost in the glare of the Sun. By watching which stars rise just before sunrise, the time of the year can be determined.

The Egyptian calendar was divided into 36 weeks of 10 days each so it was natural to choose 36 stars somewhat equally spaced stars so the helical rising of each of the 36 stars represented the start of a new week. In addition to the heliacal rising, the stars would rise throughout the night at regular intervals (about 40 minutes apart). The Egyptians used these risings to mark the passage of the night, specifically to track the journey of the Sun god Ra in his night boat from sunset to sunrise. In a 12 hour period, 18 of the stars would rise. However, the twilight hours make the amount of darkness shorter than 12 hours, summer nights are shorter than winter nights, and the stars chosen were south of the equator. All these factors reduced the number of selected stars that rose during the night to around 12. Eventually, the night was divided into 12 equal periods to match these risings. Later, to match the night, the day was divided into 12 equal periods as well, giving us the 24-hour day that even the metric system did not do away with.

The division of these Egyptian hours in the 60 minutes and further into 60 seconds was left to the Babylonians. They used a Samarian number system with a notation similar to our decimal system. The main difference was that we use ten different values for each decimal place (0-9) while the Babylonians used 60 different values for each place. Unlike our system which has a different character for each value, they only used wedge marks (>) to represent 10 and vertical bars (|) to represent one. Using the system, the number 32 was represented by >>>| |. This is clumsy by our standards but it did allow for mathematical
operations to be performed, something that is virtually impossible with number systems such as Roman numerals. For numbers greater than 60, they just added another digit, like we do for numbers greater than 10. Because each digit consists of multiple symbols, they needed a separator between digits and used a space. Although it is not obvious to our base-10 prejudice, the number 1000 looks like \(>l\ldots\)\. The system was used to do the first serious algebraic and geometric calculations.

In modern times, our decimal system has completely replaced the Babylonian sexagesimal system with the exceptions of time and angular measurement where a primary unit (hours for time and degrees for angle) is still divided into 60 parts for the first digit again into 60 parts for the second. The term `second' is derived from the fact that it is the second sexagesimal division of the primary unit.

Moving ahead a few millennia, determining the length of the year becomes a priority. Many early civilizations set the length of the year ranging from 360 to 365 days and inserted extra days as needed to account for accumulated errors. Some systems, like the Jewish calendar insert additional months as needed. The only reason for these corrections is to keep the seasons in the same months year after year. More precisely, the goal is to keep the equinoxes and solstices from moving through the year as the centuries go by. Some systems allow the months to precess relative to the seasons. The Moslem calendar does this with the cycle repeating every 33 years.

Of all the measurements of time, the seasons of the year are the purest astronomical construction, yet we seldom think of them that way. Summer starts when the Sun reaches its highest latitude and ends when it crosses the equator. All the seasons start and end when the Sun reaches maximum latitude or crosses the equator. It is perhaps little more than coincidence that these astronomically determined times correspond so well to seasonal weather patterns.

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<th>Year</th>
<th>Equinox Date</th>
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<td>March 20</td>
<td>8:04:07</td>
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<td>March 20</td>
<td>13:31:47</td>
</tr>
<tr>
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<td>March 20</td>
<td>19:17:13</td>
</tr>
<tr>
<td>2003</td>
<td>March 21</td>
<td>1:00:50</td>
</tr>
<tr>
<td>2004</td>
<td>March 20</td>
<td>6:49:42</td>
</tr>
<tr>
<td>2005</td>
<td>March 20</td>
<td>12:34:29</td>
</tr>
</tbody>
</table>

Time of the Vernal Equinox 1996-2005

The first real attempt at a consistent calendar that kept the seasons in the right place was the Julian calendar established by Julius Caesar in 46 B.C. Initially, it sounds a lot like our calendar, having a year with 365 days and a leap year (366 days) every fourth year. The problem with this calendar was that it accumulated error of a little under a day per century. After about 1600 years, this error amounted to 14 days. That is, the equinoxes and solstices were occurring up around the 10th of the month rather than our current 21st. The Catholic Church was the primary force for improving the calendar. The church's motivation was that the various religious holidays were no longer being celebrated on the proper day. Pope Gregory decided to make up only 11 of the 14 day error so the resulting calendar would match the religious calendar set down in 325 A.D. by the Council of Nicaea.

By this time, enough information had been accumulated (about 1600 years worth) to get a good estimate of the length of the year. On October 4, 1582 a change was implemented. First, the 11 days were accounted for by making the next day October 15, 1582. Next, the Gregorian calendar was implemented in which century years (years divisible by 100) are no longer leap years unless they are divisible by 400.
by 400. This is the system in use today. Most of us didn’t even notice because the year 2000 was a leap year as most folks expected. The odd thing was at this is the first century leap year since 1600. A side note, not all regions willingly adopted the Gregorian calendar. In the Americas, it was not adopted until about 1700. In Russia, I believe it was 1920 before it was used.

Since there is no special reason why there should be a nice round number of days in a year, even the Gregorian calendar will accumulate errors over time. To show this, I calculated the time of the Vernal Equinox (first day of spring) for the period from 1000 B.C. to 3000 A.D (okay, okay, I had a computer to help me). The table shows the time of the equinox over a five-year period. Notice that in 2002 the equinox occurs about six hours later than in 2001 and the same is true for 2002-2003. In the year 2004, the equinox would advance another six hours but the addition of February 29th (2004 is a leap year) moves the equinox back one day. That’s why we have leap years. By 2005, the time of the equinox is back to nearly where it started four years ago but it is one hour earlier than in 2001. This one hour shift every 4 years amounts to about a day each century. This error is largely corrected by not having leap years on century years. The time of the equinox over the years is plotted in Figure 1. The top plot covers the years 2050 to 2150. The short zigzag pattern is the 4-year leap year cycle where the movement of the equinox to a later time over 3 years is cancelled by the leap year. The overall trend of the plot is downward, to earlier equinoxes. By skipping the leap year once per century (the middle of the plot) the equinox is pushed later to correct the downward trend.

The middle plot shows a 1000 year span (1700-2700). Notice that the 100 year wide zigzag bands tend to move upward. By skipping a leap year every 400 years (the long diagonal bands), we keep this under control. The final plot shows a 4000 year span. Over this time scale, a definite downward trend appears. In spite of all the corrections, the equinox is getting earlier by about 21 seconds per year. At this rate, it may be necessary to skip a leap year every 4000 years or so. I don’t know about you, but I’m anxious to see what my year 4000 calendar looks like.

Perhaps the most convoluted conjunction of astronomy, time keeping and religion comes about in the calculation of Easter. Easter was originally defined as the first Sunday after the first full Moon on or after the first day of spring. Many attempts over a few centuries were proped to calculate the date of Easter. The difficulty of predicting the full moon and the uncertainty of the equinox in the Julian calendar made this a daunting task. In the end, the Church gave up and redefined Easter as the Sunday after the paschal moon (a theoretical construct based on golden numbers and epacts) on or after March 21. Even this simplified system takes 5,700,000 years to repeat. The calculation of Easter shows the potential difficulty of connecting earthy constructs (the day of the week, the yearly calendar) with natural astronomical cycles (the orbits of the Earth and Moon).

The sole time interval not directly related to astronomy is the seven day week. It seems to have originated as a Jewish or Babylonian tradition. However, in defense of astronomy, each of the days is named for one of the seven ancient planets (the Sun, the Moon and the five naked eye planets).

In short, we owe (nearly) all our traditional time keeping methods to ancient astronomers. The astronomical clocks of planetary motion served well for thousands of years until the development of modern precise timekeeping methods that showed the inaccuracies of these natural clocks. Next time, I will delve into the various modern timing methods and explain the mysteries of such things as universal time, mean time, apparent time, sidereal time, Greenwich time, and a few others.
The second partial phase, of course, begins with the end of totality at 6:31, when the Moon begins to leave the umbra. The second penumbral phase begins when the Moon completely clears the umbra at 8:04, and the entire eclipse is over when the Moon leaves the penumbra at 9:22 -- so we can all hit the hay nice and early.

The whole event is summarized below.

**Total Lunar Eclipse of Saturday, November 8, 2003**

- Moon Enters Penumbra 3:15
- Moon Enters Umbra 4:32
- Moon Rise 5:02
- Sun Set 5:05
- Totality Begins 6:06
- Mid-Eclipse 6:19
- Totality Ends 6:31
- Moon Leaves Umbra 8:04
- Moon Leaves Penumbra 9:22

If any of you are inclined to try photographing this event (as I am planning to), you are invited to discuss it with me.

Also ...

Okay, gang -- here’s another Moon/Venus evening match-up. Naked-eye viewing will most definitely be possible, but binoculars might offer a plus.

On November 25, the two will be very close, very low in West-Southwest. sunset will be at about 4:55, by which time they should both be visible -- with the Moon a rather thin crescent, about “two days old” (ie, about two days past New Moon).

**[2003 December]**

Here’s the last Moon/Venus match-up for 2003. Once again, naked-eye viewing will most definitely be possible, but binoculars might offer a plus.

On December 25, the Moon will again be near Venus, very low in the Southwest. Sunset will be at about 4:59, by which time they should both be visible -- with the Moon a fairly thin crescent, somewhat over “two days old” (ie, somewhat over two days past New Moon).

Happy Solstice!
**FREE** to first caller, 150 AAVSO finder charts and associated information. 856-9203. Bill Wood

**Wanted:** Milburn or Mettler wedge for Meade 10’ LX-200. Please contact Robin Peel at 505-792-4555 or robinp@mindspring.com.

**For Sale:** Two like-new Tele Vue Eyepieces - dual (1.25’’ and 2’’), barrels - 22mm Panoptic and 9mm Nagler - asking $200 each - e-mail BarryGordon@CompuServe.com or else call 867-6424.

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**New Mexico Astronomical Society**

**New Mexico Astronomical Society Telescope Specialists**

**Telephone**

- Shannon@taas.org
- 296-0537 (H)

- Sammy Lockwood
- Judy Stanley
- 254-0674 (H)

- Barry Spletzer
- Ryan Gray
- Elizabeth@taas.org

- Mark Kroska
- pr@taas.org

- Karen Keese
- archivist@taas.org
- 299-4686 (H)

- Pat Appel
- treasurer@taas.org
- 873-1517 (H)

- Rebecca Burki
- Neil Goldberg

- Dan Richey
- Pat Appel
- 286-7993 (H)

- Dawn Gray
- 856-0549 (H)

- Michael Pendley
- 296-0537 (H)

- Jay Harden
- unnn_coord@taas.org
- 296-0549 (H)

- Mark Kroska
- 884-9108 (H)

- Ryan Gray
- 856-2054 (H)

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**Editor’s Note**

Please note that the deadline for the December 2003 issue of The Sidereal Times will be Friday, October 31st, as the finished manuscript must be at the printers on Monday, November 3rd, so that you will receive it by e-mail that day or by s-nail mail the following Saturday. My e-mail address is editor@taas.org. This is my first issue using the new Adobe publishing software InDesign. I’ve had fun learning the program; let me know what you think. Can you read it? Is it pretty? You know that kind of stuff.

---

**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.

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<td><a href="mailto:unnn_coord@taas.org">unnn_coord@taas.org</a></td>
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ARTICLES/ADVERTISEMENTS: Articles, personal astronomical classified advertisements and business card size advertisements for businesses related to astronomy must be submitted by the deadline shown on the Society calendar (generally the Saturday near the new Moon). Rates for commercial ads (per issue) are $120 per page, $60 per half page, $30 per quarter page, $7 for business card size. The newsletter editor reserves the right to include and/or edit any article or advertisement. E-mail attachments in Microsoft Word, 11 point Palatino, justified, no indent at paragraph beginning, one space between paragraphs is preferred. ASCII and RTF are acceptable. One column is approximately 350 words. Contact the Newsletter Editor at editor@taas.org for more information.

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The Albuquerque Astronomical Society

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