Calendar of Events

November Meeting
Friday, NOV. 11, 2005
7:30 PM
1001 Malott
Astronomy for Scouts

PUBLIC OBSERVING
Sunday Dec. 04
8:00PM, Memorial Stadium

December Meeting
Friday, Dec. 09, 2005
7:30 PM
1001 Malott
The Search for Exoplanets
Dr. Steve Shawl

From the Officers

Report From the Officers on the October Meeting:
The October meeting went well, in the sense that there were no problems because we didn’t have a meeting. Instead, we encouraged people to attend the public talk Dr. Jim Kasting of Penn State. This way we avoided a meeting during Fall Break and the same night as Late Night at Allen Fieldhouse. We have great speakers, but very few of them can dunk a basketball, so our attendance would have been minimal, not to mention the parking issues.

Anyway, if you didn’t attend Dr. Kasting’s talk, it was a bit more technical than planned, but dealt with the question of how one identifies evidence for life on another planet, using current understanding of the changing conditions on Earth during the time period of the origin and evolution of life, particularly about 2.5 billion years ago. The science is fascinating, especially the way in which life forms naturally alter the environment/atmosphere to produce significant impacts on the chemical makeup of the atmosphere and the overall temperature of the Earth. Sounds strangely relevant.

For next month, we will have our monthly meeting, though it won’t be the traditional format. Rick Heschmeyer has coordinated a lecture/presentation for the Scouts in the area. They will attend the meeting on Nov. 11, learn about the basics of astronomy and the solar system, followed by an observing session out on the lawn outside Malott. The current roster of attendees numbers over 150 so, for the first time in the history of AAL, 1001 Malott will be full to overflowing. This an outstanding opportunity to communicate and encourage an interest in amateur astronomy.

More important, we will need to have a number of telescopes set up outside, weather permitting, to handle the observing load for the group, as well as people to keep things organized and on schedule. This would be a great time to bring your equipment to show these students what is available for the amateur and how well it works. IF YOU CAN COME TO THIS MEETING, WHETHER YOU HAVE A TELESCOPE OR NOT, PLEASE COME. IF YOU HAVE AN EASY TO USE TELESCOPE THAT YOU WOULD LIKE TO SET UP AND

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Broadcast times for the above NOVA program on Channel 11: 11/15 - 7pm; 11/16 - 2am; 11/20 - 1am.
HELP THE SCOUTS OBSERVE WITH, BRING IT. If you plan on coming to either help or to bring a telescope, please let Rick and Bruce know at their regular email addresses.

For December 09, our speaker will be Dr. Steve Shawl, who will give a presentation on the Search for Exoplanets—Planets Outside Our Solar System. This may be the hottest topic in Astronomy and the driving force behind many of the planned NASA missions of the next decade.

While the weather has been cooperating a lot more than usual during the week days, our attempt at an open house at Memorial Stadium on Sunday, Oct. 30 was a washout. There were a few temporary patches of clear sky as the front moved in from the west, but trying to shoot through holes in the clouds was deemed too frustrating. This was especially unfortunate because of the spectacular alignment of Mars with the nearby Pleiades. However, Mars will still be very bright for our next session, so join us as we attempt to view the sky again on Sunday, Dec. 04—our usual last Sunday schedule was altered because of Thanksgiving.

As noted on the front page, November is also the month when PBS/Nova is presenting a special show on Newton. The dates and times of the broadcast for Channel 11, KTWU are provided. The primary show time is 7PM Nov. 15, the usual Tuesday slot for NOVA. My apologies on the time slot listed last month for the show on Einstein—it was 8PM Eastern time but 7 PM Central. The times in this issue are from the KTWU web site, so they are correct. If you missed the Einstein 2-part NOVA, it has gotten excellent reviews, both for the science and the insight into Einstein the person. You can probably count on seeing it at a couple of our meetings in the Spring—we will let you know as soon as we have a copy of the DVD.

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The Astronomical League has many activities to encourage amateur astronomy including Observing Clubs. The Observing Clubs offer certificates of accomplishment for demonstrating observing skills with a variety of instruments and objects. Each Club offers a certificate based upon achieving certain observing goals. These are usually in the form of a specific number of objects of a specific group with a given type of instrument. Occasionally there are multiple levels of accomplishment within the club. There is no time limit for completing the required observing, but good record keeping is required.

When you have reached the requisite number of objects, your observing logs are examined by the appropriate authority and you will receive a certificate and pin to proclaim to all that you have reached your goal. Many local astronomical societies even post lists of those who have obtained their certificates. This month we feature the details on the Double Star Club. The purpose of the Double Star Club is to introduce observers to 100 of the finest double and multiple stars in the heavens. You don't need a large, expensive apochromatic refractor to view the objects on this list since a small refractor, Newtonian reflector, or Schmidt-Cassegrain will do just fine. All objects on this list were originally observed with a three-inch refractor using between 75X and 150X. Again, this program is meant to allow you to enjoy a different aspect of our wonderful hobby, and not to test your equipment. Double star observing can be very forgiving. You don't need the darkest skies, the clearest skies, or even a moonless night to observe many of these objects. Some can be observed from your backyard under moderate light pollution, some can be observed under less than transparent skies, and some can even be observed with the moon up. However, as usual in astronomy, the best results can be obtained under optimum conditions. The point is, always try for the best conditions, but if you don't have them, don't worry about it. You can still enjoy this program. To qualify for the AL’s Double Star Certificate and pin, you need only be a member of the Astronomical League, either through an affiliated club, as a Member-at-Large, or as an International Member-at-Large, and observe the 100 selected objects on the included list. Any telescope may be used, but one with an objective 60mm in diameter or larger is recommended. It is preferred that the stars be found by star hopping and not by Go-To methods, although we will not insist on this if the rest of the observations are well done. For info about the club and the observing guide, visit http://www.astroleague.org/al/obsclubs/dblstar/dblstar1.html.

If you have any suggestions for talks, speakers, or public events, please feel free to contact us, particularly Rick Heschmeyer (rcjbm@sbcglobal.net), the events coordinator for the club. Hope to see you next week at the November meeting. ALL for now.
NASA'S HUBBLE REVEALS POSSIBLE NEW MOONS AROUND PLUTO

Using NASA's Hubble Space Telescope to view the ninth planet in our solar system, astronomers discovered Pluto may have not one, but three moons. If confirmed, the discovery of the two new moons could offer insights into the nature and evolution of the Pluto system; Kuiper Belt Objects with satellite systems; and the early Kuiper Belt. The Kuiper Belt is a vast region of icy, rocky bodies beyond Neptune's orbit.

"If, as our new Hubble images indicate, Pluto has not one, but two or three moons, it will become the first body in the Kuiper Belt known to have more than one satellite," said Hal Weaver of the Johns Hopkins Applied Physics Laboratory, Laurel, Md. He is co-leader of the team that made the discovery.

Pluto was discovered in 1930. Charon, Pluto's only confirmed moon, was discovered by ground-based observers in 1978. The planet resides about 3 billion miles from the sun in the heart of the Kuiper Belt.

"Our result suggests other bodies in the Kuiper Belt may have more than one moon. It also means planetary scientists will have to take these new moons into account when modeling the formation of the Pluto system," said Alan Stern of the Southwest Research Institute, Boulder, Colo. Stern was co-leader of the research team.

The candidate moons, provisionally designated S/2005 P1 and S/2005 P2, were observed approximately 27,000 miles away from Pluto. The objects are roughly two to three times as far from Pluto as Charon.

The team plans to make follow-up Hubble observations in February to confirm the newly discovered objects are truly Pluto's moons. Only after confirmation will the International Astronomical Union consider names for S/2005 P1 and S/2005 P2.

Surveys observed the two new candidate moons on May 15, 2005. The candidates are roughly 5,000 times fainter than Pluto. Three days later, Hubble looked at Pluto again. The two objects were still there and appeared to be moving in orbit around Pluto.

(Continued on page 8)
Fast Cosmic Blasts Linked to Binary Mergers
By Robert Naeye, skypub.com

Compelling new evidence strongly supports the prevailing theory that most short gamma-ray bursts (those lasting 2 seconds or less) are triggered when two compact objects in a binary system spiral and then smash into each other in a cosmic cataclysm. In some cases, two neutron stars collide and form a black hole. In others, a black hole swallows a neutron star. Either way, material is ejected in two oppositely directed high-speed jets along the black hole's rotational axis, creating the GRB.

The latest evidence for the merger theory comes from five short GRBs observed since May 2005. Four of the five, occurring on May 9th, July 24th, August 13th, and September 6th, were caught by NASA’s Swift satellite. A short GRB on July 9th was detected by NASA’s HETE-2 (High Energy Transient Explorer-2) satellite. Both Swift and HETE-2 can pinpoint the location of bursts quickly, allowing ground- and space-based telescopes to study the fading afterglows. The afterglows, in turn, are the keys that are helping astronomers unlock the short-GRB mystery. HETE-2’s detection of the July 9th burst was particularly important since it led to the first visible-light detection of a short GRB afterglow, which enabled astronomers to localize the burst in its host galaxy to very high precision.

All five of the short bursts exploded in relatively nearby galaxies and had similar peak luminosities. The short bursts are generally much closer and about 1,000 times less energetic than the more common long GRBs, which come from the explosions of massive stars. The energy range for the short bursts matches what theorists expect for merging compact objects. Despite the fact that the five short bursts are much less powerful than the longer variety, they still pack an extraordinary punch, blazing with the energy of more than a billion Suns during their moment of peak output. This is too much energy for giant flares from magnetars (highly magnetized neutron stars), which means these events can only account for a small fraction of short GRBs.

Follow-up observations of all five short bursts have failed to uncover any hint of supernova-like activity, essentially ruling out the possibility that these events were caused by solitary exploding stars. Hubble Space Telescope afterglow observations of the July 9th burst are particularly significant. Since Hubble could see its afterglow, a supernova could not have been obscured by dust, and Hubble looked 100 times deeper than was necessary to reveal a supernova. “You can’t hide the
The one-two hurricane punch from Katrina and Wilma along with predictions of more severe weather in the future has scientists pondering ways to save lives, protect property and possibly even control the weather. While efforts to tame storms have so far been clouded by failure, some researchers aren’t willing to give up the fight. And even if changing the weather proves overly challenging, residents and disaster officials can do a better job planning and reacting.

In fact, military officials and weather modification experts could be on the verge of joining forces to better gauge, react to, and possibly nullify future hostile forces churned out by Mother Nature. While some consider the idea farfetched, some military tacticians have already pondered ways to turn weather into a weapon.

Harbinger of things to come?

The U.S. military reaction in the wake of Hurricane Katrina that slammed the U.S. Gulf coast might be viewed as a harbinger of things to come. While in this case it was joint air and space operations to deal with after-the-fact problems, perhaps the foundation for how to fend off disastrous weather may also be forming. Numbers of spaceborne assets were tapped, among them:

1. Navigation and timing signals from the Global Positioning System (GPS) of satellites;
2. The Global Broadcast Service, a one-way, space-based, high-capacity broadcast communication system;
3. The Army’s Spectral Operations Resource Center to exploit commercial remote sensing satellite imagery and prepare high-resolution images to civilian and military responders to permit a better understanding of the devastated terrain;
4. U.S. Air Force Space Command’s Space and Missile Systems Center Defense Meteorological Satellite Program (DMSP) satellites that compared “lights at night” images before and after the disaster to provide data on human activity.

Is it far-fetched to see in this response the embryonic stages of an integrated military/civilian weather reaction and control system?

The use of space-based equipment to assist in clean-up operations -- with a look toward future prospects -- was recently noted by General Lance Lord, Commander, Air Force Space Command at an October 20th Pacific Space Leadership Forum in Hawaii.

"We saw first hand the common need for space after the December 2004 tsunami in the Indian Ocean," Lord said. "Natural disasters don’t respect international boundaries. Space capabilities were leveraged immediately after the tsunami to help in the search and rescue effort…but what about before the disaster?"

Lord said that an even better situation is to have predicted the coming disaster and warned those in harm’s way. "No matter what your flag or where you waive it from…the possibility of saving hundreds of thousands of people is a mandate to continually improve," he advised. The U.S. Air Force is also looking at ways to make satellites and satellite launches cheaper and also reduce the amount of time it takes to launch into space from months to weeks to days and hours, Lord said. Having that capability will increase responsiveness to international needs, he said, such as the ability to send up a satellite to help collect information and enhance communications when dealing with international disasters.

What would a military strategist gain in having an "on-switch" to the weather?

Clearly, it offers the ability to degrade the effectiveness of enemy forces. That could come from flooding an opponent’s encampment or airfield to generating downright downpours that disrupt enemy troop comfort levels. On the flipside, sparking a drought that cuts off fresh water can stir up morale problems for
warfighting foes. Even fooling around with fog and clouds can deny or create concealment – whichever weather manipulation does the needed job.

In this regard, nanotechnology could be utilized to create clouds of tiny smart particles. Atmospherically buoyant, these ultra-small computer particles could navigate themselves to block optical sensors. Alternatively, they might be used to provide an atmospheric electrical potential difference – a way to precisely aim and time lightning strikes over the enemy’s head – thereby concoct thunderbolts on demand.

Perhaps that’s too far out for some. But some blue sky thinkers have already looked into these and other scenarios in "Weather as a Force Multiplier: Owning the Weather in 2025" – a research paper written by a seven person team of military officers and presented in 1996 as part of a larger study dubbed Air Force 2025. That report came with requisite disclaimers, such as the views expressed were those of the authors and didn’t reflect the official policy or position of the United States Air Force, Department of Defense, or the United States government. Furthermore, the report was flagged as containing fictional representations of future situations and scenarios. On the other hand, Air Force 2025 was a study that complied with a directive from the chief of staff of the Air Force "to examine the concepts, capabilities, and technologies the United States will require to remain the dominant air and space force in the future."

"Current technologies that will mature over the next 30 years will offer anyone who has the necessary resources the ability to modify weather patterns and their corresponding effects, at least on the local scale," the authors of the report explained. "Current demographic, economic, and environmental trends will create global stresses that provide the impetus necessary for many countries or groups to turn this weather-modification ability into a capability."

The report on weather-altering ideas underscored the capacity to harness such power in the not too distant future.

"Assuming that in 2025 our national security strategy includes weather-modification, its use in our national military strategy will naturally follow. Besides the significant benefits an operational capability would provide, another motivation to pursue weather-modification is to deter and counter potential adversaries," the report stated. "The technology is there, waiting for us to pull it all together," the authors noted.

In 2025, the report summarized, U.S. aerospace forces can "own the weather" by capitalizing on emerging technologies and focusing development of those technologies to war-fighting applications.

"Such a capability offers the war fighter tools to shape the battlespace in ways never before possible. It provides opportunities to impact operations across the full spectrum of conflict and is pertinent to all possible futures," the report concluded. But if whipping up weather can be part of a warfighter’s tool kit, couldn’t those talents be utilized to retarget or neutralize life, limb and property-destroying storms?

"It is time to provide funds for application of the scientific method to weather modification and control," said Bernard Eastlund, chief technical officer and founder of Eastlund Scientific Enterprises Corporation in San Diego, California.

Eastlund’s background is in plasma physics and commercial applications of microwave plasmas. At a lecture early this month at Penn State Lehigh Campus in Fogelsville, Pennsylvania, he outlined new concepts for electromagnetic wave interactions with the atmosphere that, among a range of jobs, could be applied to weather modification research.

"The technology of artificial ionospheric heating could be as important for weather modification research as accelerators have been for particle physics," Eastlund explained.

In September, Eastland filed a patent on a way to create artificial ionized plasma patterns with megawatts of power using inexpensive microwave power sources. This all-weather technique, he noted, can be used to heat specific regions of the atmosphere. Eastlund’s research is tuned to artificial generation of acoustic and gravitational waves in the atmosphere. The heating of steering winds to help shove around mesocyclones and hurricanes, as well as controlling electrical conductivity of the atmosphere is also on his investigative agenda.
supernova for the July 9th burst," says Derek B. Fox (Pennsylvania State University). "But whenever we observe a long burst in a nearby galaxy where we can detect a supernova, we do detect a supernova."

The five short bursts have exploded in a variety of environments. But four of the GRBs occurred far from any site of recent star formation, adding further credence to the binary-merger scenario. It takes 100 million years or longer for two compact objects in a binary system to merge as their mutual orbit slowly decays due to the loss of orbital energy from gravitational-wave emission. This gives a binary plenty of time to wander far from its birthplace. In contrast, long GRBs always have been observed in or near star-forming regions, because the massive stars that produce them don't live long enough to travel far from their points of origin.

For both July events, follow-up observations revealed powerful X-ray flares long after the burst. NASA's Chandra X-ray Observatory caught a flare 16 days after the July 9th event. Swift's X-ray Telescope caught bursts a full day after the July 24th explosion. These flares may be the signature of remnant matter left over from the initial merger that later fell into the black hole. Peter Mészáros (Pennsylvania State University) and several colleagues suggest that these X-ray "hiccups" are caused by infalling material from the tidal disruption of a neutron star by a black hole. M. Coleman Miller (University of Maryland) favors a double-neutron-star merger as being the messier type of event, arguing that black holes will usually swallow an entire neutron star in one gulp, providing no fuel for subsequent flares. After analyzing the July 9th burst's fading afterglow, Fox and his colleagues estimated the opening angle of the jet that produced the GRB: about 15°. "This is the first time anyone has been able to do this for a short GRB," says Fox, who adds that if we assume that all short GRBs beam their energy in a similar fashion, we see only 1 in 30 compact mergers that actually occur (most mergers won't produce jets aimed toward Earth). Fox's paper, and three other papers on short GRBs, appear in the October 6th Nature.

"Right now, there is no smoking-gun positive evidence for the merger theory," says Miller. "But there is a lot of negative evidence that rules out the other options. So the merger theory is the most reasonable option." Calculations of how often neutron star–neutron star or black hole–neutron star binaries merge will help physicists working at the Laser Interferometer Gravitational-Wave Observatory (LIGO) facilities in Washington and Louisiana. LIGO should be able to detect the gravitational waves from compact-binary mergers out to about 700 million light-years once planned upgrades are completed in 5 to 10 years. Detecting gravitational waves coinciding with a short GRB would be the "smoking gun" proving beyond all doubt that compact mergers trigger short GRBs.
The team looked long and hard for other potential moons around Pluto. "These Hubble images represent the most sensitive search yet for objects around Pluto," said team member Andrew Steffl of the Southwest Research Institute. "It is unlikely that there are any other moons larger than about 10 miles across in the Pluto system," he said.

The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency. The Space Telescope Science Institute in Baltimore conducts Hubble science operations. The Institute is operated for NASA by the Association of Universities for Research in Astronomy, Inc., Washington.

The other team members for this observation are: Max Mutchler, Space Telescope Science Institute; Marc W. Buie, Lowell Observatory, Flagstaff, Ariz; William J. Merline, John R. Spencer, Eliot Y. Young, and Leslie A. Young, Southwest Research Institute.

For detailed information and images about this research on the Web, visit:

Eastlund said that the reduction in severity or impact of severe weather could be demonstrated as part of a carefully tailored program plan.

"In my opinion, the new technology for use of artificial plasma layers in the atmosphere: as heater elements to modify steering winds, as a modifier of electrostatic potential to influence lightning distribution, and for generation of acoustic and gravitational waves, could ultimately provide a core technology for a science of severe weather modification," Eastlund told SPACE.com.

The first experiments of a program, Eastlund emphasized, would be very small, and designed for safety. For example, a sample of air in a jet stream could be heated with a pilot experimental installation. Such experiments would utilize relatively small amounts of power, between one and ten megawatts, he pointed out. Both ground-based and space weather diagnostic instruments could measure the effect. Computer simulations could compare these results with predicted effects. This process can be iterated until reliable information is obtained on the effects of modifying the wind.

Computer simulations of hurricanes, Eastlund continued, are designed to determine the most important wind fields in hurricane formation. Computer simulations of mesocyclones use steering wind input data to predict severe storm development. After about 5 years of such research, and further development of weather codes, a pilot experiment to modify the steering winds of a mesocyclone might be safely attempted. Such an experiment would probably require 50 to 100 megawatts, Eastlund speculated.

"I estimate this new science of weather modification will take 10 to 20 years to mature to the point where it is useful for controlling the severity and impact of severe weather systems as large as hurricanes," Eastlund explained.
A Wrinkle in Space-Time

By Trudy E. Bell

When a massive star reaches the end of its life, it can explode into a supernova rivaling the brilliance of an entire galaxy. What’s left of the star fades in weeks, but its outer layers expand through space as a turbulent cloud of gases. Astronomers see beautiful remnants from past supernovas all around the sky, one of the most famous being the Crab Nebula in Taurus.

When a star throws off nine-tenths of its mass in a supernova, however, it also throws off nine-tenths of its gravitational field.

Astronomers see the light from supernovas. Can they also somehow sense the sudden and dramatic change in the exploding star’s gravitational field?

Yes, they believe they can. According to Einstein’s general theory of relativity, changes in the star’s gravitational field should propagate outward, just like light—indeed, at the speed of light.

Those propagating changes would be a gravitational wave.

Einstein said what we feel as a gravitational field arises from the fact that huge masses curve space and time. The more massive an object, the more it bends the three dimensions of space and the fourth dimension of time. And if a massive object’s gravitational field changes suddenly—say, when a star explodes—it should kink or wrinkle the very geometry of space-time. Moreover, that wrinkle should propagate outward like ripples radiating outward in a pond from a thrown stone.

The frequency and timing of gravitational waves should reveal what’s happening deep inside a supernova, in contrast to light, which is radiated from the surface. Thus, gravitational waves allow astronomers to peer inside the universe’s most violent events—like doctors peer at patients’ internal organs using CAT scans. The technique is not limited to supernovas: colliding neutron stars, black holes and other exotic objects may be revealed, too. NASA and the European Space Agency are now building prototype equipment for the first space experiment to measure gravitational waves: the Laser Interferometer Space Antenna, or LISA.

LISA will look for patterns of compression and stretching in space-time that signal the passage of a gravitational wave. Three small spacecraft will fly in a triangular formation behind the Earth, each beaming a laser at the other two, continuously measuring their mutual separation. Although the three ‘craft will be 5 million kilometers apart, they will monitor their separation to one billionth of a centimeter, smaller than an atom’s diameter, which is the kind of precision needed to sense these elusive waves.

LISA is slated for launch around 2015.


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