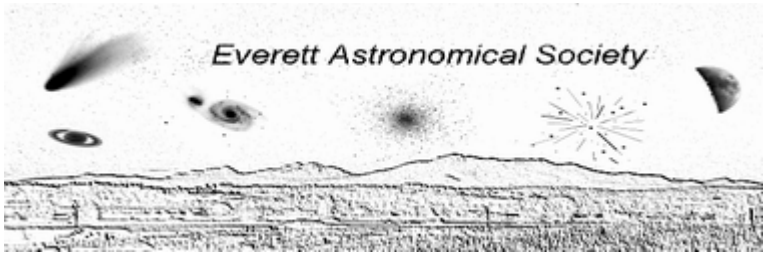
Volume MMIV. No. 10



The Stargazer

October 2004

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EAS BUSINESS…

NEXT EAS MEETING - SATURDAY OCTOBER 30TH 7:00 PM - PROVIDENCE PACIFIC CLINIC (916 PACIFIC AVENUE) IN THE MONTE CRISTO ROOMS ON THE MAIN FLOOR.

★ Film - *The Privileged Planet* Based on the book, "*The Privileged Planet: How Our Place in the Cosmos is Designed for Discovery*" by Discovery Institute senior fellows Jay Richards and Guillermo Gonzalez, the film explores the many ways in which Earth is ideally suited, not only for complex life, but also for observing the universe around us.

Map/directions to the EAS meeting are available at: http://members.tripod.com/everett_astronomy/directions_to_club_meetings.htm

Scheduled Meeting Dates:
Nov 20th – EAS Meeting – 7:00 PM
Dec 11th – EAS Holiday Dinner

RECAP OF THE SEPTEMBER MEETING

Greg Donahue, Celestial North, on the Mars Exploration Rovers mission – current status, scientific results, and the history of the mission so far..

MEMBER NEWS

★ **New EAS T-Shirts available !** See our updated T-shirts, available at this month's meeting. Chose from T, Long-sleeve T, or sweat shirt in a variety of sizes.

CLUB STAR PARTY INFO

Upcoming star party schedule:

We also try to hold informal close-in star parties each month during the spring and summer months on a weekend near the New moon at a member's property or a local park. (call Bob Lyons at (425) 337-1510 for info or check the EAS website.) Members contact Bob Lyons for scope borrowing.

FINANCIAL HEALTH

The club maintains a $500+ balance. We try to keep approximately a $500 balance to allow for contingencies. Emailing a digital copy of the newsletter has been suggested to reduce printing and postage costs, and speed up delivery, please email Mark if electronic copy would be OK for you.

CLUB SCOPES' STATUS

SCOPE	LOAN STATUS	WAITING
10-INCH DOBSONIAN	ON LOAN	NO WAIT LIST

EAS members: contact Bob Lyons (425) 337-1510 or 'bdlyons at verizon.net' to borrow a scope.

ASTRO CALENDAR

October 2004
Oct 01 - End of Mars Solar Conjunction
Oct 09 - Draconids Meteor Shower Peak
Oct 13 - Moon Occults Mars
Oct 14 - Partial Solar Eclipse, Visible From Russia, Alaska & Pacific Ocean
Oct 14 - Moon Occults Mercury
Oct 14 - Moon Occults Mercury
Oct 16 - Asteroid 40 Harmonia At Opposition (9.4 Magnitude)
Oct 18 - STARDUST at Aphelion
Oct 21 - Orionid Meteor Shower Peak
Oct 25 - Destination Mars at UW
Oct 28 - Lunar Eclipse visible from entire US !
Oct 30 - EAS Meeting – 7:00 PM
Oct 30/1 - Daylight Saving - Set Clock Back 1 Hour
Oct 31 – Halloween – A good sidewalk astronomy night !!

November 2004
Nov 03 - Taurids Meteor Shower Peak
Nov 03 - Asteroid 21 Lutetia At Opposition (9.8 Magnitude)
Nov 05 - Venus Passes 0.5 Degrees From Jupiter
Nov 07 - Asteroid 27 Euterpe At Opposition (8.8 Magnitude)
Nov 09 - Moon Occults Jupiter
Nov 10 - Moon Occults Venus
Nov 11 - Moon Occults Mars
Nov 14 - Moon Occults Mercury
Nov 17 - Leonids Meteor Shower Peak
Nov 20 - EAS Meeting – 7:00 PM
Nov 21 - Mercury At Its Greatest Eastern Elongation (22 Degrees)

December 2004
Dec 05 - Venus Passes 1.2 Degrees From Mars
Dec 07 - Moon Occults Jupiter
Dec 11 - EAS Holiday Dinner
Dec 13 - Geminids Meteor Shower Peak
Dec 21 - Winter Solstice, 12:42 UT
Dec 22 - Ursids Meteor Shower Peak
Dec 24 - Cassini, Huygens Probe Release
Dec 25 - Asteroid 192 Nausikaa At Opposition (9.7 Magnitude)
Dec 30 - Mercury At Its Greatest Western Elongation (22 Degrees)

January 2005
Jan 03 - Earth At Perihelion (0.983 AU From Sun)
Jan 03 - Quadrantids Meteor Shower Peak
Jan 04 - Moon Occults Jupiter
Jan 13 - Saturn at Opposition
Jan 13 - Mercury Passes 0.3 Degrees From Venus
Jan 14 - Huygens Probe Lands on Titan
Jan 14 - Cassini, Titan Flyby
Jan 31 - Moon Occults Jupiter

OVER THE AIRWAVES

"Our group of radio script writers now consists of EAS and SAS members Jim Ehrmin, Pat Lewis writer emeritus, Greg Donohue, and Ted Vosk, who are now regularly writing and helping to produce our astronomy radio show, "**It's Over Your Head**" on radio station **KSER, FM 90.7.** The six-minute segment is broadcast **every Wednesday morning at approximately 7:20 A.M.** and gives a weekly look at what's up in the sky over Snohomish County, with other information. If you have a good idea for an astronomy broadcast or would like to try your hand at writing a script, call Pat Lewis at (206) 524-2006 or email to joagreen@aol.com If you are a listener to the program, show your support by giving the program director of KSER a call!" Web page with lots of archives and other info is available at http://www.itsoveryourhead.org/

KPLU 88.5 FM National Public Radio has daily broadcasts of "Star Date" by the McDonald Observatory of the University of Texas at Austin, Monday through Friday at 8:58 A.M. and 5:58 P.M. Saturday and Sunday). The short 2 minute radio show deals with current topics of interest in astronomy. The University of Washington TV broadcasts programs from NASA at 12:00 AM Monday through Friday, 12:30 AM Saturday, and 1:30 AM Sunday on the Channel 27 cable station.

EAS LIBRARY – BOOK & VIDEO LIST

The EAS has a library of books, videotapes, and software for members to borrow. We always value any items you would like to donate to this library. You can contact a club officer or **Librarian Mike Locke**, phone (425) 259-5995, email mlocke at lioninc.com, to borrow or donate any materials.

MEMBERSHIP BENEFITS & INFORMATION

Membership in the **Everett Astronomical Society** (EAS) will give you access to all the material in the lending library. The library, which is maintained by Scott Gibson, consists of several VCR tapes, many books, magazines, and software titles. Membership includes invitations to all of the club meetings and star parties, plus the monthly newsletter, ***The Stargazer.*** In addition you will be able subscribe to ***Sky and Telescope*** for $7 off the normal subscription rate, contact the treasurer for more information. **When renewing your subscription to *Sky & Telescope* you should send your S&T renewal form along with a check made out to Everett Astronomical Society to the EAS address.** The EAS treasurer will renew your *Sky and Telescope* subscription for you. **Astronomy** magazine offers a similar opportunity to club members.
EAS is a member of the **Astronomical League** and you will receive the Astronomical League's newsletter, ***The Reflector***. Being a member also allows you the use of the club's telescopes, an award winning 10 inch Dobsonian mount reflector, built as a club project or the 60mm refractor. Contact Bob Lyons (425) 337-1510 to borrow a telescope. EAS dues are $25. Send your annual dues to the **Everett Astronomical Society**, P.O. Box 12746, Everett, WA 98206. Funds obtained from membership dues allows the Society to publish the newsletter, pay Astronomical League dues and maintain our library.

OBSERVER'S INFORMATION…

LUNAR FACTS

Oct 05	Last Quarter Moon
Oct 13	New Moon
Oct 20	First Quarter Moon
Oct 28	Full Moon – Total Eclipse !
Nov 05	Last Quarter Moon
Nov 12	New Moon
Nov 19	First Quarter Moon
Nov 26	Full Moon

Digital Lunar Orbiter Photographic Atlas of the Moon

The Lunar and Planetary Institute has created a digital version of the Lunar Orbiter Photographic Atlas of the Moon, and Consolidated Lunar Atlas available online at:
http://www.lpi.usra.edu/research/cla/menu.html
http://www.lpi.usra.edu/research/lunar_orbiter

UP IN THE SKY -- THE PLANETS

Object	Rises	Transits	Sets	Constellation
Sun	**6:52 am**	**11:52**	**16:52**	**Libra**
Mercury	Daylight	Daylight	**17:21**	**Libra**
Venus	**3:37 am**	Daylight	Daylight	**Virgo**
Mars	**5:27 am**	Daylight	Daylight	**Virgo**
Jupiter	**4:04 am**	Daylight	Daylight	**Virgo**
Saturn	**21:42**	**5:25 am**	Daylight	**Gemini**
Uranus	Daylight	**19:46**	**1:03 am**	**Aquarius**
Neptune	Daylight	**18:26**	**23:11**	**Capricornus**
Pluto	Daylight	Daylight	**23:06**	**Ophiuchus**

(times local time for Everett PST)

NOAA SUN CALCULATOR

Need to know exactly what time the sun will set on Sept. 26, 2065? Or when it rose in 565 BC? How about the length of daylight a week from Tuesday in Albuquerque, N.M.? Just go to NOAA's solar calculator, now available on the Web. http://www.srrb.noaa.gov/highlights/sunrise/gen.html

INTERNATIONAL SPACE STATION – VISIBLE SEATTLE PASSES

ISS Visibility –
http://spaceflight.nasa.gov/realdata/sightings/SSapplications/Post/SightingData/Seattle.html or also see link

http://www.heavens-above.com/PassSummary.asp?lat=47.979&lng=-122.201&alt=0&loc=Everett&TZ=PST&satid=25544

MONTHLY COLUMNS

The columns Monthly Constellation, Young Astronomer's Corner, Planetary Focus, Astronomy & Telescope Lingo, Astronomy Fun Facts, and Mirror Images will not be included this month due to personal issues (and the Red Moon for the Red Sox !) for our associate editor. He plans to include them beginning again next month.

ASTRONOMICAL NOTES -- ON & OFF THE NET…

AFTER TRIO OF EXPLOSIONS, SCIENTISTS SAY SUPERNOVA IS IMMINENT

Three powerful recent blasts from three wholly different regions in space have left scientists scrambling. The blasts, which lasted

only a few seconds, might be early alert systems for star explosions called supernovae, which could start appearing any day.

The first two blasts, called X-ray flashes, occurred on September 12 and 16. These were followed by a more powerful burst on September 24. The burst seems to be on the cusp between an X-ray flash and a full-fledged gamma ray burst, a discovery interesting in its own right. If these signals lead to supernovae, as expected, scientists would have a tool to predict star explosions, and researchers could watch explosions from start to finish.

A team led by Dr. George Ricker of MIT, detected the explosions with NASA's High-Energy Transient Explorer (HETE- 2). Science teams around the world, using space- and ground- based observatories, have joined in, torn and conflicted over which burst region to track most closely.

"*Each burst has been beautiful*," Ricker said. "*Depending on how these evolve, they could support important theories about supernovae and gamma-ray bursts. These past two weeks have been like 'cock, fire, reload.' Nature keeps on delivering, and our HETE-2 satellite keeps on responding flawlessly*," he said.

Gamma ray bursts are the most powerful explosions known other than the Big Bang. Many appear to be caused by the death of a massive star collapsing into a black hole. Others might be from merging black holes or neutron stars. In either case, the event likely produces twin, narrow jets in opposite directions, which carry off tremendous amounts of energy. If one of jets points to Earth, we see this energy as a gamma ray burst.

The lower-energy X-ray flashes might be gamma ray bursts viewed slightly off angle from the jet direction, somewhat similar to how a flashlight is less blinding when viewed at an angle. The majority of light particles from X-ray flashes, called photons, are X-rays, energetic, but not quite as powerful as gamma rays. Both types of bursts last only a few milliseconds to about a minute. HETE-2 detects the bursts, studies their properties, and provides a location, so other observatories can study the burst afterglow in detail.

The trio of bursts from the past few weeks has the potential of settling two long-standing debates. Some scientists say X- ray flashes are different beasts all together, not related to gamma-ray bursts and massive star explosions. Detecting a supernova in the region where the X-ray flash appeared would refute that belief, instead confirming the connection between the two. Follow-up observations of the September 24 burst, named GRB040924 for the date it was observed, are already solidifying the theory of a cosmic explosion continuum from X-ray flashes up through gamma ray bursts. More interesting for supernova hunters is the fact X-ray flashes are closer to Earth than gamma ray bursts. While the connection between gamma ray bursts and supernovae has been made, these supernovae are too distant to study in detail. X- ray flashes might be signals for supernovae; scientists can actually sink their teeth into and observe in detail.

"*Last year HETE-2 sealed the connection between gamma ray bursts and massive supernovae*," said Prof. Stan Woosley of the University of California at Santa Cruz, who has championed several theories concerning the physics of star explosions. "*These two September bursts may be the first time we see an X-ray flash lead to a supernova*." "*We all expect much more of this type of exciting science to come after the launch of Swift*," said Dr. Anne Kinney, director of NASA's Universe Division. The Swift spacecraft, scheduled to launch no earlier than late October, contains three telescopes (gamma ray, X-ray and UV/optical) for quick burst detection and immediate follow-up observations of the

MYSTERY OBJECT NEITHER STAR NOR BROWN DWARF

Astronomers using the Gemini North and Keck II telescopes have peered inside a violent binary star system to find that one of the interacting stars has lost so much mass to its partner that it has regressed to a strange, inert body resembling no known star type. Unable to sustain nuclear fusion at its core and doomed to orbit with its much more energetic white dwarf partner for millions of years, the dead star is essentially a new, indeterminate type of stellar object. "*Like the classic line about the aggrieved partner in a romantic relationship, the smaller donor star gave, and gave, and gave some more until it had nothing left to give*," says Steve B. Howell, an astronomer with Wisconsin-Indiana-Yale-NOAO (WIYN) telescope and the National Optical Astronomy Observatory, Tucson. "*Now the donor star has reached a dead end -- it is far too massive to be considered a super-planet, its composition does not match known brown dwarfs, and it is far too low in mass to be a star. There's no true category for an object in such limbo*."

The binary system, known as EF Eridanus (abbreviated EF Eri), is located 300 light-years from Earth in the constellation Eridanus. EF Eri consists of a faint white dwarf star with about 60 percent of the mass of the Sun and the donor object of unknown type, which has an estimated bulk of only 1/20th of a solar mass.

Howell and Thomas E. Harrison made high-precision infrared measurements of the binary star system using the spectrographic capabilities of the Near Infrared Imager (NIRI) on the Gemini North telescope and NIRSPEC on Keck II both on Mauna Kea in December 2002 and September 2003, respectively. Supporting observations were made with the 2.1-meter telescope at Kitt Peak National Observatory near Tucson in September 2002.

EF Eri is a type of binary star system known as magnetic cataclysmic variables. This class of systems may produce many more of these 'dead' objects than scientists have realized, says Harrison. "*These types of systems are not generally accounted for within the usual census figures of star systems in a typical galaxy*," Harrison says. "*They certainly should be considered more carefully*." The white dwarf in EF Eri is a compressed, burnt-out remnant of a solar-type star that is now about the same diameter as the Earth, though it still emits copious amounts of visible light. Howell and Harrison observed EF Eri in the infrared because infrared light from the pair is naturally dominated by heat and longer wavelength emissions from the secondary object.

The scientific detective work to deduce the components of this binary system was complicated greatly by the cyclotron radiation emitted as free electrons spiral down the powerful magnetic field lines of the white dwarf. The white dwarf's magnetic field is about 14 million times as powerful as the Sun's. The resulting cyclotron radiation is emitted primarily in the infrared part of the spectrum.

"*In our initial spectroscopy of EF Eri, we noted that some parts of the infrared continuum light became about 2-3 times brighter for a time period, then went away. This brightening repeated every orbit, and thus had to have an origin within the binary*," Howell explains. "*We first thought the brightness change resulted from the difference between a heated side and a cooler side of the donor object, but further observations with Gemini and Keck instead pointed to cyclotron radiation. We 'see' this additional infrared component at the phases which occur when the radiation is beamed in our direction, and we do not see it when the beaming points in other directions*." The 81-minute orbital period of the two objects was probably four or five hours when the mass transfer process began about five billion years ago. Originally, the secondary object may also have been similar in size to the Sun, with perhaps 50-100 percent of a solar mass.

"*When this interactive process of mass transfer from the secondary star to the white dwarf begin, and why it stopped, both remain unknown to us*," Howell says. During this process, repeated outbursts and novae explosions were very likely. The physics of the process also caused the two objects to spiral closer to each other. Today, the two objects orbit each other at about the same separation as the distance from the Earth to the Moon. The donor object has regressed to a body with a diameter roughly equal to the planet Jupiter.

The combined observing power of the Gemini 8-meter and Keck 10-meter telescopes and their large primary mirrors, which were essential to this research, Howell says, makes it clear that neither spectral features of the donor nor its composition match any known type of brown dwarf or planet. Derek Homeier created a series of computer models that attempt to replicate the conditions at EF Eri, but even the best of these do not match perfectly. The shape of the spectra indicate a very cool object (about 1,700 degrees Kelvin, equivalent to a cool brown dwarf), yet they do not have the same detailed shape or key features of brown dwarf spectra. The coolest normal stars (very low mass M-type stars) are about 2,500 degrees K, and Jupiter is 124 degrees K. The close-in "hot Jupiter" exoplanets detected indirectly by other astronomers using their gravitational effect on their parent stars are estimated to be 1,000-1,600 degrees K. There is a small chance that the EF Eri system could have originally consisted of the progenitor of the present-day white dwarf star and some sort of "super-planet" that survived the evolution of the white dwarf to result in the system observed now, but this is considered unlikely. "*There are about 15 other known binary systems out there that may be similar to EF Eri, but none has been studied enough to tell*," Howell says. "*We are working on some of them right now, and trying to improve our models to better match the infrared spectra*." Co-authors of this paper on EF Eri are **Paula Szkody of the University of Washington in Seattle**, and Joni Johnson and Heather Osborne of New Mexico State. Preprint of paper: http://arxiv.org/format/astro-ph/0409735
http://www.gemini.edu/index.php?option=content&task=view&id=73&Itemid=0&limit=1&limitstart=1

MARS ROVERS PROBING WATER HISTORY AT TWO SITES

NASA's Spirit and Opportunity have been exploring Mars about three times as long as originally scheduled. The more they look, the more evidence of past liquid water on Mars these robots discover. Team members reported the new findings at a news briefing today. New findings raise the possibility Opportunity's work area was soaked long ago, before it dried and eroded into a wide plain. There are also signs some rocks may have gotten wet again, after an impact excavated a stadium-size crater in the plain. Evidence of this exciting possibility has been identified in a flat rock dubbed "Escher" and some neighboring rocks near the bottom of the crater. These plate-like rocks bear networks of cracks dividing the surface into patterns of polygons, somewhat similar in appearance to cracked mud after the water has dried up here on Earth. Alternative histories, such as fracturing by the force of the crater-causing impact, or the final desiccation of the original wet environment that formed the rocks, might also explain the polygonal cracks. Rover scientists hope a lumpy boulder nicknamed "Wopmay," Opportunity's next target for inspection, may help narrow the list of possible explanations. "*When we saw these polygonal crack patterns, right away we thought of a secondary water event significantly later than the episode that created the rocks*," said Dr. John Grotzinger. He is a rover-team geologist from the Massachusetts Institute of Technology, Cambridge, Mass. Finding geological evidence about watery periods in Mars' past is the rover project's main goal, because such persistently wet environments may have been hospitable to life. "*Did these cracks form after the crater was created? We don't really know yet*," Grotzinger said. If they did, one possible source of moisture could be accumulations of frost partially melting during climate changes, as Mars wobbled on its axis of rotation, in cycles of tens of thousands of years. According to Grotzinger, another possibility could be the melting of underground ice or release of underground water in large enough quantity to pool a little lake within the crater. One type of evidence Wopmay could add to the case for wet conditions after the crater formed would be a crust of water- soluble minerals. After examining that rock, the rover team's plans for Opportunity are to get a close look at a tall stack of layers nicknamed "Burns Cliff" from the base of the cliff. The rover will then climb out of the crater and head south to the spacecraft's original heat shield and nearby rugged terrain, where deeper rock layers may be exposed. Halfway around Mars, Spirit is climbing higher into the "Columbia Hills." Spirit drove more than three kilometers (approximately two miles) across a plain to reach them. After finding bedrock that had been extensively altered by water, scientists used the rover to look for relatively unchanged rock as a comparison for understanding the area's full range of environmental changes. Instead, even the freshest-looking rocks examined by Spirit in the Columbia Hills have shown signs of pervasive water alteration. "*We haven't seen a single unaltered volcanic rock, since we crossed the boundary from the plains into the hills, and I'm beginning to suspect we never will*," said Dr. Steve Squyres, principal investigator for the science payload on both rovers. "*All the rocks in the hills have been altered significantly by water. We're having a wonderful time trying to work out exactly what happened here*," he added. More clues to deciphering the environmental history of the hills could lie in layered rock outcrops further upslope, Spirit's next targets. "*Just as we worked our way deeper into the Endurance crater with Opportunity, we'll work our way higher and higher into the hills with Spirit, looking at layered rocks and constructing a plausible geologic history*," Squyres said. Jim Erickson, rover project manger said, "*Both Spirit and Opportunity have only minor problems, and there is really no way of knowing how much longer they will keep operating. However we are optimistic about their conditions, and we have just been given a new lease on life for them, a six-month extended mission that began Oct. 1. The solar power situation is better than expected, but these machines are already well past their design life. While they're healthy, we'll keep them working as hard as possible*." http://marsrovers.jpl.nasa.gov
http://athena.cornell.edu

NEW STAR CLUSTER MAY BE FINAL MILKY WAY 'FOSSIL'

Just when astronomers thought they might have dug up the last of our galaxy's "fossils," they've discovered a new one in the galactic equivalent of our own backyard. Called globular clusters, these ancient bundles of stars date back to the birth of our Milky Way galaxy, 13 or so billion years ago. They are sprinkled around the center of the galaxy like seeds in a pumpkin. Astronomers use clusters as tools for studying the Milky Way's age and formation. New infrared images from the Spitzer Space Telescope and the University of Wyoming Infrared Observatory reveal a never-before-seen globular cluster within the dusty confines of the Milky Way. The findings will be reported in an upcoming issue of the Astronomical Journal. "*It's like finding a long-lost cousin*," said Dr. Chip Kobulnicky, lead author of the report. "*We thought all the galaxy's globular clusters had already been found*." "*I couldn't believe what I was seeing,*" said Andrew Monson, graduate student at the University of Wyoming, who first spotted the cluster. "*I certainly wasn't expecting to find such a cluster*." The newfound cluster is one of about 150 known to orbit the center of the Milky Way. These tightly packed knots of stars are among the

oldest objects in our galaxy, having formed about 10 to 13 billion years ago. They contain several hundred thousand stars, most of which are older and less massive than our Sun. Monson first noticed the cluster while scanning data from the Spitzer Space Telescope's Galactic Legacy Infrared Mid-Plane Survey Extraordinaire; a survey to find objects hidden within the dusty mid-plane of our galaxy. He then searched archival data for a match and found only one undocumented image of the cluster from a previous NASA-funded infrared survey of the sky, called the Two Micron All-Sky Survey. "*The cluster was there in the data but nobody had found it*," said Monson. "*This discovery demonstrates why Spitzer is so powerful -- it can see objects that are completely hidden in visible light*," said Dr. Michael Werner, project scientist for Spitzer. "*This is particularly relevant to the study of the plane of our galaxy, where dust blocks most visible light*." Follow-up observations with the University of Wyoming Infrared Observatory helped set the distance of the new cluster at about 9,000 light-years from Earth -- closer than most clusters -- and set the mass at the equivalent of 300,000 Suns. The cluster's apparent size, as viewed from Earth, is comparable to a grain of rice held at arm's length. It is located in the constellation Aquila. Additional information about the Spitzer Space Telescope is available at http://www.spitzer.caltech.edu. and the UW Infrared Observatory http://physics.uwyo.edu/~mpierce/WIRO/

Largest Field of Meteorite Impact Craters

Researchers working as part of a Franco-Egyptian team have discovered several dozen circular geological structures using radar satellite images that enabled them to view the underground sections of arid regions up to several meters in depth. These structures are gathered together in an area measuring 5,000 square km in the Southwestern Egyptian desert. A mission carried out in the field in February 2004 has confirmed that most of these structures, 13 of which were studied in great detail, are meteorite impact craters. They range in size from 20 meters to 1 kilometer in diameter and may be up to 80 meters deep. This is the largest identified field of meteorite impact craters on Earth; only nine other such fields have been detected. This impact crater field is very likely the result of the fragmentation of several large meteorites that broke up when they entered the atmosphere. Another field mission has been planned for December 2004, in particular to analyze the smaller craters, which may still contain debris from meteorites whose nature remains to be determined.

Frequent Starbursts Sterilize Center of Milky Way

Life near the center of our galaxy never had a chance. Every 20 million years on average, gas pours into the galactic center and slams together, creating millions of new stars. The more massive stars soon go supernova, exploding violently and blasting the surrounding space with enough energy to sterilize it completely. This scenario is detailed by Smithsonian astronomer Antony Stark and colleagues. The team's discovery was made possible using the unique capabilities of the Antarctic Submillimeter Telescope and Remote Observatory (AST/RO). It is the only observatory in the world able to make large-scale maps of the sky at submillimeter wavelengths.

The gas for each starburst comes from a ring of material located about 500 light-years from the center of our galaxy. Gas collects there under the influence of the galactic bar -- a stretched oval of stars 6,000 light-years long rotating in the middle of the Milky Way. Tidal forces and interactions with this bar cause the ring of gas to build up to higher and higher densities until it reaches a critical density or "tipping point." At that point, the gas collapses down into the galactic center and smashes together, fueling a huge burst of star formation. "*A starburst is star formation gone wild*," says Stark. Astronomers see starbursts in many galaxies, most often colliding galaxies where lots of gas crashes together. But starbursts can happen in isolated galaxies too, including our own galaxy, the Milky Way.

The next starburst in the Milky Way is coming relatively soon, predicts Stark. "*It likely will happen within the next 10 million years*." That assessment is based on the team's measurements showing that the gas density in the ring is nearing the critical density. Once that threshold is crossed, the ring will collapse and a starburst will blaze forth on an unimaginably huge scale.

Some 30 million solar masses of matter will flood inward, overwhelming the 3 million solar mass black hole at the galactic center. The black hole, massive as it is, will be unable to consume most of the gas. "*It would be like trying to fill a dog dish with a firehose*," says Stark. Instead, most of the gas will form millions of new stars. The more massive stars will burn their fuel quickly, exhausting it in only a few million years. Then, they will explode as supernovae and irradiate the surrounding space. With so many stars packed so close together as a result of the starburst, the entire galactic center will be impacted dramatically enough to kill any life on an Earth-like planet. Fortunately, the Earth itself lies about 25,000 light-years away, far enough that we are not in danger. The facility used to make this discovery, AST/RO, is a 1.7-meter-diameter telescope that operates in one of the most challenging environments on the planet -- the frigid desert of Antarctica. It is located at the NSF's Amundsen-Scott Station at the South Pole. The air at the South Pole is very dry and cold, so radiation that would be absorbed by water vapor at other sites can reach the ground and be detected. "*These observations have helped advance our understanding of star formation in the Milky Way*," says Stark. "*We hope to continue those advancements by collaborating with researchers who are working on the Spitzer Space Telescope's Legacy Science Program. AST/RO's complementary observations would uniquely contribute to that effort*."

Motion of Primordial Universe Unveiled

New data suggests that the universe expanded rapidly in the first instants after the Big Bang New results from an instrument located high in the Chilean Andes are giving Canadian, American and Chilean researchers a clearer view of what the universe looked like in the first moments following the Big Bang.

Cosmologists at U of T's Canadian Institute for Theoretical Astrophysics (CITA), along with fellow researchers from the US and Chile, are using data from the Cosmic Background Imager (CBI) to observe a time in the universe's distant past when atoms were first forming. The findings reveal the first movements between these "seeds" that ultimately led to clusters of early galaxies. The new data also provides more proof supporting the accuracy of the standard inflationary model of the early universe, which suggests that the universe expanded rapidly in the first instants after the Big Bang. The findings appear in the October 7 online edition of Science Express. "*The long-awaited detection of these tiny signals in the first light of the universe has been made possible thanks to these remarkable technological advances in experiments such as CBI*," says University Professor Richard Bond, director of CITA. "*It has been our privilege at CITA to be fully engaged as members of the CBI team in unveiling these signals and interpreting their cosmological significance for what has emerged as the standard model of cosmic structure formation and evolution*." CBI is a microwave telescope array made up of 13 separate antennas, each about three feet in diameter and operating in 10 frequency channels. It is located at

Llano de Chajnantor, a high plateau in Chile 5,090 metres above sea level, making it by far the most sophisticated scientific instrument ever used at such high altitudes. The telescope is so high that members of the scientific team must carry bottled oxygen to work onsite. The cosmic background radiation observed by CBI originates from the era just 400,000 years after the Big Bang and provides a wealth of information on the nature of the universe. At this remote epoch none of the familiar structures of the universe existed: there were no galaxies, stars or planets, only tiny density fluctuations. The expanding universe cooled and by 400,000 years after the Big Bang it was cool enough for electrons and protons to combine to form atoms.

The new data was collected by the CBI between September 2002 and May 2004. The results are based on a phenomenon of light known as polarization -- CBI picks out the polarized light and it is the details of this light that reveal the motion of the seeds of galaxy clusters. Anthony Readhead, the principal investigator on the CBI project, says the new polarization results provide strong support for the standard model of the universe as a place in which dark matter and dark energy are much more prevalent than everyday matter. This poses a major problem for physics, according to Readhead, who explains that current physics has no explanation for why dark energy dominates the universe. The researchers are now attempting to refine the polarization observations and studying the total intensity and polarization signals in the hope of finding clues to the nature of the dark matter and dark energy.

GENESIS MISHAP BOARD & RESEARCHERS REPORT PROGRESS

As scientists begin to unpack more than 3,000 containers of samples of the sun brought to Earth by NASA's Genesis mission, the Mishap Investigation Board (MIB) has identified a likely direct cause of the failure of Genesis' parachute system to open. The parachute system failed to deploy when Genesis returned to Earth September 8, 2004. The MIB, analyzing the Genesis capsule at a facility near Denver, said the likely cause was a design error that involves the orientation of gravity- switch devices. The switches sense the braking caused by the high-speed entry into the atmosphere, and then initiate the timing sequence leading to deployment of the craft's drogue parachute and parafoil, were likely installed 'upside down'. "*This single cause has not yet been fully confirmed, nor has it been determined whether it is the only problem within the Genesis system*," said Dr. Michael Ryschkewitsch, the MIB chair. "*The Board is working to confirm this proximate cause, to determine why this error happened, why it was not caught by the test program and an extensive set of in-process and after-the-fact reviews of the Genesis system*." Meanwhile, scientists unpacking samples at NASA's Johnson Space Center (JSC), curation facility remain upbeat in their assessment of the prospects for obtaining useful science from the recovered samples. The facility counted more than 3,000 tracking numbers for the containers that hold pieces of wafers from the five collector panels. The panels secured samples of atoms and ions from the solar wind that were collected during Genesis' nearly three- year mission in deep space. Some of the containers hold as many as 96 pieces of the wafers. The team has been preparing the samples for study since the science payload and recovered samples arrived at JSC October 4. Planning is under way for preliminary examination of the samples to prepare for allocation to the science community. The samples eventually will be moved to the JSC Genesis clean room where they will be cleaned, examined and then distributed to scientists, promising researchers years of study into the origins and evolution of the solar system. "*We cheered the news from the science team about the recovery of a significant amount of the precious samples of the sun,"* said Dr. Ghassem Asrar, deputy associate administrator for the Science Mission Directorate at NASA Headquarters. "*Despite the hard landing, Genesis was able to deliver. However, we await the final report of the Mishap* Board to understand what caused the malfunction, and to hear the Board's recommendations for how we can avoid such a *problem in the future*," he added.

The recovered remains of the Sample Return Capsule (SRC) are undergoing engineering inspections and tests at the Waterton, Colo., facility of Lockheed Martin. The Genesis spacecraft and SRC were built at Waterton. Lockheed Martin is supporting the MIB both to examine the recovered hardware and in assembling documentation relevant to the development of the space system. The safety critical pyrotechnic devices and the damaged lithium sulfur dioxide battery have been secured to allow safe operations. The battery has been transported to the Jet Propulsion Laboratory in Pasadena (JPL), Calif., to begin detailed evaluation. The MIB is evaluating the recovered hardware, pertinent documentation, impact site recovery activities and interviewing people from development teams. The MIB is using a fault tree as its guide. A fault tree is a formal method for determining, organizing and evaluating possible direct causes for a mishap and to trace them to root causes. The Board's charter is to examine every possible cause and to determine whether it was related to the mishap. The Board expects to complete its work by late November.

CASSINI'S RADAR SHOWS TITAN'S YOUNG ACTIVE SURFACE

The first radar images of Saturn's moon Titan show a very complex geological surface that may be relatively young. Previously, Titan's surface was hidden behind a veil of thick haze.

"*Unveiling Titan is like reading a mystery novel*," said Dr. Charles Elachi, team leader for the radar instrument on Cassini. "*Each time you flip the page you learn something new, but you don't know the whole story until you've read the whole book. The story of Titan is unfolding right before our eyes, and what we are seeing is intriguing*." The Oct. 26 flyby marked the first time Cassini's imaging radar was used to observe Titan. The radar instrument works by bouncing radio signals off Titan's surface and timing their return. This is similar to timing the returning echo of your voice across a canyon to tell how wide the canyon is. Radio waves can penetrate the thick veil of haze surrounding Titan. Approximately 1 percent of Titan's surface was mapped during the Oct. 26 flyby. Radar images from Titan's northern hemisphere, a region that has not yet been imaged optically, show great detail and features down to 300 meters (984 feet) across. A wide variety of geologic terrain types can be seen. There are bright areas that correspond to rougher terrains and darker areas that are thought to be smoother. "*In the two days since this flyby, our understanding of Titan has grown tremendously*," said Dr. Jonathan Lunine, Cassini interdisciplinary scientist. "*Titan is a dynamic place with complex geologic processes that may be shaping its surface. Its surface may well be covered with organic materials, but we still don't know how much of the surface is liquid or solid. The fact that we have seen few craters tells us that Titan's surface is young*." The radar images show a world brimming with features that are dark and white, indicating sharp contrast. One area dubbed "Si-Si" or the "Halloween cat" because it is shaped like a cat's head is very dark and relatively smooth. That leads scientists to speculate that it might be a lake of some sort, but they caution that it is too soon to know for sure. "*With the radar in its active mode, it is like shouting at Titan and listening for the echoes*," said Dr. Ralph Lorenz, Cassini radar team member. "*But we can also*

just listen with the sensitive radar receiver, the radiometry. The radiometry data shows early indications of the composition of the surface materials. One interpretation of what it is telling us is that Titan is a place covered with organics." The optical imaging cameras on Cassini show streaks on the surface. The streaking may be caused by movement of a material over the surface by wind, flowing hydrocarbon liquids, or a moving ice sheet like a glacier. Imaging scientists are also seeing multiple haze layers in Titan's atmosphere that extend some 500 kilometers (310 miles) above the surface. At the surface Titan's atmosphere is about four times denser than Earth's. With a remarkable flyby and complicated set of spacecraft gymnastics, Cassini will try its luck with Titan again on Dec. 13, 2004. The Huygens probe will detach from Cassini on Christmas Eve and descend through Titan's dense atmosphere on Jan. 14, 2005. "*It's as if we were building a puzzle without the top of the box*," said Lunine. "*It will be necessary to piece together the clues provided by Cassini and Huygens over the next few years. Sometimes we'll be wrong and we'll need to take the pieces apart and reassemble them again until finally, a complete picture of the nature and evolution of Titan pops into view*," said Lunine. More information on the Cassini-Huygens mission is available at http://saturn.jpl.nasa.gov and http://www.nasa.gov/cassini

SEVERE GLACIAL CYCLES ON MARS

Since the arrival of Mars Global Surveyor and more recently Mars Odyssey spacecrafts, a range of facts has revealed the existence of frozen water ice in the top meters of high latitudes near-surface (~60 deg - 90 deg) of both martian hemispheres. However, its origin was still unexplained. Climatic simulations directed by astronomers from Paris Observatory and researchers from IPSL Planetology Departement (Paris VI) and published in the journal "Nature", show that this ice may come from an ancient reservoir of equatorial ice created during high obliquity episodes on Mars but which became unstable during the more recent episodes of low obliquity. This study has permitted to illustrate the existence of glacial cycles on Mars even more severe than on Earth. Even if the presence of ice caps has been observed on the Mars poles for more than three centuries, the arrival of Mars Global Surveyor and Mars Odyssey spacecrafts in 1996 and 2001 has permitted to show that important quantities of ice (more than 70% of volume) had undoubtedly also been present in the top two meters of martian high latitudes (Figure 1).

It seemed difficult to explain the existence of such a quantity of ice so nearby the surface: more than half a millimeter of water frost is currently laying down during autumn and winter at high latitudes. Nevertheless, this ice cap sublimates completely at the end of spring. This ice was proposed to be resulted from a slow diffusion of water between the Martian regolith and the atmosphere but the in situ measurements of porosity from Viking spacecrafts have shown that the regolith can not contain any ice with such a concentration. The study directed by the researchers from Paris Observatory and IPSL suggests that the solution may come from astronomical forcing of Martian climates.

For almost thirty years, sedimentary and ice cores have confirmed that the variations of the insolation received on the Earth's surface resulting from slow changes of the orbit and the Earth's obliquity had given rise to glacial/interglacial periods. However, the martian obliquity variations are chaotic and much more significant than on Earth. The Martian obliquity has indeed varied between 25 deg and 45 deg during the 5-10 Ma time intervall and between ~15 deg and 35 deg during the last 5 Ma, with a "periodicity" close to 120 000 years. A climatic 3-dimensional model of General Martian Circulation developed by the team of François Forget (IPSL, Paris VI) and simulating faithfully the current seasonal cycle of water has been used to determine the path of Martian ice through these large variations. These simulations have brought the intense latitudinal redistribution of Martian ice to light. When the obliquity overpasses 35 deg (compared to the current average value which is of ~25.19 deg), the summer insolation becomes too strong to maintain the stability of the current Northern cap which provokes a quick atmospheric transfer of ice towards the equatorial high topography region of Tharsis (Arsia, Pavonis, Ascraeus et Olympus Montes). Remarkably, these summits sides present morphological traces which may be the result of the recent presence of glaciers. When the obliquity is below the current value, the equatorial ice becomes unstable and is carried not only to the polar zones but also to the high latitudes of the both hemispheres. The latitudinal distribution of stable ice obtained is then very close to the Mars Odyssey observations, illustrating a severe martian ice age. How this ice can be preserved? As it is currently observed on Mars, ice is expected to be co-deposited with dust. When ice begins to sublimates, a dust lag is forming and prevents some ice from complete sublimation at every cycle so as to permit a "regular" forming of sedimentary meters-thick and ice-rich layers. These deposits are visible at high latitudes and more spectacularly in the polar caps. The ice observed by Mars Odyssey would also be the mark of an ancient Martian glacial age (probably inferior to 5 Ma), covered nowadays with a thin cover of dry layer. If this is true, there must be some ice not only on the top meters but on hundreds of meters depth. The radars MARSIS and SHARAD respectively aboard Mars Express (in progress) and Mars Reconnaissance Orbiter which is forseen to be launched in 2005 will probably brought additional constraints on these underground reservoirs.

LONELY HALO RAISES QUESTIONS ABOUT DARK MATTER

Dark matter continues to confound astronomers, as NASA's Chandra X-ray Observatory demonstrated with the detection of an extensive envelope of dark matter around an isolated elliptical galaxy. This discovery conflicts with optical data that suggest a dearth of dark matter around similar galaxies, and raises questions about how galaxies acquire and keep such dark matter halos. The observed galaxy, known as NGC 4555, is unusual in that it is a fairly large, elliptical galaxy that is not part of a group or cluster of galaxies. In a paper to be published in the November 1, 2004 issue of the Monthly Notices of the Royal Astronomical Society, Ewan O'Sullivan and Trevor Ponman use the Chandra data to show that the galaxy is embedded in a cloud of 10-million-degree-Celsius gas. This hot gas cloud has a diameter of about 400,000 light years, about twice that of the visible galaxy. An enormous envelope, or halo, of dark matter is needed to confine the hot cloud to the galaxy. The total mass of the dark matter halo is about ten times the combined mass of the stars in the galaxy, and 300 times the mass of the hot gas cloud. A growing body of evidence indicates that dark matter -- which interacts with itself and "normal" matter only through gravity -- is the dominant form of matter in the universe. According to the popular "cold dark matter" theory, dark matter consists of mysterious particles left over from the dense early universe that were moving slowly when galaxies and galaxy clusters began to form. "*The observed properties of NGC 4555 confirm that elliptical galaxies can posses dark matter halos of their own, regardless of their environment*," said O'Sullivan. "*This raises an important question: what determines whether elliptical galaxies have dark matter halos?"* Most large elliptical galaxies are found in groups and clusters of galaxies, and are likely the product of the merger of two spiral galaxies. In such an environment, the dark matter halos can be stripped away by gravitational tidal force and added to other galaxies or the

group as a whole. Therefore, it is difficult to determine how much dark matter the original galaxies had, and how much they have lost to the group as a whole through interactions with their environment. The importance of the issue of the intrinsic amount of dark matter associated with an elliptical galaxy has recently increased owing to a report by an international team of astronomers led by Aaron Romanowsky of the University of Nottingham, United Kingdom. This team found little, if any evidence of dark matter in three relatively nearby elliptical galaxies. Two of these were in loose galaxy groups, and one was isolated. Their result, based on optical data from the 4.2 meter William Herschel Telescope on the Spanish island of La Palma, is in clear conflict with the X-ray data on NGC 4555. The optical technique used to search for dark matter in the nearby elliptical galaxies could not be applied to NGC 4555 because it is more than 3 times as far away from Earth.

Either the galaxies observed by Romanowsky and colleagues have lost their dark matter halos through earlier interactions with other galaxies, or their dark matter halos are much more extended, or they formed without dark matter halos. The first option is possible for the galaxies in groups, but very unlikely for the isolated galaxy. The second and third options are still open, but would require a modification -- perhaps a major modification -- of the cold dark matter theory of galaxy formation.

"*This is clearly a question which deserves further consideration*," said O'Sullivan. "*It seems likely that much more theoretical and observational work on elliptical galaxies will be required before this issue can be resolved*." Chandra observed NGC 4555 with its Advanced CCD Imaging Spectrometer (ACIS) in February 2003. http://chandra.harvard.edu/photo/2004/ngc4555/

CHANCE OF A COMETARY IMPACT RE-ASSESSED UPWARD

The chances of the Earth suffering a collision with a cometary body may be higher than previously thought, according to new research by astronomers Bill Napier and Chandra Wickramasinghe. If so, international programs designed to detect a large class of potentially threatening objects, namely near-Earth asteroids, as well as strategies to mitigate the worst effects of collisions, may be in need of urgent review. This is the disturbing conclusion reached by the astronomers in a paper which is to be published shortly in the Monthly Notices of the Royal Astronomical Society. Their argument is based on the known rate at which comets enter the inner solar system from the Oort cloud, a nearly spherical swarm of some 100 billion comets that surrounds the solar system out to a distance almost halfway to the Sun's nearest neighboring star. With about 1 percent of incoming comets ending up on relatively short-period Earth-crossing orbits, it is expected that several thousand dormant comets could be currently posing a potential threat to our planet. Recent surveys of the Earth's immediate vicinity should have turned up some 400 such objects, whereas only a handful have so far been found. The researchers dismiss the current belief that all the "missing" comets have disintegrated into meteor streams. If this had happened, they argue, then we should be seeing a far greater number of meteor showers and a much brighter zodiacal cloud than is observed. They propose instead that the majority of these comets have become exceedingly black, with such low surface reflectivities that they could not be observed against the blackness of space by optical means. Surfaces reflecting less than 0.1 percent of the incident sunlight could be formed when a comet made up of a mixture of organic grains and ices approaches the sun and sublimates, leaving an outer layer of loosely connected organic material. Download full paper (PDF format): http://star.arm.ac.uk/preprints/425.pdf See also: NEO Impact Hazard, http://star.arm.ac.uk/impact-hazard/

ASTRONOMERS DISCOVER PLANET BUILDING IS BIG MESS

Planets are built over a long period of massive collisions between rocky bodies as big as mountain ranges, astronomers announced today.

New observations from NASA's Spitzer Space Telescope reveal surprisingly large dust clouds around several stars. These clouds most likely flared up when rocky, embryonic planets smashed together. The Earth's own moon may have formed from such a catastrophe. Prior to these new results, astronomers thought planets were formed under less chaotic circumstances. "*It's a mess out there*," said Dr. George Rieke, a Spitzer scientist. "*We are seeing that planets have a long, rocky road to go down before they become full grown*." Spitzer was able to see the dusty aftermaths of these collisions with its powerful infrared vision. When embryonic planets, the rocky cores of planets like Earth and Mars, crash together, they are believed to either merge into a bigger planet or splinter into pieces. The dust generated by these events is warmed by the host star and glows in the infrared, where Spitzer can see it. The findings mirror what we know about the formation of our own planetary system. Recent observations from studies of our moon's impact craters also reveal a turbulent early solar system. "*Our moon took a lot of violent hits when planets had already begun to take shape*," Rieke said. According to the most popular theory, rocky planets form somewhat like snowmen. They start out around young stars as tiny balls in a disc-shaped field of thick dust. Then, through sticky interactions with other dust grains, they gradually accumulate more mass. Eventually, mountain-sized bodies take shape, which further collide to make planets. Previously, astronomers envisioned this process proceeding smoothly toward a mature planetary system over a few million to a few tens of millions of years. Dusty planet-forming discs, they predicted, should steadily fade away with age, with occasional flare-ups from collisions between leftover rocky bodies. Rieke and his colleagues have observed a more varied planet- forming environment. They used new Spitzer data, together with previous data from the ESA's Infrared Astronomical Satellite and the joint NASA, United Kingdom and the Netherlands' Infrared Space Observatory. They looked for dusty discs around 266 nearby stars of similar size, about two to three times the mass of the sun, and various ages. Seventy-one of those stars were found to harbor discs, presumably containing planets at different stages of development. But, instead of seeing the discs disappear in older stars, the astronomers observed the opposite in some cases. "*We thought young stars, about one million years old, would have larger, brighter discs, and older stars from 10 to 100 million years old would have fainter ones*," Rieke said. "*But we found some young stars missing discs and some old stars with massive discs*." This variability implies planet-forming discs can become choked with dust throughout the discs' lifetime, up to hundreds of millions of years after the host star was formed. "*The only way to produce as much dust as we are seeing in these older stars is through huge collisions*," Rieke said. Before Spitzer, only a few dozen planet-forming discs had been observed around stars older than a few million years. Spitzer's uniquely sensitive infrared vision allows it to sense the dim heat from thousands of discs of various ages. "*Spitzer has opened a new door to the study of discs and planetary evolution*," said Dr. Michael Werner, project scientist for Spitzer at NASA. "*These exciting new findings give us new insights into the process of planetary formation, a process that led to the birth of planet Earth and to life*," said Dr. Anne Kinney.

I, ROBOTIC TELESCOPE

Today, the world of astronomy meets the science fiction world of Isaac Asimov's "I, Robot" with the commissioning of a new robotic telescope. While it lacks the humanoid qualities of the movie version, this robot will aid in humanity's quest to understand the early universe by observing the most distant and powerful explosions known. Located at the Fred L. Whipple Observatory on Mt. Hopkins, Arizona, the Peters Automated Infrared Imaging Telescope (PAIRITEL) is the first fully "robotic" infrared telescope in North America dedicated to observing transient astronomical events. The telescope, used for several years in a major all-sky survey (2MASS), has been refurbished to work autonomously. It will operate in tandem with NASA's new gamma-ray burst satellite "Swift," to be launched on November 8 from Kennedy Space Center. With PAIRITEL, a team of astronomers led by Dr. Joshua Bloom hopes to pinpoint the gamma-ray burst explosions from the first and most distant stars in the universe. A gamma ray burst (GRB) is a quick flash of gamma-ray radiation lasting about a minute, accompanied by an afterglow emission of X-rays, visible, infrared, and radio light. The afterglow may be observable for days to weeks afterward. The majority of GRBs are believed to be due to massive stars that explode violently and release tremendous blasts of energy.

"*Innovatively exploring the night sky in the time domain -- seeing how things change from night to night, and even from minute to minute -- is the next big frontier in astronomy*," said Bloom. "*PAIRITEL was optimized to study cosmic events like GRBs that are here today and gone tomorrow*." Peering back to a time when the universe was less than 1 billion years old is the holy grail of observational astronomy. So far, only energetic galaxy cores known as quasars have been used to probe the early universe. But gamma-ray burst afterglows, if astronomers are able to image them quickly, hold clear advantages over quasars. For up to one hour after the burst, afterglow brightnesses can reach up to 1000 times that of the brightest known quasar in the universe.

Also, explained Bloom, "*The stars that create GRBs likely formed before the black holes that create quasars. So by looking for the youngest and most distant GRBs, we can study the earliest epochs of the universe*." A key feature of PAIRITEL that will allow the location of distant GRBs is its rapid response time. PAIRITEL will receive signals from Swift and automatically move, in under 2 minutes, to the part of the sky where a GRB has appeared. "*My ultimate vision is to have astronomy robots talking to robots, deciding what to observe and how, with no human intervention*," said Bloom. "*As it is, PAIRITEL only e-mails us when it's found a particularly interesting source, or when something goes wrong and it needs help!"* Another key feature of PAIRITEL is its sensitivity at infrared wavelengths, setting this system apart from the bevy of visible-light robotic telescopes already in existence. Images taken with infrared filters (about twice the wavelength of visible light) are indispensable: visible light emitted from more than 12 billion light-years away is completely extinguished for observers on Earth. Bloom explained, "*Forget about the dimming due to the extreme distances: the hydrogen gas between us and the explosions makes it like searching for a firefly behind a thick London fog. In the infrared we can peer through the shroud to the good stuff*." In addition, the unique camera on PAIRITEL takes pictures simultaneously at three different wavelengths of light, allowing for instantaneous full-color snapshots. The Swift spacecraft will find GRBs at a rate 10 to 20 times higher than currently feasible, and should find more bursts in 6 months than all well-studied bursts to date. Bloom said he is most excited about using Swift and PAIRITEL "*together to find the golden needle in the haystack -- a high-redshift GRB that's farther away than the most distant known galaxy or quasar*." When PAIRITEL is not chasing down GRBs, it will be used to make precision measurements of supernovae to help determine the few fundamental parameters that dictate the expansion of the universe. Among other projects, Dr. Michael Pahre (CfA) will use PAIRITEL to study the near-infrared light of nearby galaxies to compare it with mid-infrared light in images obtained with NASA's Spitzer Space Telescope. Harvard graduate student Cullen Blake, who has written software for the project, will also use PAIRITEL to try to find Earth-mass planets around brown dwarfs.
http://swift.gsfc.nasa.gov/docs/swift/swiftsc.html
http://pairitel.org/

FROM THE EDITOR'S TERMINAL

The Stargazer is your newsletter and therefore it should be a cooperative project. Ads, announcements, suggestions, and literary works should be received by the editor before the 1st of the month of publication, for example, material for May's newsletter should be received May 1st. If you wish to contribute an article or suggestions to ***The Stargazer*** please contact Mark Folkerts by email or by telephone (425) 486-9733 or co-editor Bill O'Neil, at (774) 253-0747.

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In October's Stargazer:

The next EAS Meeting is 7:00 P.M. Saturday, October 30th at the Providence Pacific Clinic – 916 Pacific Avenue in Everett.