the Webfooted Astronomer
News from the Seattle Astronomical Society
April 2008

Plug pulled on SAS Dark Sky project

After more than three years of effort the Seattle Astronomical Society has abandoned its project to purchase land for a dark sky observing site. The decision came in mid-March after an on-line discussion in which a vast majority of the members of the dark sky project agreed that it was time to give up.

In essence the project stalled because of an inability to balance the project criteria of dark sky and proximity to Seattle. As dark sky board member Denis Janky noted in an e-mail to dark sky members March 3, "there has been disagreement among project members on how dark is dark enough. Some project members prefer a black sky and are willing to drive further than the 3-hour limit prescribed in the proposal to get it; others are willing to compromise on sky quality to reduce the drive time."

Financing was also a problem. Funds raised since the project was formally launched in February 2005 would have been enough for a down-payment on a parcel costing about $50,000; however finding a suitable property at that price point within the drive limit was proving to be a challenge.

Many of the members voting to dissolve the project were not ready to give up on the idea. "I'd like to think that it's not the end of the concept of the SAS having its own dark sky site," wrote SAS president Jon Bearscove after the closing of the project was announced. "It's a grand idea and we would all benefit from this coming to fruition someday."

Alternate capitalization models and site criteria have been discussed on occasion during the run of the project, but there is no formal project group or proposal in place as of this writing.

Many thanks to all of those who put much time and effort into the dark sky project over the last several years.

Dark sky members will receive refunds soon.

NEXT MEETING

April 16— 7:30 p.m.
University of Washington Physics/Astronomy Building, Room A-102

An Amateur's View of Galaxies

Spring is one of the best times of the year for observing galaxies. SAS member Denis Janky will give a synopsis of the process that led to the discovery of these "island universes." He will share observing tips, favorite galaxies for telescopes large and small, and other resources.

The presentation will touch on both equipment and technique, and will be of interest to beginners and experienced observers alike.

SAS Calendar

April 12 — 7 p.m.
Seattle Astronomical Society Star Parties
- Green Lake, Seattle
- Paramount Park, Shoreline

April 12 — First quarter Moon

April 16 — 7:30 p.m.
Seattle Astronomical Society Meeting
Guest speaker: Denis Janky on observing galaxies. Details on page 1.

April 16 — 9 p.m.
UW Observatory — Public viewing night

April 19 — 6:30 p.m.
Amateur telescope makers SIG meeting
Contact: atm@seattleastro.org

April 22 — early morning
Peak of Lyrid metor shower

May 5 — New Moon

May 7 — 9 p.m.
UW Observatory — Public viewing night

May 10 — 7 p.m.
Seattle Astronomical Society Star Parties
- Green Lake, Seattle
- Paramount Park, Shoreline

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Editor: Greg Scheiderer

Work group tackles light pollution issues

by Greg Scheiderer

An informal group interested in promoting ordinances that reduce light pollution got an up-close look at the latest lighting technology at its latest meeting. The Washington Light Pollution Working Group toured Seattle's Lighting Design Lab as part of its meeting on March 27.

The lab, which has been in operation since 1989, is sponsored by utilities throughout the Northwest and operated by Seattle City Light.

Michael Lane, project manager at the Lighting Design Lab, had some news that astronomers didn't really want to hear.

"The best lighting that we could ever do – and it's no good for you guys – is the Moon," Lane said, "because the lighting is low, but it's even." It's hard to get artificial lighting set up so that it doesn't produce areas of shadow and light.

There may be good news around the corner, according to Lane. LED technology is advancing and may soon offer a much better solution.

"There's a big push in the lighting industry to look at light emitting diodes," he said. "Part of it is from the energy standpoint. There's a mentality, and I don't think we're there yet, that I can save energy by going to light emitting diodes."

In addition, LEDs may well be able to provide much more even lighting than today's high-pressure sodium streetlights. "I may be able to put less – quote unquote – measured foot candles out on a site and have the same visibility. That's a big argument in our industry."

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Light pollution
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Global city lights. The Light Pollution Working Group hopes to develop legislation to curb sky glow. (Image by Craig Mayhew and Robert Simmon, NASA GSFC. Based on data from the Defense Meteorological Satellite Program)

LEDs may also offer better vision because the light they emit is more "natural" than high-pressure sodium lights, which tend to make the iris of the eye open up, allowing more scattered light into the eye and reducing the viewer's depth of field.

"Blue-white light sources, whether it's metal halide or fluorescent or LED, shrink that iris back down," Lane said. "It's more natural for us to be in a blue-white environment."

Versatility is another plus. Since LEDs can be turned on and off more readily, or their intensity varied, street lights could be turned down in the middle of the night, possibly even brightened up just when a vehicle goes by.

Lane is a member of the Illuminating Engineering Society of North America (IESNA) and sits on three of its committees, dealing with sustainable lighting, energy management, and outdoor environmental lighting. IESNA is working with the International Dark-Sky Association to develop a model lighting ordinance, but progress on that has been frustratingly slow.

"They've been working on this for three years," he said. "I have to say, as an outsider, that it's ridiculous that it's taken them three years and it hasn't gotten out to the public to look at."

Dan Salinas, who works for Nelson Electric, Inc. and is a regional vice-president of IESNA, said having common guidelines like a model lighting ordinance or LEED (Leadership in Energy and Environmental Design) standards is critical, as is good design in application of the standards. Documents like that, Salinas said, "will help make sure that whatever is done with outdoor lighting usage is done in such a way that the design is effective and uses proper design techniques so that we can mitigate the issues of sky glow and light pollution."

Lane noted that there are 66,000 high-pressure sodium street lights in Seattle. "If you're going to change them," Salinas added, "you have to make sure that what you are doing is the most efficient and cost-effective way of handling it."

The working group plans to meet regularly during the spring and summer, and possibly draft legislation on light pollution to be considered by the legislature in 2009. An early task will be to identify a sponsor for the legislation. State Rep. Pat Lantz of Gig Harbor, who this year sponsored the legislation that started the group on its work, announced at the end of the session in March that she plans to retire and not seek re-election in the fall. ★

Learn about light pollution Web sites and acronyms on page 7.

A recipe for making your own galaxy

By Greg Scheiderer

If you've got the ingredients, you, too can make your very own galaxy. Chris Brook, a post-doctoral fellow with the University of Washington astronomy department, showed us how to do it during a lecture at the March meeting of the Seattle Astronomical Society.

Brook works at the UW's N-body Shop, where astronomers are teaming with computer scientists to run simulations of galaxy formation, given an initial number of particles – *n* – and knowing the initial properties – stuff like position, mass, and velocity – of each. The simulations begin at a point in time about 300,000 years after the big bang, when the universe cooled enough for light and matter to separate. At this time, the matter was pretty evenly distributed.

Here's Brook's recipe for galaxy formation:

★ Start with a big bang to create hydrogen, helium, and dark matter. Seventy-five percent of that will be hydrogen.

★ Introduce quantum fluctuations among your gas particles so that some regions will be denser.

★ Add dark energy to make sure the universe expands at the correct rate. This is a problem for making your own galaxy at home. You can't pick up dark energy at Home Depot; it's hypothetical, and we don't really know what it is, though it's a good theoretical explanation for the accelerating expansion of the universe.

★ Mix in the dark matter. There's got to be enough mass there to ensure that the dense regions collapse due to gravity.

★ Swirl in the gas. The gas follows the dark matter in as regions collapse, and the gas leads to star formation.

In essence, the scientists take oodles of particles and give each its starting properties, and then tell the computer about the laws of physics.

"Then we press 'go' and see what happens," Brook joked. Pushing 'go' is a big deal, as these simulations take a mind-boggling amount of computer power, hundreds of thousands of CPU hours, because *n* is a big number, representing all of the particles in a vast swath of original universe.

Once the simulations are run, researchers compare the results to things we have actually seen.

"Theory and observation are working in the same direction," Brook said. After each simulation they can tweak the properties of the particles, run it again, and see how it changes the outcome. If they find a set of properties that consistently matches what we can see, they'll have a pretty good model of galaxy formation.

You can see some of the simulations for yourself, on Brook's Web site, www.astro.washington.edu/cbrook/, or on the N-body Shop's YouTube page – at youtube.com/user/nbodyshop. See 4.5 billion years of galactic evolution boiled down into a two-minute video.

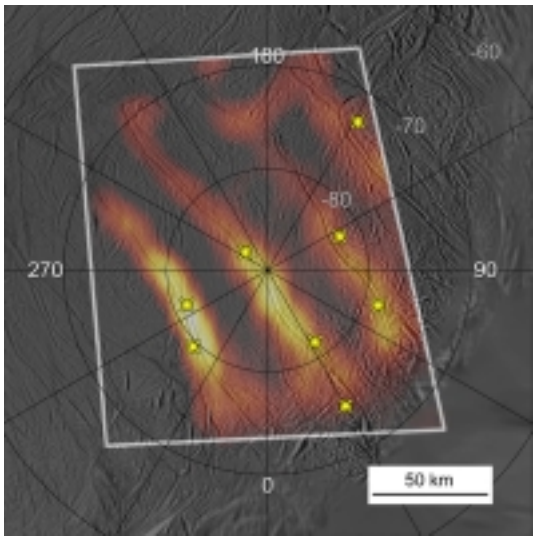
N-body shop Web site: www-hpcc.astro.washington.edu/

Cassini Finds Organics Coming from Inside Enceladus

by Ron Hobbs

Cassini, nearing the end of its four year primary mission, made its most daring flyby of the mission on March 12. Cassini passed just 50 km above the surface of Enceladus and then flew through the edge of a plume of icy particles being shot from beneath its icy crust to sample the "ground truth" of conditions within Enceladus.

Early in the mission, Cassini scientists had discovered icy particles erupting from "geysers" at the moon's south pole, the source of the E-ring. (Voyager 2 was scheduled to take pictures that would have shown this, but its camera platform jammed.) Last fall, Cassini mapped the composition, structure and density of the geysers by observing zeta Orionis being occulted by them, giving mission managers confidence that Cassini could survive a trip through the cloud of icy particles. What Cassini found was an exotic brew of carbon dioxide, carbon monoxide, and numerous organic compounds mixed with the water vapor. In fact, the chemistry of the plume is remarkably similar to that measured in comets, raising the possibility that Enceladus is an intruder from the trans-Neptunian realm. Another, more intriguing, possibility is that this primordial brew was cooked up in a sea of liquid water under the polar ice. The data from Cassini cannot confirm that possibility yet, but it sure does make it look more likely.



Heat radiating from the length of 95-mile long fractures is seen in this heat map of the south polar region of Enceladus.The warmest parts of the fractures tend to lie on locations of the plume jets, marked with yellow stars. (Photo: NASA/JPL/GSFC/SwRI/SSI)

Cassini had already found that fissures in the crust, dubbed "tiger stripes," were warmer than the surrounding crust, but detailed measurements found that they are even warmer than we knew. Regions surrounding the geysers are almost 100 degrees Celsius higher than the coldest spots of the surface. Presumably, temperatures below the ice are even higher, high enough to melt some of the ice. The source of the heat is still a matter of intense speculation and debate, but observers are already reminding us that anywhere we have liquid water, complex organics, and heat there is the potential for biology to emerge. Two of these three are now known to exist within Enceladus, which has joined the short list, with Europa and Mars, as the likeliest places beyond Earth to perhaps find life.

An extended mission for Cassini has the spacecraft making five more close flybys of Enceladus, the first being on August 11. Mission managers are talking about diving deeper into the plume. Chris McKay has suggested a Stardust-like mission that would pick up icy particles and return them to Earth, but for now we will have to wait for Cassini to better characterize the constituents of the icy plume and look for unambiguous evidence that liquid water exists below the surface. ★

The Solar System Ambassadors Program is a public outreach program designed to work with motivated volunteers across the nation. These volunteers communicate the excitement of JPL's space exploration missions and information about recent discoveries to people in their local communities. Ron Hobbs has been an Ambassador since 2001.

Tracking wildlife from space

by Patrick Barry

It's 10 o'clock, and do you know where your Oriental Honey Buzzard is?

Tracking the whereabouts of birds and other migrating wildlife across thousands of miles of land, air, and sea is no easy feat. Yet to protect the habitats of endangered species, scientists need to know where these roving animals go during their seasonal travels.

Rather than chasing these animals around the globe, a growing number of scientists are leveraging the bird's-eye view of orbiting satellites to easily monitor animals' movements anywhere in the world.

The system piggybacks on weather satellites called Polar Operational Environmental Satellites, which are operated by the National Oceanic and Atmospheric Administration (NOAA), as well as a European satellite called MetOp. Sensors aboard these satellites pick up signals beamed from portable transmitters on the Earth's surface, 850 kilometers below. NOAA began the project—called Argos—in cooperation with NASA and the French space agency (CNES) in 1974. At that time, scientists placed these transmitters primarily on buoys and balloons to study the oceans and atmosphere. As electronics shrank and new satellites' sensors became more sensitive, the transmitters became small and light enough by the 1990s that scientists could mount them safely on animals. Yes, even on birds like the Oriental Honey Buzzard.

"Scientists just never had the capability of doing this before," says Christopher O'Connors, Program Manager for Argos at NOAA.

The ARGOS program tracks the whereabouts of endangered migrating animals via miniature transmitters on the animals and the POES satellites in orbit.

Today, transmitters weigh as little as 1/20th of a pound and require a fraction of a watt of power. The satellites can detect these feeble signals in part because the transmitters broadcast at frequencies between 401 and 403 MHz, a part of the spectrum reserved for environmental uses. That way there's very little interference from other sources of radio noise.

"Argos is being used more and more for animal tracking," O'Connors says. More than 17,000 transmitters are currently being tracked by Argos, and almost 4,000 of them are on wildlife. "The animal research has been the most interesting area in terms of innovative science."

For example, researchers in Japan used Argos to track endangered Grey-faced Buzzards and Oriental Honey Buzzards for thousands of kilometers along the birds' migrations through Japan and Southeast Asia. Scientists have also mapped the movements of loggerhead sea turtles off the west coast of Africa. Other studies have documented migrations of wood storks, Malaysian elephants, porcupine caribou, right whales, and walruses, to name a few.

Argos data is available online at www.argos-system.org, so every evening, scientists can check the whereabouts of all their herds, schools, and flocks. Kids can learn about some of these endangered species and play a memory game with them at spaceplace.nasa.gov/en/kids/poes_tracking.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

SAS Gallery

SAS members put on an astronomy exhibit at a "science night" event at Echo Lake Elementary School in Shoreline on March 18. Above, Jingchun Chen shows attendees the various telescopes and binoculars brought to science night by SAS members. At left Mike Langley answers questions from an interested audience. Karl Schroeder and Greg Scheiderer also participated. (Photos courtesy Terry Stevens-Ayers, Echo Lake PTA.)

Light pollution links and acronyms

IESNA: Illuminating Engineering Society of North America
www.iesna.org/

LEED: Leadership in Energy and Environmental Design
www.usgbc.org/DisplayPage.aspx?CategoryID=19

IALD: International Association of Lighting Designers
www.iald.org/

NCQLP: National Council on Qualifications for the Lighting Profession
www.ncqlp.org/

Washington Light Pollution Working Group
groups.google.com/group/light-pollution

IDA: International Dark-Sky Association
www.darksky.org

Dark Skies Northwest
www.scn.org/darksky/

NEXT MEETING
April 16
Denis Janky, "An Amateur's view of Galaxies."
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The Webfooted Astronomer
Seattle Astronomical Society
PO BOX 31746
SEATTLE, WA 98103-1746

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