the Webfooted Astronomer
News from the Seattle Astronomical Society
May 2009

Avoid guacamole, other hazards in observatory construction

by Jerry Kuch

At the April general meeting, SAS member Jerry Galt took attendees on a tour of the issues involved in constructing one's own observatory, at home or afar.

After years of interest in astronomy, Jerry returned to the hobby with a vengeance a few years ago. Although he'd started as an optical observer, he'd always wanted to try astrophotography. Semi-retirement provided the opportunity to pursue this, while the development of some vision trouble that made eyepiece observing more difficult provided extra motivation.

Starting with a digital SLR, and an 8-inch Orion Newtonian on an Atlas mount, he quickly grew impatient with the delays that setup and polar alignment put between him and his imaging sessions. On top of that, hand guiding a scope for long exposures was tortuous, and the digital SLR was tough to focus. An upgrade to a dedicated CCD astrocamera and the installation of a RoboFocus eliminated a couple of these problems, but Jerry isn't one to solve things half way.

A piece of remote highland desert in Oregon provided dark, dry and clear skies, but presented daunting challenges for even a hardy astronomer. As a proof of concept for building an observatory at the Oregon site, Jerry decided to start with a prototype at home.

A dome in the backyard with a permanent pier for his scope, along with Ethernet cabling running under the patio, enable the scope and camera to be pointed and focused from the keyboard of Jerry's Mac with almost no setup

Continued on page 2

NEXT MEETING

May 20 — 7:30 p.m.
University of Washington Physics/Astronomy Building, Room A-102

Galileo's Footsteps

SAS member Jon Bearscove presents a slide show about his trip to Italy last spring, during which he followed in Galileo's footsteps.

As Florence, Italy presents a spectacular exhibit of ancient objects to celebrate 400 years since Galileo turned his scope on the skies, so, too SAS proposes a "visual celebration" of the limitations Galileo faced. Bring your three-inch and smaller refractors -- junk scopes welcome! -- to get a feel for what the great scientist had to work with.

If weather permits, we'll take the scopes outside and do some observing and sketching, Galileo style! It will be a fun evening following Galileo and imagining his working conditions. He had lousy optics... but dark skies!

SAS Calendar

May 17 — 2 p.m.
Astrophotography/Imaging SIG meeting
Contact: astrophoto@seattleastro.org

May 20 — 7:30 p.m.
Seattle Astronomical Society Meeting
Speaker: Jon Bearscove. Details on page 1.

May 20 — 9 p.m.
UW Observatory — Public viewing night

May 21 — dawn
Venus, Mars, and Moon form a close triangle

May 23 — 9 p.m.
Tiger Mountain Star Party (members only)

May 24 — New Moon

May 27-28
Delta Aquarid meteor shower peaks

May 30 — First quarter Moon

May 30 — 7 p.m.
Seattle Astronomical Society Star Parties
- Green Lake, Seattle
- Paramount Park, Shoreline

June 3 — 9 p.m.
UW Observatory — Public viewing night

The Webfooted Astronomer is the monthly publication of the Seattle Astronomical Society (SAS). All opinions expressed herein are those of the contributors and not necessarily those of SAS. Advertising display rates: full page (7″ x 9.5″) $50; half page (7″ x 4.75″) $30; less than half page: $5 per page inch (1″ x 5″). Personal ads are published free to current paid members of the SAS. For all others, 10 cents per word, 50 word minimum charge. Submit article ideas to Editor, The Webfooted Astronomer, PO Box 31746, Seattle, WA 98103, or e-mail to editor@seattleastro.org.

Editor: Greg Scheiderer

Observatory construction by Galt

Continued from page 1

time. Careful organization of his cabling and miscellaneous electronics into a single case allows most of the observatory setup's nervous system to be packed into a car for transport to a remote site. As a bonus, when observing at home, the astronomer gets to do so from the warmth and comfort of a fully equipped kitchen.

With that kitchen hundreds of miles away from the Oregon site, more dramatic measures were required, some of which involved dynamite and bulldozers, to obtain a similar experience. The ultimate result was a fireproof concrete cabin, a 1kW wind turbine and rooftop solar panels for power, and another dome. The instruments and supporting hardware can be pulled from one observatory and driven to the other with relative ease, and the separate cabin keeps the menace of guacamole and other snacks away from one's equipment.

Jerry's presentation was rich with images both of the dual observatories during their construction, and some deep sky photos taken using the setup described, and concluded with a discussion of Jerry's current project: a modified trailer that can serve as a shelter, bunkhouse and control room for astroimaging sessions, able to be towed to the dark skies. ★

SAS member, Jerry Galt, an oceanographer by profession, has degrees in physics, oceanography, applied mathematics and geophysical fluid dynamics. When not photographing the sky, he can be found working on myriad projects including a telescope mirror grinding machine.

Assessing the liquid assets of the galaxy

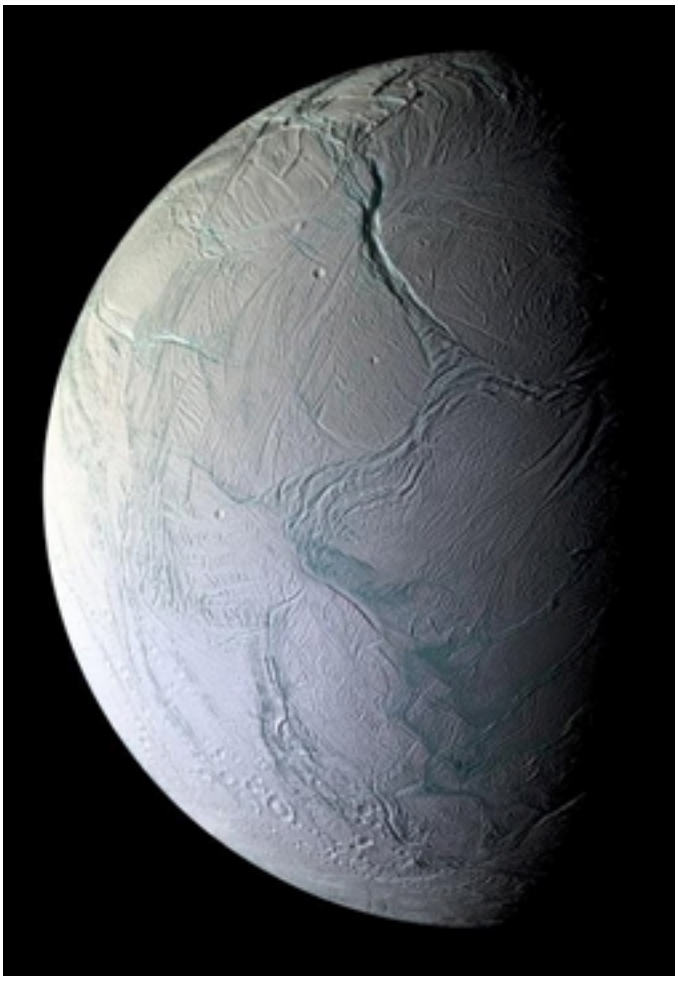
by Ron Hobbs

"Water, water everywhere …" We drink it, we swim in it, we sail our boats, we pollute it, and we mostly take it for granted. We even go to lengths to be near great bodies of it. Last weekend I drove several hundred kilometers just to walk on the shore of what remains of the once great Panthallasic Ocean and in forests made lush by meters of water falling from the sky each year. The enormous liquid plain, though greatly diminished from its extent in the last supercontinent era, is still large enough to cover a third of the planet. Sea water, though, as Coleridge's poem reminds us, is not drinkable. It is an almost magical brew of water with dissolved salts, mostly salt and sodium bicarbonate, the result of Earth's water being continually cycled over the rocky highlands.

Despite being biased toward the dry, alien environment to which we have adapted, we are, in essence, water creatures. Each of the roughly 100 trillion cells that constitute our living bodies (a number, incidentally, comparable to the number of stars in the Virgo Cluster of galaxies) live in an ocean-like bath enclosed in the spacesuit-like organ called the skin. Not surprisingly, this extracellular water has a similar salinity to that of the oceans of two billion years ago, when eukaryotic cells first evolved. Though we spend our entire lives on dry land, we live in a bag of ancient ocean water.

No wonder then that those who are interested in finding if there is life elsewhere in the universe want to "follow the water." Nowhere else in this star system do we find a world like the Earth, a planet with abundant liquid water at its surface. However, the Kepler telescope, whose photometer captured its "first light" on April 16, is looking for just such worlds. The "awe-inspiring" star field that we see in its first image, a field situated just north of the galactic plane, contains an estimated 4.5 million stars, 100,000 of which are similar to the Sun. For the next 3.5 to 6 years Kepler will watch that field and the data that it collects will answer the age-old question of whether or not worlds like the Earth, with broad seas and abundant water on its surface, are common or rare in the universe. (See *Webfooted Astronomer*, March 2009.)

Continued on page 4



On Oct. 5, 2008, just after coming within 25 kilometers (15.6 miles) of the surface of Enceladus, NASA's Cassini captured this stunning mosaic as the spacecraft sped away from this geologically active moon of Saturn. The image was voted most popular Cassini shot of 2008 by NASA Web site users. Photo courtesy NASA/JPL/ Space Science Institute.

The galaxy's liquid assets

Continued from page 3

Curiously, the most "Earth-like" object in the Solar System is the Saturnian moon, Titan. We now know for sure that its surface is covered with lakes and seas of liquid. But Titan is a bizarre simulacrum of Earth: water is there, but it takes on the role and hardness that silicate rocks have here on Earth. And its seas are composed of liquid natural gas; liquid methane and ethane with, no doubt, a smattering of higher molecular weight hydrocarbons dissolved in it. And it clearly rains on Titan. This satellite of Saturn has a methanological cycle which mirrors in many ways the hydrological cycle of Earth. It is no surprise that the Cassini scientists who work for NASA say that "[i]f Titan were a planet, it would likely stand out as the most important planet for humans to explore." [1]

It turns out that Titan very likely has liquid water, but as a mantle deep below the icy crust, just as Europa, Ganymede, Callisto and the largest trans-Neptunian objects are likely to have. Cassini has confirmed that the crust does not move in lock step with the body as a whole. Ice worlds with a liquid water mantle are likely one of the most prevalent kinds of smaller worlds in the universe. However, in many of these bodies, the water mantle is sandwiched between the icy crust and high-temperature forms of ice that would form at the bottom of their mantle oceans. This is an unlikely abode for life; at least as we currently know it.

The Jovian moon Europa is on the short list of worlds within the Solar System that may harbor living organisms. It is almost certain that beneath the ice crust, there is a planet-wide (OK, moon-wide) ocean that is likely the largest single body of water in the Solar System. At the bottom of that ocean, there may be hydrothermal events of the sort that on Earth support rich ecosystems of organisms. NASA has made the exploration of Europa and the Jovian system its next priority for a flagship mission to the outer planets, in cooperation with the European Space Agency.[2] As its part of what is being called the Europa Jupiter System Mission (EJSM), NASA will launch the Jupiter Europa Orbiter in early 2020. As its name suggests, it will ultimately be inserted into Europan orbit in the middle of 2028, where it will investigate its habitability. From orbit, with radar and dynamical studies, JEO should be able to confirm the existence of a sub-crustal ocean, and determine the thickness of the icy crust. ESA will launch the Jupiter Ganymede Orbiter which will arrive in Jupiter orbit shortly after JEO and ultimately provide a complete reconnaissance of the largest planetary satellite.

The most surprising member of the short list of potential abodes for life in the Solar System is the tiny moon of Saturn, Enceladus. This tiny world, smaller than the British Isles, has been suspected of being the source of the E-ring since Voyager days. The Cassini spacecraft, which has been exploring Saturn and its system of over 60 moons for almost five years now, found just how dramatically this occurs. Photographs show plumes of ice crystals and vapor shooting over 300 kilometers into the Enceladian sky. An attractive hypothesis is that the ice geysers derive from a liquid water ocean beneath the crust, but in 2007 observations from the Keck telescope that failed to find sodium in the plumes or in the E-ring threw cold water on that idea.[3] However, last October, Cassini made one of its closest flybys of the south pole, flying right through the core of one of the plumes. In results just released, German scientists claim to have found sodium salts, particularly NaCl and sodium bicarbonate, in the ice crystals that struck the Cosmic Dust Analyzer.

Continued on page 5

The galaxy's liquid assets

Continued from page 4

If this result is confirmed, it is some of the strongest evidence yet that that the ice plumes originate from liquid seawater in contact with the rocky core of Enceladus. If this is so, Enceladus may turn out to be one of easiest places to explore where an alien ecosystem may have developed.[4] ★

Ron Hobbs is the Public Programs Assistant for The Museum of Flight and a Solar System Ambassador for NASA's Jet Propulsion Laboratory. For more information on the SSA program see www2.jpl.nasa.gov/ambassador

1- For instance, **http://saturn.jpl.nasa.gov/files/20090420_titan_mission_description.pdf**

2- Outer Planet Flagship Mission website. **http://opfm.jpl.nasa.gov/europajupitersystemmissionejsm/**

3- Sodium issue clouds Enceladus. BBC, Dec. 16, 2007. **http://news.bbc.co.uk/2/hi/science/nature/7145530.stm**

4- New signs of hidden sea on Saturn moon. **http://www.msnbc.msn.com/id/30501915/**

SAS officers

President, Karl Schroeder
president@seattleastro.org

Board chair, Jon Bearscove
chair@seattleastro.org

VP Programs, Jerry Kuch
programs@seattleastro.org

VP Education, Mohammad Sarwat
education@seattleastro.org

VP Membership, Rod Ash
membership@seattleastro.org

VP Publicity, Judy Schroeder
publicity@seattleastro.org

Secretary, Connie Griffith
secretary@seattleastro.org

Treasurer, Maxine Nagel
treasurer@seattleastro.org

Drake: They're out there

Astronomer Frank Drake was in Seattle for the University of Washington's Astronomy Day open house, and seattlepi.com's Monica Guzman spoke with him at length.

Drake told Guzman that he believes other intelligent civilizations are out there, and that we'll probably first detect their TV or radio signals.

What if they're watching OUR television, and the first thing they discover is "My Favorite Martian"?

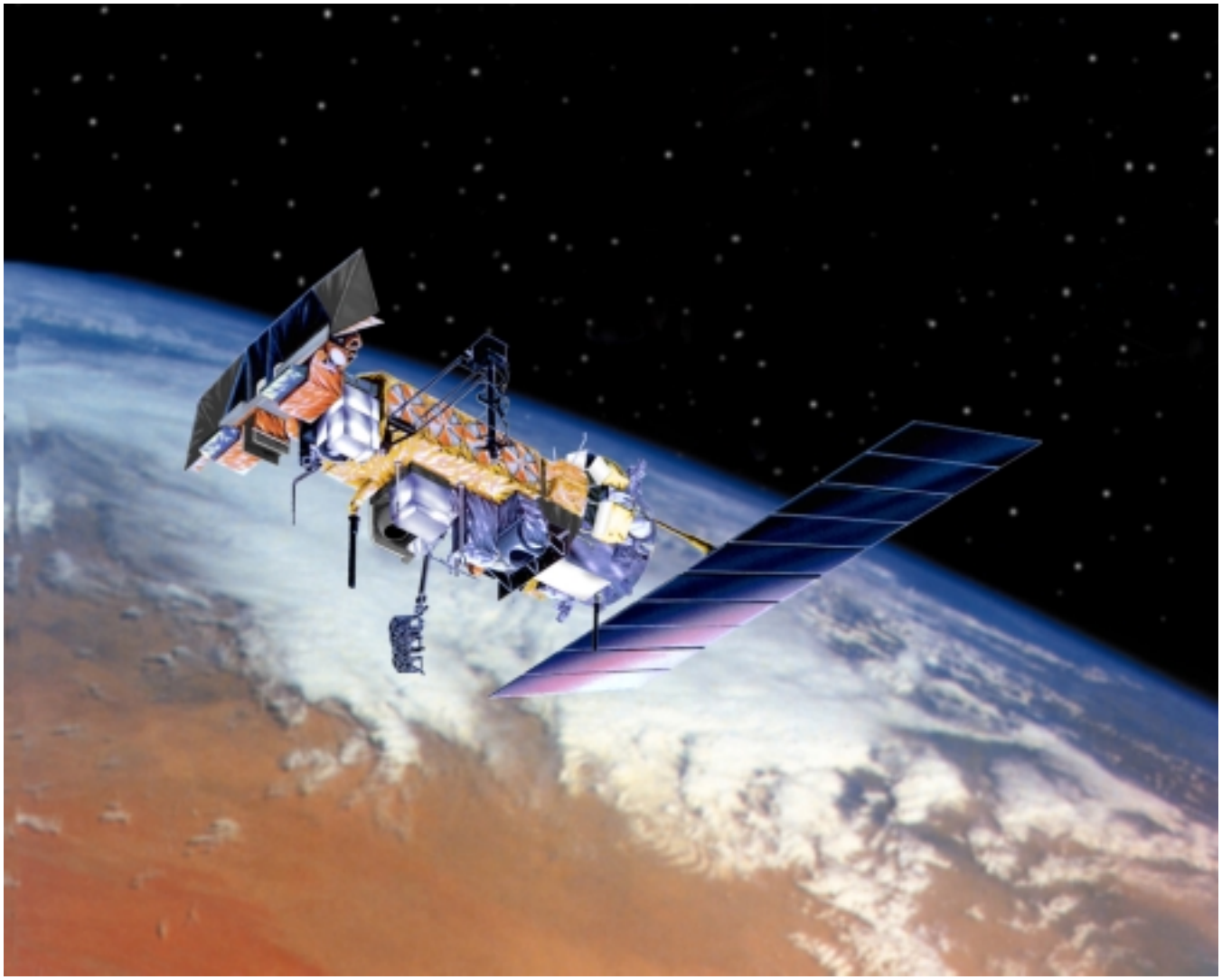
Read Guzman's blog post at **http://blog.seattlepi.com/thebigblog/archives/167744.asp** and her article at **http://www.seattlepi.com/local/405707_drake30.html**

The Swiss army knife of weather satellites

Spotting volcanic eruptions, monitoring the health of crops, pinpointing distress signals for search and rescue teams. It's not what you might expect from a weather satellite. But these are just a few of the abilities of NOAA's newest polar-orbiting weather satellite, launched by NASA on February 6 and turned over to NOAA for full-time operations on February 26.

Formerly called NOAA-N Prime and now renamed NOAA-19, it is the last in its line of weather satellites that stretches back almost 50 years to the dawn of the Space Age. Over the decades, the abilities of these Television Infrared Observation Satellites (TIROS) have gradually improved and expanded, starting from the grainy, black-and-white images of Earth's cloud cover taken by TIROS-1 and culminating in NOAA-19's amazing array of capabilities.

Continued on page 7



The new NOAA-19 is the last and most capable in the long line of Television Infrared Observation Satellites (TIROS).

Swiss army knife of weather satellites

Continued from page 6

"This TIROS series has become quite the Swiss army knife of weather satellites, and NOAA-19 is the most capable one yet," says Tom Wrublewski, NOAA-19 Satellite Acquisition Manager at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

The evolution of TIROS began in 1998 with NOAA-K. The satellites have carried microwave sensors that can measure temperature variations as small as 1 degree Celsius between Earth's surface and an altitude of 40 kilometers—even through clouds. Other missions have added the ability to track large icebergs for cargo ships, monitor sea surface temperatures to aid climate change research, measure the amount of ozone in Earth's protective ozone layer, and even detect hazardous particles from solar flares that can affect communications and endanger satellites, astronauts in orbit, and city power grids.

NOAA-19 marks the end of the TIROS line, and for the next four years it will bridge the gap to a new series of satellites called the National Polar-orbiting Operational Environmental Satellite System. NPOESS will merge civilian and military weather satellites into a single system. Like NOAA-19, NPOESS satellites will orbit Earth from pole to pole, circling the planet roughly every 100 minutes and observing every location at least twice each day.

NPOESS will have yet more capabilities drawn from its military heritage. Dim-light sensors will improve observations of the Earth at night, and the satellites will better monitor winds over the ocean — important information for ships at sea and for weather and climate models.

"A lot more capability is going to come out of NPOESS, improving upon the 161 various environmental data products we already produce today," Wrublewski says.

Not even a Swiss army knife can do that many things, he points out.

For more on the NPOESS, check out **http://www.npoess.noaa.gov**. Kids can find out about another NOAA satellite capability—tracking endangered migrating species—and play a fun memory game at **http://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.

We promise you the Sun, the Moon, and the stars... and we deliver!

The Seattle Astronomical Society is an organization created and sustained by people who share a common interest in the observational, educational, and social aspects of amateur astronomy.

Established in 1948, the SAS is a diverse collection of over 200 individuals. A variety of programs and activities is presented by the SAS throughout the year. Monthly meetings feature speakers on a wide range of topics, from the Hubble Space Telescope to electronic imaging to personal observing experiences. The club holds public observing "star parties" at Green Lake and Paramount Park every month, dark sky observing parties outside Seattle, plus such activities as meteor watches, public telescope and astronomy displays, National Astronomy Day, and an annual Awards Banquet.

The Webfooted Astronomer
Seattle Astronomical Society
PO BOX *31746*
SEATTLE, WA 98103-1746

RETURN SERVICE REQUESTED

NEXT MEETING
May 20, 2009

Galileo's Footsteps

Details, page 1

Seattle Astronomical Society Membership

Join or renew on-line at http://www.seattleastro.org/membernew.shtml or mail this form and your check to the address below. For family memberships, please include the names of persons you want to appear in the membership directory. For renewals, please include magazine subscription customer number.

Name _____

Address _____

_____

Phone _____ E-mail _____

☐ New member ☐ Renewal ☐ SAS may publish info in membership directory

☐ Individual membership – $25	**$** _____
☐ Family membership – $25	**$** _____
☐ Full-time student membership – $10	**$** _____
☐ Receive paper copy of newsletter (free on-line) – $15	**$** _____
☐ Sky & Telescope magazine – $33	**$** _____
☐ Astronomy magazine – $34	**$** _____
☐ Donation (optional)	**$** _____
	TOTAL $: _____

Mail to: Seattle Astronomical Society, c/o Treasurer, PO Box 31746, Seattle WA 98103-1746