

The SPECTRUM

A Roper Mountain Astronomers Publication

Volume 18

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Number 10

Message From The President ...

Ahhh Summer. It is a time for, vacations, camping, fishing, swimming, lying in the sun, and, unfortunately, lousy seeing! Since I picked up Godzilla, our wonderful mobile observatory, there has not been an evening when it was worth hauling out to a dark site to use it!

Now don't get me wrong. I like summer as much as the next guy. I moved down here because I would rather sweat than shiver. I hate the sloppy, cold, clammy, restrictive weather that comes with winter, but the night skies are fabulous. I hope many of our members enjoyed the Perseid meteor shower on August 12th. (See accompanying article thanks to the NASA website.)

We have had a change of plans for the speaker for August. Our speaker will be Jim Lamm from the Charlotte Area Amateur Astronomers. He is the "Meteorite Man." Gayle Riggsbee from the Charlotte club has highly recommended this program. If you want to learn about meteorites and probable hold a few, this is the meeting to attend.

September also brings us a great speaker, Dr. William Baker from Furman University. His program on General Relativity and String Theory may prove to be one of the most interesting and mentally challenging we have had this year. He presented this program at the regional Mensa gathering earlier this year. I am sorry I missed it at that time, but I am certainly looking forward to it at the meeting on September 15th.

Summer brings our annual club picnic in September. Come to the meeting for place and time or look on the website. It also brings the beginnings of a transition time for the club in that the nominating committee is going to be doing its work to nominate a slate of officers for the executive board. If you have any interest in serving on the board, please contact James Spurck, Steve Crowe, or Judson Mitchell.

I'd really like to see our mobile observatory get some use at outreach sessions for the school district this year. I also want to see Godzilla show up at every star party when the conditions make it feasible.

Keep your eye on the sky!

Jerry P.

August 2005 RMA Club Meeting August 18th - 7:30 p.m.

Agenda: Jim Lamm "The Meteorite Man" from Charlotte NC
Jim is the Vice President of Circulation for the Charlotte Observer and a avid astronomy with a special interest in meteorites.
He will be bringing some of his collection.

The RMA Needs You!



The time for electing new officers is fast approaching. Anyone interested in serving as an officer or member-at-large on the Executive Committee is encouraged to contact a club officer or a Nominating Committee member and let us know! The members of the nominating committee are: Judson Mitchell, James Spurck and Steve Crowe.

Current Nominees:

President: Vacant

Vice President: Vacant

Treasurer: Art Barber

Secretary: James Spurck

Member-at-Large:

Bruce Douberley

Lee Pettijohn

Allen Harrison

Karen Polsinelli



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Crackling Planets

August 10, 2005: Have you ever walked across a wool carpet in leather-soled shoes on a dry winter day, and then reached out toward a doorknob? ZAP! A stinging spark leaps between your fingers and the metal knob.

That's static discharge--lightning writ small.

Static discharge is merely annoying to anyone on Earth living where winters have exceptionally low humidity. But to astronauts on the Moon or on Mars, static discharge could be real trouble.

"On Mars, we think the soil is so dry and insulating that if an astronaut were out walking, once he or she returned to the habitat and reached out to open the airlock, a little lightning bolt might zap critical electronics," explains Geoffrey A. Landis, a physicist with the Photovoltaics and Space Environmental Effects Branch at NASA Glenn Research Center in Cleveland, Ohio.

This phenomenon is called triboelectric charging.

The prefix "tribo" (pronounced TRY-bo) means "rubbing." When certain pairs of unlike materials, such as wool and hard shoe-sole leather, rub together, one material gives up some of its electrons to the other material. The separation of charge can create a strong electric field.

Here on Earth, the air around us and the clothes we wear usually have enough humidity to be decent electrical conductors, so any charges separated by walking or rubbing have a ready path to ground. Electrons bleed off into the ground instead of accumulating on your body.

But when air and materials are extraordinarily dry, such as on a dry winter's day, they are excellent insulators, so there is no ready pathway to ground. Your body can accumulate negative charges, possibly up to an amazing 20 thousand volts. If you touch a conductor, such as a metal doorknob, then--ZAP!--all the accumulated electrons discharge at once.

On the Moon and on Mars, conditions are ideal for triboelectric charging. The soil is drier than desert sand on Earth. That makes it an excellent electrical insulator. Moreover, the soil and most materials used in spacesuits and spacecraft (e.g., aluminized mylar, neoprene-coated nylon, Dacron, urethane-coated nylon, tricot, and stainless steel) are completely unlike each other. When astronauts walk or rovers roll across the ground, their boots or wheels gather electrons as they rub through the gravel and dust. Because the soil is insulating, providing no path to ground, a space suit or rover can build up tremendous triboelectric charge, whose magnitude is yet unknown. And when the astronaut or vehicle gets back to base and touches metal--ZAP! The lights in the base may go out, or worse.

Landis and colleagues at NASA Glenn first noticed this problem in the late 1990s before

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Prozac for Plants ...

How do you get plants to grow on Mars? The first step: relieve their anxiety.

August 5, 2005: Anxiety can be a good thing. It alerts you that something may be wrong, that danger may be close. It helps initiate signals that get you ready to act. But, while an occasional bit of anxiety can save your life, constant anxiety causes great harm. The hormones that yank your body to high alert also damage your brain, your immune system and more if they flood through your body all the time.

Plants don't get anxious in the same way that humans do. But they do suffer from stress, and they deal with it in much the same way. They produce a chemical signal -- superoxide (O₂⁻) -- that puts the rest of the plant on high alert. Superoxide, however, is toxic; too much of it will end up harming the plant.

This could be a problem for plants on Mars.

According to the Vision for Space Exploration, humans will visit and explore Mars in the decades ahead. Inevitably, they'll want to take plants with them. Plants provide food, oxygen, companionship and a patch of green far from home.

On Mars, plants would have to tolerate conditions that usually cause them a great deal of stress -- severe cold, drought, low air pressure, soils that they didn't evolve for. But plant physiologist Wendy Boss and microbiologist Amy

Grunden of North Carolina State University believe they can develop plants that can live in these conditions. Their work is supported by the NASA Institute for Advanced Concepts.

Stress management is key: Oddly, there are already Earth creatures that thrive in Mars-like conditions. They're not plants, though. They're some of Earth's earliest life forms--ancient microbes that live at the bottom of the ocean, or deep within Arctic ice. Boss and Grunden hope to produce Mars-friendly plants by borrowing genes from these extreme-loving microbes. And the first genes they're taking are those that will strengthen the plants' ability to deal with stress.

Ordinary plants already possess a way to detoxify superoxide, but the researchers believe that a microbe known as *Pyrococcus furiosus* uses one that may work better. *P. furiosus* lives in a superheated vent at the bottom of the ocean, but periodically it gets spewed out into cold sea water. So, unlike the detoxification pathways in plants, the ones in *P. furiosus* function over an astonishing 100+ degree Celsius range in temperature. That's a swing that could match what plants experience in a greenhouse on Mars.

See Prozac for Plants - Page 3

RMSC Friday Starry Nights Volunteers are needed!

No PH Degree needed! In this case PH degrees are like the curly tail on a pig, it makes him no more prettier.

So come on out and help volunteer. Astronomy is a lot more fun when you share it with others. So let us give an 'oink' for astronomy and chew off those curly tails and have fun.

Contact Doug Gegen at (864) 679-7016 ahead of time so he can put you on the volunteer list at the gate.

Check Out Scopes

This is a reminder to members that the club has two telescopes that club members can check out from month to month. They are the 6" and 8" Sky-Quest dobsonians the club purchased over a year ago. Club scopes need to be brought to one of the RMA scheduled events and need to be returned at the following month's meeting. Contact Jerry Polsinelli for more details.

Benefactor, Patron and Business Sponsor Information

Patron: \$50 - Benefits:

Free T-Shirt, Monthly Recognition in RMA Newsletter & Website and certificate of appreciation.

Benefactor: \$100 - Benefits:

Free T-Shirt, Monthly Recognition in RMA Newsletter & Website, one year subscription to either Astronomy or Sky and Telescope and certificate of appreciation.

Business Sponsor:

\$250 - Benefits:

Free T-Shirt, Monthly Recognition in RMA Newsletter & Website, one year subscription to Astronomy or Sky and Telescope, Paid Membership to RMSC and "framed" certificate of appreciation.

MASP - Mid Atlantic Star Party

*The 11th annual Mid
Atlantic Star Party!*
November 1-8, 2005

Come for a day or stay for the entire event! There is plenty of room even if you do not pre-register and there should always be someone at the registration desk to assist you. There are benefits from pre-registration including discounts, event shirts and activities with limited participation. There are talks scheduled Friday afternoon and all day Saturday and some activities specifically for young children.

For further information visit www.masp.org.

PROZAC FOR PLANTS

from Page 2

The researchers have already introduced a *P. furiosus* gene into a small, fast-growing plant known as *arabidopsis*. "We have our first little seedlings," says Boss. "We'll grow them up and collect seeds to produce a second and then a third generation." In about one and a half to two years, they hope to have plants that each have two copies of the new genes. At that point they'll be able to study how the genes perform: whether they produce functional enzymes, whether they do indeed help the plant survive, or whether they hurt it in some way, instead.

Eventually, they hope to pluck genes from other extremophile microbes -- genes that will enable the plants to withstand drought, cold, low air pressure, and so on.

The goal, of course, is not to develop plants that can merely survive Martian conditions. To be truly useful, the plants will need to thrive: to produce crops, to recycle wastes, and so on. "What you want in a greenhouse on Mars," says Boss, "is something that will grow and be robust in a marginal environment."

In stressful conditions, notes Grunden, plants often partially shut down. They stop growing and reproducing, and instead focus their efforts on staying alive--and nothing more. By inserting microbial genes into the plants, Boss and Grunden hope to change that.

"By using genes from other sources," explains Grunden, "you're tricking the plant, because it can't regulate those genes the way it would regulate its own. We're hoping to [short-circuit] the plant's ability to shut down its own metabolism in response to stress."

If Boss and Grunden are successful, their work could make a huge difference to humans living in marginal environments here on Earth. In many third-world countries, says Boss, "extending the crop a week or two when the drought comes could give you the final harvest you need to last through winter. If we could increase drought resistance, or cold tolerance, and extend the growing season, that could make a big difference in the lives of a lot of people."

Their project is a long-term one, emphasize the scientists. "It'll be a year and a half before we actually have [the first gene] in a plant that we can test," points out Grunden. It'll be even longer before there's a cold- and drought-loving tomato plant on Mars--or even in North Dakota. But Grunden and Boss remain convinced they will succeed.

"There's a treasure trove of extremophiles out there," says Grunden. "So if one doesn't work, you can just go on to the next organism that produces a slightly different variant of what you want."

"Amy's right," agrees Boss. "It is a treasure trove. And it's just so exciting."

Author: Karen Miller | Credit: Science@NASA

CRACKLING PLANETS ... *from Page 2*

Mars Pathfinder was launched. "When we ran a prototype wheel of the Sojourner rover over simulated Martian dust in a simulated Martian atmosphere, we found it charged up to hundreds of volts," he recalls.

see captionThat discovery so concerned the scientists that they modified Pathfinder's rover design, adding needles half an inch long, made of ultrathin (0.0001-inch diameter) tungsten wire sharpened to a point, at the base of antennas. The needles would allow any electric charge that built up on the rover to bleed off into the thin Martian atmosphere, "like a miniature lightning rod operating in reverse," explains Carlos Calle, lead scientist at NASA's Electrostatics and Surface Physics Laboratory at Kennedy Space Center, Florida. Similar protective needles were also installed on the Spirit and Opportunity rovers.

On the Moon, "Apollo astronauts never reported being zapped by electrostatic discharges," notes Calle. "However, future lunar missions using large excavation equipment to move lots of dry dirt and dust could produce electrostatic fields. Because there's no atmosphere on the Moon, the fields could grow quite strong. Eventually, discharges could occur in vacuum."

"On Mars," he continues, "discharges can happen at no more than a few hundred volts. It's likely that these will take the form of coronal glows rather than lightning bolts. As such, they may not be life threatening for the astronauts, but they could be harmful to electronic equipment."

So what's the solution to this problem?

Here on Earth, it's simple: we minimize static discharge by grounding electrical systems. Grounding them means literally connecting them to Earth--pounding copper rods deep into the ground. Ground rods work well in most places on Earth because several feet deep the soil is damp, and is thus a good conductor. The Earth itself provides a "sea of electrons," which neutralizes everything connected to it, explains Calle.

There's no moisture, though, in the soil of the Moon or Mars. Even the ice believed to permeate Martian soil wouldn't help, as "frozen water is not a terribly good conductor," says Landis. So ground rods would be ineffective in establishing a neutral "common ground" for a lunar or Martian colony.

see captionOn Mars, the best ground might be, ironically, the air. A tiny radioactive source "such as that used in smoke detectors," could be attached to each spacesuit and to the habitat, suggests Landis. Low-energy alpha particles would fly off into the rarefied atmosphere, hitting molecules and ionizing them (removing electrons). Thus, the atmosphere right around the habitat or astronaut would become conductive, neutralizing any excess charge.

Achieving a common ground on the Moon would be trickier, where there's not even a rarefied atmosphere to help bleed off the charge. Instead, a common ground might be provided by burying a huge sheet of foil or mesh of fine wires, possibly made of aluminum (which is highly conductive and could be extracted from lunar soil), underneath the entire work area. Then all the habitat's walls and apparatus would be electrically connected to the aluminum.

Research is still preliminary. So ideas differ amongst the physicists who are seeking, well, some common ground.

Author: Trudy E. Bell | Credit: Science@NASA

Roper Mountain Astronomers

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AUG



September 2005 RMA Meeting ...

Agenda: "General Relativity"
September 15th
7:30 p.m.

Dr. William Baker will be doing a program for us on General Relativity at our September meeting.

Calendar Of Events

Aug. - Sept. 2005

- Aug. 04 (Thr.) - New Moon
- Aug. 06 (Sat.) - Public Star Party, location TBA
- Aug. 11 (Thr.) - Perseid Meteors
7:00 p.m. RMA Board Meeting
- Aug. 12 (Fri.) - Perseid Meteors
First Quarter Moon
- Aug. 13 (Sat.) - Public Star Party, location TBA
- Aug. 18 (Thr.) - 7:30 p.m. RMA General Public Meeting
- Aug. 19 (Sat.) - Full Moon
- Aug. 26 (Fri.) - Last Quarter Moon
- Aug. 27 (Sat.) - Possible Public Star Party
- Spt. 03 (Mon.) - Labor Day
- Spt. 05 (Sat.) - Public Star Party, location TBA
- Spt. 08 (Thr.) - 7:00 p.m. RMA Board Meeting
- Spt. 10 (Sat.) - Public Star Party
- Spt. 11 (Sun.) - First Quarter Moon
- Spt. 15 (Thr.) - 7:30 p.m. RMA General Public Meeting
- Spt. 17 (Sat.) - Full Moon
- Spt. 22 (Thr.) - Autumnal Equinox
- Spt. 25 (Sun.) - Last Quarter Moon

Please contact Frank Hinson, the Observing Coordinator at 2bfrank@charter.net or via phone at 864-963-8163 for further details and events pending. Check the website for updates to this event list.

RMA MEMBERSHIP FORM

Name: _____ / _____ Renewal

Address: _____

City: _____ State: _____ Zip: _____

Phone (HOME): _____ Email: _____

Do you own a telescope or binoculars? Yes No

What Kind? _____

Areas of Interest: _____

Student: __\$12 • **Teacher:** __\$15

Newsletter: __\$12 • **Individual:** __\$20

Family: __\$25 • **Patron:** __\$50 • **Benefactor:** __\$100

Business Sponsor: __\$250

Check here if you desire to have the RMA Newsletter delivered to your email address in full color rather than being sent to your physical mail address: Yes

NOTE: Corresponding memberships entitle individual to receive the newsletter alone and do not include participation in private club activities. Student/Teacher memberships require proof of status and include participation in private club activities.

RMA Astronomy

Class Teacher

Phil Chartier

The Astronomy Classes that are normally held before each RMA General meeting will be postponed until further notice. Thanks to all who have participated. Phil Chartier

Refreshment for RMA Meeting

Refreshments will be provided by Deb Harris