



Orbit

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Roger Hill, Editor

During a one year span from April 2007 to March, 2008 I had a chance to visit Arizona, the Texas Star Party, the Manitoulin Star Party, and Split Rock . Fine astronomical places all, but I saved the best 'til last: San Pedro de Atacama in Chile.

As I wrote in 2008, I'd wanted to follow in the footsteps of Bill and Ann Tekatch, the first people I'd met who had travelled to Chile for an astronomical vacation. Tales that Les Nagy brought back of the wonders of the southern skies from the outback in Australia left me hoping that one day I'd see what the fuss was all about. A trip to the Texas Star Party (had to be one of the wettest on record) in 2007 saw me under the best skies I'd ever seen. With the Milky Way high in the sky, the ground was definitely darker where it was "shaded" from the galactic core, but Les said that the Australian skies were darker and the Milky Way, although impressive under the dark skies of west Texas, was but a pale shadow of what our southern compatriots saw.

In March, 2008, I got to see for myself. As I walked out of the restaurant we ate at that first evening, I saw a couple of clouds in the sky, it was still twilight. I then realized that I was looking at the Magellanic Clouds. I'd seen them before from the Caribbean and the Pacific coast of Mexico, but only as they hugged the horizon. Each night seemed to be more spectacular than the last.

And then Les Nagy moved down to Chile at the beginning of 2010. He'd visited San Pedro de Atacama in the (Northern) Spring of 2009, and came back entranced. He wound down all his affairs in Hamilton, packed everything he needed into a 20' steel container, and headed off to live in Chile.

Les and I had first met back in the mid '70's, but our friendship really got off to a good start when we renewed our acquaintance at StarFest in 1993. In the years afterwards, we had some great fun doing things like observing all 9 planets (as they were, then) in one night...starting off with Venus, naked eye, in the middle of the afternoon. We proceeded on to Mercury, by offsetting my scope from Venus. Mars, though, eluded us in the daytime. Jupiter and Saturn were easy, and we tasked Bill Parker with finding Uranus. Les hunted down Pluto in his 8" Dob (lovely optics in that scope...I have no idea who has it now, but that was one exquisite piece of glass)., while Charles and Patty Baetsen teamed up to find Neptune. Only Mars was left, and we had to wait until a couple of hours before dawn to catch the Red Planet. It was a fun project.

In those roughly two decades I had more fun, astronomically speaking, than at any other time in my life.

Les came back in 2013 for a couple of weeks, but this time he brought Paola with him, and I got a chance to meet the delightful Chilean that he seems so happy with. Much like I'd dreamed of seeing the southern stars, so Paola had dreamed of Niagara Falls, and so it was my extreme delight, along with my wife, to take her there.

And then last year, during one of my rare forays on to Facebook, I spotted that Les, just an couple of hours earlier, had proposed to her and she had accepted! I offered my congratulations, and she told me that Les wanted to speak to me. It was then that I found out that I'd be making another trip to Chile, to stand beside Les as he and Paola got married.

So, a week after the March general meeting, I'll arrive in San Pedro de Atacama, to stand under the incredible southern skies once again.

In other things, I got an email from Jeff Booth, winner of the January Forum Contest, who sent the following suggestion:

(see over)

“ Why don't you put some gentle pressure on all the folks you know in this astro hobby to write a vignette for Orbit. Just a wee, short piece. (Much smaller than a labour-intensive full feature article). Doesn't have to be long, 400 words or so ... maybe with a photo. Make this vignette a regular monthly feature (assuming someone will step forward each month). The Subject?: I dunno ... no, really, I do not know.

Perhaps a few of .. "How I Got Hooked on Astronomy", or "My Best Astronomy Moment", "My Worst Astronomy Moment", "Romance Under the Stars" ... etc. You might even give this vignette a standing head or a standing artsy logo put it on the same page each month .. second page? third page, or last page? “

Kind soul that he is, he volunteered the first one, and you'll find it on Page 10. I should also add that he exceeded his guidelines somewhat, by including a dozen pictures, over 700 words and I had to squeeze it on to 2 pages.

So this is why you'll find Vignette #1 on Page 10! Thanks, Jeff!

A message from the President by Gary Bennett

Another busy month with good things moving along!

We made 2 major announcements at our February meeting. Those announcements were the kind that deserve to be made in person, so if you weren't at the meeting, this is what you missed:

- 1) We received a \$ 2,000.00 grant from RASC National! We weren't expecting that, so it was a nice surprise. You may recall that our observatory has a new steel roof and that was a big expense that meant some of our outreach programs were going to be “lean” this year. So now we're “game on” again!
- 2) In February we learned that Royal Botanical Gardens has formally embraced our proposal to proceed with establishing an astronomy program that may include a 105 seat world class planetarium. Long before we “break ground” on the planetarium, we will be helping to plan and deliver public outreach programs that will take place on the grounds of RBG. Other plans include designating RBG grounds and surrounding areas as a “dark sky preserve”.

Another piece of good news is that Ed Mizzi has agreed to take on the role of Chairman of our Youth Outreach Committee. This is a new role and we are sure that some of you will want to be part of it too. On his own, Ed had already been delivering astronomy outreach at schools and with scouting groups. Now that we have formalize this as a committee, we hope that Ed will be able to get some helpers to spread the joy. Working with youth is so rewarding and you don't need to be an expert astronomer to make a huge impact. So please accept this announcement as a formal invitation to join this new committee. If you would like to learn more, contact me at president@hamiltonrasc.ca

Galaxy Season Challenge

Warmer weather always means that galaxy season has arrived. We are very fortunate to have 2 world-class telescopes for the enjoyment of our members and their guests. This equipment makes galaxy season especially enjoyable. A handful of people have worked very hard to make this all possible and the only thanks we need is that people will come out and put it to good use. Please make a special effort to this Spring to get out to the observatory. AND.... Don't forget to invite others to join you. We have a fabulous new bulletin board (forum) which is a great way to tell others that you're heading out to the observatory.

The Forum...what we learned in February.

For all of you who participated in the second month of the Forum, you know how much fun it was. Some people have taken to it like ducks to water. In fact, there's a very nice community developing on the forum, and if you asked any of them, they'd tell you they're having a wonderful time.

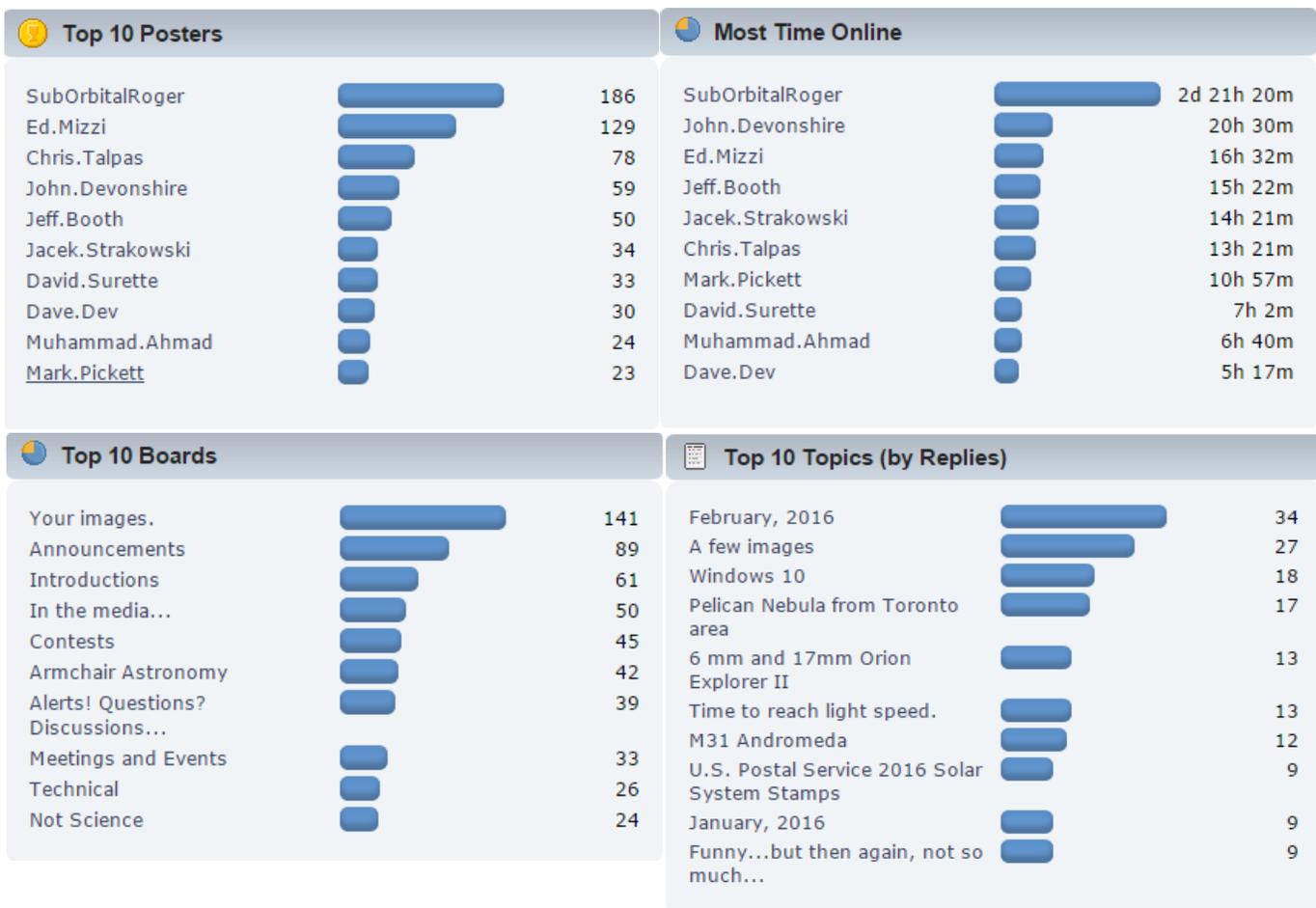
What's the attraction? Well...think of the forum as the online equivalent of the chat that occurs at a meeting. You know how it can be tough, at times, to get people back in their seats at the break between the business portion of the meeting and the guest speaker? Well, that's the sort of thing that happens on the forum.

So, it's a good place to chat. There's also a competition on there, too. In February, people were challenged to take a picture of Orion, unguided. There were lots of entries, and the "winner" will be decided at the March meeting...and everyone will get to vote.

You can find some great information there, too. And I do mean GREAT! Chris Talpas has secured a subscription to Astronomy Technology Today for members of the RASC Hamilton chapter. For those not familiar with this magazine, it is dedicated to discussing astronomical equipment. The January 2016 issue was attached (note: it is 40MB in size!). Each issue will be posted in this section as it becomes available. It's yet another benefit of membership, but you have to get on to the forum to get it.

Another facility has been added...you can now get reminders of events in the calendar. If you click on the  icon, you can select when you want to get an email reminder about this event. Needless to say, you must be registered on the forum to get this. There are some events on the calendar that you can "register" for, as well...that way the organizer knows who's coming, and who to alert if the event is cancelled.

Finally, here are the stats for the year, so far:



What if extraterrestrial observers called, but nobody heard?

Researchers suggest a way of searching for weak signals from beyond Earth

McMaster University

HAMILTON, March 1, 2016 - As scientists step up their search for other life in the universe, two astrophysicists are proposing a way to make sure we don't miss the signal if extraterrestrial observers try to contact us first.

René Heller and Ralph Pudritz say the best chance for us finding a signal from beyond is to presume that extraterrestrial observers are using the same methods to search for us that we are using to search for life beyond Earth.

Here on Earth, space researchers are focusing most of their search efforts on planets and moons that are too far away to see directly. Instead, they study them by tracking their shadows as they pass in front of their own host stars.

Measuring the dimming of starlight as a planet crosses the face of its star during orbit, scientists can collect a wealth of information, even without ever seeing those worlds directly.

Using methods that allow them to estimate the average stellar illumination and temperatures on their surfaces, scientists have already identified dozens of locations where life could potentially exist.

In a paper to be published in the journal *Astrobiology*, and available now online, Heller and Pudritz turn the telescope around to ask, what if extraterrestrial observers discover the Earth as it transits the sun?

If such observers are using the same search methods that scientists are using on Earth, the researchers propose that humanity should turn its collective ear to Earth's "transit zone", the thin slice of space from which our planet's passage in front of the sun can be detected.

"It's impossible to predict whether extraterrestrials use the same observational techniques as we do," says Heller. "But they will have to deal with the same physical principles as we do, and Earth's solar transits are an obvious method to detect us."

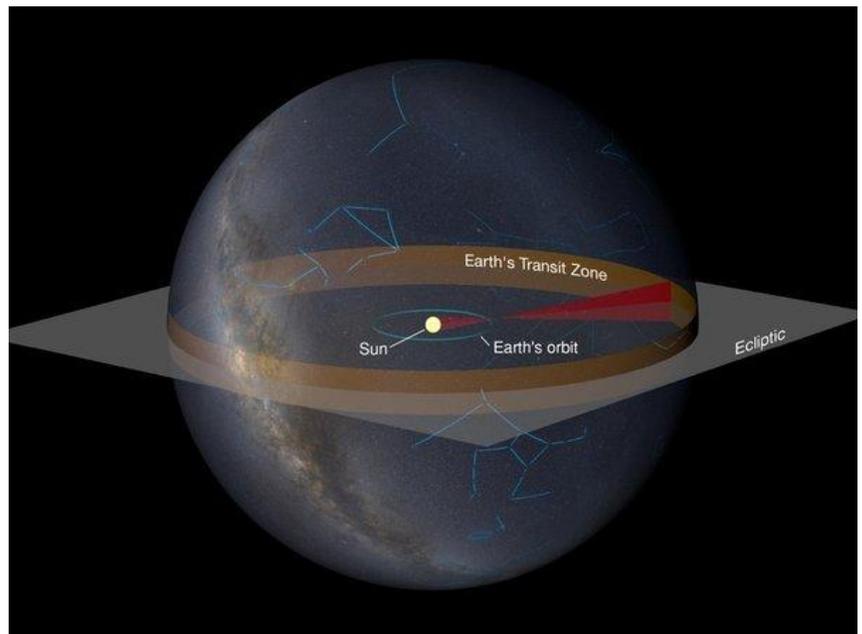
The transit zone is rich in host stars for planetary systems, offering approximately 100,000 potential targets, each potentially orbited by habitable planets and moons, the scientists say - and that's just the number we can see with today's radio telescope technologies.

"If any of these planets host intelligent observers, they could have identified Earth as a habitable, even as a living world long ago and we could be receiving their broadcasts today," write Heller and Pudritz.

Heller is a post-doctoral fellow who, while at McMaster, worked with Pudritz, a professor of Physics and Astronomy. Heller is now at the Institute for Astrophysics in Göttingen, Germany.

The question of contact with others beyond Earth is hardly hypothetical, as several projects are under way, both to send signals from Earth and to search for signals that have been sent directly or have "leaked" around obstacles, possibly travelling for thousands of years.

Heller and Pudritz propose that the Breakthrough Listen Initiative, part of the most comprehensive search for extraterrestrial life ever conducted, can maximize its chances of success by concentrating its search on Earth's transit zone.



NASA Is Testing Its Alien-Detecting Tools in Chile's Atacama Desert

With its dry climate and high elevation, the Atacama Desert plateau in Chile is one of the best locations on Earth for stargazing. A major hub for astronomical research, the region will soon to be home to the largest ground telescope ever built—a facility so sensitive that it may be able to detect signs of life in the atmospheres of alien worlds.

But it's not just the skies above the Atacama Desert that stand to revolutionize our search for extraterrestrial life. It's also the ground below. Often called the driest place in the world and the subject of punishing ultraviolet radiation, the Atacama Desert is about the closest environment to Mars that you can get, short of schlepping over to the Red Planet.



ARADS researchers sample ground-truth material obtained from 2.2 meter depth science excavation pit. Image: NASA

That's why NASA has been sending expeditions to the desert to field test new life-detecting instruments that will hopefully be bundled into future Martian missions. The latest project—Atacama Rover Astrobiology Drilling Studies (ARADS)—just wrapped its first deployment to Yungay Station, where conditions are particularly reminiscent of Mars.

The ARADS team spent a month braving the bone-dry, gusty environment during the hot Southern hemisphere summer, in order to work out the kinks in NASA's life-detecting toolkit. During their stay, the researchers ran experiments with a Mars-prototype drill, a sample transfer arm, a Signs of Life Detector (SOLID) developed in Spain, and a mock-up of the Wet Chemistry Laboratory (WCL) that accompanied the Phoenix lander to the Martian surface in 2008.

“Putting life-detection instruments in a difficult, Mars-analog environment will help us figure out the best ways of looking for past or current life on Mars, if it existed,” said NASA Ames space scientist Brian Glass, who is the principal investigator of the ARADS project, in a NASA statement. “Having both subsurface reach and surface mobility should greatly increase the number of biomarker and life-target sites we can sample in the Atacama.”

Indeed, even during this trip, the team was able to sample three main sites: Yungay, Salar Grande, and Maria Elena. Yungay has been a hotspot for astrobiological studies for over a decade because of its incredibly harsh conditions. Indeed, in 2003, a team tested out the same life-detectors that were onboard the 1975 Viking landers, and found exactly as much life as the original detectors discovered in the Martian soil—zilch. Given that even the most inhospitable regions of Antarctica seem to support extremophile microbes, the abject barrenness of Yungay has made it a popular haunt for astrobiologists ever since.

Salar Grande, meanwhile, is a shimmering salt flat, while Maria Elena has been found to be even drier and more inhospitable than Yungay. Clearly, the ARADS team has a wide range of extraordinary sites to choose from when it comes to developing alien-hunting tools for Mars.

To that point, the team leads will continue returning to the Atacama over the next four years to test out drills, detection kits, and rovers, with the aim of fine-tuning the process of rooting out extremophile organisms, and distinguishing between biotic and abiotic signatures.

Eventually, the descendents of these instruments are expected to voyage to the deserts of Mars, where they will repeat the drill, so to speak. These efforts may provide scientists with the first hard evidence of life, past or present, beyond Earth.

Alternatively, Atacama's astronomers may be the ones that stumble across hard evidence of biological entities inhabiting farflung planets in the Milky Way, through the apertures of the super-telescopes that call the plateau home.

Only time will tell, but regardless, this singular Chilean desert is shaping up to be the ace in the hole when it comes to the search for extraterrestrial life.

The Atacama Cosmological Telescope

On the 9th of March, 2008, four guys from the Hamilton Centre managed to make it to the Atacama Cosmological Telescope, 17,000 feet above sea level. The site is one of the most incredible that I have ever visited. Not so much for the instrument itself, but for the location. However, we didn't expect it to be surrounded by a tall fence which was topped by razor wire!

Most unexpectedly, the gate was open, and a truck was inside. Further, the ground-shield was open, allowing us a glimpse of the telescope inside. I wish I'd done a bit more research on the scope to try to understand what I was looking at, but I frankly didn't expect to see anyone there, let alone be able to have look inside the shield.

We were greeted by Mark Devlin, who no doubt was even more surprised to get a knock on his door. But he took some time out of a (no doubt) very busy schedule, and told us a little about the operation of the scope. This was very much appreciated, as was his concern to ensure we were reasonably functional at the altitude. Considering that we had one fellow who stayed in our Toyota 4x4 the entire time, it was an obvious concern.

We decided to push on a bit higher, though, and got to about 17,600 feet. I recently came across an interview with Mark, part of which is quoted below. The rest of it can be found at <http://www.upenn.edu/pennnews/current/2014-03-13/interviews/qa-mark-devlin>. A couple of pictures I took that day are to be found on the next page, along with some from the University of Pennsylvania of their camera.

Q: With colleagues across the globe, you are also working on the Atacama Cosmology Telescope in Chile—the highest observatory in the world—that is also studying how the universe began and evolved. Can you talk a little bit about that project?

A: That project is very active right now. That one is, again, looking at the early universe, the cosmic microwave background. We commissioned it in 2006 with our first camera. Now we have our second camera on it and that is going to be fully operational during the summer. We take a lot of trips down to the Atacama in Chile, which I would say is harder to work in than Antarctica by quite a bit.

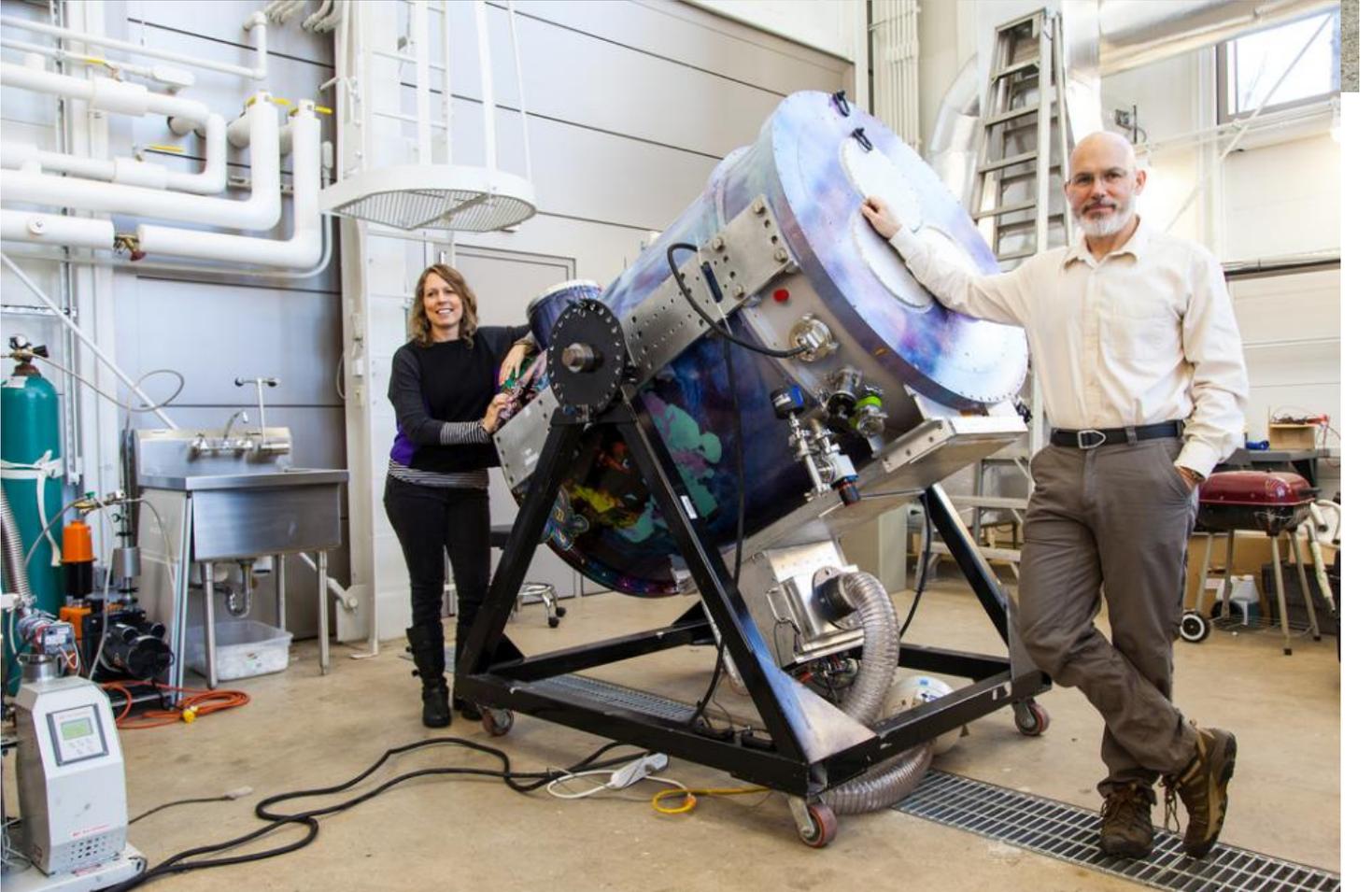
Q: Why so?

A: Antarctica is run by the National Science Foundation and they have a big huge base down there and it's like having your mother take care of you. They cook all your meals, they drive you around. All you do is work, and all the logistics and everything is taken care of. In Chile, we're on our own. We're in the middle of the mountains, a very, very remote mountaintop at 17,000 feet. It can be cold there, too, and windy, and there's not very much oxygen. I'm a pretty decent diesel mechanic now. You have to bring your own generators, and you have to refuel, and you have to drive up the roads. It's a huge amount of work. But it has a lot of advantages over Antarctica in the sense that you can get there anytime and you have access to more of the sky. It's high. It's not quite like being in a balloon, but it's still pretty good. At 17,000 feet, half of the atmosphere is gone, so there is half as much pressure, half as much oxygen. The Atacama is also known as the driest place on the planet, so it's extremely arid. Water is particularly bad for being able to see through at millimetre wavelengths. It's got to be high and dry. We're constantly upgrading the telescope. In fact, we're writing a new proposal right now to make it even better by adding a third camera. We've been very successful with that and are pushing the boundaries.

Q: I understand that you worked with [Jackie Tileston](#), an associate professor of fine arts and painting at [PennDesign](#), her husband, and Benjamin Schmitt, a Ph.D. student in physics at Penn, to create the [ARTacama Project](#), an art installation on the Atacama telescope.

A: Yes. Our cameras are big pieces of equipment. They are like the size of an oil drum. They're very expensive and we have to keep our detectors at a fraction of a degree above absolute zero. They're like big thermos bottles—very, very expensive and complicated thermos bottles. Whenever we buy a new camera, we choose a color, and I chose poorly last time: yellow. I'm not quite sure why. We decided to see if any undergraduates wanted to do an art project to paint it. Surprisingly, no undergraduates really wanted to do it, but Jackie, who is obviously a very accomplished artist, said, 'Oh yeah, I'll do it.' She and her husband talked to us and learned about the science and understood the theme, and basically adapted her artwork, her style, to create a rather large, wall-size painting. She then got a grant from the [Department of Fine Arts](#) to have it turned into a sticker, like the ones they wrap around buses. A company came in, measured the camera, and then took a high-resolution image of her painting and put it on a sticker. We then came in and covered the whole camera and took it to Chile, and I think we now have the [highest art installation in the world](#).

Next Page: (Clockwise, from top left): 1) Kevin Hobbs inside the ground shield of ACT. 2) ACT, and the diesel generator inside its fence; 3) Looking down on ACT, with Steve Barnes, Derek Baker and Kevin Hobbs. 4) The new ACT camera, with Mark Devlin and Jackie Tileston.



What you missed last month... words by Roger Hill, pictures by Ed Mizzi

Did you miss the February meeting? If you did, you missed Dave Dev give a great talk about Space Medicine. You also missed Jeff Booth getting the first prize for the Forum Contest. You missed Andy Blanchard make an announcement about the Hamilton Centre and the RBG exploring a partnership to put a Planetarium at their headquarters. You missed hearing about the Hamilton Centre get a \$2,000 grant from National Office to replace the Chilton Building Roof!

You should come out to a meeting...you never know what you'll learn!



Vignette # 1: Jeff Booth “Romance, it really is in the stars.”

It’s hard to put astronomy and motorcycling into the same sentence.

But those seemingly disparate pursuits did come together, some time back, between a young man and the young woman who was sitting two rows in front of him.

The class was Physics. The instruction was interesting enough. Light, diffraction, velocity, acceleration, mass ... all that good stuff.

Ever more interesting, too, was the young woman, who the young man saw every time he looked straight forward to pay attention to the instructor. On this particular day, the master of physics was holding forth on gravitation, more specifically holding forth on Newton’s law of universal gravitation. You’ve heard of it ... that’s the equation that allows you to calculate the force of attraction between two bodies, so long as you know their masses and how far they are away from each other.

The instructor, again in direct line of sight with the young woman – and working to deepen his students’ understanding of the concept, urged his charges to calculate the force of attraction between two things ... any two things. With that, the aforementioned young male moved forward, about two metres, to the young female: “What’s your weight?” he inquired, with a smile.

The young woman replied: “A hundred and fifteen pounds.” Certainly, that sort of question to a young woman isn’t the sort of thing one hears about too often, but context is everything right?

The Physics class continued, without further exchange. Apparently no significant romantic advantage gained. However, later that day, the two masses ran into each other again outside, with him attempting to engage her in conversation about, of all things, how one mass attracts another. That avenue of conversation didn’t get too far. Seen that result before, though, earlier that same day.

Turned out, however, the young woman was waiting outside for a friend, who was unexpectedly late. Naturally, such a turn of events can also offer up another opportunity to advance one’s social agenda. “So, you wanna go for a ride on my motorcycle?” he asked.

This inquiry put some shine on the apple that Newton’s equation failed to achieve. “Sure, OK,” came her reply. After the motorcycle ride, and its accompanying caress of warm evening air, wider, more personal conversation did happen and revealed that both young adults had “first” telescopes at home, she with a Tasco refractor, he with a Tasco Newtonian.

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Let’s fast forward a few decades, just to look back in time:

During those intervening years, things astronomical have never been far off the table. There were interludes with the Newtonian (but now with a broken mount). Even this first-scope instrument revealed the major moons of Jupiter and rings of Saturn to anyone interested. It even featured prominently in projecting the 1994 solar eclipse, when children were taken out of school specifically to watch a live projection – and in their own backyard, too!

There was a trip to the Kennedy Space Center, the shuttle Discovery, a Moon rock you could actually touch, rockets, their engines, modules under construction of the now-orbiting International Space Station. On another visit, some Martian ejecta material that, like the Moon rock, you could actually touch.

Even visits to cultural and archaeoastronomy sites such as Stonehenge. To the standing stones of Callanish, on a salt-sprayed isle in the Outer Hebrides of Scotland. The Pyramids of the Sun, the Moon and of the Feathered Serpent, all on a high plain in Mexico.

There was a first effort at astrophotography – in an Aldershot field in the middle of the night – to try and capture an image of comet Halle-Bop. (Got it!)

In recent months, there has been a bit more serious and disciplined engagement in the pursuit of astronomy, by both now not-so-youthful former students of physics. Perhaps most interesting here was learning about Stellarium, that easy-to-access software for skywatchers. The guy with the motorcycle and the gal on the back seat used it only recently to check out the heavens above their respective place and time of birth, just to see what was there. Different countries, different years. Nearly 3,000 kilometers apart. At the zenith for his place and time of birth was Perseus. At the zenith for her place and time of birth was Andromeda.

1. 1994 Solar Eclipse. Our kids, Daniel and Alexandra were taken out of school by Daddy and Mommy so they could watch the solar eclipse live, at home.
2. Shuttle Explorer – Connie and Jeff near the space shuttle Explorer, at the Kennedy Space Center.
3. Stonehenge. As it turns out, I was allowed access into the site itself at that time, which explains why the pics are so close up.
4. The Callanish Standing Stones, Outer Hebrides, Scotland.
5. Teotihuacan the Pyramid of the Sun, taken from atop the Pyramid of the Moon.
6. Comet Hale-Bopp 2 from an Aldershot field, beside Hwy. 403, about 1:30 a.m..



SOLAR ECLIPSE - 1994



