The Fremont Peak
Observer
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Out of the Fog

By Doug Brown

The observatory phone rings. "It's Peter. How's the fog looking up there?"

"Just a minute, I'll check…. Well, I can almost see one of the telescope pads."

"Oh. It's sunny down here. I was hoping to come up. Is it blowing hard?"

"It's blowing *real* hard. I don't think it'll clear."

None of the three of us are inclined to go outside. We huddle in the meeting room, eat our various dinners, and chat about photometry of the Pluto occultation, astronomy in general, anything. Dave's got lots of ideas. Eventually, we arrange the chairs for the public presentation.

"It's still looking pretty nasty out there, the boy scout troop hasn't been by, and its 8:00. Perhaps nobody will come tonight." Going home early looks like an attractive possibility.

The wind howls again. We hear a vehicle. It's Derek, our resident ranger. "Would you like me to check Doe flat?" he offers.

We all look at each other for a moment, tempted to just say no and then head for home. "Um, yeah, why not?" Derek heads out into the elements.

Ten minutes later three cold, damp, shivering people arrive. Sarah, accompanied by her parents, has brought a school friend. "In this weather, we thought the observatory would be closed", they say. Sarah owns a telescope. That's probably it for tonight's attendance.

But soon we've packed in over 40 people. The boy scouts all have headlamps and damp Gore-Tex. People are everywhere. Where did they all come from? Oh, well, probably they'll start to fall asleep once they get warm.

The talk tonight is a Powers-of-10 overview of the universe, starting at the earth's north pole. We zoom out a few AU and look back, asking questions to gage their level of understanding. Someone confuses stars and planets, but many seem to understand, and lots of the scouts know all the planet names.

We establish the light year as a yardstick. Several already know c is invariant and exactly how fast it is. Someone asks about FTL. We touch on tachyons.

(Continued on Page 4…)

FPOA Programs: 2007

Note: please check http://www.fpoa.net/schedule-2007.html for changes to events and schedules

Saturday Evening Programs

August:	4th, 11th, 18th
September:	1st, 8th, 15th
October:	6th, 13th, 20th
November:	3rd

The observatory is open to the public on these evenings

Solar Programs

August:	11th
September:	8th
October:	13th

Solar observing is offered at the Observatory during the afternoon on these dates.

Board Meetings

August:	11th	*FPOA Observatory*
September:	8th	*FPOA Observatory*
October:	13th	*FPOA Observatory*
November:	10th	*FPOA Observatory*

Special Programs

August:	11th	*Star-B-Q*
		Annual Meeting
September:	8th	*Rob Toebe Night*
		Member Appreciation

In This issue…

The Galactic Radio Plume and Other PARI Adventures

By Laura Clark

I never thought I'd be able to do my own research in astronomy using instruments 85 feet in diameter before I graduated from college. But I got the opportunity to do so in June, through a two-week program run by Duke University at Pisgah Astronomical Research Institute (PARI) in North Carolina. The site we were at actually had a pretty interesting history, which explained why there are currently four running radio telescopes. It was used by NASA to track the Apollo missions, before being taken over by the Department of Defense during the Cold War to track Soviet satellites. Impossible to ignore are the two enormous gray death-ray-looking *things*, one on each side of the campus, each at least 120 feet tall and 85 feet in diameter, usually pointing straight up. These are the radio telescopes we, twenty-two high school students from all over the country, were going to get to use to do our own research projects.

One of the activities we did as an introduction to the program was a session in the portable planetarium, called Star-Lab. Among other things, we looked at the Milky Way in the frequency of neutral hydrogen (1420.406 MHz), and a few of us noticed this huge radio plume, actually about 27,500 lightyears across, swirling above and around the galactic center (near Jupiter). Another student, Jerry, and I decided to find out more about this plume for our research project. We started by trying to find information on the plume or others like it, but as it turned out there had been very little research done on it. The only major information we found was an entry in the Astronomical Journal acknowledging that it existed and suggesting it was made of hot gas and dust; the source also mentioned that similar plumes have been detected above other spiral galaxies, such as Andromeda. But other than pictures (see figure 1 for a picture), that's all we found, which was actually very interesting since it meant that any data Jerry and I collected would probably be the first of its kind.

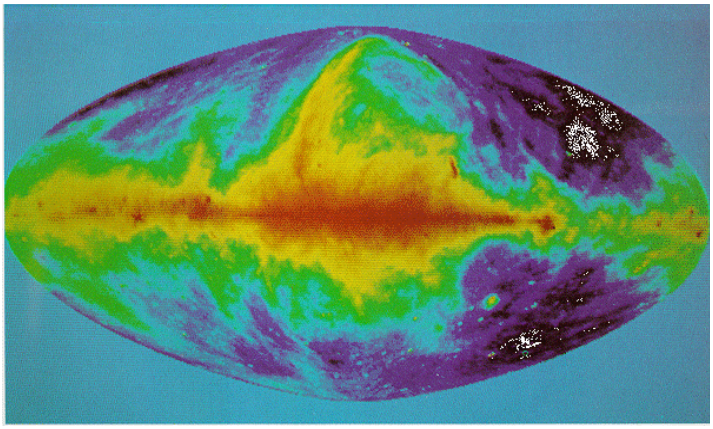
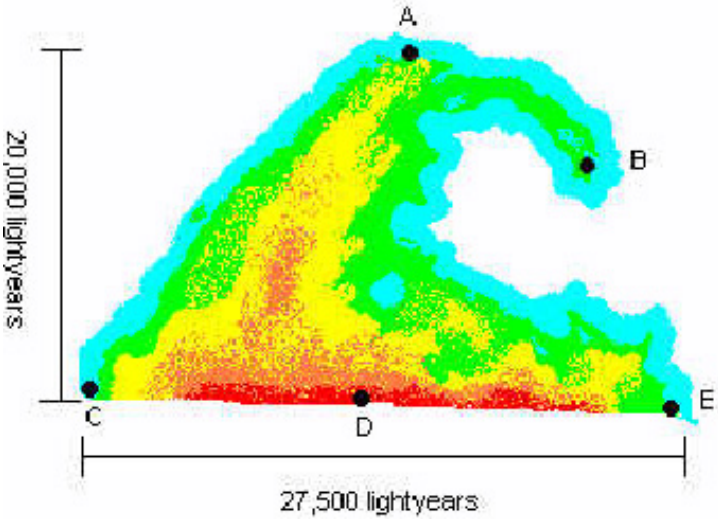


Figure 1

Instead of one of the 26-meter radio telescopes, which had too high resolution, we used a 4.6-meter radio telescope named Smiley. Smiley is so named because when the research site was used to track Soviet spy satellites, the Americans there knew when those satellites were going to fly over and take pictures of the site. So they painted a smiley face on the radio dish, and whenever the Soviets were scheduled to fly over the Americans would point Smiley straight up at them. But back to the data. Using Smiley, which observes at the frequency of neutral hydrogen, we were able to calculate the Doppler shift of the hydrogen gas in the plume, and then the velocity of that gas, so that we could find out the motion of the plume. We discovered that it rotates counterclockwise when viewed from above, and that the average speed of the gas at the points we observed was around 5 km/s. We weren't able to figure out what caused the plume in the first place or exactly what it was made of, but we were able to determine its motion, something no one else has recorded doing.



A
RA: 13h 41m 34s
Dec: -9° 46m 31s

B
RA: 12h 14m 30s
Dec: -27° 18m 12s

C
RA: 17h 24m 50s
Dec: 7° 4m 43s

D
RA: 17h 29m 18s
Dec: -30° 0m 0s

E
RA: 14h 50m 47s
Dec: -41° 27m 38s

I make these two weeks sound like solid work, but they really weren't completely. We started out with lectures on various aspects in astronomy, such as astrobiology, how telescopes work, meteorites, Doppler motion, and coordinate systems for mapping the night sky. Then we started brainstorming topics we might be interested in researching, and came up with related questions we could answer through our research. Once we formed groups and confirmed those questions, we began our research. All of this was spaced out by other activities—we went on several group hikes, a half-day canoe trip, and even a fishing trip. We also ran around and played various sports in the afternoon, although there were a lot of thunderstorms and our games were usually cut short. But all in all it was a terrific experience, and simply being around other teenagers who love astronomy as much as I do helped make it that way.

Laura Clark is an FPOA member and a senior at Pacific Collegiate School. She is doing research on the super bubble of neutral hydrogen above the center of the Milky Way, observable only in the radio frequencies. She plans on going into aeronautical or astronautical engineering after graduation.

Chapter 3: CCD Imaging

By Frank Dibbell.

The modest little manual that comes with the Orion *StarShoot* Deep Space Color Imaging Camera suggests you familiarize yourself with the camera and the controls in daylight.

This is a Good Idea.

Sadly, not one I heeded initially. I felt with my long-ago experience in film astrophotography, plus my 30+ years of computer/software expertise, I had no reason to do this step.

On a clear and crisp 30 degree evening I dutifully set up my scope, and spent about 20 minutes getting the EM-10 equatorial mount properly polar-aligned. I then proceeded to target the open star cluster M-45 (also known as the Pleiades, or Seven Sisters). I boot up my computer, attach the camera to the telescope, then, and only then, find out that the power cord for the camera does NOT have a standard DC jack at the end, but rather a "cigarette lighter" jack. The cord is 4 feet long and my truck, with the cigarette lighter, is 200 feet away. In fact, even if my truck were right NEXT to the telescope, the cord would still not stretch. At this point it became clear to me WHY the sales person at Orion wanted me to buy the Dynamo Pro 12v DC Mobile Power Station ($99).

After another trip to Orion Telescope I am now the proud owner of the Dynamo Pro 17 12v DC Power Station. This baby also has 250 cold cranking amps of power to jumpstart a dead car battery, plus an 800,000 candlepower halogen spotlight (which I am sure my fellow astrophotographers will love).

I should also note that shortly after purchasing my Dynamo Pro 17 12v DC Power Station, I found out that Costco sells a unit that is fairly similar for only $49. Costco's Power Station has 450 cold cranking amps AND it has an air compressor for keeping your tires at their proper inflation. But it didn't have the 800,000 candlepower halogen flood light (only a 250,000 candlepower "work light").

Having learned my lesson, I went back to the Orion *StarShoot* Deep Space Imaging Camera manual, and went through the process, step by step, in daylight, to learn the basic mechanics of camera operation. During this process, I learned how to properly focus the camera. Focusing with an eyepiece is simple – you look through the eyepiece and turn the focusing knob until the image is sharp and clear. The camera does not have an eyepiece.

Focusing the camera is a tedious process, whereby you find a bright star, and bring it to focus using an eyepiece. Then you replace the eyepiece with the camera, and proceed to take a series of "pictures" using the software controls on the computer. The process involves taking an image, waiting for it to download and display, then assessing its sharpness. If it is out of focus, you turn the focusing knob a bit, take another image, and repeat the process.

In the daylight you can practice by using the telescope to photograph a distant object. After several dozen iterations of taking an image and adjusting the focus knob, you do get an image that is in decent focus. For my test, I took a picture of a house under construction up on the hill about a half mile away. I also learned the difference between old USB 1.0 and new USB 2.0. My laptop, as it turns out, is 20th century technology, and only has a USB 1.0 port. It takes several seconds to a minute to download one frame from the camera to the computer. I thought this was Normal. Then I purchased a USB 2.0 PCI card, and wow! It downloads frames now in a split second! (I inserted this little lesson here, though I really didn't learn it until about the 4th time out in the field… I thought someone might benefit from knowing this now rather than later…)

The next step… photographing an easy target: the Moon! My first opportunity to photograph the Moon will occur on January 23rd, as the moon approaches 1st quarter. Wish me good weather! And stay tuned for my experiences with that endeavor!

Frank Dibbell is a founding member of the FPOA and an ersatz astrophotographer. This series of articles details his experiences in trying CCD photography step by painful step. It is hoped that some find this helpful in their own endeavors, or a the very least, modestly humorous.

20th annual FPOA Star-B-Que

The 20th annual FPOA Star-B-Que and Annual Meeting will be held on Saturday, August 11, 2007, at the observatory and adjacent picnic area. The picnic portion of the event will begin approximately 5:00 PM, and the, raffle, astronomy trivia quiz, and Astronomical-Gastronomical contest will be held subsequently.

The FPOA Annual Meeting, election of board members, and ratification of changes to the Purpose section of our bylaws will also occur during the Star-B-Que. If you are interested in becoming a board member, please let one of the present board members know, and we shall put you on the ballot. The FPOA is always looking for new board members to bring new ideas and thoughts about how to more effectively accomplish our mission.

Our guest speaker, Dr. Raja Thakurta, UCO/Lick Obs, will present "Journey Back to the Big Bang", an illustrated journey through the Universe, which uses some of the latest astronomical images and most realistic and current computer animations to review key concepts and observational findings in modern cosmology.

If you are planning to attend the Star-B-Que, PLEASE RSVP to (831) 623-2465 or e-mail info@fpoa.net. If you have any questions about the Star-B-Que, please feel free to contact any FPOA Board Member.

As a special treat this year, we've arranged for the Perseid meteor shower to peak later that night, with no interference from the moon.

More information can be found our web site or at

http://fpoa.net/Star-B-Q%202007.pdf

Out of the Fog *(cont. from Page 1)*

At 10 Ly stars are in scope and we talk stellar evolution. They know our star is average, which is good—the big ones evolve too fast for complex life to emerge. "...and we'd be burned to a crisp", someone notes. This is starting to seem like a pretty good audience. Come back next time and we'll talk about black holes in depth.

Zooming out to about 1 kLy they notice the structure of the galactic arms. That elicits some questions; they're getting interested. At this distance we show colorful nebula, describe EGGs and the embryonic solar systems' race with time to form before nearby stars blow the dust and gas away. Some of the people in row three are sitting up now.

At 10 kLy we use a Compact-Disc galactic scale model to visualize galactic dimensions and the sun's location and motion. Someone wonders how fast earth travels through space. Newtonian reference frames. We discuss the solar system's galactic plane crossings and possible implications for earthly evolution. Birdseed illustrates the number of stars. Questions and discussion flow.

The video clip at 10 MLy visualizing a flight out of the galactic plane to the Virgo cluster brings it all together in an Aha moment.

Zooming out to 1 GLy and further we see frothy voids, walls, and the edge of the visible universe. A question about dark matter takes us into its relationship to large-scale structure.

They have really warmed up now and nobody is asleep. Time has flown as we have flown through time. Eventually we need to cut off the questions. They really have been a good audience.

After the talk Sara's friend approaches and asks if time travel is possible. We talk about wormhole speculations, but put them in perspective and turn to the twin paradox. Says she likes science, but math is hard. Sarah joins us—she likes science and loves math. Keep at it; we need people like you to go into fields of science and engineering. "Check out fpoa.net. You could join FPOA, and use the Challenger telescope." But she demurs.

Most people have left now, but some have gone to look at the Challenger. We start to clean up.

On her way out, Sarah puts a folded twenty into the donation slot. Evidently she thinks we are a good cause; there is hope she'll get involved.

Glad Derek came by. What a great audience!

www.fpoa.net
Check out our web site improvements. Among others, we've added a number of hyperlinks to the public page, and there's a new Who's Who page in the members-only section that we hope to expand over time. Send your photos, bios, and other suggestions to webmaster@fpoa.net.

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The ***Fremont Peak Observer*** is published four times a year (Winter, Spring, Summer, and Fall). Articles from members are encouraged, and should be emailed to *fpoa@sbcglobal.net* . Articles should be either in plain text or MS Word format. Deadlines are Feb 1, May 1, Aug 1 and Nov 1 respectively. The Observatory's phone number is 831-623-2465.

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Website: www.fpoa.net
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For Observatory scheduling and access:
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EMAIL DELIVERY OF *THE OBSERVER*

Dear FPOA Members,
We have been delivering notification of the *Observer* via email for the past several issues. This obviously saves the Association postal expenses, and assures the quickest delivery to you. However, several of you no longer have valid email addresses, due to ISP changes, moves, etc. If you would like to continue to receive, or begin to receive, notification of the *Observer* via email, please send your current email address to **fpoa@sbcglobal.net**