V I E W

PISGAH ASTRONOMICAL RESEARCH INSTITUTE

Volume 5 Number 3 Fall 2005

The PARI optical ridge

Perhaps because of its roots as a NASA tracking station, or because of the two massive 26-meter telescopes framing the main campus, PARI is often perceived only in terms of radio astronomy. Yet, during the past five years, the campus has also become a center for optical astronomy.

PARI now hosts five optical telescopes available for research and education. Three can be used either locally or for remote observations via the Internet. They include the PARI/Furman Observatory, the Friends of PARI Telescope and the South Observatory. The newest is the PARI/Furman Observatory. Furman University provided a 0.35m (14-inch) telescope and CCD camera. PARI provided a Paramount ME robotic mount and an observatory.

Furman Professor David Moffett with the 14-inch PARI/Furman telescope.

PARI Calendar

September 10	Volunteer Weekend
September 14	Astronomical Society of the Pacific Conference in Tucson
September 16	Public Evening at PARI
October 15	SGRA Workshop
October 21	Public Evening at PARI
October 22	Volunteer Weekend
November 12	Volunteer Weekend
November 18	Public Evening at PARI
December 3	Volunteer Weekend
December 16	Volunteer Weekend

For more information, please see the Events Calendar section on our website at www.pari.edu

Two other observatories, the Solar Telescope and the Polaris North Field Telescope, are robotic and run autonomously. The computer programs that operate these telescopes and their cameras check the weather before initiating operations. During the day in clear skies, the Solar Telescope enclosure will open and the telescope records images of the Sun to study sunspots and the rotation rate of the Sun. Images of the Sun are also published daily on the PARI web page. The new robotic Solar Telescope is set on a Losmandy telescope drive system donated by Leon Morrison of Morehead, NC.

On clear nights, the Polaris North Field Telescope monitors Polaris and surrounding stars. Since October 2004, the Polaris Telescope has collected more than 5,000 images of the North Star and other stars in a 4 degree field of view. PARI presented a description of the Polaris North Field Telescope at the June 2005 American Astronomical Society meeting in Minneapolis, MN.

NCTA delegation visits PARI

A delegation from the North Carolina Technology Association (NCTA) visited PARI in August. NCTA is a statewide organization of technology companies and others who are interested in developing, promoting and preserving the technology resources of North Carolina. In addition to a campus tour, the NCTA delegates learned about PARI's education and research initiatives, and discussed ways NCTA and its member companies can help promote the resources of PARI for industrial and educational needs throughout the state.

Harvard-Smithsonian equipment donation

PARI's Don Cline and Dave Clavier traveled to Cambridge, MA, to pick up equipment donated to PARI by the Harvard-Smithsonian Center for Astrophysics (CfA). In the top photo, they are meeting with Dr. Charles Alcock, CfA director.

At the right, they are loading an iris photometer, an instrument used for measuring the location and brightness of stars on a glass plate. The photometer will be installed at PARI for use in our astronomical photographic plate preservation project.

PARI invited to NC House Committee

PARI was invited to make a capabilities presentation to the Science and Technology Committee of the NC House of Representatives. The presentation was arranged by State Representative Trudi Walend of Brevard, shown here in the House chamber with PARI's John Avant. Rep. Walend said "PARI has developed into a first-class center for science research and education. It is time to let the rest of the state know about this valuable resource in our community."

StarLab expands programs

StarLab, PARI's popular traveling planetarium, has three new programs in the works. Available now is a program for 3rd and 4th graders called "The Moon and Stars: Now You See Them, Now You Don't." A program on radio astronomy, developed at PARI with a National Science Foundation grant, is scheduled for release next spring. A third program will recognize the rich cultural heritage of the Cherokee Nation with a presentation of characters envisioned in the night sky by Native Americans. Now entering its fifth year, StarLab has become one of the state's most popular astronomy programs, having been visited by more than 34,000 people.

Comets: Why the Fascination?

astronomer's corner

Dr. Bob Hayward, Astronomer/Educator

In teaching students about the Solar System we use a model of the nine planets that illustrates that the Solar System is basically a flat plane. Astronomers define that plane to be the plane of the Earth's orbit, the ecliptic, and that definition works well because most Solar System objects – planets, asteroids and even manmade space probes - have orbits that lie in or close to the ecliptic. Because of this these objects are seen in the sky neatly in or at least near the thirteen constellations of the zodiac.

However, there is a major exception to this rule: comets. Comets are known to come into the inner part of the Solar System from all directions. In addition, comets are known to come from the very outer regions of the Solar System where they spend the major portions of their lives and where they were probably formed. This region of the Solar System, known as the Oort Cloud after the Dutch astronomer Jan Oort who first suggested it, lies some 100,000 times as far away from the Sun as the Earth. Because it appears that these bodies in the Oort Cloud are remnants of the solar nebula from which the Solar System condensed perhaps 4½ to 5 billion years ago, astronomers are particularly interested in the composition of comets. If we can investigate the composition of comets, we will have a good understanding of what the primordial composition of the Solar System itself was.

The generally accepted model of a comet is that of a "dirty snowball," or "dirty iceberg," first put forth by astronomer Fred L. Whipple. Comets appear to be a mixture of dust and frozen gases or ices including water ice. In the depths of space that's all there is to a cometary body – a frozen hunk of ice and dirt. But as it falls into the inner part of the Solar System, the heat of the Sun causes the ices to turn back into gases, or sublimate, releasing the dust as well. These materials form a cloud, called a coma, around the solid body, or nucleus, of the comet and the mixture of gas and dust is blown away from the comet by the solar wind, particles streaming from our central star. Since the dust is heavier than the individual molecules of gas, they separate and many comets show two or more tails. Astronomers can study these tails with telescopes equipped with spectrographs and thus determine the composition of the gas and dust.

Until recently, that was about the best we could do. However, in January 2004 a NASA spacecraft named Stardust flew within 236 km of a comet called Wild 2 (pronounced Vild). During this fly-by through the coma of the comet, Stardust collected cometary particles that will be returned to the Earth in January 2006. Then, for the first time, we will have physical samples of a comet to study in the laboratory.

Another exciting mission, just completed, was Deep Impact. In this mission NASA sent a spacecraft to Comet Tempel 1. Consisting of a mother ship and an impact capsule, Deep Impact was a first attempt to actually perform an experiment with a comet. On the morning of July 4, 2005 the 820-pound impactor was sent crashing into Tempel 1 at a relative speed of 23,000 mph. The result of this was a bright flash as the impactor and probably some cometary material was vaporized. A large cloud of material was observed ejected from the comet by this event. At this writing the composition of this material is still being analyzed through pictures and data collected both by the mother ship and earthbound telescopes. In addition, the impactor itself sent back a cornucopia of data and pictures prior to its destruction on impact.

Bob Hayward's column is a regular feature of our newsletter. For additional information, or if you'd like to ask Dr. Bob a question, e-mail askDrBob@pari.edu or, write Dr. Bob at One PARI Dr., Rosman, NC 28772

Grants help upgrade and expand "Smiley" program.

PARI's popular "Smiley" program, officially the School of Galactic Radio Astronomy (SGRA), makes it possible for students to use our 4.6 meter radio telescope via the Internet. During the past year, PARI obtained an American Astronomical Society grant that helped upgrade Smiley's control system. The project included a new telescope motor controller unit, absolute positioning capability and a new server with associated Internet access software.

Dr. Joe Daugherty, professor of computer sciences at UNC-Asheville, led a student development team that wrote a new software interface for the control system. Dr. Daugherty also served as mentor to an undergraduate who developed the tilt sensor programming code.

The upgrades were completed in time for summer use by Duke TIP (Talent Identification Program) students and a group of undergraduate students working at PARI on a National Science Foundation grant. All the students can now access Smiley from home, as can a group of home school students who visited PARI and learned to use the telescope.

PARI has been awarded another grant, from the American Institute of Physics Meggers Project, that will support an additional workshop to train 10 high school teachers in Smiley's use for their classrooms. The Meggers Award also includes funds to hire a high school teacher who will develop additional lesson plans for Smiley.

To date, more than 100 high school teachers have been trained to use Smiley and their classroom use has benefited more than 3,000 students.

PARI

Pisgah Astronomical Research Institute
One PARI Drive, Rosman, NC 28772
Phone: (828)862-5554 Fax: (828)862-5877
Web: www.pari.edu

Don Cline	President	dcline@pari.edu
David Clavier, PhD	Vice President of Administration and Development	dclavier@pari.edu
Michael Castelaz, PhD	Director of Astronomical Studies and Education	mcastelaz@pari.edu
Mel Blake, PhD	Research Associate Astronomer	mblake@pari.edu
Bob Hayward, PhD	Astronomer/Educator	rhayward@pari.edu
Charles Osborne	Technical Director	cosborne@pari.edu
Lamar Owen	Director of Information Technology	lowen@pari.edu
Ann Daves	Accountant & Assistant Treasurer	adaves@pari.edu
Thad McCall	Facilities Manager	tmccall@pari.edu

The Pisgah Astronomical Research Institute (PARI) is a not-for-profit public foundation established in 1998. Located in the Pisgah National Forest near Brevard, NC, the PARI campus is a dark sky location for astronomy and was selected in 1962 by NASA as the east coast tracking station for manned space flights. Today, the 200 acre campus houses radio telescopes, optical telescopes, 30 buildings, a full-time staff and all the infrastructure necessary to support astronomy education and research. PARI offers educational programs at all levels, from K-12 through post-graduate research, and is affiliated with the 16-campus University of North Carolina system through PARSEC, a UNC Center hosted at PARI. For more information about PARI and its programs visit:

www.pari.edu

Newsletter via e-mail:

Help us help you. Get your PARI newsletter faster and in color by sending your e-mail address to:

newsletter@pari.edu