

## Contact List

**Kitt Peak Visitor Center**—318-8726  
Nick Petrosino, Supervisor  
npetrosino@noao.edu  
318-8732

**NOAO Public Outreach**  
Rich Fedele, Manager  
rfedele@noao.edu  
318-8163  
Robert Wilson,  
Sr. Program Coordinator  
rwilson@noao.edu  
318-8440

Kitt Peak Docent Program

950 N Cherry Ave  
Tucson, AZ 85719

**Docent Forum:** <http://groups.yahoo.com/group/docentforum/>

**Docent Calendar:** <http://groups.yahoo.com/group/docentforum/>

**Volunteering at Kitt**

**Peak:** <http://www.noao.edu/outreach/kpoutreach.html>

[www.noao.edu](http://www.noao.edu)



## Next Docent Meeting Monday, December 18

The next docent meeting will be held on Monday, December 18. The meeting will convene at 6:00 in the main conference room and will feature dinner and a speaker. Docents should visit the docent forum calendar to schedule their hours. Docents who do not have web access may contact Nick Petrosino. See the URL for the docent calendar at lower left.

«First Name» «Last Name»  
«Mailing Address»  
«City» «State» «Zip Code»

Kitt Peak Docent Program

# DOCENT NEWS

Number 110

December 2006



## REFLECTING ON KITT PEAK

### Points of Interest:

- The docent meeting is scheduled for Monday, December 18 and features dinner and a speaker.
- December 4: Asteroid 2006 WB near-Earth flyby at 0.018 AU
- December 10: Moon occults Saturn
- December 13: Geminids Meteor Shower peak
- December 22: Winter Solstice, 00:22 UT
- December 22: Ursids Meteor Shower peak
- December 25: Moon occults Uranus
- December 27: Johannes Kepler's 435th birthday (1571)
- December 28: Cassini, Titan flyby

For additional information about these points of interest, visit <http://www2.jpl.nasa.gov/calendar/>.

Docents make a point of telling guests that all the research telescopes on Kitt Peak are reflectors. This is true. But reflectors come in various designs and use various optical configurations. It is important to understand the differences.

The reflector was invented by the Scottish mathematician James Gregory and refined by Sir Isaac Newton in 1668. The problem with refracting telescopes of the era was chromatic aberration caused by the bending of light through a lens. The light came to focus at slightly different places and resulted in bright objects being surrounded by halos of different colors. This problem was not easily corrected with the technology of the day.

The solution, then, was to use mirrors instead of lenses because mirrors do not bend, or refract, light; therefore, they do not introduce chromatic aberration. The telescope that Newton designed employed a primary mirror with a parabolic figure that reflected

light to a flat secondary placed at the front of the telescope and at forty-five degrees to the primary to reflect the light through an opening on the side of the telescope tube.

The telescopes at Kitt Peak are not designed in this fashion. The NOAO instruments are classical cassegrains, in which a convex secondary is used to focus light at a point behind the primary mirror.

If *classical cassegrain* describes the design of the telescopes, *Ritchey-Chretien* describes the design of the optics. The Ritchey-Chretien uses hyperboloidal primary and secondary mirrors, which are free from coma and spherical aberration and deliver wide flat fields of view. Most modern reflectors use this optical configuration.

The Ritchey-Chretien was the product of a collaboration between American astronomer George W. Ritchey and French optician Henri Chretien.

## CORONADO MAKING SLOW PROGRESS

Anyone entering the MCNP observatory (formerly known at the Razdow) will notice some new equipment taking up room beside the telescope stand. A computer cabinet that was formerly located in the large visitor center observatory have been relocated to the MCNP.

Inside the cabinet is a computer that was appropriated from another station at the visitor center and then sent downtown to be cleaned up. New software was installed, a keyboard and monitor were found, and the whole assembly was moved to its current location in the MCNP.

Inside the cabinet are the two new cameras supplied my Meade for use on the 60-mm H-

alpha and 70-mm Calcium K-line telescopes. These two instruments will eventually supply the images to the web site and, it is hoped, to the solar display in the visitor center.

The two books about the Sun and solar observing that were on the shelf in the back of the visitor center office have been moved to that same cabinet for the convenience of the telescope operators. They are in the drawer that contains the keyboard and so will be readily available to fill those moments between groups of visitors.

Once the computer is running and the cameras are installed, the images should be visible on the monitor for guests to see even if they are not displayed anywhere else.

## TWENTY NEW STARS IN THE NEIGHBORHOOD

Astronomers have identified 20 new stellar systems in our local solar neighborhood, including the twenty-third and twenty-fourth closest stars to the Sun. When added to eight other systems announced by this team and six by other groups since 2000, the known population of the Milky Way galaxy within 33 light-years (10 parsecs) of Earth has grown by 16 percent in just the past six years.

The discoveries were made by a group called the Research Consortium on Nearby Stars (RECONS), which has been using small telescopes at the National Science Foundation's Cerro Tololo Inter-American Observatory (CTIO) in the Chilean Andes since 1999. These new results will appear in the December 2006 issue of the *Astronomical Journal*.

Our goal is to help complete the census of our local neighborhood and provide some statistical insights about the demographics of stars in our galaxy: their masses, their evolutionary states, and the frequency of multiple star systems, says RECONS Project Director Todd Henry of Georgia State University in Atlanta. Due to their proximity, these systems are also excellent targets for exoplanet searches, and ultimately, for astrobiological studies of whether any planets that are found could support life.

The 20 newly reported objects are all red dwarf stars, which now comprise 239 of the 348 known objects beyond our Solar System within the 10-parsec boundary of the RECONS survey. Thus, red dwarfs likely account for at least 69 percent of the Milky Way residents.

Red dwarfs are among the faintest but most populous objects in the Milky Way, Henry explains. Although you can't see a single one with the naked eye, there are swarms of them throughout the galaxy.

The distances to these stars were measured via a classic trigonometric parallax technique using the 0.9-meter telescope at CTIO. The parallax technique for measuring the distance to a star takes advantage of the simple geometry of Earth's changing position in the cosmos as it orbits the Sun each year. The apparent back and forth motion of a nearby star during the year reflects the motion of the Earth around the Sun, much like how your finger appears to jump back and forth in front of your eyes if you blink one eye, then the other.

From Earth, nearby stars appear to make tiny ellipses in the sky because the Earth does not jump from one side of its orbit to another, but slides smoothly around the Sun. The extreme points of the Earth in its orbit are much like the positions of your eyes in your head, and the size of the apparent motion of your finger depends on how close you hold it to your eyes when nearer, it seems to jump more, relative to distant background objects.

With observations over several years, it is possible to make parallax measurements with an accuracy of 1 milliarcsecond (0.000003 degrees), or about one two-millionth the width of the full Moon. This allows astronomers to measure distances

accurate to better than 10 percent out to more than 300 light-years.

The team of astronomers includes Henry, Wei-Chun Jao, John Subasavage and Thom Beaulieu of Georgia State University, Phil Ianna of the University of Virginia in Charlottesville, and Edgardo Costa and Rene Mendez of the Universidad de Chile. The RECONS long-term parallax program began under the auspices of the National Optical Astronomy Observatory (NOAO) Survey Program in 1999, and continues via the Small and Moderate Aperture Research Telescope System (SMARTS) Consortium.

We expect to announce more systems within 10 parsecs in the future, notes Henry. The pool of nearby stars without accurate parallaxes is nowhere near drained.

The purpose of this survey is to discover and characterize overlooked stars and brown dwarfs in the vicinity of the Sun. Objects are scrutinized by measuring their positions (and wobbles), their brightnesses and colors, and by taking spectroscopic fingerprints to examine their atmospheric composition. The estimated "missing" population of solar neighborhood members is expected to be composed primarily of very low mass stars with spectral type M (known as red dwarfs), and objects of spectral types L and T, many of which are actually brown dwarfs with too little mass to start long-term thermonuclear reactions.

These L- and T-dwarfs shine feebly, glowing only because of energy leaking out since their gravitational formation, many billions of years ago. RECONS has also found several nearby white dwarfs, which are the burned-out cores of intermediate-mass stars, lurking in the solar neighborhood.

For more information, see the RECONS Web page at: <http://www.chara.gsu.edu/RECONS/>

### CONTACTS:

Douglas Isbell  
National Optical Astronomy Observatory  
Phone: (520) 318-8214  
E-mail: [disbell@noao.edu](mailto:disbell@noao.edu)

Todd Henry  
Department of Physics & Astronomy  
Georgia State University  
Atlanta, GA  
phone: 404-463-9954  
email: [thenry@chara.gsu.edu](mailto:thenry@chara.gsu.edu)

# December 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 Vance ©, Gerald	2 Ken, Vance New Scope
3 Larry, Jerry	4 Aubrey (C), Mike	5 Gerald	6 Sheila, John, Richard (C)	7 Jerry, Mike, Laura	8 Gerald, Mike (C), Vance	9 Jim, Eugene
10 Jerry, Gerald	11 Joyce, John	12 Mike	13 Sheila, Aubrey (C)	14 Jerry, Ken	15 Gerald, Richard (C)	16 Jim, Jerry
17 Gerald, Mike	18 Ken, Mike Docent Meeting	19 Joyce, Bob	20 Sheila, Aubrey (C)	21 Jerry, Eugene	22 Gerald, Vance (C), Doug	23 Larry L., Mike
24 Anna	25 Visitor Center Closed	26 Joyce	27 Sheila, Eugene	28 Gerald, Bob	29 Doug, Vance	30 Gerald
31 Anna						

## NEW STAFF FOR THE EVENING PROGRAMS

With the departure of Jace Eckenrod to Tucson Electric Power and conferences and illness taking other nighttime staff away from the NOP and AOP schedules, those who remain have been laboring long hours to keep the programs running. But help is on the way.

Public Outreach just hired two new employees to help shoulder the load. Robin Clark and Alexander McCormick will begin training on Tuesday, December 5 at Kitt Peak in preparation for joining the evening staff. Docents who encounter them should feel free to introduce themselves.

Robin Clark recently moved to Tucson from San Francisco. She holds a Bachelor's degree in Astronomy from Mt. Holyoke College and a Master's degree in Science Communication from Boston University. She has published articles in *Star and Sky* magazine and the *Journal of the American Association of*

*Variable Star Observers*. Robin also brings much amateur experience to the job. She currently owns an 8-inch SCT and is experienced in astrophotography.

Alexander McCormick took his undergraduate degree in Astronomy and Physics from Dartmouth and is now enrolled in classes at Steward Observatory at the University of Arizona. He intends to pursue a graduate degree in the near future. Alexander also brings to the program outreach experience gained during his years at Dartmouth as well as observing, and to a lesser extent imaging, experience.

A third new-hire is probable shortly. In the meantime, Robin and Alexander are welcome additions to the nighttime staff and will further enhance the already excellent Nightly Observing Program.