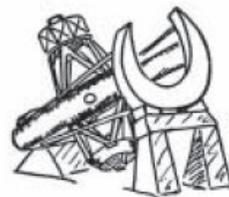


# The Big Eye



The Newsletter of the Friends of Palomar Observatory

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## Robo-AO Comes to Palomar

A demonstration of new technology is now underway with Palomar Observatory's 60-inch telescope. The Robo-AO program promises to deliver a relatively affordable and portable method that will produce super-sharp images of the universe for mid-sized research telescopes around the world.

The technique is designed to correct for an age-old problem for astronomers that everyone has seen –the twinkling of starlight. Twinkling is caused not by the stars themselves, but rather by our own atmosphere. As starlight passes through moving layers of air the light is shifted around producing the twinkling effect and a slight blurring of astronomical photographs.

A technique called adaptive optics allows ground-based telescopes to remove the blurring affects caused by Earth's atmosphere. Adaptive optics systems use the light of a star as a calibration source. It then rapidly bends a small deformable mirror to correct for the distortions to the light. These

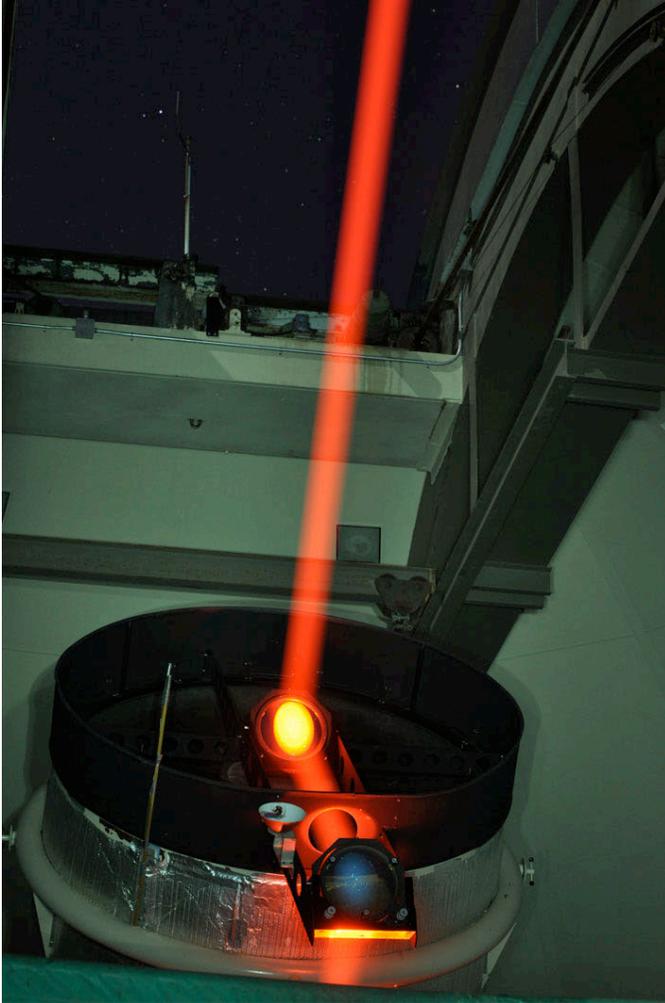
corrections are made faster than the atmosphere can change -- often thousands of times per second.

By projecting a laser into the sky astronomers can expand this technique to cover a larger fraction of the sky. The 60-inch telescope is now armed with a 12-Watt laser that emits invisible ultraviolet (UV) light.



As the UV laser shines up toward its astronomical target astronomers make use of something known as Rayleigh scattering. The UV light scatters off of molecules in the air, giving a return signal that tells the deformable mirror in the adaptive optics system how to correct for atmospheric turbulence.

Being invisible to human eyes is one of the chief advantages for the laser. Because you can't see the laser light this system requires no human spotters to be staged outside looking for airplanes. All laser-guide star systems (like the one that has been used on the 200-inch Hale Telescope) that make use of visible light are required by



the Federal Aviation Administration to have spotters. Even hand-held laser pointers can be a danger to aircraft.

The Robo-AO system does not require spotters, which is perfect because the telescope normally operates in robotic mode without any people being present.

This technique is not new. What is new is the ability to use adaptive optics on automated telescopes, such as Palomar's 60-inch, that run nightly without people there to attend to it.

The Robo-AO system will be the world's first robotic laser-guide star adaptive optics system, delivering ultra-sharp imaging for up to hundreds of targets per night. This will enable the exploration of science targets inaccessible to large diameter telescope adaptive optics systems. A fully-working testbed

has been operating at Caltech in the Cahill Center for Astronomy and Astrophysics basement for several months, and the system is expected to start its science demonstration period later this year on the 60-inch telescope.

The Robo-AO project is a collaboration between Caltech Optical Observatories and the Inter-University Centre for Astronomy and Astrophysics and is partially funded by the National Science Foundation.

# My Dream of Palomar

by Richard Garcia

It was a beautiful spring day in 2007 that I began my first tour as a docent at Palomar Observatory. I introduced myself to a group of about 30 visitors consisting of adults, children, and senior citizens. While doing so, I reached into the side pocket of my cargo shorts to retrieve a tattered pocket paperback book, held together with scotch tape. The book titled “ Stars” was held up to show the group. I asked by a show of hands, who was here for the first time? To my surprise it was the seniors citizens holding their hands up. I realized, the story I was planning to tell to the group about the book I held, and my dream of Palomar Observatory was also their dream.

My dream began as a small boy living in a desert agricultural community in Southern California. There was not yet the problem of light pollution generated by a growing population. It seemed that every star in the night sky could be seen and I was fascinated by what they might be. It was the fifties. The United States was planning a Space program to compete with the Russians, drive-in movies were showing rocket ships traveling to the Moon and Mars, Rock & roll music on the radio playing “One Eyed, One Horned Flying Purple People Eater“, and the UFO craze was on. Wow! I was filled with questions that my family couldn’t begin to answer, nor did I possess the reading skills to find out for myself. There was a magazine stand around the corner from where I lived that sold everything from newspapers to soda pop. It was a place I would frequent to return empty pop bottles for the deposit to earn spending money. The small bottles were 3 cents and a whole nickel for the large ones.

On one of my visits I glanced over to a rack of magazines. A picture of a large telescope on the cover of one of the magazines caught my eye. I had placed the bottles I had brought to return on the ground, and took the magazine from the rack. I began to skim through the black & white pictures of planets, groups of stars, complicated



diagrams and charts, which I didn't completely understand. The storeowner, whose name has since faded from my memory, asked, "What are you looking for?" I answered, "I don't know." He pulled out a pocket paperback book from behind the counter. He asked me to look it over and tell him what I thought.

The book "Stars" from the Golden Nature Guide series was filled with colored illustrations of the sun, planets, constellations, and on page 29 the story of the world's largest telescope, Palomar. I was over stimulated with excitement. The storeowner must have seen it in my face by the huge smile that was growing. It took me 2 weeks to collect enough pop bottles to purchase the book, which sold for a dollar.

The book would turn out to be my Rosetta Stone of Astronomy. I was motivated to learn to read, which fueled my passion for astronomy. It was at this point of my life that I knew someday I would be part of Palomar Observatory. As a young adult I began to plan out my career in astronomy by attending a local city college.

Unfortunately, my childhood dreams had to be put aside as a result of military and eventually family obligations. Although I had changed my choice of career, I never quite let my passion for astronomy slip away. I would visit various Planetariums in California, but never seem to have time to do more. I would read of discoveries made by Caltech Astronomers at Palomar Observatory, from quasars to the impact of Jupiter by Comet Shoemaker Levy 9. It seemed that every time I picked up an astronomy related article Palomar Observatory was involved. I so badly wanted to be part of this, but my focus was needed elsewhere. It was not until the Christmas of 1994 when my wife, Monika, surprised me with my first entry-level reflector telescope. It was just in time to view the arrival of two comets—Hyakutake and the following year Hale-Bopp.

The feelings I had held back for so long were rejuvenated. As my career in Law Enforcement began to wind down, Monika encouraged me to get involved with a local Astronomy club. This eventually led to meeting the two greatest people on the planet, other than my family, Scott Kardel Public Affairs Coordinator, and Susan Vergara Public Outreach, Palomar Observatory. Through their encouragement, I am living the dream I always wanted, even though it took me fifty years to reach. I must admit, I sometimes feel like a duck soaring with eagles.

This is the beginning of my fifth tour session, as a Palomar Observatory Docent. The excitement I feel today is the same as when I discovered astronomy through my first book "Stars". I have had the honor to present to the visiting public, the history of this magnificent institution and the story behind its founder, George Ellery Hale.

*Richard Garcia is one of many docents at Palomar Observatory who help tell the stories of our history, exploration and more. In 2009 he was presented with the Russell W. Porter award, one of the top honors a docent can receive.*

## Remembering Gus Weber

When you visit the observatory you'll likely notice that our picnic area to one side of the main parking lot is named for one of the workman who worked on the mountain, Gus

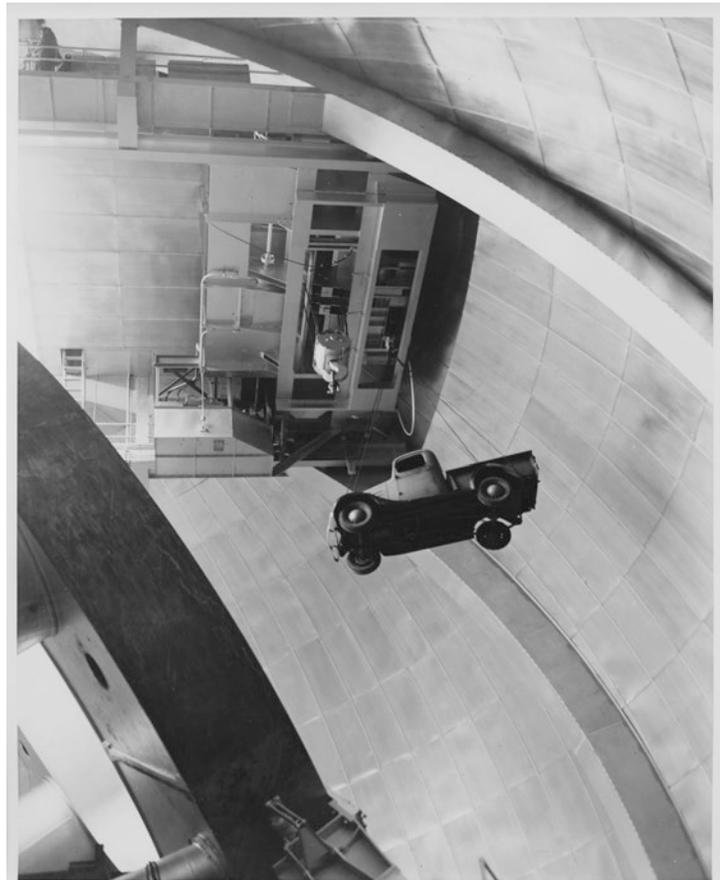


Weber (1895 – 1968). Gus planted many of the now tall trees on the observatory grounds. Apparently Gus also liked to drive his pickup truck through the big back door and park it inside the dome of the 200-inch telescope.

Observatory superintendent Byron Hill had enough of that and decided one day to teach him a lesson. While Gus was off working, Hill had his truck lifted to the top of the dome.

According to [The Perfect Machine](#) by Ronald Florence:

*Weber, suspecting a practical joke, searched the mountain before he came into the dome and saw the visitors staring up above the telescope. His barrage of swearing was another treat for the visitors.*



## 75 Years Ago This Month

March 26, 1936 the 200-inch glass Pyrex glass disc began a 16-day journey by rail from its birthplace in Corning, NY to Pasadena, CA. The trip of 20-ton disc captivated the country and helped to make it the most famous piece of glass ever cast.



## Friends of Palomar Observatory Programs for 2011

We are still expecting final confirmation on some dates and details for our 2011 events. Details of the first events will be sent out in April.

## Find Palomar Observatory on Facebook

Do you have a Facebook account? If you do, you can become a fan of Palomar Observatory. Just search for "Palomar Observatory" and become a fan today.

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