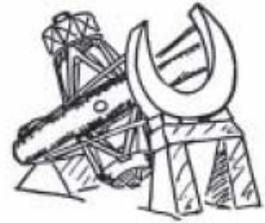


# The Big Eye



The Newsletter of the Friends of Palomar Observatory Vol. 7, No. 1

We at Palomar Observatory have had a busy year this year, and are happy to share some of the highlights with our Friends of Palomar members.

**On the observatory front**, the single biggest activity in the past year was the refurbishment of the 200-inch telescope prime focus cage in February and March 2012. Routinely performed every 7-8 years, this extensive refurbishment involves removing the entire 25-ton top of the telescope -- the "prime-focus cage" -- and carefully lowering it the 60 feet to the dome floor.

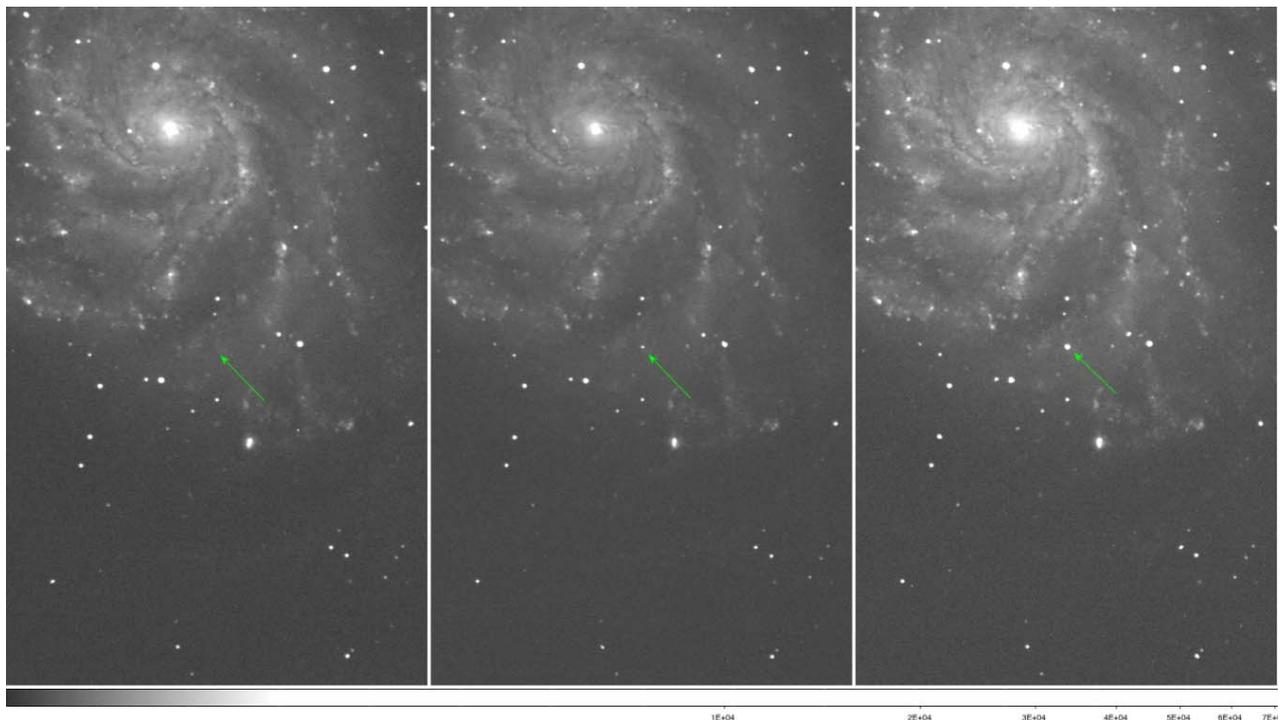


*Prime Focus on the Observing Floor*

Once on the dome floor all the mechanisms and mirrors in this top assembly are inspected, serviced, and repaired as needed, and the overall structure is restored and maintained. Finally, when all the maintenance work is complete the top is again raised and re-installed at the top of the telescope. The

entire process takes roughly six weeks from start-to-finish, and virtually the entire observatory staff is involved on a day-to-day basis. We are happy to report the telescope successfully returned to observing on Monday April 12 and has performing flawlessly since. The entire Palomar observatory crew is to be congratulated on the highly successful completion of this major telescope service.

**On the science** front Palomar has been particularly active in the past year. At the top of the list of science impacts is the study of many a supernova with the Palomar Transient Factory (PTF). Supernova are the violent explosions that end of the lives of stars much more massive than our sun, and PTF is a project that pulls together essentially all the Palomar telescopes in a team to help study them and other changing (or 'transient') sources in our sky. Particularly notable is the PTF discovery and study of a new class of very bright supernova and the discovery of a special kind ('Type-1a') of supernova in a "close" neighboring galaxy (M101 or the "Pinwheel" galaxy) only a few million light-years away! Both of these discoveries are extremely important and will take astronomers years of research to fully understand. That discoveries were made at Palomar is no accident; Palomar is unique in our ability to team together the telescopes to search the sky every night for new discoveries.



*SN2011fe*

We are also working hard to commission a new 200-inch instrument called the "PALM-3000" adaptive optics system. Adaptive optics is a technique that measures and removes atmospheric

effects -- the so-called 'twinkle' of stars in our sky. When complete and operational the new adaptive optics system will be used to search for and study planets around stars other than our sun. Over the

past 15-years astronomers have discovered roughly 1000 planets around other stars, but only a handful of these have had their picture taken so we can see the planets directly. The new 200-inch system will allow us to search for and image more of these planets -- allowing us to both study other solar systems, and understand how common or rare our own solar system is in our galactic neighborhood.



*PALM 3000 on the 200" Hale Telescope*

## THE PALOMAR OBSERVATORY DOCENT CORNER

### **Embrace the Turns**

by Chuck Horst

I will be forever grateful for the pleasant turn of events handed to me two years ago. Sending my youngest child off to college was a mixed bag of emotions, but it provided me the time to explore my personal interests. The turn came when I met Scott Kardel who managed public outreach for Palomar Observatory. Through Scott, I was introduced to a great group of people who shared a similar passion of mine, astronomy. Not just astronomy with backyard telescopes, but research astronomy with the world's largest telescopes. Once I received the invitation to join the Palomar Observatory docent staff, I found it difficult to sleep until the training began. Just like Christmas as a child, I was counting the days until I could head up and see what I had always regarded as holy ground, Palomar Observatory and the Hale 200 inch telescope. Being the most influential telescope in history, I regarded Palomar as a monument to George Ellery Hale. The astronomers who used the telescopes he built changed how we see and understand the universe.

Life continued to take turns for me, and fortuitous ones at that. At the annual SDSU John Shopp Memorial astronomy lecture, Dr. Richard Ellis of Caltech was speaking on the History of Telescopes. Unbeknownst to me, another turn in the road was rushing towards me and I never saw it coming. A friend of mine, who attended graduate school with me 15 years prior, was also present. It just so happened that Dr. Jeff Cooke held a post doctorate position for Dr. Ellis. We began to talk and Jeff asked me if I would like to assist with his research. As it turned out, Jeff had discovered the two most distant stars seen by mankind. Oh, and by the way, he liked to use BIG telescopes. I put up a serious fight, but I eventually succumbed to his superior reasoning and agreed to embark on a quest with him to observe on every eight-meter or larger telescope in the world.

It wasn't long until I found myself driving back up the mountain to the observatory, not to conduct tours, but to actually be spending the night "assisting" Jeff with supernova observations. I am not ashamed to tell you that there were tears in my eyes as I drove up the Highway to the Stars; my childhood dream was being realized. I had never seen the Monastery, the daytime sleeping quarters for visiting astronomers, during my docent activities. The Monastery had the charm and warmth of a European 2-story chalet. Most notable astronomers over the past 63 years had slept during the day there. After observing that evening, my first morning was nearly sleepless. I actually lived the part of those revered astronomers I had talked about during the weekend tours.

I never grew tired of observing. It was daunting and overwhelming at first. Observing with the 200-inch telescope was like being handed the controls of a 747, but no lives were actually in jeopardy, except our own if we broke it. The observatory staff had already considered this. Jeff was of course, well experienced. I on the other hand, was another story. Jean and Kajsa, Palomar's Night Assistants, actually drove the telescope. That was good news since they really did run the show and we didn't have to worry about breaking the vintage masterpiece. The

astronomer operated the instrument and the multi-million dollar Double Beam Spectrograph (DBSP) was in our hands. Kevin, the night lead and our Support Astronomer, made sure we were trained on the instrument and well versed for what the night would throw our way. The only thing we couldn't control was the weather.

The weather did finally cooperate and after six Palomar observing runs, I can now reflect on how accepting the entire staff was to me. Not only was I invited to sit in, like a visiting musician, but I was also made to feel welcome each time I returned. And not just by the great staff at the telescope, but the monastery staff as well. Some say it was the Oreo cookies I always brought, but I know differently. There were hugs from Jean, Kajsa let me open the massive shutters, and I remember Kevin asking me "Now Chuck, you are an observer what do you think about..." I don't even remember the question, just that Kevin thought of me as an observer. I hope my response was remotely rational.

Once I familiarized myself with the science that we were engaged in I was addicted. We were looking for the youngest Type Ia supernovae that could be found. These were Palomar Transient Factory follow up observations of recently discovered supernova. The purpose of finding early supernovae was to request a target of opportunity, ToO, on the Hubble Space Telescope. What's a ToO? Jeff was requesting priority observing time and essentially interrupting the Hubble to obtain his observations next. Being involved with directing the Hubble's observations, now that was seriously cool!



*Chuck Horst*

Not to detract from their significance, neither the Hale nor Hubble was an eight-meter telescope. We needed to return to our quest. Of all the eight-meter plus telescopes in the world, at the top of the list would be the twin 10-meter Keck telescopes in Mauna Kea, Hawaii. The best way for me to describe Jeff would be gracious. He has permitted me to assist him on three separate visits to the Keck observatory. Since they both need to be checked off our list we somehow found it necessary to use Keck I and Keck II. We were afforded the privilege of a private summit tour of the telescopes. It was breath taking!

During our last Keck visit, I was invited to become an approved observer with my own Keck webpage. Also, Jeff was asked to consult on an observing run at the Subaru telescope. Someone needed to carry the bags so I volunteered to be that guy. It just so happened that the Subaru telescope is 8.2 meters. Check one more telescope off the list!

To explain the next turn in the road I need to provide a little back-story. I attended graduate school 15 years prior in the pursuit of a master's degree in astronomy. After completing my course work, I was invited to pursue a PhD program in Physics and left my Master's degree in astronomy unfinished. I never wrote the thesis. I started the PhD, but well as they say "life happened". I enjoyed developing a business and the accomplishments that I was a part of. However, as years progressed since my graduate studies, I began to resign myself that the thesis just wasn't in the cards. But, I was born with the desire to work in astronomy.

Now here is the biggest curve yet. Not only did Jeff invite me to observe with him, but I was also asked to join his research team in pursuit of very distant galaxies. And why we were at it, let's get that thesis done. It was a significant effort by the SDSU faculty to convince the Dean of the college to readmit my 15-year-old course work. To keep the story short, today I turned in the first draft of my thesis!

During one of those trips to Keck, Jeff once again discovered the most distant supernovae. The paper will be coming out in Nature and yours truly just happened to help enough to be listed as a co-author. We have plans to continue my thesis work and generate a few papers from the research. I hope the 8.1-meter Gemini, or 8.2-meter VLT, or (*substitute any 8-meter telescope here*) are absolutely necessary for the research.

I better start a list of the eight-meter telescopes and see how many more remain to be visited. And, I'll be keeping my eyes open for the next turn in the road...

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