

SIRIUS ASTRONOMER

NEWSLETTER OF THE ORANGE COUNTY ASTRONOMERS
See our web site at <http://www.ocastronomers.org>

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OCA Member Dave Kodama somehow managed to get a jet in this photo of the Mercury transit of the sun on November 15 at Anza. Look very closely at the top of the sun for the planet. The photo was 1/60 sec. on Fuji Velvia 50 slide film, taken through a Pronto scope with a 2x teleconverter. Check out more of Dave's photography on his website at: <http://www.eanet.com/kodama/astro/>.

CHAPMAN MEETINGS

The next meeting of the OCA is on Friday, December 10, at 7:30pm in the Science Hall of Chapman University in Orange. The free and open meeting will feature Judith Love Cohen, who will speak about designing the Hubble Space Telescope and working with young people, as well as a What's Up? presentation by Chris Butler.

STAR PARTIES

The Anza site and Observatory will be open Saturday, December 4. The Silverado site will be open for observing on Saturday, December 11. Dress warmly and check weather information before leaving town or call the Anza observatory at 909-763-5152.

COMING UP

The Geminid meteor shower peaks the morning of the 14th. Periodic Comet Machholz 2 (141) brightens to mag 7.1 by mid-month, according to Don Machholz' Comet Comments. OCA Outreach opportunities are available in December-call Jim Benet at 714-693-1639 for more info.

!!!!!!HAVE A SAFE HOLIDAY SEASON!!!!!!

President's Message

by **Russell Sipe**

The Last President's Letter of the Millennium

Okay. Okay. I know. I know. This month does NOT wrap up the second millennium. yes, we've all been fighting the good fight. Fighting common culture, and massive media marketing. We tell our friends, our neighbors, our UPS man. This is *not* the end of the millennium. The end of western civilization's accounting of the second millennium since the erroneous determined date of the birth of Christ won't be for another year! Let's get it right people!

Well, the fact is, the whole thing is a mess anyway. When Pope Gregory replaced the Julian calendar with the Gregorian calendar (I wonder if that's what he called it?) scholars thought Jesus was born in the year they labeled 1 A.D. It turns out Jesus was most likely born in 4 B.C. So the whole thing is academic anyway. The true end of the second millennium came in 1997. Or was it 1996? I get so confused.

Whatever the actual truth of the matter, popular culture has spoken. And popular culture will not be denied! This IS the final month of the second millennium. So, welcome to the last president's letter of the millennium. Of course the title of my president's message in December 2000 will be "The Last President's Letter of the Millennium -- Part 2". This assumes of course that I am re-elected president of OCA. Oh yes, OCA. Guess we'd better get back to the subject at hand. Sorry, this happens to me every millennium or so.

We had two big observing highlights this past month. The much anticipated Leonid meteor storm did occur, albeit not in truly apocalyptic numbers.. Nevertheless, Zenithal Hourly Rates (ZHR) greater than 2000 were recorded in more than one location in Europe and the Middle East.

How many of you monitored the Moon during the peak? Brian Cudnik of Houston, Texas did. And he caught a whopper. He video recorded a bright flash on the darkened portion of the waxing Moon most likely caused by the lunar impact of a sizable Leonid meteor during the peak of the storm. Check it out at <http://iota.jhuapl.edu>.

Even though we didn't really expect a Leonid meteor storm here in the West, many of us took extra measures to observe this year, just in case. But after a few hours of dodging clouds, observing about ten meteors an hour, the clouds finally took over about 2 A.M. making my bed look pretty appealing. Thanks to Chris McGill and Dick Samstag for hosting the Silverado site for the event. Jay Glowacki has a report on the web site.

Thanks also to Bob Gill who hosted a terrific "Transit of Mercury" observing party at Cal State Fullerton. It made the front page of the *Orange County Register*.

See you at the December meeting!

"The goodness of the night upon you"
Othello Act 1 Scene 2

Russell Sipe

A Killer Still Stalks

by Keith Benicek, M.S.

(OCA member Keith Benicek shares with us his abridged version of a feature article on the demise of the dinosaurs. He has spent years on archaeological digs. The full version will be published in the coming months in one of the major science publications. --Editor)

There has been an insidious serial killer loose on our warm, friendly and comfortable blue planet, running unrestrained for as long as there has been recorded history. Systematically seeking out the victims. Patiently stalking those that are inadequately adapted and weaker to its seductive advance, then it moves on to even the strong. There has never been any other equivalent serial or mass murder in man's history. Not Khan or the barbaric Huns, nor the most ruthless of ancient China's emperors. Even relatively modern dietary induced killers, especially cancer and heart disease, will have nothing close to the total body count despite the relentless climb in their yearly slaughter. Besides, all of these famous killers have very different *modus operandi* than Earth's greatest serial killer.

There is but one objective and result that will satisfy this killer we seek to discover. It is the symptom of its very nature: *total extinction of the species*. Its plan is repeated like a well-choreographed script, time after time. You will be surprised to learn the name of this destroyer of life, but knowing its true name will not stop it, and it will embarrass many in science and media that have falsely accused other culprits for their own public glory or for profit. Men of science have only in the last half century had proof that an ancient serial mass murder existed.

An historical record cast in mineral and stone shows a timeline, the fingerprints of history's greatest exterminator and the corpses that punctuate the equilibrium of life on the blue planet, Earth. This is the first clue for the truly scholarly to help identify its name and method of serial extinction. One of the best of science's astute visionaries and my inspiration wrote in his book, "we are lured, attracted by the notion that mysteries of heroic scale require solutions of equally heroic scale, solutions totally different from the mundane, day-to-day events we experience all around us." (Robert T. Bakker, 1986).

This previously unsolved story is of the wholesale extinction of life on Earth--not just of dinosaurs, but that will play an important focus in this quest to identify the true nature of mass deaths that will strike again, even to the human species.

In any thorough criminal investigation, all the facts must be considered, not just the ones that grab headlines to wow the public jury. We will be forced to rely on circumstantial evidence, separating the relevant details from the irrelevant clues. The reliability of the circumstantial evidence must be examined closely and understood. Because all of these historical exterminations happened millions upon millions of years ago, timeline accuracy is difficult. The first fact that you must understand as a co-investigator is that the geographic record--the fossils and Earth's soils--can only yield a 100,000-year margin of error. In other words, you cannot determine any particular geologic point or date in time by an increment smaller than 100,000 years. Sounds like a pretty wide margin of error when you think of your life span. Consider though, Dinosauria existed for over 240 million years. This fact alone casts some serious doubts on most of the sensationalized "Hollywood" dinosaur killers, such as comets, asteroids and death stars, as you will see.

Since there are a great number of variables involved in this serial mass killer, such as Earth's ever-changing environment, both ecological and geological, where do you best look for the real suspect of the crime. The one that is always overlooked, especially conveniently for those that promote celestial catastrophes, is the search for a repeatable pattern throughout history.

Extinctions are commonplace on your Earth; in fact your life style may be contributing to one or more extinctions of a species as you read this. It has been mistakenly portrayed that dinosaurs were the subjects of a single extinction event. *In actual fact they evolved through many extinctions.*

Mass extinctions have occurred on a repeated basis and they do appear to have a visible correlation to each other's *modus operandi*. Well before the dinosaurs, the first evidence of a mass extinction was the end of the Cambrian period of time, 500 MYA (Million Years Ago). 50% of all "animal families" became extinct. Then the lesser Devonian extermination, 345 MYA reported the demise of 30% of all "animal families".

The next mass killing was indeed a “whopper”. It occurred at the end of the Permian Period, 248 MYA and it meant the end of the first “proto-dinosauria”, such as the “fin back” Dimetrodons. All in all, 50 % of all land animal families, 95% of all marine species, all Trilobites and a host of trees were pasted into total extinction. There is, incidentally, no evidence of asteroid craters or iridium layers to be found!

The first bonafide dinosaurs appeared in the mid-Triassic Period, with rapid expansion and diversification, but again the serial killer struck at the end of the Triassic Period, 213 MYA, while geologic changes were occurring. This time the serial killer whipped out all two-tusked land families and the great marine lizards that were mistakenly identified as dinosaurs. Once again, 144 MYA, at the end of the Jurassic Period (as in *Jurassic Park*), the extinction serial killer struck, leaving fewer than 35% of the land Dinosauria and aquatic animals.

Of course, the final “hammer blow” for dinosaurs, as Hollywood and some non-biology-based scientists like to think of it, came at the end of the Cretaceous Period, 65 MYA. Was it really a hammer blow cataclysm? Not really.

From the beginnings of the Triassic through the end of the Cretaceous Periods, there have been some 285 valid dinosaur species known to date. Within the last 2 million years of the end of the Cretaceous Period, there were but 8 to 12 species left. The ecology of the time was already in trouble and the “Simpson index”, a formula indicating a serious “unevenness” in species types, spelled that extinction was already underway. The end of the Cretaceous Period roughly meant the end of what was left of the ancient dinosaurs, a great deal of aquatic life including the swan necked sea lizards like the Plesiosaurs, some sea going mammals, plankton and all ammonites. This extinction was highly selective, because the feathered dinosaur kin (birds), survived and continued to flourish, as did the crocodiles, amphibians like frogs and gilled salamanders, turtles, nearly all small mammals, insects and deep ocean life. Hardly the scenario of an indiscriminant killer asteroid, comet or space dust!

All told there are geologic records of eight selective serial great mass extinctions that punctuated the equilibrium of evolution on Earth.



All these extinctions find commonality in both land and aquatic life systems. Culvier’s law of “land - sea simultaneity” dictates that anytime a land ecosystem suffers a mass extinction, the oceans system will suffer the same consequences. There are major clues here; let’s look at where they are repeated in time, over and over again.

The Earth is dynamic--alive if you will--in its growth and evolution. Its crust is made up of tectonic plates floating on the semi molten mantle. Earlier in Earth’s 4.6 billion-year history, all the continents were joined as one super continent. As that single continent broke up, rejoined, and separated again and again, floating on its individual plate, the ecology of Earth changed repeatedly and constantly from warm to cold, or dry to very wet in cycles of millions of years. Why? Because land masses, oceans and

the depths of bodies of water create the weather, and the volume of water on the Earth’s surface is not constant. Great time cycles occur wherein a large percentage of Earth’s water seeps into the mantle at junctures of the tectonic plates. We are presently at the beginning of such a “draining” cycle according to scientist S. Maruyama of the Tokyo Institute of Technology.

As part of the continental tectonic movements, the shape, depth, and temperature of the shallow oceans/seas change, which then affects surface temperature and the ecology, which then affects land and aquatic based life forms.

Continental drift also has a violent partner: volcanic activity. In times of aggressive movement, volcanic activity increases. As an important note, iridium is plentiful in the Earth’s mantle and by percentage more than in typical asteroids. Remember that Earth was conceived of coalesced solar system debris just as are asteroids and comets. Geologic evidence shows that iridium is often dispensed during large volcanic episodes on Earth, including during the K/T extinction boundary period.

When ocean levels drop and shallow seas drain, vast ecological changes occur which effect all life. The consequence of repeatedly lowered water levels is travel access between once land-locked areas and whole detached continents, these are commonly referred to as “land bridges.” Once isolated species had the opportunity to migrate via the new land bridges, they began to mingle and feast on each other in a never-ending search for new feeding grounds.

In particular, during the latter half of the Cretaceous period, the North American continent was once again physically connected by these land bridges to Europe and Asia. Since the largest animals required the most geographical area to feed on, the largest carnivores and herbivores commuted or migrated, whereas small life, mammals, and cold-blooded creatures had no need or ability to migrate that great distance.

We have seen recently what happens when unaccustomed populations intermingle: biological disasters ensue. Viruses are spread unabated! 3000 years ago the imperialist Chinese reported mass deaths shortly after its aggressive expansion of territory and mixing of isolated population, by a disease that has become to be known as smallpox. 15th Century Italians identified a new mass killer that disseminated its population as influenza. Cortez invaded Mexico with only 500 men, a few horses and a handful of crude firearms, but his presence killed millions of Aztecs. Their serial murders were not by physical violence, but by the introduction of European smallpox, which Cortez' soldiers carried. Migrating rats carried the Black Plague, which killed millions in middle age Europe.

Historically, America has also suffered biological mass murders. Over three-fourths of Native American inhabitants died not from the relentless western push of colonists or war, but from common diseases such as tuberculosis, small pox, measles, chicken pox and the common cold. Unaccustomed to the new diseases, the Native American had no immunities; the slaughter was again in the multi-millions!

The 1918 Pandemic, a European flu strain America and the rest of the world had not been exposed to, mass murdered 20 million of Earth's humans. It started simply when American "doughboy" soldiers returned from Europe at the end of World War One. The war offered the first new opportunity for mass mingling of varied unaccustomed populations, just as with prehistoric land bridges. Here's something very frightening: in 17 days one case of the 1918 flu spread to and killed 7,000 humans in New York City alone. For the few scientists that attempt to refute disease as a serial mass killer because of a lack of evidence in the fossil record, let me point out that none of the diseases mentioned above left any evidence on bones for the fossil record. The process of death by these diseases is far too short a time span for the victim to exhibit structural physiological signs.

With all the pieces of the puzzle as clues, let's assemble the picture of the circumstantial evidence and find the perpetrator of all these serial mass murders.

Continually dynamic climatic changes linked to land mass movements provide some of the evidence. While these changes didn't happen "overnight", at the peak of an extreme, such as global warming or ice ages, life forms with the highest metabolisms usually suffer the most. Slow metabolism creatures (crocodiles, etc.) can wait it out, Birds migrate to escape, flora die or evolve and shallow sea life may be wiped out.

Earth's ongoing volcanic activity has created documented worldwide ecosystem damage. Between the effects of acid rain and volumes of sharp-edged particulate dust which lasts in the atmosphere for decades based upon long-term volcanic activity, a greenhouse effect would surely have contributed to mass extermination. When Kakatoa erupted (the sound was heard around the world), the dust remained in the atmosphere for nearly a decade causing a "little ice age" in Europe. Yellowstone Park, which is the world's largest volcano and erupts every 600,000 years, would likely kill every human, animal and most of the vegetation in North America according to the USGS. Historically, it is overdue for another eruption!

Much lowered sea levels and drained inland shallow seas are a fact of earth's evolution. The disappearance of shallow seas removed the habitat of many prehistoric animals for obvious reasons. As their inland seas drained, its warmer waters mixed with the deep ocean colder waters. The chain reaction extermination is well recorded. As a consequence of the cycles of lowered ocean and sea levels, land bridges allowed various types of land animals to migrate in progressive waves to new areas. The increased competition for food created an evolutionary imbalance and also allowed for the transference of new communicable diseases. And, there is one last *very important* ingredient I have purposely left out till the end. It is the song of life on Earth, in fact the living Earth itself and that is evolution as a process. Without extinctions, you would not be here at all! You see, serial extinctions are a key process in the evolutionary life cycle.

In 1859, Hugh Falconer, a prominent English paleontologist, suggested to Charles Darwin that he should modify his theory of evolution from a slow continuous process to one showing long-term stability with sudden transmutations by a small isolated community of animals that would then succeed the previous species. Falconer's ideas were lost to time until 1972, when Stephan Jay Gould and Niles Eldridge published an article entitled "Punctuated Equilibria." This shook paleontology worldwide and is now soundly accepted as evolutionary process.

Now, if you remember what I described at the beginning as “history’s greatest exterminator and the corpses that punctuate the equilibrium of life”, the exterminator’s identity is in front of you. The name of Earth’s greatest serial mass killer is the Earth itself; “Mother Nature” if you will. It is the evolution of life and the evolution of your planet that mandates extinctions. The inevitable climatic, geologic and environmental changes, microbial viral mutations and sheer evolutionary process demands extinction so that the next adapted life can replace the old, just as *Homo Sapien Sapiens* replaced *Homo Erectus*, who replaced Australopithecine’s and so on. We will someday be replaced and pass into extinction too.

As for the matter of cataclysmic asteroid or comet impacts being the “Iron Fist from the heavens” squelching life on Earth? Please, get real! There is no evidence that shows cosmic collisions killed anything. Craters and tektites are all there is as a proven result of an impact. There has been no sign of K/T boundary iridium in or attached to fossilized bones. Fossilization is the process where organic material (the bone) is replaced by the leaching of surrounding minerals.

A massive impact would indiscriminately kill everything within that quadrant of the Earth and it DIDN’T, as was illustrated before. With the 100,000-year margin of error, the Chicxulub crater event can’t even be accurately attributed to the actual death of the last dinosaur. In fact a recent study (GSA ’97) by Prof. Gerta Keller, an eminent paleomicrobiologist from Princeton University, which was refused publication by *Science* magazine because it refuted the Alvarez Impact Hypothesis, showed that the great planktic extermination started 150,000 years before the so called impact boundary and “ended at least several thousand years prior to the K/T boundary... Evidence for a precise K/T boundary age for the impact crater is non-existent; current data suggests that the event even predates the K/T boundary.” Alvarez also made a scientific procedural blunder when sampling strata for post K/T life forms, as data revealed that Alvarez had used only vertical positions as specimens as a guide to abundance and had not sampled horizontally (Sloan et al 1986). Subsequent sampling in the Hell Creek Formation and other areas now indicate that some Dinosaurs existed for a very short time after K/T!



Another hole in the impact extermination solution and a point for the gradual extinction of the dinosaur is a published study by B. Galbrun (1997) which shows that European dinosaurs were all gone well before the North American dinosaurs disappeared around the K/T boundary.

Not all geologists buy into this impact catastrophe nonsense. Gary Peterson, a highly regarded planetary geologist and department chairman at San Diego State University, wrote me and said “I like to take a globe and put a scaled dot 100 miles in diameter on the globe. Then stand back and view the dot as having been the cause of the extermination of all of the world’s species. Well, I’m still skeptical.”

The dot (see arrow) indicates a “generous” 150-mile-diameter impact site. Remember you are only seeing one-third the surface area of the total Earth. Why perpetuate the heavenly catastrophe? The disciplines of geology and to a slightly lesser degree astronomy have always suffered from “Paleo Envy.”

Where most major cities boast substantial well-attended museums of Natural, Paleontological and Anthropological science, the absence of, or scaled-down facilities for astronomy and geology are obvious. So what best to get a little attention from the public than some Hollywood scary doom and despair. “Asteroids are on the loose, they killed the dinosaurs and they’ll kill all of you.” To my relief anyway, most reputable astronomers will have nothing to do with the absurd “killer impact” debate and don’t support it.

Hopefully Hollywood and the sensationalism-loving media will become bored with cosmic catastrophe scenarios and shift back to real science in explaining the biology of evolution and extinction. Asking a geologist or astronomer what killed the dinosaurs is like asking your gardener what killed your dog, just because there’s a hole in your backyard. (copyright Keith Benicek)

(What do YOU think? Do you agree or disagree? Why? Send your comments and/or thoughts to me at: chrism31@gte.net and I will print them in the next issue. Don’t delay! --Editor)

Virtual Astronomy

by **Dave Kodama**

Leonid Shower Update

The 1999 Leonid meteor shower is now history, and though the results are still coming in, the general feeling seems to be one of disappointment that the hoped-for storm didn't materialize. But "quality, not quantity" might be the way to summarize the show. At peak, a rate of a few hundred meteors an hour was reported, but with a high percentage of bright meteors. This generally agrees with my observation, though I made no attempt to establish a count.

A large part of the United States was clouded out and was not able to view the Leonid activity. Unfortunately, because meteor shower activity is one of those astronomical events which is difficult to record and pass along via any medium, there was not any real alternative for astronomers even on the internet. However, both **Sky & Telescope's** website (now under the management of OCA's Russell Sipe!) and Gary Kronk's website were gathering early reports from observers around the world which convey some of the excitement:

<http://www.skypub.com/sights/meteors/leonids/98firstreports.html>

<http://medicine.wustl.edu/~kronkg/leonidresults.html>

Early photographic results are also available at the sites of amateur astronomers Wil Milan, Jerry Lodriguss, and Bob Yen, though whether Bob is an amateur might be questioned since he had 14 cameras going!

<http://www.airdigital.com/leonids1998.html>

<ftp://ftp.cyberenet.net/home/jml/LEONIDS/LEONIDS.HTM>

<http://www.comet-track.com/meteor/leonids98/leonids98.html>

You might want to also check the *Virtual Astronomy Online* page (<http://www.chapman.edu/oca/virtual.htm>) on the OCA web site, as I will continue to add on to these lists as more information becomes available.

Personally, I had a hectic, but good outing (Comdex convention by day, Leonid observing by night). I ended up a few miles inside the California side of the California-Nevada border on the advice of the Las Vegas Astronomical Society's contact man, Jim Mellor, who was listed on their web site:

<http://www.ccsn.nevada.edu/other/LVAS/>

Via email, Jim gave me numerous suggestions for places to try. I first checked these out on Delorme's software product TopoUSA, (which covers the entire United States on four CD-ROMs), and then I settled on two possible locations, which I checked out in the daylight on my drive to Las Vegas. In the mean time, Jim and the LVAS were checking out another site northeast of Las Vegas so he followed up with another email to me later. Wonders of the computer age! If you aren't connected yet, hurry up and join the crowd!

Reminder: If you would like to be emailed weekly notices of upcoming OCA meetings, send a note to me at: kodama@alumni.caltech.edu.

From CheapCam to \$\$\$CAM

or, the short story of one OCA Member's journey into CCD imaging

by **Liam Kennedy, OCA member**

Oh woe is me. Imagine my dilemma. I have had my wonderful 10" LX200 for the past 18 months and from the moment I handed over the money for it I have been dreaming and planning for the day when I could purchase a CCD imager as well. I am not someone who makes purchase decisions of these magnitudes very lightly. Instead I agonize over every piece of information and advice that I can possibly obtain about every aspect of the product.

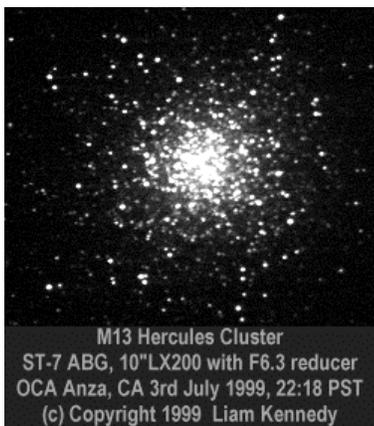
My particular journey into CCD Imaging actually started out in a very modest and cost-effective way. With the help of a **Sky & Telescope** magazine article I converted a very cheap non-astronomical CCD unit into a pretty useable system good for planetary and lunar imaging. I converted a Connectix QuickCam Monochrome camera by hacking a "somewhat" round hole in the front big enough to allow me to insert an eyepiece adapter. This allowed me to directly insert this device directly into the prime focus of my telescope. I was completely surprised when after all my amateurish efforts I actually saw an image appear on my computer screen! You can see some of the results of this early work on my web site. One of the particularly interesting pieces of work was a 2-hour animation I created one night out at Anza when three of Jupiter's moons were moving into occultation and transit at the same time--which you can also view on the website.



NGC7331—my first ever galaxy

Even despite the limitations of the QuickCam (and others in OCA have done some truly remarkable work), I did find that it taught me a few things which have helped me in moving on to the world of deep space CCD astronomy. One of the best lessons I was taught was related to the art of placing and focusing the image onto the CCD chip. In comparison to the more costly CCD's, getting the image and focusing using the QuickCam is so easy--mainly because of the very fast image download times which allow for a very easy and quick visual feedback mechanism. So, the QuickCam was an interesting diversion for a while, but the months went by and eventually, I just had to turn my attention to upgrading to a more capable device. Something which I could use to image fainter objects than my LX200 and I could even see. As with my purchase of the LX200, I spent endless hours seeking advice, reading articles, and buying books until I felt I had enough rudimentary knowledge to make an informed decision. I placed a question on the Meade User Group List (MAPUG) and also on the new OCA Forum (which you can find on the website) asking for some final pieces of advice from the experts out there on what I should do. I received a bunch of very helpful advice from OCA Members like Dean Jacobsen.

I decided to get an ST-7 from SBIG, which I purchased from my favorite Astronomy shop, **Oceanside Photo and Telescope** (www.optcorp.com). Along with the CCD I purchased several other items including a Zero-Image-Shift focuser (the NGF-S). My QuickCam experiences, along with advice from OCA friends, had taught me there is far too much movement of the primary mirror when manually focusing using the standard mechanism on a telescope like the LX200.



M13 Hercules Cluster

ST-7 ABG, 10" LX200 with F6.3 reducer
OCA Anza, CA 3rd July 1999, 22:18 PST
(c) Copyright 1999 Liam Kennedy

After thoroughly reading the SBIG Manuals, setting up the CCD, and playing around for a few days in my living room I made a trip up to Anza on an off-star-party weekend to see first-light with my new device. I would have gone up on any weekend--but I was particularly grateful to setup for the first time on an "off-weekend" so that I could spare my neighboring astronomers from the inevitable initial tantrums as I tried to figure out what goes where. In the end I must admit there were very few points of total frustration. I mainly just took my time with it all and accepted the fact that I couldn't possibly start out being an expert.

On that first night I managed to take images of the moon, M13, M57 and M17. On the whole I was quite pleased with the results. Since then, I have progressed onto my first galaxies with the help of a neighboring pad owner John. I was totally amazed at the sensitivity of the ST7 and how easy it was to see the faint smudges of galaxies (or even multiple galaxies) with just a few seconds of exposure in focus mode. I know for certain that being a member of OCA has allowed me to progress in this hobby far faster than I could ever have managed on my own. Check out the latest images on my site at <http://www.thekennedys.net/astropics> - you'll certainly find the images have room for improvement. I have even included some of my best "failures" for all to see. All comments are appreciated! Oh woe WAS me! Not any more!

Space Update

Gathered by Don Lynn from NASA and other sources

(To find out more on these topics, or those of past months' columns, through the World Wide Web, send your Web browser to our OCA website <http://www.chapman.edu/oca/> and select Space Update Online.)

Galileo (Jupiter mission) – Images taken of Jupiter's moon Io during the October flyby have revealed that the volcano Prometheus is much like Kilauea in Hawaii, but much larger. Prometheus has two hot spots, one a caldera (17 × 9 miles) where the lava emerges, from which it travels through lava tubes for about 60 miles, to emerge at the other hot spot, where it raises a plume (more than 30 miles high) when the lava hits colder material, in this case sulfur-dioxide snow, and spreads out in numerous lava flows. Prometheus has been erupting every time it has been observed in the past 20 years, by Voyager, Galileo, and the Hubble Space Telescope, and so has probably had at least a 20-year long eruption. The Galileo images of Io were 50 times more detailed than the best previous Io pictures made by Voyager in 1979. Some damage was sustained due to radiation in the vicinity of Io — the fast camera mode of imaging got out of sync, degrading images taken in this mode, and the moving grating in the infrared spectrometer stalled. Most observations, however, were successful. Another Galileo flyby on Thanksgiving Day, even closer to Io, should be producing more spectacular images about the time you read this. Galileo has returned thousands of images in its nearly 4 years orbiting Jupiter, despite the stuck main antenna. About a month ago, the spacecraft completed 10 years in space since launch.

Extra-Solar Planet eclipse – Geoffrey Marcy and a team of other astronomers have announced detecting a partial eclipse of a star by a planet, the first detection of an extra-solar planet by this method. The planet is 60% larger than Jupiter in diameter, though its mass is somewhat less. It was discovered days earlier by Marcy's usual methods. The star is much like the Sun in age, size, and color, and is known by its catalog number HD209458. The period (year) of the planet is quite short, at 3.5 days, indicating it orbits far closer to its star than our closest planet Mercury. It's gotta be really hot there! Theorists had been predicting that Jupiter-like planets very close to a star would be larger and less dense due to the heat, and this is the first time that has been measured to verify this. Further study may be able to get a spectrum of the planet's atmosphere as starlight passes through it. Marcy's team has detected a large portion of the known planets by the planets' gravity wobbling their stars enough to detect in a very sensitive spectrograph.

Planet orbiting a double star – Astronomers have found evidence of the first known planet to orbit around a double star. Other planets orbit one star of a wider pair of stars, but none around both of a pair of stars. The Microlensing Planet Search (MPS) project has been searching for planets by monitoring millions of stars to see if a planet produced a gravity lensing effect, as predicted by Einstein's General Relativity. One such lensing event best fits computer models of orbiting a double star, though other astronomers have produced other possible explanations of the data.

Kuiper Belt Objects (KBO) – Also called Trans-Neptunians, KBOs are asteroids or comets orbiting outside the major planets' orbits. The most distant KBO known was just found and designated 1999 DG8. It is probably about 60 miles in diameter, made of ice and rock, and is currently 60 AU from the Sun (1 AU is the Earth's distance from the Sun). A good orbit calculation will await more observations, so it is not known how far it will get at the farthest point of its orbit. One other recently discovered KBO, 1999 CF119, has the orbit with the largest known far point, at 200 AU, but it is currently at a point in its orbit closer than 1999 DG8. There are about 100 known KBOs now, although the first one was discovered only 7 years ago. It is thought that the short period comets are KBOs that were deflected into the closer parts of the Solar System, while long period comets are thought to be deflected in from the Oort Cloud. The Kuiper Belt is just outside of the planets, and is disk shaped, while the Oort Cloud is farther out and spherical shaped. KBOs are now recognized to fall into 3 classes: Main Belt (a nearly circular belt outside the orbits of Neptune and Pluto), Resonant KBOs (pass near Neptune's orbit at regular intervals), and Scattered KBOs (ones with eccentric orbits, apparently thrown there by an encounter with Neptune). Both 1999 DG8 and 1999 CF119 are Scattered KBOs.

Planet formation – A new study on planet formation shows that the thin spinning pancake of cosmic dust and debris that forms around stars to become planetary systems turns into a ring during formation of planets. Once the planets form, the inner part of the disk clears out, leaving the ring outside this. The Solar System's Kuiper belt may be the remnant of such a ring.

Space Shuttle and Hubble Space Telescope (HST) – The next Shuttle mission, which is to service HST, has been delayed until December 6 in order to complete a Shuttle main engine replacement. If launch is delayed past December 15, it will not occur until January. Even though all systems have been tested for Y2K problems, NASA decided not to have the Shuttle in space on New Years Day. HST needs 3 gyros to take observations, and has 3 spares (6 total). Because 3 gyros had failed

some months ago, the Shuttle Service mission was split into two flights, with the first flight to happen as soon as possible, and include replacing all 6 gyros. In mid-November, HST had one more gyro fail. It automatically went into safe mode, which precludes taking any observations, and will wait for the Shuttle mission to arrive. Also included in the servicing will be replacing the fine guidance sensor, a transmitter, a solid-state recorder, a computer, and a device to protect the batteries during charging.

Mars Global Surveyor (MGS) – Used its Thermal Emission Spectrometer to observe the landing site for the Mars Polar Lander, due to set down December 3. The polar cap dry ice that has been covering the chosen landing site receded during early November, leaving mostly barren ground to land on. With the southern Martian spring, temperatures in the area have been rising to a balmy (for the Martian Antarctic) minus 100 F.

Mars Climate Orbiter (MCO) – The first report from the MCO Failure Board was released in November. Most recommendations in the report were for better communications and procedures so that the mistake in units (reported here last month) that resulted in the crash of MCO would have been discovered. It also recommended changes for the Mars Polar Lander, including pre-warming its landing rockets, but the problems discovered were not nearly as serious as that of MCO. A final report will be issued in February.

Deep Space 2 (Mars penetrator missions) – The twin probes that are riding on the Mars Polar Lander, will split off hours ahead of arrival at Mars December 3, and will smash into the surface at about 400 miles per hour, burying themselves a yard or two under the surface. They will perform tests on the soil, including searching for water. A contest was held to name them, and the winning entry is Amundsen & Scott, after the first 2 explorers to reach the Earth's South Pole in 1911-1912.

Deep Space 1 (asteroid, comet and technology test mission) – Failed to take any images of the asteroid Braille within 15 minutes of closest approach back in July, and some vague information was released about misaiming the camera. Further study has showed that one factor in misaiming was that the asteroid was much darker than expected. Because similar navigation techniques are planned for Deep Space 1's flyby of Comet Wilson-Harrington a year from January, spacecraft Stardust's flyby of comet Wild-2 3 years later, and flybys by Deep Impact and CONTOUR. Unfortunately, only one comet and very few asteroids have ever been imaged from close distances, so the range of brightness, shape, and other characteristics is not known well, and it appears that no two are alike. Further study will be made to better navigate spacecraft by asteroids and comets.

NEAR (Near Earth Asteroid Rendezvous) – Returned images and other observations of asteroid Mathilde in 1997. Study of these has indicated that Mathilde is probably a loosely consolidated rubble pile, barely held together by its own gravity. The largest crater seen is more than 60% of the width of the asteroid. This size of impact would have shattered a ball of rock or ice, yet this rubble pile appears to have absorbed the impact without breaking apart. Lab simulations of high-speed impacts on softer material have shown this same property of absorbing impacts, with little debris lost. This may be bad news for the Deep Impact mission that plans to smash a projectile into Comet Tempel 1 in 2005 to study all the debris that is thrown out.

Chandra (X-ray observatory) – Was found to be suffering some permanent damage to the CCD X-ray detectors when passing through the Van Allen radiation belt. Apparently, energetic protons in the region were being focused by the telescope optics on the detectors. New procedures are being followed during passages through the belt to prevent further damage.

Leonid meteors – Leave trails that can last up to an hour, while other showers mostly leave trails that fade in seconds. A lidar (laser radar) at the Air Force Starfire Range, along with visible light and infrared spectrographs, are being used to study these trails to determine why they persist. The high speed of the Leonids orbit at encounter with Earth may contribute to the effect. It is known that the trails glow with chemiluminescence, the light source of fireflies. The study so far has proved that sodium is involved, but is not the chief source of glow. NASA has reported that its airborne observations, made flying above the Mediterranean area for 3 days around the expected peak of the Leonid meteor shower November 16-18, encountered a meteor storm condition, with a meteor seen every second or two. It lasted only ten minutes. It occurred at 6:10 Pacific Time on the 17th, when we in the Western US were unfortunately turned by the rotating Earth in the wrong direction to collide with any Leonids.

SOFIA (Stratospheric Observatory For Infrared Astronomy) – The airplane-mounted telescope under construction to replace the retired Kuiper Airborne Observatory was reported in this column a couple of years ago. The design calls for a thick glass mirror to be milled out in a honeycomb pattern to make a thin (and therefore lightweight) yet strong mirror. The milling has been completed, removing almost 8000 pounds of glass, over 80% of the original weight. The mirror will now be figured by the French company REOSC that did the Gemini Telescope mirrors. It is a 106-inch diameter mirror, f1.28 focal length, to be part of an f19 Cassegrain/Nasmyth telescope. The telescope will operate from visible light through the entire infrared spectrum into submillimeter wavelengths. It will fly above 40,000 feet, getting above 99% of the atmospheric components that block infrared from reaching Earth's surface. SOFIA will be operational in 2002.

ASTROLLANEOUS

UPCOMING OCA BOARD ELECTIONS

Reminder: **Elections** for the 2000 OCA Board of Trustees will be held at the January Annual General Meeting. Nominations for the Board will remain open through the end of the December meeting. Any member may be nominated; however, you may want to check first with the member to be sure he or she will accept the nomination.

MOUNT WILSON

- **CALENDARS FOR 2000 NOW AVAILABLE**

The Mount Wilson Historical Calendar for the year 2000 is now available. As in the past, the calendar contains 12 historic photos related to astronomy on Mount Wilson, plus historical dates of interest and astronomical events for the coming year. To order, send a check (payable to Mount Wilson Institute) for \$12 per calendar (includes shipping; \$8 is tax-deductible as a contribution to the Mount Wilson Observatory) to: Mount Wilson Institute, Hale Solar Laboratory, 740 Holladay Road, Pasadena, CA 91106. If you have any questions, please call Bob Eklund at (310) 333-3478.

- **OBSERVING SESSION**

We have reserved the Mt. Wilson 60" telescope for a second observing session to take place on Saturday May 6, 2000. To obtain more information or to be considered for joining this session, contact Jay Glowacki at jay.glowacki@aero.org or evenings at 310/831-4199.

CLASSIFIEDS

Wanted: Galoc "Telescopic" 16.3mm 75-degree eyepiece in excellent condition only. Contact: Alan Ruud, 1634 Santa Ana Canyon Road, Orange, CA 92865-1733, 714-637-0710 phone, w/message machine, or 714-637-6183.

December's Featured Speaker: Judith Love Cohen

Designing the Hubble's Science Ground Station

Judith Love Cohen is a Registered Professional Electrical Engineer in the State of California. She received her bachelor's and master's degrees in Engineering from the University of Southern California thirty years ago. Judith worked for several local aerospace companies on NASA projects such as the Lunar Excursion Module (part of the Apollo project) and the Hubble Space Telescope. She has received numerous awards and recognitions, such as the Outstanding Engineer Award from the Institute for the Advancement of Engineering, and has been a biographee in Who's Who in the West and Who's Who in American Women. She also raised four children; one of them is now an engineer. Her hobbies include hiking, folk dancing and writing. She became interested in encouraging girls to study engineering while active in the Society of Women Engineers, which led her to write a series of children's books. Her website <http://www.cascadepass.com> not only describes the books and CDs available, but provides career advice.

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