Orbit

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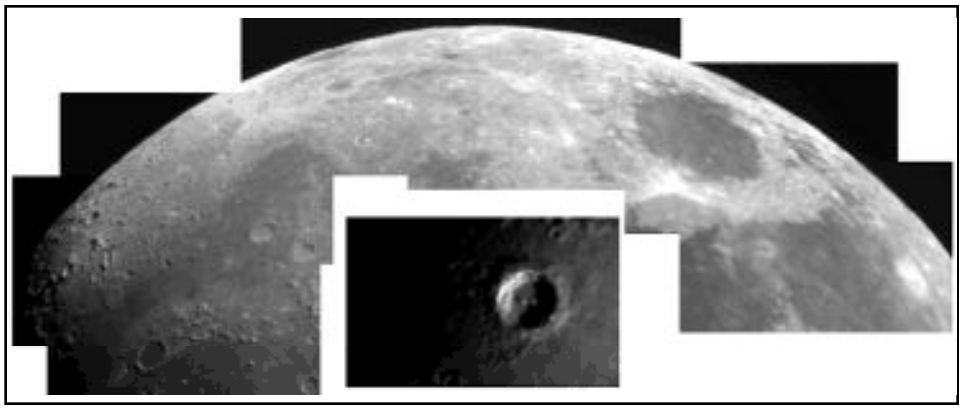
Happy New Year!!



Mosaic of the moon that was a collaboration between Bob Botts and Steve Barnes. The individual images were captured with Steve's SBIG STV, through Bob's 8" SCT, then reconstructed from TIF files in Photoshop, and saved as a JPEG.

Photo of the Christmas eclipse by Colin Haig. Look for an article about Colin's eclipse adventure in an upcoming issue.

Give It a Second Look

by: Bob Botts

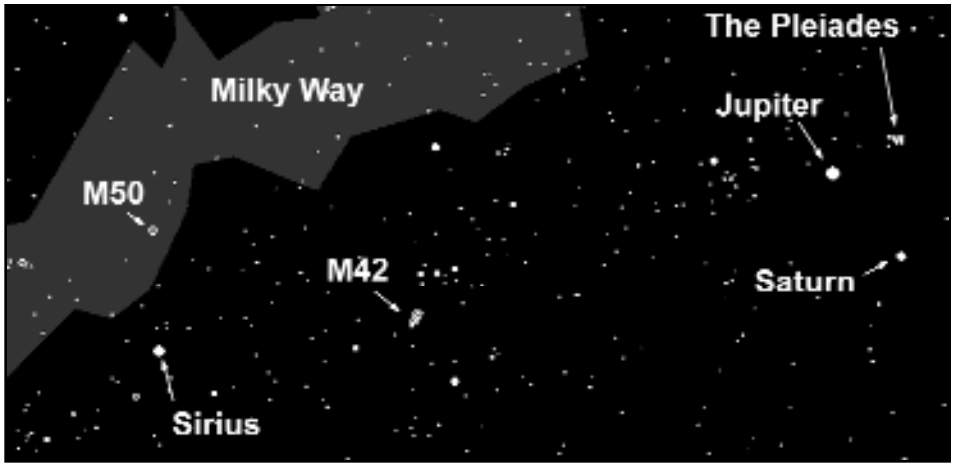
By looking at the display counters in various camera stores this past Christmas season it became fairly obvious that digital technology now significantly rivals the more traditional film medium. As this blossoming new technology threatens to steamroll its predecessor, it has provided two tremendous windfalls for those of us who are still shooting wet. Digitizing your legacy slides, prints and negatives is now easy, affordable, accessible. If you're like me, you have many thousands of slides and negs, that are packed away in various states of disarray. No matter what efforts you utilize in storing your images, these films are slowly, miniscually, yet relentlessly fading away. Scanning your slides won't do anything to stop the decay, but, it will provide a manageable means of backing up your images.

CD-ROM writers are now as cheap as $150 Cdn, and disks

See "Second Look" on page 3

To Old Times and New Beginnings

by: Scott Barrie



Every year for almost 15 years our family has been invited to spend New Years with friends at a cottage on a lake west of Huntsville in Muskoka. It's become a tradition that we all look forward to and has provided a wealth of memories we look back on fondly.

The road never gets plowed right in to the cottage and so we always have to go the last quarter mile on foot dragging luggage and provisions on toboggans, and for a number of years the kids rode on those toboggans too. Adding to the adventure is the fact that we often arrive after dark and there's an incredible exhilaration that comes from stumbling through the woods in knee-deep snow in near total darkness. It makes the cottage seem all that much more hospitable once the fire inside is roaring.

This year we went up a day early and drove through a snowstorm much of the way. It wasn't quite dark when we arrived but it was very cold, the snow was very deep, and it was continuing to fall. So, while the Pronto always comes along, when we head north, it didn't look like there would be any reason to take it out of the case. The next day was more of the same. The sun tried to poke through a couple of times but it met with little success, and as we prepared for a late New Years Eve barbeque the snow started to fall again.

Hours later, after after the usual midnight festivities and then finally getting the kids off to bed, I stepped outside for a breath of fresh air and was knocked out by what I saw. The sky was clear as a bell!

Within moments my friend Bill and I had the Pronto set up on the frozen lake, and the tour had begun. I know part of my enthusiasm was due to withdrawal caused by too much cloud of late but nevertheless, from our perspective it was a spectacular night. By the time the cold finally drove us in an hour and a half later we'd seen Jupiter, Saturn, numerous Messier objects, over a dozen decent meteorites, and I don't remember ever seeing the winter Milky Way as clearly. Perhaps more importantly, I'd been able to share the experience with an old friend, and there were plenty of laughs echoing across the lake and memories interspersed along the way. There were no new objects found and we witnessed no astronomical "events", but it was a night under the stars that I'll long remember. It was the perfect start to a new year and, with any luck, it was the first of

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President's report, January 2001

by: Harry Pulley

December was a cold and cloudy month around here. Lately the sky has offered glimpses of clear skies, only to cloud up shortly after I've stepped outside. Hopefully the weather will improve sometime soon. One exception was when I got a few decent CCD images from the observatory during our beginner's night session on Saturday the 2nd. Only a few others came out, I assume because of the cold. Remember that we have a warm-up room in our observatory so don't let the low temperature keep you away!

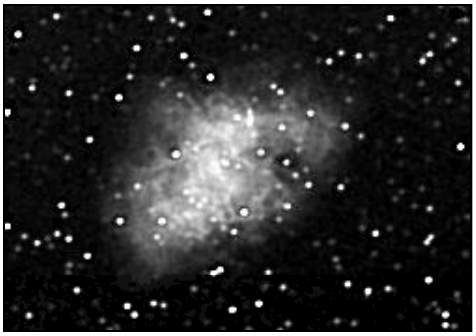


Photo of M1 by: Harry Pulley

I hope everyone got some astro XMas presents under the tree, and I hope your weather allowed you to view the partial eclipse on the 25th. Next year we have Mars coming around for an apparition with a large apparent diameter, but a poor low altitude for viewing. Still, I'm looking forward to seeing the red planet again and plan on organizing some club activities around it.

If you have any ideas, please let me know.

Aurora photo by: Bob Botts

Second Looks

are as cheap as 50 cents/each (when bought in bulk). Each disk holds 750 megs worth of data, which translates to anywhere from tens, to hundreds of scanned images, (depending on the storage format you choose). For comparison, the cost of storing slides, is about $1/page (@ 25 slides/page) for archival quality plastic sleeves.

Just as importantly, the benefit of digitizing an image, is that this storage medium allows the image to be corrected, and/or manipulated, according to the needs, or whims, of the user. To the astrophotographer, this is new ability to correct exposures 'after-the-fact' is akin to winning a lottery. Previously tweaking images was for many, cost, or time prohibitive. Scanning a slide or negative won't extract information that was never there, but, it will allow the photographer to return to a legacy image, where for example, he/she can easily correct the colour balance which had shifted dramatically due to reciprocity failure. In my latest batch of aurora shots, the images were so green shifted, that I was severely disappointed... in fact, I could hardly justify to myself the cost of processing. Something Oliver Stone said in response to criticism of his black comedy "Natural Born Killers" stuck in my mind, "give it a second look... you've missed some important stuff",... so I had the slides scanned. I was truly amazed with the improvement after tweaking the colour balance, and actually had a hard copy printed from the most promising scan.

It's not necessary to actually own all the of the hardware to scan your images yourself. In fact, the hardware to scan your images while not outside the reach of the home user, is a bit hefty for most. You can however, have your images scanned to a disk at most camera stores. Your scanning needs can now be handled at Sky Optics, where you can also pick up some expert advice on films, techniques and of course, equipment.

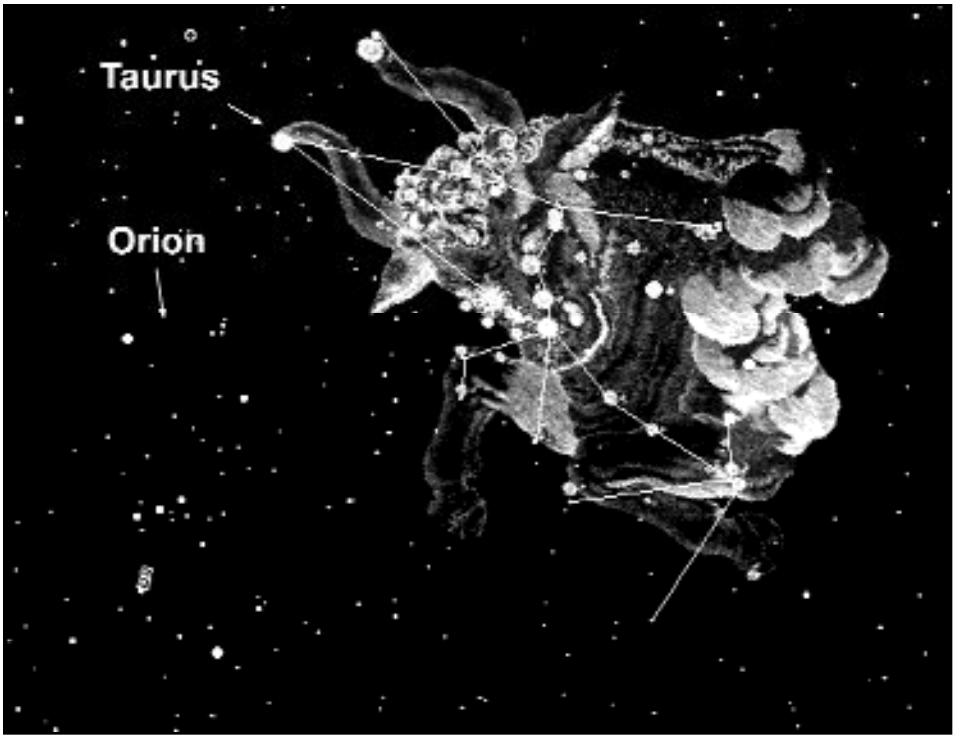
Greek in the Round: Taurus

by: Ev Rilett

Perhaps the most famous of Zeus' relations with earthly maidens was his affair with Europa. Europa went out one morning with other maidens to gather flowers in their favourite meadow by the sea. She caught sight of a mighty but beautiful form - a bull like none other she had ever seen. Some say his colour was snow-white, others chestnut; but all agree that his coat glistened with beauty in the sun. His horns were the shape of the crescent Moon and, though he looked powerful, his demeanour seemed so gentle that the maidens drew nearer to admire the creature.

Europa thought to herself that the bull seemed more like a man than an animal. When he lay down at her feet, it seemed like an invitation to mount him and she accepted that invitation. The mighty bull leaped to his feet and raced to the open sea. Her terror blended with amazement when she opened her eyes and saw that his heavy galloping hooves were airborne upon the tops of the waves. All around her, sea-gods on dolphins (even Poseidon himself) sprang up and accompanied the pair.

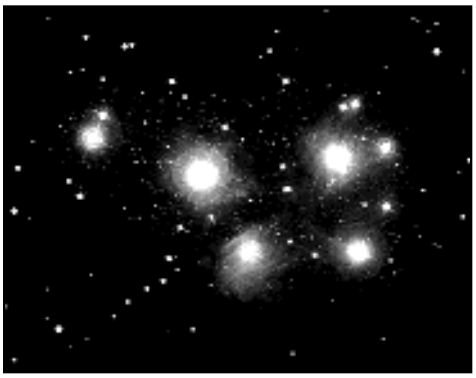
She was, of course, carried off by the king of the gods, Zeus, in the guise of a bull. After a 600-mile journey across the wave tops, Zeus ravished Europa in Crete, his birthland. Unlike some of Zeus' less fortunate conquests, however, Europa did not suffer the revenge of Hera, Zeus' wife. She eventually bore Zeus three sons. Europa had five brothers, all of whom went in search of her, but never found her although they had many adventures themselves.



The constellation Taurus has usually been identified with the disguise Zeus assumed to carry Europa away. Europa's name has been given to a major moon of Jupiter (Roman version of Zeus) and also to the continent we now call Europe.
The Hyades is a star cluster located in Taurus and in Greek mythology the Hyades were the daughters of Atlas and Aethra and half-sisters of the Pleiades. Zeus had a son Dionysus, by Demeter, who was kidnapped and nearly killed. Thus, Zeus changed him into the shape of a kid to hide him from Hera (his extremely jealous wife) and entrusted him the care of the Hyades sisters. He rewarded their faithfulness by placing them in the stars. The Hyades make the shape of a V in the sky that is composed of 6 stars, the bright red Aldebaran (meaning the "Next One", from the fact that it rises after the Pleaides) being the main one. In the lore of the ancients, the Hyades were associated with wet and stormy weather; the name itself is said by some to be derived from an archaic Greek word meaning "to rain". Pliny speaks of them as "...a star violent and troublesome; bringing forth storms and tempests raging both on land and sea..."

The Pleaides, M45, are the small group of stars most often referred to as the "Seven Sisters", the most famous cluster in the night skies. One of the most significant roles the Pleaides played was to the Agricultural seasons. In ancient times of no calenders, the Pleaides marked the beginning of the new year, which

was divided into two parts. The rising indicated the winter and the setting indicated the spring. When the Pleiades rose in the fall, it was time to reap and in the spring when they set, it was time to sow. Thirty centuries ago, sailors waited for the spring rising of the Pleaides before setting to sea and also the ships were taken



out of the water at the fall rising.

Although they are known as the "Seven Sisters", to the naked eye, the average individual can see only 6 of them. There are many stories as to why this is so. The Big Dipper is often referred to as the Seven Brothers and it is said that the lost Pleaid was taken by Mizar to be his wife, and to this day she resides with him as Alcor. Another legend is that 6 of the Pleaids married immortal gods while Merope married a -mortal- and, out of shame, the light of her star is so weak that it cannot be seen.

If you want to test your vision, try to see how many Pleaides you can count with your naked eye. If you cannot see 6, maybe you need to think about having your vision checked.

A. Muse

The Elegant Universe: Wraps in Superstrings

Part II

by: Mike Jefferson

SPACE AND TIME SINCE EINSTEIN was the title of Thursday's thesis. Dr. Greene shows how String Theory is attempting to meld and ameliorate the inconsistencies among:

-**SPECIAL RELATIVITY** and the **SUBJECTIVITY OF SPACE-TIME**,

-**GENERAL RELATIVITY** and the **WARPING OF SPACE-TIME** and

-**QUANTUM MECHANICS** and **SPACE-TIME**.

Also presented were the concepts of parallel universes and time travel and quantum entanglement and the meaning of separate universes. Space-time has both a space dimension and a time dimension. **Relativity** says that in space-time light approaches at the same speed always. Our common conceptions of motion (i.e., two vehicles approach at their combined speeds or one moves away from the other at only the difference between their velocities, etc.) are accurate only at 'slow' speeds but not at ultra-high velocities. He used a video graphic to show that:

$$\frac{\text{Distance}}{\text{Duration}} = \frac{\text{Space}}{\text{Time}}$$

By changing the vectors, the distance covered in the same direction in all cases will vary, even though the time spent travelling is the same in all cases.

Time is not the same for everyone. Very high speeds and strong gravitational fields will slow time down, as Einstein showed. We move through both space and time, and motion through space eats up motion through time and, therefore, time slows down. If you are sitting still, time moves at light speed. Therefore, light does not pass through time at all.

In **General Relativity**, time decelerates in a field of intense gravitational force. This force results in more highly accelerated motion and it also warps space and space-time to 'communicate' gravity.

In blackholes there are very huge masses in very tiny volumes. The event horizon of such a body is the point of no-return and time slows down immensely at this juncture.

Quantum Mechanics and Space-time: From 1900 to 1930, classical physics failed to describe the micro-realm. Consequently, Quantum Mechanics was developed. This led to a replacement of classical determinism by Quantum Probability, which has much experimental support. In the wave-particle duality (Heisenberg), the solid, inelastic body is replaced by a wave, which itself has an area in front of I of uncertain wavelets. Since Quantum Mechanics is probabilistic and observations are not, this leads

us to a many-worlds interpretation (I would assume to be on the same model as the Schrodinger's Cat though-experiment).

Time travel presents us with a variety of conundrums. It would be possible to travel into the past and kill your grandfather!! It would also be possible to journey back and give someone some information that would have serious consequences for something that you would be doing in the future! These are called time paradoxes. However, the 'many worlds' of Quantum Mechanics yields a consistent framework here, so, is time travel possible? It would seem to be so if one were to follow one of the following models:

1.The Godel Rotating Universe,

2.Tipler's Rotating Cylinder,

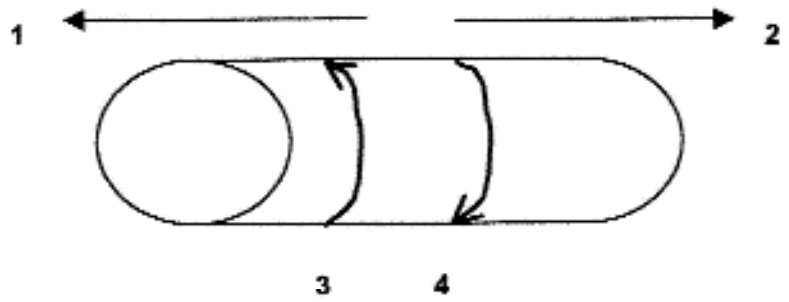
3.The Newman, Unti, Tamburino (NUT) Universe,

4. Gott's Cosmic Strings, or

5.Thorne's Wormholes (as depicted in Carl Sagan's "Contact").

String Theory and Space-time:

Solid particles are replaced by vibrating strings op. Cit. The differing vibrational patterns are the fingerprints of the different particles. The purpose, here, is to unite **General Relativity** and **Quantum Mechanics** because space actually has 3+ dimensions. In the 1980's, there were 9 space and 1 time dimension. In the 1990's, there were 10 space and 1 time dimensions. In the 1920's the dimensions are seen as large and are directly visible. In much more recent times, they are small and not directly visible. A rotating cylinder can give us 4-D.



This can be spread out to yield a space-time fabric complete with tiny spheres which allows an extra dimension (5).

Is there more than one time dimension?

If so, how can space evolve in time?

i.e., evolve into a new concept of space. But Einstein said that this was impossible! But, what if this leads us to the true nature of the universe? Wonders that are founded on the 'the truth of what is' are far deeper than 'what if' questions.

Postscript: It is the author's feeling that Dr. Greene views this new work as a modern tool for further long-term forays into the future of physics. It is not to be thought of as the end of physics or the final word for all time.

As with all problems investigated by human, there are likely many ways of probing each one. Despite the fact that we run our lives based on the 'Copernican' model of the solar system, it is possible to construct a system based on the Ptolemaic view that will have everyone wondering why we changed in the first place – its reality is so convincing. After all, we can see only what we have been able to conceive.

We then proceed to invent what has been conceived. We do not really discover or create – as this would imply the production of a something out of a nothing.

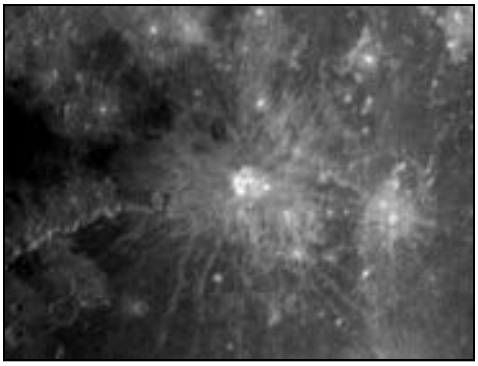
The new concept is a product of its past, will have been prepared for and must be understood within the context of that preparation. If it does yield anything new, that will be forced to fit previous conceptual patterns so that we can always account for the unknown in terms of the known. It will also be expressed in terms of a language which is not just the means of declaration, but without the trappings of language.

These were wonderful evenings and I'm thrilled that I was given the opportunity to attend.

Shooting Lunar Rays

by: Harry Pulley

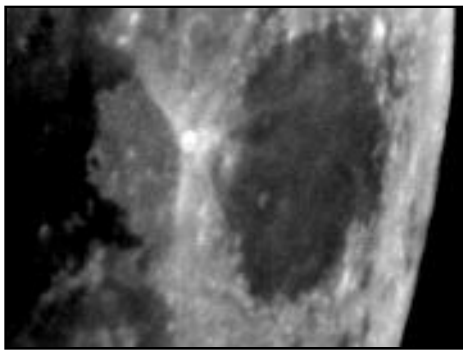
I often hear fellow astronomers say there is no reason to observe with the bright Moon in the night sky. Even experienced lunar observers complain of the lack of interesting features on the Moon when near full. I counter that the Moon itself is a worthwhile target, especially near full. Where it is lacking in visible relief features like partially shadowed craters, it is bountiful in albedo features, including the lunar rays.



all photos by: Harry Pulley

Once you've become interested in ray craters, you'll want to examine them on consecutive nights. Like all features on the Moon, ray systems change in appearance over the month. When a ray system is illuminated by sunlight from a low angle, it is often invisible, while at high angles the parent crater itself often disappears. At what sunrise lighting angles do they appear and at what sunset angles do they disappear? Is the angle different for each ray system or similar for all of them?

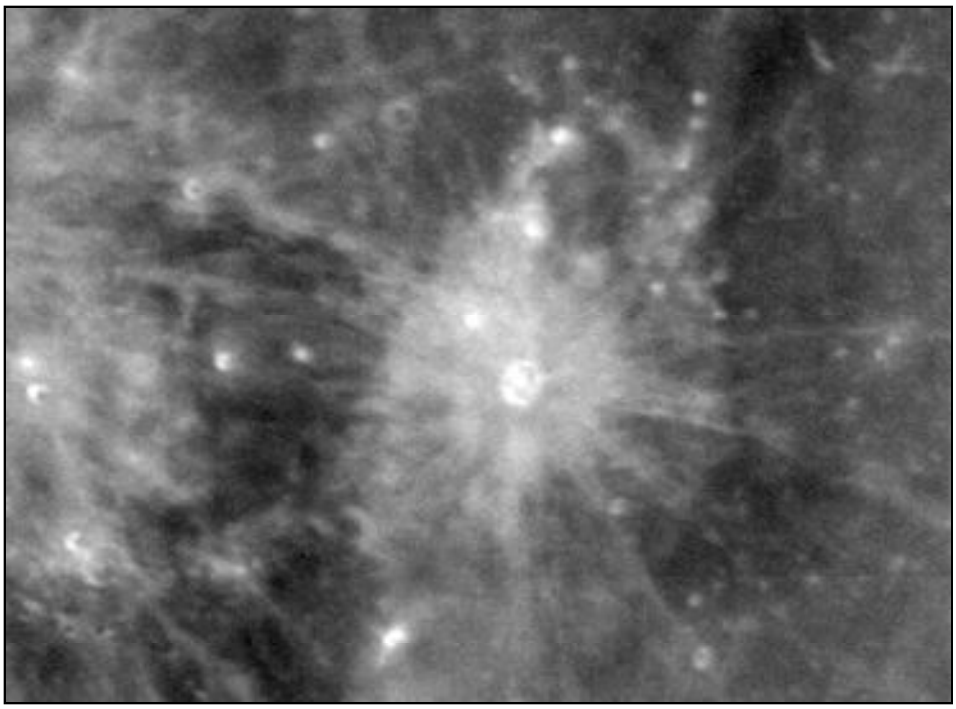
By observing and imaging lunar ray systems on successive nights, we may be able to answer these questions.



The origin of craters on the Moon was debated for a long time. Astronomers debated whether volcanic processes or impact process could have created them. The impact argument can easily explain the ray systems but the volcanic side does not provide a close fit. Impact debris placement tends to be symmetrical, as seen on the Moon, while volcanic eruptions on earth tend to have some directional bias. When I think about the two possibilities, I wonder how anyone could ever have thought volcanic processes created the craters. It appears obvious to me that impacts were the cause.

Viewed near full, the Moon is often too bright for comfortable observing, especially when seen through a large scope. Neutral density or polarizing filters can bring the brightness down for more relaxed viewing. I find red and green filters also provide a nice contrast enhancement, especially between the bright rays and dark albedo features. The two filters can also be combined for a dim brown view when a neutral density filter is not available.

You can record ray systems by sketching, taking photographs or CCD images. Sketching has the least setup time but is the most time-consuming activity. Sketching also has the lowest required investment, requiring just pencil and paper. Photography is fairly quick to set up and has wide fields to capture the entire Moon at



Coming Events:

January 4, 2001 - General Meeting at the Steam Museum. Program Member' Night.

January 11, 2000 - Board Meeting at the observatory. Come on out and help shape the future of the centre.

February 1, 2001 - General Meeting at the Steam Museum. Program TBA.

February 8, 2000 - Board Meeting at the observatory. Come on out and help shape the future of the centre.

March 1, 2001 - General Meeting at the Steam Museum. Program TBA.

March 8, 2000 - Board Meeting at the observatory. Come on out and help shape the future of the centre.

Directions to observatory

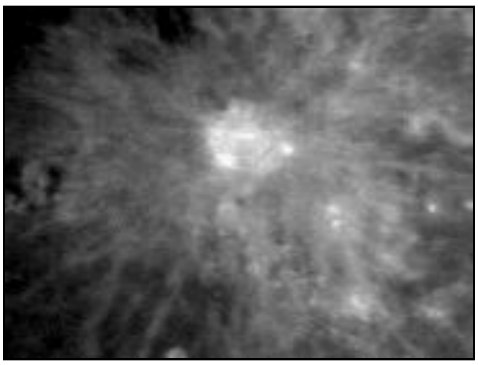
From Hamilton or Guelph:
- Hwy 6 N of Hamilton,
- Take Concession 7 East eastbound, cross Centre Rd.
- Continue on 7E, past the rail tracks, proceed to near the end.
- Our gate is on the south side on the last lot (south west).

From Mississauga or Milton:
- Britannia Road past Hwy 25, Guelph Line, Cedar Springs to end
- South 1 block on Milborough Town Line to Concession 7 East.
- Right on 7th Concession, then first driveway on left.
- Our gate is on the south side on the last lot (south west)

From Burlington or Oakville:
- Dundas Street (HWY #5) to Cedar Springs Road
- Cedar Springs Road to Britannia Road
- Left (west on Britannia road to Milborough Town Line
- South 1 block on Milborough Town Line to Concession 7 East.
- Right on 7th Concession, then first driveway on left.
- Our gate is on the south side on the last lot (south west)

Hamilton Centre Observatory
43° 23, 26" N 79° 55, 22" W
Telephone 689-0266

once but the dynamic range of film may limit the results. CCD cameras offer a wider dynamic range but a smaller field of view. CCD imaging takes longer to set up than photography but since disk space is cheap, it is more affordable to take many images. Instant results are another bonus of CCD work over film that must be developed and possibly printed. As each recording method has



advantages over the others, you can use different methods on different nights to study the rays.

When sketching the rays, use the two-sketch system. Do a line-outline drawing while under the Moonlight, and do a final drawing later with shading from the comfort of your desk. For the final drawing of light areas like ray systems, I often find it easiest to shade an area evenly with pencil and blending stump, using an eraser to mark out the bright markings. The two-sketch system lets you maximize your available time at the eyepiece while yielding a good finished drawing in the end.

When taking photographs of ray systems, it is usually best to try exposure times shorter than normally called for. If you take the usual exposure, the ray systems may be overexposed and washed out. Experiment with one, two and four-stop underexposure. Write down what you do so you can repeat the results next month without using so much film.

Most astronomy CCD cameras have larger dynamic ranges than most films. This means you can often capture both the bright rays and dark shaded areas in the same image. With anti-blooming enabled cameras, the chip becomes non-linear after a certain point, often half of the full well depth.

Experiment with images that are completely linear and those that have some non-linearity. I prefer fully linear lunar images but in some cases it is nice to expose shadowed areas deeper by allowing the bright areas to be gated.

Go ahead and shoot some lunar rays!