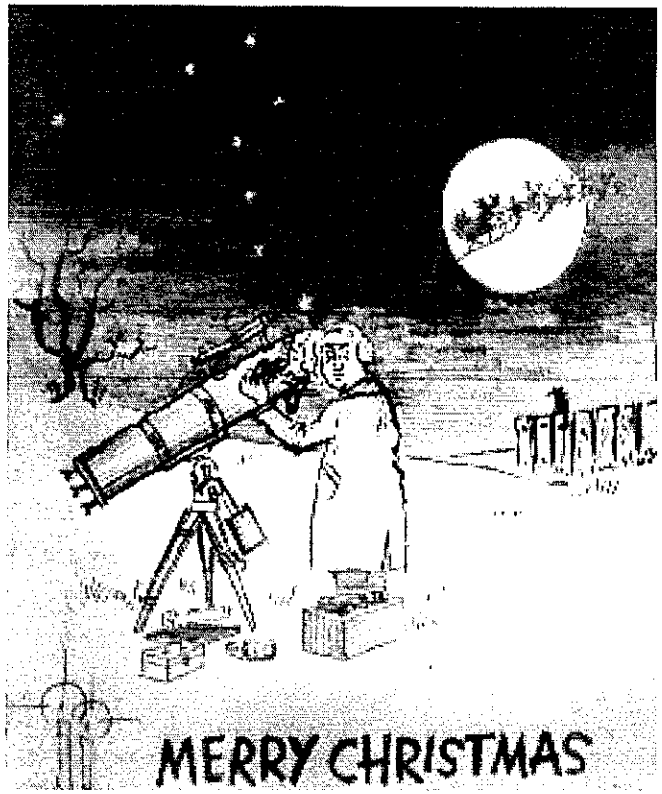
the focal point

Monthly Notices of the Atlanta Astronomy Club, Inc.

Vol. VII No. 7 December, 1994



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NEXT MEETING – DECEMBER 9

MEETING NOTICE ON PAGE 14

the focal point

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FROM:
Leonard B. Abbey, Editor
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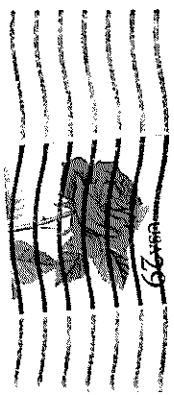

First Class

W. Tom Buchanan
105 Carriage Station Circle
Roswell, Georgia 30075

9510.

The Atlanta Astronomy Club Inc., the South's largest and oldest astronomical society, meets at 8:00 p.m. on the third Friday of each month at Agnes Scott College's Bradley Observatory. Occasional meetings are held at other locations (check the hot line for details). Membership is open to all. Annual dues are $20 ($10 for students). Discounted subscriptions to *Astronomy* ($18), and *Sky & Telescope* ($20) magazines are available. Send dues to: **Alex Langoussis, Treasurer, 3595 Canton Road, Suite A9-305, Marietta, Ga. 30066**

Hot Line: Timely information on the night sky and astronomy in the Atlanta area is available on a twenty-four hour basis on the Atlanta Astronomy Club hot line: 621-2661.

IS PLUTO AN ESCAPED SATELLITE OF NEPTUNE?

by Tom Van Flandern

The recent Voyager encounter with Neptune has revived speculation that Neptune's unusual large moon, Triton, was captured early in the history of the solar system. The basis of this conjecture is primarily that Triton is the only large moon of any major planet (ignoring asteroid-sized bodies) which revolves in a retrograde direction around its primary. ("Retrograde" means in the opposite direction from the spin of the primary.)

There is no known way that such a satellite could have formed naturally in such an orbit. It could not have fissioned (broken off) from Neptune, because Neptune's spin would have caused it to orbit in the expected direction. Nor could it have condensed from a cloud of material in orbit around Neptune, because the cloud of material, which must also have helped to form Neptune in the first place, had to be responsible for starting Neptune spinning the other direction. The only remaining option appears to be that Triton formed elsewhere, and was captured by Neptune into its backwards orbit.

There are problems, however, with this capture conjecture. Where are we to suppose that Triton formed, if not as a moon of Neptune? Didn't Neptune ever have any natural satellites of its own? And most difficult of all, how is it possible for Neptune to capture Triton? Let me elaborate on this last question for a moment.

When only two rigid bodies interact, and gravity is the only force involved, capture and escape are impossible. If a body is a satellite, it remains a satellite forever; if not, it cannot become one. The "sphere of influence" is the volume within which a mass can hold satellites permanently bound to itself. One body cannot move permanently into the sphere of influence of another body without the assistance of a third body or the intervention of a force other than gravity.

If two bodies have the same or similar orbits, gravitation always works to keep them apart. The motion of the smaller body is called libration: it repeatedly gains and falls back in its orbit relative to the larger body, but never approaches it. This situation exists in several instances in the solar system. The most notable examples are the "Trojan asteroids", which orbit the Sun in the same orbit as Jupiter, but can never approach the giant planet very closely.

Intervention by a third mass at just the right moment to permit a permanent satellite capture by Neptune is an extremely improbable event. Moreover, no suitable third bodies massive enough to accomplish the job are known to exist in the outer solar system today. The force of tidal friction is far too weak to accomplish the capture of Triton, to say nothing of the low probability of the right circumstances occurring. Drag in a medium of gas and dust surrounding Neptune could not slow Triton enough to permit capture, unless the medium were dense enough to remove more velocity than Neptune itself adds to Triton as it approaches. A medium so dense as to remove that much velocity would cause the decay of Triton into Neptune's atmosphere within a few revolutions through continued drag.

It is true that there is an avenue of approach of a potential satellite, through the so-called "inner Lagrangian

WHAT'S UP

	SUN			MOON					
Date	Rise	Azi	Set	Azi	Rise	Azi	Set	Azi	Age
12/15/94	7:35	117.7	17:30	242.2	15:59	67.4	5:21	291.8	13.1
12/16/94	7:36	117.8	17:31	242.1	16:43	66.0	6:12	293.6	14.0
12/17/94	7:36	117.8	17:31	242.1	17:31	65.7	7:02	294.3	14.9
12/18/94	7:37	117.9	17:31	242.0	18:22	66.7	7:50	293.8	15.8
12/19/94	7:37	117.9	17:32	242.0	19:16	68.9	8:34	292.2	16.7
12/20/94	7:38	117.9	17:32	242.0	20:12	72.2	9:15	289.4	17.6
12/21/94	7:38	117.9	17:33	242.0	21:09	76.4	9:53	285.7	18.6
12/22/94	7:39	117.9	17:33	242.0	22:08	81.3	10:30	281.1	19.5
12/23/94	7:39	117.9	17:34	242.0	23:07	86.7	11:05	275.9	20.5
12/24/94	7:40	117.9	17:34	242.0	-----	-----	11:39	270.5	21.5
12/25/94	7:40	117.9	17:35	242.1	0:08	92.4	12:15	264.8	22.6
12/26/94	7:41	117.8	17:35	242.1	1:11	98.1	12:52	259.4	23.6
12/27/94	7:41	117.8	17:36	242.1	2:16	103.5	13:33	254.3	24.7
12/28/94	7:41	117.7	17:37	242.2	3:22	108.3	14:19	250.0	25.8
12/29/94	7:42	117.7	17:37	242.3	4:30	111.9	15:11	247.0	27.0
12/30/94	7:42	117.6	17:38	242.4	5:36	114.0	16:09	245.6	28.1
12/31/94	7:42	117.5	17:39	242.5	6:39	114.3	17:12	246.1	29.2
1/1/95	7:42	117.4	17:40	242.6	7:37	112.7	18:19	248.5	0.8
1/2/95	7:43	117.3	17:40	242.7	8:27	109.5	19:26	252.3	2.0
1/3/95	7:43	117.2	17:41	242.8	9:12	105.1	20:32	257.1	3.0
1/4/95	7:43	117.1	17:42	242.9	9:52	100.1	21:35	262.5	4.1
1/5/95	7:43	116.9	17:43	243.1	10:28	94.5	22:36	268.2	5.1
1/6/95	7:43	116.8	17:44	243.2	11:01	89.0	23:34	273.7	6.0
1/7/95	7:43	116.6	17:44	243.4	11:34	83.8	-----	-----	7.0
1/8/95	7:43	116.5	17:45	243.5	12:07	78.9	0:30	278.8	7.9
1/9/95	7:43	116.3	17:46	243.7	12:42	74.7	1:26	283.5	8.8
1/10/95	7:43	116.1	17:47	243.9	13:18	71.0	2:20	287.5	9.7
1/11/95	7:43	115.9	17:48	244.1	13:57	68.3	3:13	290.6	10.5
1/12/95	7:43	115.7	17:49	244.3	14:39	66.5	4:06	292.9	11.4
1/13/95	7:43	115.5	17:50	244.5	15:25	65.8	4:57	294.1	12.3
1/14/95	7:43	115.3	17:51	244.7	16:15	66.3	5:45	294.1	13.2
1/15/95	7:42	115.1	17:52	244.9	17:09	68.0	6:31	292.9	14.2

OFFICERS AND OTHER DIGNITARIES

President:	Steve Gilbreath	409-1915
First Vice-President: (Program)	Jerry Armstrong	942-4249
Second Vice-President: (Observing)	Eric Shelton	664-2837
Recording Secretary:	Terry McHann	441-9097
Corresponding Secretary:	Leonard Abbey	634-1222
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Publicity:	Ken Poshedly	979-9842
Edibles:	Terry McHann	441-9097
Facilities:	Leonard Abbey	634-1222
Light Pollution:	Tom Buchanan	587-0774

Jason Ware, this is a relatively bright region of nebulosity just north of the M-42 complex. It is large, about 15'x10 and surrounds several relatively bright stars. The "Running Man" is seen as the dark region between the areas of nebulosity, and often shows up in wide angle photographs of the Great Nebula. It would be observed more often if it weren't located so close to M-42, and greatly deserves more attention.

NGC 2022 This is a small, but relatively bright planetary nebula about 20" in diameter. It is slightly brighter at the center, and fades gradually to the edges.

NGC 2024 The Flame Nebula. This is a relatively bright nebula which is best seen at low powers. Just northeast of Zeta Ori, this fascinating object is about 15'x10', and is divided by a lane of dark nebulosity which branches through it. While some also call this the Christmas Tree Nebula, I find that it more closely resembles a celestial oak leaf. This object definitely deserves close scrutiny.

AAC ACTIVITIES

The December Meeting

For December, we will make our seasonal visit to **Fernbank Science Center's planetarium** for a free peek at their Christmas show, **"Star of Wonder"**. As usual, our December meeting will be held on the **second Friday, December 9**. The show begins promptly at **8:00 p.m.**, so plan to be there a little early.

Last Month's Meeting

Our November meeting was one of the most memorable meetings in our forty-seven year history. Over 120 people crowded Emory's White Hall to hear world-famous planetary photographer Don Parker discuss his imaging techniques. He also had some very interesting things to say about the planet Mars, one of his specialties. For instance, did you know that in recent years Mars has experienced global warming? Maybe the martians should outlaw the use of Freon. Or maybe Freon is really harmless?

About This Issue

This issue is a little shorter than usual. This is due to an unfortunate computer crash which required almost a week to recover from. We will be back to our usual verbose selves by next month.

This Month's Cover . . .

Our cover illustrates how the Christmas spirit might come to an inveterate observer. It was drawn by Bill Close, and first appeared on the cover of the December 1952 issue of *The Atlanta Astronomers' Report*. The surprised observer is Bill himself!

point", on just the right trajectory with just the right speed in just the right direction in all three dimensions, which would bring a potential moon close enough to Neptune with a small enough relative velocity that a non-gravitational force could then capture it. But the odds against such a fortuitous approach are so enormous as to make this loophole a practical impossibility. Even if there were millions of Triton-like objects at the time and only one was going to be captured, the odds against capture are still overwhelming. The easiest way to make capture work is to have millions of Triton-like bodies, and have one of them approach close to the optimal trajectory while an even larger mass impacts on Neptune, accreting enough new mass onto Neptune that the planet's sphere of influence enlarges, capturing the nearby Triton permanently.

Since none of these capture mechanisms seem very plausible, let us examine the alternatives to capture. First we need to look at the overall picture in the outer solar system. Neptune has rings and small inner asteroidal moons, very much like the other gas giant planets. But it has no large normal moons, unlike the others. In addition to the abnormality of Triton's retrograde motion, Neptune's other long-known moon, Nereid, is on an extremely elongated orbit, far more eccentric than that of any other moon in the solar system, and quite close to the threshold of escape.

Add to this picture two moon-size bodies: Pluto, and Pluto's own large moon Charon. This pair orbits the Sun in a planetary orbit *which crosses the orbit of Neptune*. This in itself is an extraordinary situation, since crossing orbits are usually unstable (i.e. eventually these bodies either collide with Neptune or are ejected from the solar system by it).

Now it could be the case that Pluto and Charon are the fortunate survivors of millions of Triton-like bodies. If so, it is odd that their orbits cross that of Neptune, since non-crossing orbits are far more stable. Why aren't there lots of similar bodies in many of those stable orbits?

The other gaseous giant planets, Jupiter, Saturn, and Uranus, have large natural satellite systems with more or less circular, co-planar, equatorial, regularly-spaced orbits. Although Neptune's two outer satellites appear typical in respect to mass and physical characteristics, their orbits are most abnormal. It seems altogether fair to suggest that Neptune may have started with a normal system of satellites, similar to the other gas giant planets; but then something disrupted that satellite system, making the orbits abnormal.

Could that disrupter have been Pluto? Pluto's mass is too small to change Triton from prograde to retrograde under any circumstances. Moreover, Pluto could not have escaped into an orbit with so much greater a mean distance from the Sun than Neptune's without the intervention of a far more massive body. If Triton had been the body Pluto interacted with, Nereid's orbit would still be unexplained, and vice versa. The existing situation can be efficiently brought about, it would seem, only by the intervention of some mass larger than either Pluto or Triton; in fact, larger than any existing solar system moon.

To test whether a larger mass could in fact bring about the existing situation, R. A. Harrington and I (in work done at the U.S. Naval Observatory) calculated test encounters with hypothetical bodies of varying mass, encounter distance, inclination, and velocity. We started with an assumed regular four-satellite system for Neptune, modeled on Jupiter's four Galilean satellites. The findings were illuminating: to produce disruptions of the observed sort, the encountering body needed to have a mass in the range of two to five Earth masses, and a velocity similar to outer planet

velocities (but not as high as that of bodies coming from outside the solar system). In other words, the only hypothetical encountering bodies which worked well in disrupting the Neptune satellite system as observed were what we might call "Planet X"-type bodies, previously in planetary orbits around the Sun beyond Neptune.

The computer calculations eventually, by trial and error, found an encounter by a 3-Earth-mass body which could simultaneously reproduce a Triton-like, a Nereid-like, and a Pluto-like post encounter orbit for three of Neptune's original normal satellites. A fourth original satellite could then be added in such a way that it would go off with Pluto, and become Pluto's satellite Charon, among other possibilities. Despite its small mass, Pluto's gravitational sphere of influence is 10,000,000 km, as long as it stays away from Neptune's sphere of influence. So if Charon were pulled away from Neptune in the same general direction and with a similar velocity to Pluto, it would become permanently gravitationally bound to Pluto, because it would necessarily start out INSIDE of Pluto's sphere of influence. With little velocity relative to Pluto, Charon would initially fall toward Pluto, entering a highly elliptical orbit. Tidal forces would then circularize Charon's satellite orbit and synchronize the spins of both bodies, which is precisely the situation we observe today.

Although the body doing the disrupting might have escaped the solar system following the encounter, the statistical odds are that it would have remained in a highly eccentric and inclined solar orbit with a long period. This is just the sort of body which has been suggested as a hypothetical undiscovered planet beyond Pluto, based on unexplained disturbances in the orbits of the outer planets. Certainly, if such a "Planet X" were to be discovered in a highly-inclined and eccentric orbit which approached Neptune's orbit at perihelion, and has a mass near the interesting range of 2-to-5 Earth masses, its existence would argue strongly for the essential correctness of the whole scenario we have just described.

We conclude that a plausible explanation for the unique irregularities in the satellite system of Neptune (retrograde motion of Triton and a "comet-like" orbit for Nereid), and also for the existence of moon-sized planet Pluto and its satellite Charon in Neptune-crossing planetary orbits, is that an as-yet undiscovered trans-Neptunian planet had a close encounter with the Neptune system sometime in the past. If so, Pluto and Charon are probably indeed escaped former satellites of Neptune.

It is also interesting to note that Triton's orbit has been circularized by tidal friction. That fact plus recent Voyager indications that the moon is currently undergoing geologic activity suggests that the rate of tidal evolution may well be greater than usually assumed. The ultimate fate of Triton under the influence of this tidal activity, perhaps in as little as a few tens of millions of years, is to decay into the atmosphere of Neptune, and eventually be assimilated by the planet. Now *that* will be one spectacular satellite re-entry!

Tom Van Flandern is a professional astronomer and is the author of *Dark Matter, Missing Planets & New Comets*, a book which discusses a number of radical new ideas about the history of the solar system.

Constellation of the Month - Orion

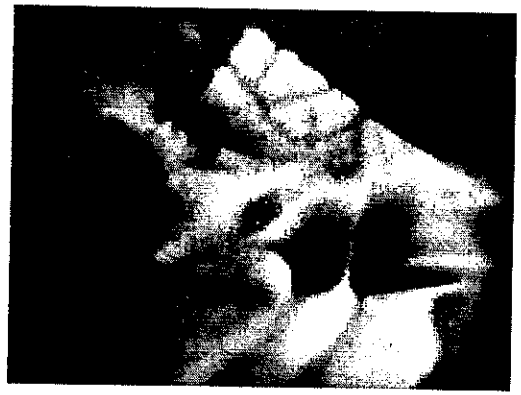
by Rick Raasch, Dallas

One of the most easily recognized constellations, Orion, lies near to the Milky Way, and thus contains many open clusters and some of the best nebulae in the heavens. Led by the bright stars Betelgeuse and Rigel, this constellation holds many fine telescopic and binocular objects, along with some of the most photographed regions of the sky. Its arrival in the night sky signals the beginning of the winter observing season, with its crisp, clear nights and fine "seeing". So bundle up, make some coffee or hot chocolate, and get out under the stars for some of the finest observing of the year!

M-42 The Great Nebula. One of the finest sights in the sky, this nebula is easily visible to the naked eye as the "fuzzy" star in the middle of Orion's sword. It appears distinctly nebulous in binoculars or finder scopes, and shows an amazing amount of detail through the telescope. It is fully a degree in extent, with a wealth of fine curling wisps of nebulosity curving out from the brightest region surrounding the four relatively bright stars known as the Trapezium. On good nights with low power, I have even been able to see colors in this object. The region around the Trapezium appears as a cold steel blue color, while the wispy regions further away can appear as a soft ruddy pink. Slightly separated from the main nebulosity, is M-43. This nebula is seen as a comma shaped cloud surrounding an eighth magnitude star just north of the Great Nebula. The more time you spend in this area, the more fine detail can be seen.

M-78 This is another fine area of nebulosity. It is about 6' in diameter, and surrounds two magnitude 10 stars. It is somewhat fan shaped, and appears comet-like at low powers. NGC's 2064, 2067, and 2071 lie in very close proximity to M-78, and are all nebulous regions as well.

NGC 1973-75-77 Dubbed the "Running Man" nebula by SIGAP leader



This drawing of the core of the Orion Nebula was made by Leopold Trouvelot in 1874. It was taken from his observations with the 15" refractor at Harvard College Observatory.

something that has happened to the telescope. Being mounted permanently, it doesn't often get out of collimation.

I can't believe that some people don't ever collimate theirs, *Boy!* would those people be surprised if they did! I would also be interested in what their definition of fine is or maybe it's just that they don't know what a collimated telescope is and are afraid to ask fearing that their ignorance might show, which is ignorance in itself. Believe me, in my job working with people who buy and use telescopes I have seen that a lot.

I am still amazed at how much I learn about astronomy from customers that come into the store and ask me a question that I don't know, so we look it up together.

I work part time at an astronomy store in Irvine, Texas and I have taught people how to collimate every type of telescope that is available. I have a C14 and 8" Schmidt Camera under a dome. As for collimating a Schmidt Camera, I leave that for Celestron.

Don't Forget Your Discounts!

Your membership in the Atlanta Astronomy Club entitles you to discounts from some of the most prestigious astronomical publishers.

Sky & Telescope magazine, the best all-round astronomy publication in the world, offers annual subscriptions to members for $20. This is a discount of over 25% off the standard rate. In order to take advantage of this special price you must make your payment through the club treasurer. Most members renew their subscriptions when they renew their memberships.

Sky Publishing Corporation, the publisher of ***Sky & Telescope,*** also offers members who subscribe to their magazine through the club a 10% discount on their extensive catalog of books and star atlases. You can place your order for these items directly, either by mail or by means of their 800 number. Just mention that you subscribe to ***Sky & Telescope*** through the Atlanta Astronomy Club, and deduct 10%from the price.

Astronomy Magazine is available at $16 per year. Two-year subscriptions are $32. You must order through the treasurer in order to get the discount.

Other special bargains on books and handbooks are announced from time to time at the meetings.

The Observer's Dictionary

by Jack Kramer, Libertyville, Illinois

Over the years, members of the Lake County Astronomical Society have used a variety of terms that amateur astronomers have adopted for our own purposes. Sometimes we've coined new words and at other times we've taken existing words and applied entirely new meanings to them. You'll notice some form of this lexicon in use whenever you observe with almost any group of amateur astronomers. In our case, we felt it necessary to create this dictionary in order to bring new observers up to speed quickly, since all these terms actually have been used during our observing sessions.

averted imagination (n) - 1. a condition where an observer knows an object is in the field of view and thereby convinces himself that he is seeing it.

bigamist (n) - 1. a person who owns more than one telescope. 2. Variously spelled as **BIGamist** when one of the telescopes is a light bucket (which see).

big dob (n) - 1. a very large dobsonian-mounted telescope (also see *light bucket*) 2. (proper name) - Steve McAllister's CB handle.

blob (n) - 1. any object with a shape that's difficult to define, as in "I can see a faint *blob* " or "That little *blob* is Halley's Comet?" (also see *smudge*)

class glass (n) - 1. refers to any especially good optical components, as in "That apochromat is *class glass* ".

cloud bait (n) - 1. any new piece of gear taken to an observing site for the first time.

clouds from hell (n) - 1. phrase denoting a condition where clouds appear from nowhere and soon cover the entire sky. Use of this phrase is generally followed with profanity.

commiserate (v) - 1. to share in another observer's misery in not being able to observe due to miserable weather, as in "What *miserable* weather this has been!"

fuzzball (n) - 1. a term used to describe a globular cluster that cannot be resolved.

fuzzy (n) - 1. refers to any object that appears indistinct, as in "Each field in the Virgo Cluster of Galaxies is full of little *fuzzies* ". 2. (adj) A less than salubrious psychomotor state, as in "After being up all night observing, I feel really *fuzzy* the next day". 3. **fuzzy alert** (interj.) - a notice to fellow astronomers that one has just detected an unknown faint object. (also see *fuzzy* definitions 1 and 2)

gotit (interj.) - 1. an exclamation indicating that success has been achieved in locating an object, as in "*Gotit !* "

gunky (adj) - 1. refers to a meteorological condition characterized by a pervasive layer of clouds, as in "The sky turned *gunky* just as we set up our telescopes." 2. (n) - **gunk** - the *gunky* stuff in the sky.

jiggle (v) - 1. to cause tremors in the telescope as a means of spotting a faint object in the field of view, as in "*Jiggle* the telescope a bit and you'll just make out a faint *blob* (which see)."

light bucket (n) - 1. a really big telescope.

lookatthatmeteor (interj.) - 1. an exclamation used to inform other observers that if they had been looking skyward instead of peering through

their telescopes, they would have seen a bright meteor. The word "where?" in response to this exclamation is generally considered superfluous. (see *wow*)

M0 (M zero) (n) - 1. attributed to or describing a cloudy sky through which no Messier objects can be seen, as in "All I saw was *M0*".

moocher astronomer (n) - 1. refers to an observer who comes out to an observing session without a telescope or binoculars of his or her own.

nail (v) - 1. to achieve success in locating a difficult object with certainty, as in "I finally *nailed* NGC 2158". (see *gotit*)

nudge (v) - 1. meaning to slightly rotate a telescope about one of its axes, as in "*Nudge* the scope a bit in R.A.".

oops (interj.) - 1. derivation obscure, but generally an exclamation of dismay indicating that one has just kicked the leg of one's tripod in the dark or broken someone else's thermos bottle, as in "*Oops!*". Synonyms for this term may be found in a dictionary on profanity.

portable (adj) - 1. a quality of being smaller and lighter than the average refrigerator, as in "If this telescope is *portable* why does it take two people to move it?"

skosh or **skoash** (adv) - 1. quantitatively referring to a small amount, as in "Aim your scope a *skosh* to the left of that star". (also see *smidgin*)

smidgin (n) - 1. see *skosh*

smudge (n) - 1. a barely perceptible object, as in "The nebula looks like a faint *smudge* in the center of the field" (see *blob*)

social disease (n) - 1. refers to a condition experienced by astronomers where social commitments prevent them from getting out to observe. 2. You don't want to know.

squat nebula (n) - 1. an object which is impossible to see, as in "I can't see *squat*."

sucker hole (n) - 1. a small break in an otherwise cloudy sky that dupes astronomers into thinking they have a shot at some very abbreviated observing. 2. **sucker zone** (n) - expands the concept to a larger open area in an otherwise cloudy sky; may inspire false hope until beset by total *gunk* (which see).

twoinchitis (n) - 1. a disease common to amateur astronomers where the victim earnestly believes that if only his telescope optics were two inches larger, he could see all he ever wanted to see in the night sky and be happy forever.

wishful seeing (n) - 1. a condition where an observer is convinced that the skies at a site are so good that he/she can see any object, whether or not the object can, in fact, be seen.

wow (interj.) - 1. exclamation to inform other observers that they just missed a beautiful meteor, as in "*Wow!!!*" (also see *lookatthatmeteor*)

If these are new terms to you, then study this dictionary and dwell in ignorance no longer! Regular use of these terms may also guarantee your being recognized as a seasoned observer.

Collimating SCT's

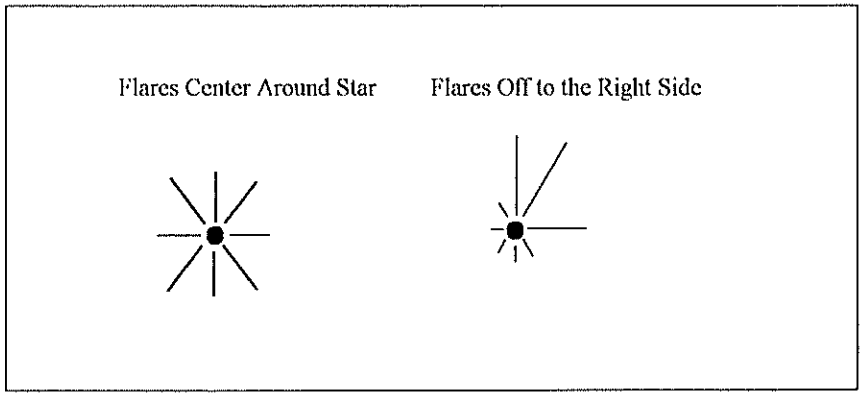
Jack Hudler, Fort Worth

About the only time I collimate my C14 is when it needs it. How do you tell if it needs it? Well center a 4th or 5th magnitude star, use a 12.5-mm or 9-mm eyepiece and focus carefully. Then defocus slightly (going through the focus and back) and look for small spikes or flares. A telescope with good collimation will have flares extending radially around the star in an even pattern (see illustration) if any of those flares are off to one side then your telescope needs collimation. You can achieve a high degree of collimation with a C8 but it takes time and patience.

The method that is described in the C8 manual is a good way to do it *but* remember not to force the collimation screws. They should turn with a slight force but if you turn one screw you will have to take up the slack in the others. Don't forget to provide a little slack in the others before you tighten one, *and* don't adjust the center screw if your model of C8 has one , otherwise you could drop the secondary on the primary mirror taking a big chunk out of both! If the collimation is really bad then place a 25-mm eyepiece in it and de-focus the star a lot. You will then see the familiar looking donut shape with the center hole (which is the secondary) offset to one side. Now adjust the secondary like your manual describes and keep doing this until the center hole gets centered. Then put a higher power eyepiece in it and tweak it some more. Then check your results each step with the test I described earlier. Don't do this when the stars are scintillating or twinkling (in lawman's terms).

Looking at the visual alignment of the reflection of the primary in the secondary is a good "rough" way to check it, but the only way to do it and make it count is on a star.

I check the collimation every time I open up, however I may not correct it that night. It depends on what I am doing. If I am doing photography, planetary, splitting doubles, of if it's really bad! then I will take the time. Of course if it's really bad then I start looking for



Some supporting evidence for the minimum can be deduced from observations of "naked-eye" sunspot sightings. Reports of sunspots seen without visual aid can be traced back to 28 B.C., and before. These sightings were made when the sun was obscured by heavy haze or smoke, or was low in the sky during early evening or morning hours. (*Note* we now realize that this practice can be highly dangerous, and *must* be avoided.) As naked-eye sightings are relatively rare, the likelihood of their discovery is statistically greatest during times of high sunspot activity. Although a number were observed prior to, and later than the Maunder Minimum, apparently none were recorded during the period from 1639 to 1720 (Kanda, 1933). However, at least two other similar "gaps" do exist in Kanda's compilations.

Additional evidence comes from a generally unrelated field. It concerns the abundance of carbon 14 in tree rings. For technical reasons, we would expect to find a relative abundance of the element when solar activity has been at low levels. During the period of Maunder's minimum this is exactly the case. Increasing amounts do occur that peak in the year 1690 (DeVries, 1958).

Further, both the naked-eye-sunspot and carbon 14 indices correlate extremely well with each other and with long-term auroral activity, a phenomenon closely associated with periods of high sunspot number, and historically viewed with wonder. Aurorae were very rare during the period; far less common than in seventy-year periods previous to, and following the Minimum (Clerke, 1894).

In fact, in his extensive analysis, Eddy found virtually no evidence to dispute the minimum. Thus it appears that the sun did undergo major changes, with possible terrestrial effects, during the 17th century. We are not certain what mechanism could cause such an event to occur. Many explanations have been suggested, ranging from the interaction of secondary and tertiary (or even additional) sunspot cycles, to complex explanations of the physics of the solar dynamo itself.

Perhaps Eddy best summarizes the scenario when he concludes, "the reality of the Maunder Minimum and its implications of basic solar change may be but one more defeat in our long and losing battle to keep the sun perfect, or, if not perfect, constant, and if inconstant, regular".

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The "True" Nature of Light

The following is a portion of an article that appeared in *The Aldrich Observer*, the newsletter of the Aldrich Astronomical Society in Massachusetts. The author is unknown; the article was originally downloaded from a computer bulletin board, where its title was:

Dark Conspiracy Involving Electrical Power Companies Surfaces

For years the electrical utility companies have led the public to believe they were in business to supply electricity to the consumer, a service for which they charge a substantial rate. The recent accidental acquisition of secret records from a well-known power company has led to a massive research campaign which positively explodes several myths and exposes the massive hoax which has been perpetrated upon the public by the power companies.

The most common hoax promoted the false concept that light bulbs emitted light; in actuality, these "light" bulbs actually absorb *dark* which is then transported back to the power generation stations via wire networks. A more descriptive name has now been coined; the new scientific name for the device is DARKSUCKER.

This newsletter introduces a brief synopsis of the darksucker theory, which proves the existence of dark and establishes the fact that dark has great mass, and further, that the dark particle (the anti-photon) is the fastest known particle in the universe. Apparently, even the celebrated Dr. Albert Einstein did not suspect the truth...that just as *cold* is the absence of *heat, light* is actually the *absence* of *dark*... scientists have now proven that light does not really exist!

The basis of the darksucker theory is that electric light bulbs suck dark. Take for example, the darksuckers in the room where you are right now. There is much less dark right next to the darksuckers than there is elsewhere, demonstrating their limited range. The larger the darksucker, the greater its capacity to suck dark. Darksuckers in a parking lot or on a football field have a much greater capacity than the ones in use in the home, for example.

It may come as a surprise to learn that darksuckers also operate on a celestial scale; witness the Sun. Our Sun makes use of dense dark, sucking it in from all the planets and intervening dark space. Naturally, the Sun is better able to suck dark from the planets which are situated closer to it, thus explaining why those planets appear brighter than do those which are far distant from the Sun.

Occasionally, the Sun actually oversucks; under those conditions, dark spots appear on the surface of the Sun. Scientists have long studied these "sunspots" and are only recently beginning to realize that the dark spots represent leaks of high-pressure dark because the Sun has oversucked dark to such an extent that some dark actually leaks back into space. This leakage of high-pressure dark frequently causes problems with radio communications here on Earth due to collisions between the dark particles as they stream out into space at high velocity via the black "holes" in the surface of the Sun.

As with all manmade devices, darksuckers have a finite lifetime caused by the fact that they are not 100% efficient at transmitting collected dark back to the power company via the wires from your home, causing dark to build up slowly within the device. Once they are

full of accumulated dark, they can no longer suck. This condition can be observed by looking for the black spot on a full darksucker when it has reached maximum capacity of untransmitted dark...you have surely noticed that dark completely surrounds a full darksucker because it no longer has the capacity to suck any dark at all.

A candle is a primitive darksucker. A new candle has a white wick. You will notice that after the first use, the wick turns black, representing all the dark which has been sucked into it. If you hold a pencil next to the wick of an operating candle, the tip will turn black because it got in the way of the dark flowing into the candle. It is of no use to plug a candle into an electrical outlet; it can only collect dark...it has no transmission capabilities. Unfortunately, these primitive darksuckers have a very limited range and are hazardous to operate because of the intense heat produced.

There are also portable darksuckers called flashlights. The bulbs in these devices collect dark which is passed to a dark storage unit called a battery. When the dark storage unit is full, it must be either emptied (a process called "recharging") or replaced before the portable darksucker can continue to operate. If you break open a battery, you will find dense dark inside, evidence that it is actually a compact dark storage unit.

Dark has great mass. When dark is drawn into a darksucker, friction caused by the speed and mass of the dark particles (called anti-photons) actually generates substantial heat, thus it is unwise to touch an operating darksucker. Candles represent a special problem, as the dark must travel into a solid wick instead of through clear glass. This generates a great amount of heat, making it very dangerous to touch an operating candle.

Scientists are working feverishly to develop exotic new instrumentation with which to measure the actual speed and energy level of dark. While such instrumentation is beyond the capabilities of the average layman, you can actually perform a test to demonstrate the unbelievable speed of dark, right in your own home. All that is required for the simple test is a closed desk drawer situated in a bright room. You know from past experience that the tightly shut drawer is FULL of dark. Now, place your hand firmly on the drawer's handle. Quickly yank the drawer open...the dark immediately disappears, demonstrating the blinding speed with which the dark travels to the nearest darksucker!

The secrets of dark are at present known only to the power companies. Dark must be very valuable, since they go to such lengths to collect it in vast quantities. By some well-hidden method, more modern power "generation" facilities have devised methods to hide their collection of dark. The older facilities, however, usually have gargantuan piles of solidified dark in huge fenced-in areas. Visitors to these facilities are told that the huge piles of material are supplies of coal, but such is not the case.

The power companies have long used secret acronyms to disguise their activities; "DC" stands for "Dark Conspiracy", while "AC" is suspected to represent the "Alternate Conspiracy" which will most likely be used exclusively once the secrets of DC are totally understood. DC is rapidly yielding its secrets to the probing eyes and instruments of honest scientists around the world.

The Maunder Minimum; Some Questions, Some Answers

by Peter O. Taylor

"For the space of three years now (the sun) has remained without spots, which at other times, were so frequently to be seen". So wrote the famous Dutch astronomer, Huygens, to his contemporary Hevelius, on 16 September 1658 (Shove, 1983). Strangely, it would be late in the nineteenth century before two well-known solar astronomers, Gustav Spoerer and E.W. Maunder, would describe fully the lull in solar activity that lasted for almost seventy-years, spanning the entire reign of Louis XIV and encompassing the times of Milton and Newton.

During what we now consider to be normal circumstances, the number of sunspots regularly rises and falls in accordance with an average cycle length of approximately eleven years. During cycle "minimum" the numbers often fall to zero, while at "maximum" daily counts have soared to over three-hundred.

Although Spoerer's work (Spoerer, 1887) preceded Maunder's, it is the latter who is generally credited with the most complete description of the strange behavior of the sun in the 17th century. In his second paper on the subject, Maunder (Maunder, 1922) reported the following findings: During the period from 1645 to 1715, only a few spots were seen. For nearly half of this time, 1672 to 1704, no spots were observed on the sun's Northern Hemisphere; and for sixty years, until 1705, there was never more than one group visible at any one time. Thus it appears that the total number of spots for the entire period would have been less than we have come to expect in any one active year since that time.

Did this prolonged lull actually occur, or was it a lack of sophisticated equipment, or skilled observers, that only made it seem so? Is there other evidence, from associated, or seemingly unrelated studies, that could confirm its existence? Was anyone even looking? These are some of the fundamental questions that have been asked during the many years that have elapsed since Maunder's time.

Well-known solar physicist, John Eddy, in his analysis of the Maunder Minimum (Eddy, 1976), answered many of these questions. Eddy concluded that the modest equipment that is required for serious sunspot observation was readily available in the 17th century. In fact, drawings of the sun from that era show almost all of the detail that modern drawings show. And of course, the 17th century supported many accomplishments in other areas of astronomy, many by active solar investigators. For example, the first known division in Saturn's ring-system was discovered in 1675, along with five of its moons (1655 to 1684), implying a telescopic resolution of nearly one arc-second. Other examples include Romer's discovery in 1675 of the velocity of light from observations of the orbits of Jupiter's satellites; and transits of Venus and Mercury were recorded, demonstrating a certain familiarity with sunspots and their motions.

Eddy mentions many of the noted astronomers of the day. To name but a few: Flamsteed, Hooke, Halley, Huygens, Hevelius, Romer, Cassini, Grimaldi, and so on; many of whom regularly observed the sun and recorded their observations.