THE PRAIRIE ASTRONOMER 80

=Saturn's Interior Is Hotter Than Sun's Surface Says Smith

The surface of the sun is not as hot as the interior of Saturn, the second-largest planet in the solar system, a space scientist says.

Dr. Edward J. Smith of the Jet Propulsion Laboratory said the discovery was made during the recent flight of Pioneer II past the planet with rings.

Smith said the intense heat may have remained from when the planet was formed from dust clouds 4½ billion years ago.

At the annual joint meeting of the American Physical Society and the American Association of Physics Teachers, Smith said the planet's interior has a temperature of 18,000 degrees, measurements from the satellite showed. The sun's surface has a temperature of 10,000 degrees.

The spacecraft, which traveled 1.5 billion miles in six years, also may have found a second new ring around the planet, said University of Iowa professor Dr. James A. Van Allen, who discovered a radiation belt around the earth that was named after him.

He said the new ring seems to be composed of dark objects of unknown size and makeup.

Dr. Tom Gehrels of the University of Utah said the rings around Saturn apparently were formed in two ways. The inner rings, consisting mainly of ice balls a few inches in diameter are believed to have been created by leftover material after the planet condensed.

The outer rings, composed of solid, gravel-like material, may be the remains of a shattered asteroid or moonlet, or debris swept up by the planet as it moves along in its orbit.

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JANUARY MEETING IS LAST TUESDAY

The January meeting of the Prairie Astronomy Club will be held at Hyde Observatory on Tuesday, January 29, 1980, at 7:30 p.m. (Hyde Observatory Committee members are reminded that their first meeting in two months will precede the PAC meeting at 6:30 p.m. Please be prompt--we are likely to have a lot to discuss.)

Program Chairman Rick Johnson was indefinite about the main program, but several items will be on the agenda for brief exposure:

☐Steve Myatt will tell us "How To Walk In Off The Street And Buy A $2,000 12½-inch Telescope-- And Wow! What A Mount It Has!" (The title is likely to be longer than his talk.)

OBSERVING CHAIRMAN'S REPORT:

This month one object seems to have a name that fits the cold temperatures we experience this time of year. The Eskimo nebula, NGC 2392 is a fairly bright planetary in Gemini. Located about one degree south and 2 degrees east of delta Geminorum, the nebula should be visible in telescopes of four inches aperture or larger. It will appear as a fuzzy star with a faint ring of light around it. For those with smaller telescopes, M44, the Beehive Cluster, should prove an interesting sight. Use low power and look about a degree and a half south of Gamma Cancri. Some color in the stars of the cluster should be apparent in larger telescopes.

In Monoceros, look for a series of small clusters in a faint nebula known as the Rosette Nebula. Located about 2 degrees east of epsilon Monocerotis, the cluster is probably the only part of the Rosette that is easily seen. The sky background is darker around the stars of the cluster than in the surrounding area, and that is probably all of the nebula that you will see.

In Canis Major, the companion to Sirius should make an interesting target for those with 8-inch or larger telescopes. It is presently at a position angle 48° west of north and at a separation of about 7½ arc seconds. This is one of the few times one can see the "pup", since the 8th magnitude white dwarf is now closing in on Sirius.

In Puppis, look about 5 degrees south of Alpha Monocerotis for M46, a small but interesting cluster of stars. Those with 6-inch telescopes should have no trouble in finding NGC 2438, a small ring-type planetary nebula in the northern half of M46. It appears as a somewhat fainter version of the Ring Nebula in Lyra, although it is slightly smaller and more circular than its famous counterpart. A bit west of M46 is another cluster, M47, which is more irregular, but has brighter stars than does M46. REMEMBER THAT JUPITER AND MARS COME TO OPPOSITION ON FEBRUARY 24TH AND 25TH RESPECTIVELY. MARS WILL BE HIGH IN THE SKY, AND ABOUT 3 DEGREES NORTH OF JUPITER. THE MARTIAN DISC WILL BE ABOUT 13 ARC SECONDS IN DIAMETER AT MAXIMUM. --David Knisely

COMA IN NEWTONIAN TELESCOPES, Part 1

An Article
By LARRY STEPP

The optical aberration which has the greatest effect in degrading the image of a well made Newtonian telescope is coma. This is noticeable at the edge of the visual field as an elongation of the star images into teardrop-shaped blurs of light. The name "coma" comes from the comet-like appearance of the blur.

A parabolic telescope mirror reflects light coming from a star on the optical axis to form a single point image in the center of the field of view. Light rays coming from a star which is off the optical axis form an image that is off center in the field of view, and the image is no longer a single point, but is shaped like a teardrop 1½ times as long as it is wide. A continuous image such as an image of the moon or a nebula will suffer from the same effect, causing a lack of resolution and a reduction of contrast at the edges of the field of view.

For this reason, anyone concerned about the quality of the image produced by a Newtonian telescope needs to consider the extent of the effect of coma, that is, the size of the comatic image produced. Most books written for amateur astronomers do not deal directly with the size of the comatic image, but talk about the "coma free field."

While admitting the definition is subjective, these books generally will telll you that coma increases directly with increasing distance of the image off axis, and inversely as the square of the focal ratio of the telescope. That is,

$$s \propto r/f^2$$

where s is the length of the comatic image, r is the distance of the image from the center of the field of view, and f is the focal ratio of the telescope. It is then stated that the "coma free field" of an f/5 telescope is about 1 inch in diameter, and telescopes of other focal ratios have coma free fields which vary proportionately. The second column of Table 1 gives the diameter of the "coma free field" figured in this manner for telescopes of different focal ratios.

TABLE #1		
Focal Ratio	"Coma Free Field" (inches)	Image Size ½" Off Axis (000ths of in.)
4	0.64	5.9
5	1.00	3.8
6	1.44	2.6
7	1.96	1.9
8	2.56	1.5
10	4.00	0.9
12	5.77	0.7

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January 15, 1980

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COMA IN NEWTONIAN TELESCOPES
(Continued from Page 3)

The actual formula for calculating the size of the comatic image in a Newtonian telescope (accurate for images close to the axis) is:

$$s = (3/16)r/f^2$$

The units of length for r are the units in which s is expressed, if r is in inches then s is in inches. The third column of Table 1 gives the linear size of the comatic image calculated for a star at the edge of a 1-inch field at the focal plane.

Notice that the diameter of the mirror does not appear in the formula. The size of the comatic image of a star in the Mount Wilson 100 inch f/5 telescope 1/2 inch off axis is the same size as the image 1/2 inch off axis in an amateur's 6-inch f/5! What does vary is the angular size of the image. Table #2 lists the angular size of the comatic image of a star at the edge of a 1-inch diameter field for different telescopes.

Now, let's explore the idea of a "coma free field." Once an acceptable size for s is assumed, the diameter of the "coma free field" d (d = 2r) is fixed for a given focal ratio--the comatic image becomes larger than acceptable outside a field of diameter d. The idea that an f/5 telescope has a coma free field of 1 inch diameter is now seen to mean the "acceptable" size of the comatic image is 0.00375 inch. This idea of a coma free field comes from the limiting graininess of photographic plates in use half a century ago. Modern

TABLE #2 ANGULAR SIZE OF IMAGE ½-INCH OFF AXIS (Arc Sec.)					
Focal Ratio	Primary Mirror Diameter				
	4¼	6	8	10	12½
4	71.	50.	38.	30.	24.
5	36.	26.	19.	15.	12.
6	21.	15.	11.	9.0	7.2
7	13.	9.4	7.0	5.6	4.5
8	8.9	6.3	4.7	3.8	3.0
10	4.5	3.2	2.4	1.9	1.5
12	2.6	1.9	1.4	1.1	0.9

For Discussion: A Stab At The Astronomy Day Prize?

Edmund Scientific, Barrington, New Jersey, has inaugurated an annual astronomy award. The award was announced by Stephen R. Lett, Vice President for Marketing. Lett explained that the award will be for groups (not individuals), and that all organized astronomical societies in the United States and Canada are eligible to enter.

Besides a suitably engraved plaque, a $500.00 cash award or a $750 Edmund gift certificate will be presented to the winning organization.

Judging will be based on the diversification of a program especially designed by each society for National Astronomy Day (April 26 this year). Independent judges (all astronomers) will consider the size of the group's membership in making their decision. Edmund's First Annual Astronomy Award will be presented during the Astronomical League's annual meeting (July 3-6) at Dallas, Texas.

Entries must be postmarked on or before May 20, 1980.

We will be discussing whether the Prairie Astronomy Club should make an effort to win this financially worthwhile and prestigious award, at our next club meeting.

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"The Telescope" Gets a Name

Balloting at the December club meeting produced a name for the long-nameless Club 12½-inch telescope...

and her name is PAT (Prairie Astronomy Telescope).

PAT's name was submitted by Trixie Schmidt, who, for her efforts, won a copy of T. W. Webb's CELESTIAL OBJECTS FOR COMMON TELESCOPES, VOLUME I: THE SOLAR SYSTEM.

PAT, by the way, complete with her newly-refurbished mirror, stands ready to serve club members on a reservation-type basis. Check with Club Vice President John Lammers about making arrangements for use of the scope--er, PAT. If you can't get ahold of John, call Earl Moser.

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Handbooks And Atlases To Go

A few Observer's Handbooks are left, now that we have received our complete allottment of 18 from the Royal Astronomical Society of Canada. Club members who signed the list will have first crack at the remaining books at the start of the January meeting. Any unclaimed copies after that will be sold to anyone interested. The price is $4.00.

Ron Veys has received shipment of the ATLAS OF THE HEAVENS books ordered for Messier Group members. Please get yours at the January meeting if you ordered one.
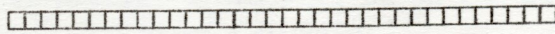
A REMINDER: PRAIRIE ASTRONOMY CLUB DUES WERE RAISED EFFECTIVE JANUARY 1. REGULAR MEMBERSHIP NOW COSTS $14.00 PER YEAR, FAMILY MEMBERSHIP IS $16.00 AND NEWSLETTER SUBSCRIPTIONS ARE NOW $5.00.

COMA IN NEWTONIAN TELESCOPES
Part 1--Continued from P.6

films make this a somewhat outdated value for an acceptable linear image size, perhaps a factor of 4 too large. To impose a more modern linear standard, the values in column 2 of Table 1 can be divided by 4 to give a photographically defined coma free field.

We have examined the idea of acceptable limits to the size of the comatic image based on a photographic standard. In the next part of this article, we will develop a diffraction limited standard, and an observer limited standard.

(PART 2 OF THIS SERIES WILL APPEAR IN NEXT MONTH'S ISSUE)

JANUARY CLUB MEETING
(--Continued From Page 1)

In other words, Steve has discovered this nondescript little shoppe in Colorado Springs that has come up with a super telescope mount.

☐Rick Johnson will tell us about Larry Stepp's superb focusser, which is now on the market and, we understand, being advertised.

☐Discussion on Astronomy Day prize by Edmund (see article on page 7 in this issue).

And, we'll know whether Small Tyke Veys has arrived by the presence or absence of father of same. This meeting could be a cliffhanger!

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