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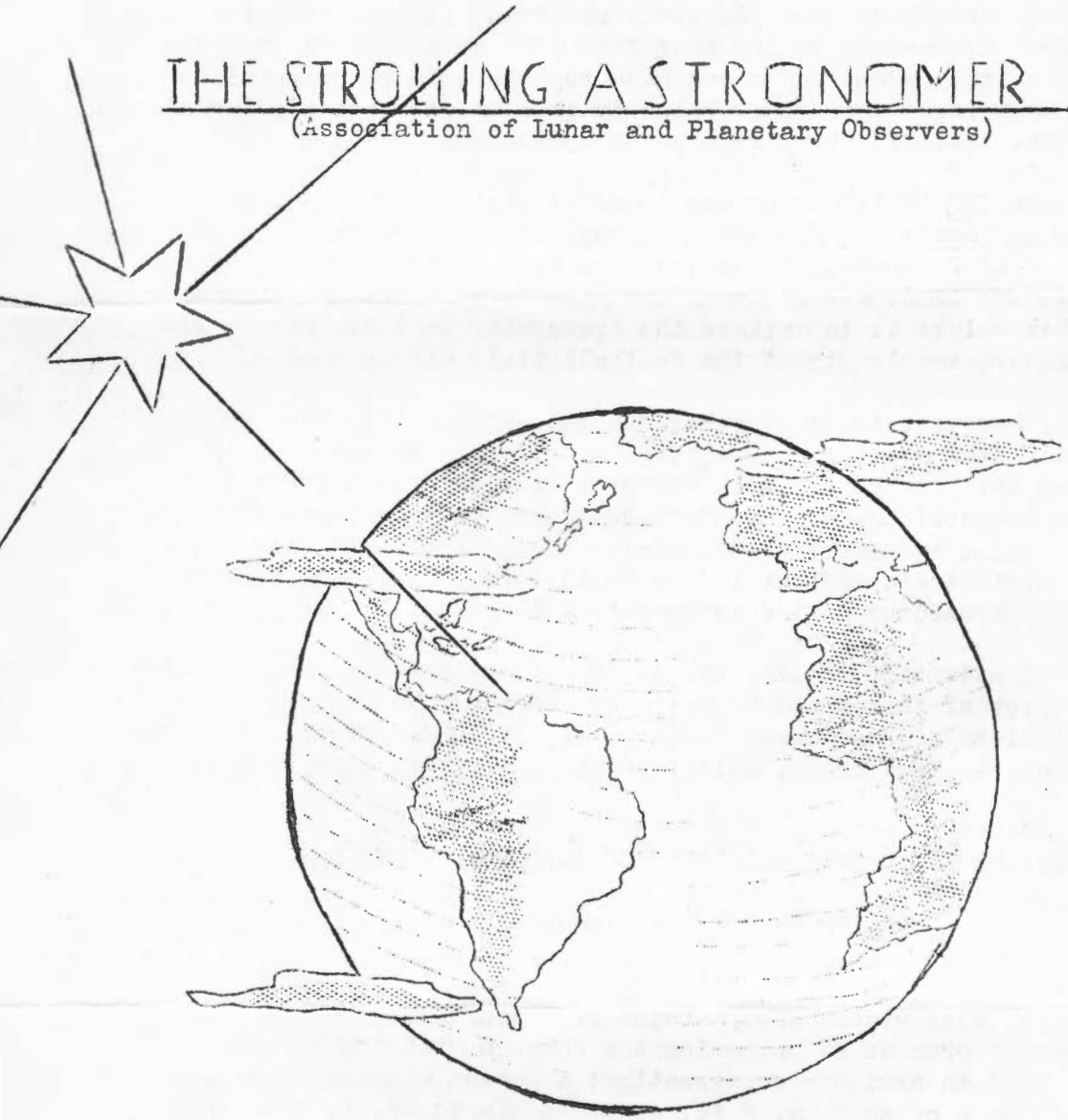
(Association of Lunar and Planetary Observers)



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SEASON'S GREETINGS

The Strolling Astronomer wishes all of its readers a very merry Christmas and a most happy New Year. We hope that 1949 will bring to them larger and better telescopes, clearer skies, and excellent seeing.

Judging by reports we have received, amateurs in this country did more really valuable lunar and planetary observing in 1948 than for many years. We look forward to seeing this fine work continued in the year to come. Many truly excellent views have been reported; observations that show such things as ten dark belts on Jupiter or Cassini's Division in front of the ball of Saturn require no apologies.

It is time for active observers to order their 1949 volume of The American Ephemeris and Nautical Almanac. It can be obtained from the Superintendent of Documents, Washington 25, D. C. The price (clothbound) is $3.25. To try to do useful lunar and planetary observing without tables in this volume is to imitate the fraternity initiate who is required to measure the length of the football field with a needle.

Perhaps, however, the coming holiday season is a time when we should relax a little from ordinary pursuits. Our readers may accordingly find the following article by Mr. C. P. Richards refreshingly different from most of what we publish. Many readers expressed their enjoyment of Mr. Richards' charming and informal discussion of the Christmas Star a year ago. Our contributor's address is 530 North 19th St., Salem, Oregon. He is National Treasurer of the Astronomical League.

We invite attention to the enclosed sheet accompanying Mr. Richards' article. Copies of this sheet were kindly and generously supplied by the Geological Society of the Oregon Country, of Portland, Oregon. We especially thank Mr. O. E. Stanley, Editor of The Geological News-Letter.

AN AID TO THE VISUALIZATION OF ASTRONOMICAL VALUES

by Carl Price Richards

One of the most widely used methods of teaching is by means of comparisons--the process of comparing the unknown with the known. It is extensively used in ordinary conversation; a person wishing to tell another what kind of man a certain Mr. X is, compares him to Mr. Y, with whom both are acquainted, possibly adding some qualification such as being taller or heavier. It is used constantly in such phrases as "quick as lightning", "eyes like an eagle's" and "as white as snow". Frequently the comparison is a gross exaggeration, but, nevertheless, serves the purpose. When endeavoring to convey conceptions of scientific phenomena, analogies are often essential. One recalls the admonition at the beginning of the elementary text book on electricity to help the student to visualize the nature of an electric current--"imagine water flowing through a pipe". That analogy, of course, needed very extensive qualifications, but served as a basic idea upon which to build the true conception.

One might also cite biblical authority for teaching by comparison. There it is stated that One who was the Prince of Teachers "spake in parables". To convey conceptions of abstract ideas He constantly used comparisons, such as "the kingdom of heaven is like unto - - -", always selecting that which was familiar to His audience for a symbol of the ideas He was teaching.

In the astronomical field analogies of various kinds are extensively used to enable the serious student, as well as the general public, to grasp as nearly as possible a true conception of dimensions and distances encountered in the realm of the stars. The most common of these is the comparison represented by the mental picture of "an express train travelling at sixty miles an hour continuously day and night" from the earth to some planet or star, telling how many years it would take to reach its destination. In recent times that picture has been modernized by substituting an airplane at 300 miles an hour in place of the train at a mere 60 and, accordingly, is probably more realistic to the present air-minded generation. In Herschel's day, presumably, the comparison was to the stage coach at eight miles an hour. Hence, at any rate, we advance with the times in such things, though it is probably true that the conception conveyed by each analogy was, respectively, equally clear to the people of each period.

Another frequently used analogy is that of the scale model. This usually takes some such form as comparing the sun to a large pumpkin at the corner of Broadway and Main; then the earth would be the size of a cherry seed a block away; Jupiter would be like an orange a few blocks further on; while Sirius would be represented by a big boulder on top of yonder hill so many miles from town. Other schemes might be cited; all have more or less merit and one or another of them, doubtless, has served as the sole mental picture of astronomical distances to many individuals throughout their lives.

A somewhat more technical method, which encompasses the whole gamut of physics from electrons to universes, is shown in the accompanying table. To appreciate it one needs an arithmetical sense; but, given that, it carries with it a conception which can be very helpful in visualizing the vastness of astronomical dimensions and the minuteness of physical entities. The basic idea is that every line represents a multiple or sub-multiple of the same unit---the mile. Unfortunately, the use of that non-metric unit has necessitated "slipping a cog" in one or two of the comparative figures, such as 50 feet, which is not exactly one hundredth of a mile. It is close enough, however, and does not affect the general purpose of the table, which is to assist one in making mental comparisons.

It should be kept in mind that the figures represent lineal values and that each line indicates 100 times the value of the line immediately below it. And it should also be realized that in square area, each line is 10,000 times the one below, and that the cubic space represented is a million times that indicated by the succeeding line.

For instance, take the .01 mile line (which for convenience, as stated above, has been compared to 50 feet). This lineal value is 100 times the

one below it called .0001 mile, or six inches. It is obvious that there are 10,000 6-inch squares in a 50 ft. square, also that there are 1 million 6-inch cubes in a 50 ft. cube.

Now, to clinch the conception, pick out some four-story building down town, which has a 50 ft. frontage, preferably at a corner, and compare it with a 6-inch cardboard box which approximates a cube. The relative volumes are as a million is to one, the same as indicated in this table by any one line relative to the line next to it. A good grasp and visualization of this relationship will help greatly to a comprehensive appreciation of the proportions of many astronomical values, typical examples of which are cited opposite some of the lines. Thus, the earth-sun radius of 93 million miles typifies the 100 million shown on the fourth line above the unit mile; and the 10 billion miles of the fifth line above the unit affords a comfortable margin over the actual distance across the solar system, the relation being roughly one to a hundred.

Similarly, where a volumetric conception is desired, as with the local cluster and the galaxy, which appear on adjacent lines, it is indeed impressive to realize that their spacial relation is one of the same order as that of the cardboard box to the four-story building, or one to a million.

The derivation of what might be termed the astronomical yard-stick, the light-year, is given below the table and several of the higher mileage figures are compared with light-year values. Another frequently used yard-stick is also approximately indicated; the earth-sun radius, often called the astronomical unit, and usually taken as 92,900,000 miles, is closely approached by the 100 million line. Hence the lines above it indicate successive hundred multiples of such a unit.

Conversely, with the fractional values of the mile as one goes down the table, each line represents one hundredth the linear value of the one above. Thus one quickly descends into the diminutive of the physical world.

Regarding the table as a whole, it goes from the ultra-big to the ultra-small; from the super-telescopic to the sub-microscopic. The transition is by uniform steps, each of 100 linear, 10,000 superficial, and 1,000,000 volumetric units greater or smaller than the adjacent one. It might be that it was a table like this which that anonymous wag had in mind when he perpetrated that delightful doggerel which runs somewhat as follows:-

> The big fleas have little fleas — And the great fleas in their turn
> Upon their backs to bite 'em; — Have greater fleas to go on;
> Little fleas have lesser fleas, — Greater still have greater still,
> And so ad infinitum. — And then, so on and so on.

The lower portion of the table portrays the field of the physicist, and the upper part seeks to cover the realm of the astro-physicist. The possibility of unlimited extension of this table below its lowest fractions and beyond its upper limits would seem to point to the truth of those

cynical definitions which described, first, the physicist as "one who is constantly endeavoring to find out more and more about less and less, till, ultimately, he expects to know everything about nothing."

Then, in contrast, there is pictured the astro-physicist as "a scientist who realizes that, relatively, he knows less and less as his horizon extends more and more, till ultimately, he fears, he will know nothing about everything."

That, of course, is a case of reductio ad absurdum, but, can one wonder at the conclusion when it is pointed out that the anagram of "ASTRONOMERS" is "NO MORE STARS"!

A FLASH UPON THE MOON

Many of our readers probably saw the note in Journal of the Royal Astronomical Society of Canada, Volume 42, pg. 194, 1948 (July-August) entitled "An Unusual Observation of the Moon." It is described therein how Mr. A. J. Woodward, 1081 Dufferin St., Toronto 4, Ontario, Canada, noticed "a small bright flash" on the earthlit part of the moon. The time of the observation was about 9:40 P. M., E. D. S. T., on August 8, 1948. The flash appeared bluish white, then grayish yellow, and lasted about three seconds. Mr. Woodward remarks: "This could have been a meteorite in our own atmosphere some 75 or 100 miles away; but it had the appearance of an object striking the moon's surface." The observer was using a 3-inch refractor at 50X. The age of the moon was four days.

Mr. David P. Barcroft of Madera, Calif., was much interested in this phenomenon and promptly corresponded with Mr. Woodward. Thanks to Barcroft's action and Woodward's replies, we are able to give here some additional information.

It appears that the observer was testing his telescope after having made some adjustments and was about to quit looking when the flash appeared. It arrested his attention as "a bright bluish white sparkle (like bright sparkle of frost on the ground)." The moon was 30 degrees above the horizon, and the sky was very clear. The object resembled the star Procyon in brightness and apparent size; one thus has a stellar magnitude of zero or plus one.

The position of the flash has been indicated by Mr. Woodward on a chart of the moon. Measurements give approximately: lunar longitude 30°E, lunar latitude 10° N. This position is near the craterlet Milichius, about midway between Copernicus and Kepler. However, the location must be very uncertain at best; it is not easy to pin-point positions on the earthlit hemisphere as a rule, for reference-points are lacking. Now if what Woodward witnessed was the impact of a huge meteorite on the lunar surface, as he suspected, one may wonder whether one could hope to see, and perhaps even to photograph, the crater (near Milichius?) resulting from the impact. The editor confesses that he thinks it just about impossible to establish that such a crater is a new lunar formation. The new crater simply could never be differentiated

from among the hosts of pre-existing tiny lunar craters. Let us take the very favorable case that the impact-crater is the same size as Meteor Crater in Arizona. Its diameter of 4,000 feet will subtend only 0".7 when the moon is closest. Unless it is brighter or darker than its environs, its mere visibility will demand low lighting and good conditions with ordinary apertures. The experienced selenologist will realize that it is impossible to prove the newness of so inconspicuous an object--unless perhaps in a few well-studied regions like Plato and Ptolemey.

The speck showed a slight motion from lunar north to lunar south, as Woodward remembers it. The path-length was "short." A peculiar circumstance is that there were apparently two terminal bursts not quite in the same position--the brighter and earlier one, bluish white, the dimmer and later, grayish yellow. The differing positions confirm that the speck moved.

It would be a delightful surprise to learn that someone besides Mr. Woodward observed this flash on August 8. The awful truth, however, probably is that such duplicate observations will be obtained only through careful advance planning plus long hours at the eyepiece.

The editor considers that we have here an observation of a seventeenth moving lunar speck to add to the 16 mentioned in a recent summary (The Strolling Astronomer, Volume 2, No. 10, pgs. 4-5, 1948). Woodward's object in its general behavior resembles these 16 specks. Certainly the differences, or the individual peculiarities, do not exceed what we would find in selecting at random 17 bright terrestrial meteors. It is also significant that our Canadian colleague, like some of the other observers involved, made this observation objectively and without preconceived ideas of its interpretation. And so, if we may be so rash as to conclude on a very bold note: in the years 1941-8 members of the A. L. P. O. have witnessed 17 meteors luminous in the atmosphere of the moon.

COMET 1948 L

What has been advertised as "the best comet since Halley's" was obviously intended for southern hemisphere observers! Presumably S. C. Venter in Pretoria, South Africa, has had some fine views. In middle northern latitudes the comet rose little before the sun when at its best in early November. Perhaps others shared the experience of E. J. Reese in Uniontown, Penna., who was unable to find the comet at all on November 11, although the sky was unusually clear. On the same morning E. E. Hare with the unaided eye found the tail to be eight degrees long upon a brightening dawn sky. Trees blocked a telescopic view for him and doubtless for others. On November 12 E. L. Forsyth of Fallbrook, California, observed the comet at $12^h\ 30^m$, Universal Time, in a clear sky, perhaps with a 6-inch reflector. He remarks: "Star-like head. Same size as Venus in telescope [angular diameter Venus 14"] on November 12 . Magnitude about 3. Has a long straight tail over 10 degrees long."

R. C. Maag at Lawrence, Kansas, submits the following summary of his views:

Date	Universal Time	Stellar Magnitude	Coma	Length of Tail
1948, November 10	$11^h\ 35^m$	2		20^o
November 12	11 30	2.5		18-20
November 13	11 27	2.5-3.0		18-20
November 14	11 23	2.5-3.0		16-18

T. Cragg of Los Angeles, California, has sent in a fine report, illustrated with drawings of the comet. A summary similar to Maag's would be:

Date	Universal Time	Stellar Magnitude	Coma	Length of Tail
1948, November 10	$13^h\ 30^m$	2.5-3.0		4^o-5^o
November 12	13 25	2.7-3.2		8-9
November 13	13 55	2.75-3.0		14
November 14	13 0	2.6*		14

*Step-estimate: Eta U. Ma. 3 Comet 1 Beta Corvi. Mr. Cragg used a 6-inch reflector at 45X on three dates and a 4-inch richest-field at 12X on November 14. He was in Los Angeles on November 10 and 12 and near or at Mount Wilson Observatory on November 13 and 14. The greater observed length of tail on the later dates is doubtless due to the lack of city lights and haze.

On November 10 Cragg noted two condensations in the tail immediately behind the head. On November 12 these were considerably farther from the head; they were moving away from it at a rate of three or four degrees per day. Computing the linear velocity requires knowledge of the distance of the comet and of the direction of the tail in space, information probably already possessed by some professional astronomers. Mr. Cragg, who is an ardent solar observer, is unable to correlate these condensations with any unusual or intense solar activity.

Cragg further writes that on November 14 the tail bent somewhat at its extreme end. Photographs, he reports, showed two streamers continuing straight beyond the bend so that the comet had a triple tail. He also noted visually on this date that the tail between the bend and the head was brighter toward its edges than at its center, an aspect suspected on November 13. The stellar nucleus of the comet was prominent on all four dates.

Those wishing to read more about this comet would enjoy Mailing 100 of Professor G. B. Blair's informative Astronomical Information Sheets. The editor's address is 1059 Sierra St., Reno, Nevada.

AUTUMN OBSERVATIONS

Readers are reminded that all dates and times in The Strolling Astronomer are by Universal Time, unless the contrary is expressly stated. Universal Time is the local mean solar time at Greenwich.

The evening sky will lack planets in December. Saturn, now in Leo, will be well placed after midnight; and Venus is still observable in the morning twilight, though now getting closer to the sun's place in the sky.

Our leading Venus-observer for the last month is T. Cragg, who obtained seven drawings with a 6-inch reflector from November 2 to November 12. The detail frequently took the form of straight dusky bands, or belts, perpendicular to the line joining the cusps. It is pertinent in this connection that E. Pfannenschmidt wrote on October 8: "Some of our Munich observers have noticed belt-like objects on Venus this apparition..." Readers will also recall that F. E. Ross in 1927 photographed such Venusian belts with the Mount Wilson 60-inch reflector. If these belts are to be interpreted as parallel to the equator of Venus--and no other interpretation appears reasonable--then the poles of rotation must lie near the cusps. The differing positions of two white areas upon the terminator on November 5 and 6 suggest to Cragg that the period of rotation is about 24 days. He stresses that this value is a tentative one. The editor perhaps too pessimistically wonders whether the presumably atmospheric features at the visible surface of Venus can shed any light on the rotation of the underlying solid surface. However, knowledge of the motions of Venusian clouds would be very worthwhile in itself.

Cragg's drawings indicate that the markings on Venus are extremely and rapidly variable. One might here mention the conclusion of the Lowell Observatory astronomers after years of photographing the planet: the detail changes too rapidly to permit a determination of the rotation. On November 11 Cragg found both cusp-caps small and inconspicuous. On November 12, though, both were good-sized and notable, the south one showing a bright protrusion toward the equator (assuming cusps near poles).

We have received observations of Saturn from E. K. White (7-inch reflector), T. Cragg (6-inch reflector), E. J. Reese (6-inch reflector), E. E. Hare (7-inch reflector), and R. Missert (6-inch reflector). On the ball the most conspicuous belt is still the South Equatorial Belt, though Cragg opines that it is fainter than during 1947-8 and White calls it "rather faint." This belt has looked single to White and Hare, and usually to Cragg as well, showing that its components are probably harder to separate than in 1947-8. Reese found it double in a splendid view on November 18 and observed the north component to be the darker, and Hare on November 11 confirmingly called the belt darkest at its north edge.

Reese and Cragg have occasionally seen small humps upon the edges of the South Equatorial Belt, chiefly upon the north edge. Hare found "some longitudinal variations in intensity" in this belt. The second most conspicuous belt is the

North Temperate Belt, which lies about 1/4 of the way from the shadow of Ring A to the north limb. This belt is narrow but very dark. At $13^h\ 5^m$ on November 5 Cragg drew a bulge on the southern side of the N. T. B. perhaps 40 degrees short of the central meridian. This bulge had a darker center. The South Polar Band is now inconspicuous, though broad and fairly dark. It lies very close to the south limb, and its visibility further suffers from lack of contrast with the dusky South Polar Shading. Cragg and Reese have seen a delicate North North Temperate Belt about 3/4 of the way from the shadow of Ring A to the north limb. Hare and Reese have recorded a thin and difficult Equatorial Band in the bright Equatorial Zone. Hare on November 11 compared it to "a pale string of beads." Reese alone has reported a South Temperate Belt; very thin, it was "glimpsed occasionally" a little south of the S. E. B. on November 18.

The Equatorial Zone, the space between the projected rings and the S. E. B., remains the brightest part of the ball and in fact of the whole Saturnian System. The North Tropical Zone, the region between the rings and the N. T. B., is the second brightest part of the ball. White on November 1 thought it fully as bright as the E. Z. Reese on November 18 drew a rather narrow bright zone in middle southern latitudes. This zone appears on many of his fine drawings from early 1946 to the present. On 11 of his 1947-8 drawings Reese measured its center to lie at latitude 48 south. Cragg's drawings of November 10, 11 and 12 appear to confirm this zone. On November 10 and 11 he shows it partly composed of separate bright spots, but he has sometimes drawn Jovian zones in the same way. On November 6 Cragg drew a tiny white south polar cap.

Cragg has had considerable success in seeing markings other than belts and zones on the ball. He has drawn a number of bright areas south of the S. E. B., often on the limbs but sometimes more nearly centrally placed. A white area on the east limb (right in simple inverted view) at $13^h\ 15^m$ on November 6 has a puzzling dark border fully as dark as the two northern belts. At $13^h\ 15^m$ on November 9 he saw a dark mark near latitude 45° south and about 20 degrees short of the C. M. One is reminded of R. R. La Pelle's spot of February 19, 1948 (The Strolling Astronomer, Volume 2, No 5, pg. 5, 1948). At $13^h\ 10^m$ on November 10 Cragg drew a dark spot in the E. Z. at the south edge of the projected rings and perhaps 35 degrees short of the C. M. At $13^h\ 15^m$ on November 12 a bright spot at the same latitude about 40 degrees short of the C. M. was drawn. It was extremely bright, being observed right through Ring C. with little or no discernible loss of luster Now it is regrettably true that we shall probably be able to establish nothing about the rotation-rates of any of these objects that Mr. Cragg has so creditably recorded. Only additional data can help. We again urge our readers to record central meridian transits of all recognizable Saturnian spots. Two transits of the same spot will at least give an approximate rotation-period and may hence be worth more than a dozen drawings. A little extra effort here may yield high rewards.

Cassini's Division has been visible this autumn for dozens of degrees near each ansa but not in front of the ball. White has twice observed the Third Division, and othere may have depicted it imperfectly as a shading near the inner edge of Ring B. When T. Cragg looked through the Palomar

200-inch last June, this division looked like a space-gap(which Cassini's is) to him. Encke's Division has been invisible, presumably because of the closing of the rings since last apparition. Ring B remains dimmer than the E. Z., though its outer edge is not much dimmer.

We finally come to the Ring C projection upon the ball. To White it appears rather faint, and he estimates its width at the central meridian as 1/2 that of Cassini's at the ansae. It is naturally wider at the limbs. Reese on November 18 considered it not more than 3/10 as wide as the shadow of the rings and elsewhere describes it as "an exceedingly fine dark line outlining the inner edge of Ring B." Cragg finds the C projection difficult and is usually unable to see it. Hare on November 11 observed this projection at the C. M. to be 1/2 as wide as the shadow of the rings, but a gray fringe on both sides increased its breadth to 3/4 that of the shadow. Hare interprets the northern fringe as a dusky inner edge to Ring B and the southern fringe as Ring C seen unaugmented by its own shadow. (The shadow of C lies north of C itself at the present positions of the sun, the earth, and Saturn.) Only White has reported being able to see Ring C off the ball; it extends 4/10 of the way from the inner edge of Ring B to the globe, he says. Our readers might like to compare the preceding observations of Ring C with those we reported a year ago.

On pages 5 and 6 of our November issue we spoke of dark bands on the walls of the lunar crater Proclus and of the possibility that they are a recent development. F. R. Vaughn writes that Mount Wilson lunar photographs taken in 1938 show these bands under a magnifier. The case for a change in Proclus is thus weakened.

On pg. 4 of our Novembember issue we described how Heidelberg, Germany, observers on September 19 discovered in the North Equatorial Belt of Jupiter a white gap 10 degrees long centered at longitude (II) 273°. We can unfortunately add little to this report. Reese with his 6-inch reflector on September 11 observed the center of "a thin, light section of the N. E. B." to lie at 279° (II). Does one here have a precursor of the gap? On September 23 Reese stopped observing at C. M. (II) 259° and saw no gap in the N. E. B. However, a drawing of Jupiter by Meyer at Stuttgart, Germany, with a 5-inch telescope on September 26 at C. M. (II) 242° shows a gap distinctly near the expected position. J. C. Bartlett with his 3.5-inch reflector in Baltimore, Maryland, never observed the gap here discussed but saw rifts in the N. E. B. on several dates during the apparition.

Reese reports longitudes (II) of the Red Spot Hollow from September 13 to November 7 as follows: Preceding end 222° (2 transits), center 234° (3 transits), and following end 247° (4 transits). It appears that the very slow motion in increasing longitude continued up to the end of the apparition. Reese found the Hollow rather bright in September-November, possibly the brightest of the whole apparition. Its color was either "yellow-ochre" or "yellow-white." Meyer drew the Hollow distinctly on September 26, showing a dark band bounding its following shoulder. He also drew a diagonal rift (in a N. prec.-S. fol. direction) across the South Equatorial Belt at the N. prec. corner of the Hollow. On August 11

Meyer with an 8-inch telescope at 380X drew the South Tropical Zone following the Hollow to be much disturbed and crossed by several dark columns. The Hollow was observed by J. C. Bartlett with a 3.5-inch reflector at 100X on November 14 near C. M. (II) 201°. He saw it quite clearly and found it "white and much brighter than any other marking save the Equatorial Zone." At C. M. (II) 168° on November 21 Bartlett found the Hollow rather dull so far from the C. M., indeed barely brighter than the South Tropical and South Temperate Zones.

In October the plainest Jovian belts were still the North Equatorial Belt and the South Equatorial Belt (North?). Reese obtained six C. M. transits of a brilliant white bay in the north edge of the N. E. B. ; it moved from 299° (II) on July 25 to 277° on September 28. The drift is ordinary for the latitudinal position. Reese obtained his last view of Hare's enclosed white cloud in the South Temperate Belt on September 12. It was then about 16 degrees long, and its center was at 57° (II). Hare got a good view of Jupiter on October 18 at C. M. (II) 154°. He reports : "The former South Equatorial Belt South was rather faint, but it was still sinuous and was partially in contact with a South Equatorial Belt now double (or shall we say triple?)"

And now to our December observations. If sub-freezing temperatures are annoying, there will surely be no mosquitoes!

S U B S C R I P T I O N R A T E S

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S T A F F

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