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Latimer James Wilson

Foremost among the real veterans of amateur astronomy and telescope making in the United States must be listed the name Latimer J .Wilson. Born nearly 60 years ago, Latimer Wilson heard many times during his youth, from an appreciative mother, the beauties of the firmament, as she had seen them frequently through the telescope of the great Barnard, resident of Nashville, Ky., where Latimer was born. This basis of interest served as a foundation upon which he erected an astronomical career which is at once the joy and inspiration of many present day enthusiasts. In 1908, when Langley's "New Asstronomy" became available to him, it reawakened his early interest in astronomy to the extent that he "fashioned for himself a glass" from a single 4-inch lens, whose performance Latimer describes succintly as giving "pretty colors." This experience merely served to whet his astronomical appetite, and anticipating a rare occurrence, he completed in 1910 his first real telescope, of 10-inch aperture, reflecting type. This served him well for a year, during which time he photographed Halley's comet, and made his first photographs of the moon. Without a background of photographic experience of any sort, Wilson learned the hard way, but one guaranteed to produce a permanent impression. Many gallons of developer were poured down the drain; many photographic plates were numbered serially, and the notation on the envelope read "exposure incorrect" or "focus lacking." However, from each unhappy result, valuable experience was gained which served him, and a host of other amateurs as well, for years to come.

While the writer, then a child of seven, was gazing heavenward and receiving his first permanent impression of a celestial object, Latimer Wilson was taking his first photograph of a comet—Halley's 1910—with a camera strapped to his 10-inch reflector. Next year he decided that a slightly larger telescope would be as large as observing conditions in Nashville warranted—an opinion which he holds to this day—and accordingly he constructed a 12-inch reflector which has served him to the present date, although it did not end his constructional activity. Since that time he has made several other telescopes for particular uses, the latest of which is a 4-inch reflector of long focus for observation of fine planetary detail.

Wilson's activity with the 12-inch telescope was so productive, that Dr. Philip Fox invited him to become a member of the American Astronomical Society; his renown spread to France and attracted the attention of one of the leading astronomers of the day, the late Camille Flammarion, who proposed him for membership in the Societe Astronomique de France, of which he soon became a life member.

During this period of intense astronomical activity, he contributed articles of interest to the famous English magazines, "English Mechanics" and "Knowledge," while in this country his work was published in "Popular Astronomy" to which he still contributes. Shortly after the world war, Wilson became associated with Frederick Leonard in the Society for Practical Astronomy, and the association in meteoric work continues. Today he is regional director of the American Meteor Society, as well as Jupiter, Mars and Saturn Section leader and regional director of the association which sponsors this magazine, the AAAA group. Wilson's activities were not confined to using his telescope, for by correspondence he aided others to construct their own, notably Clyde Tombaugh, who in 1926 was beginning work on a telescope that was to lead him to world prominence a few years later through the discovery of the elusive Pluto.

About the time of this discovery, Lati-

(Continued on page 12)

Weather and the Astronomer

By W. EDWARDS BROWN

Amateur astronomers will be interested to learn that long-range forcasting of atmospheric disturbances, hence periods of good and bad visibility, bears good prospects of becoming something that can be relied upon.

The importance of reliable weather forecasts to farmers, restaurateurs, and those engaged in communications and transportation is, of course, inestimable. Aside from its value as a means of forecasting, an accurate record of actual weather conditions covering a number of years, has proved of considerable value in interpreting otherwise inexplainable fluctuations in such items as telephone and highway traffic. Some evaluation of future changes in these items due to weather abnormalities are entirely feasible.

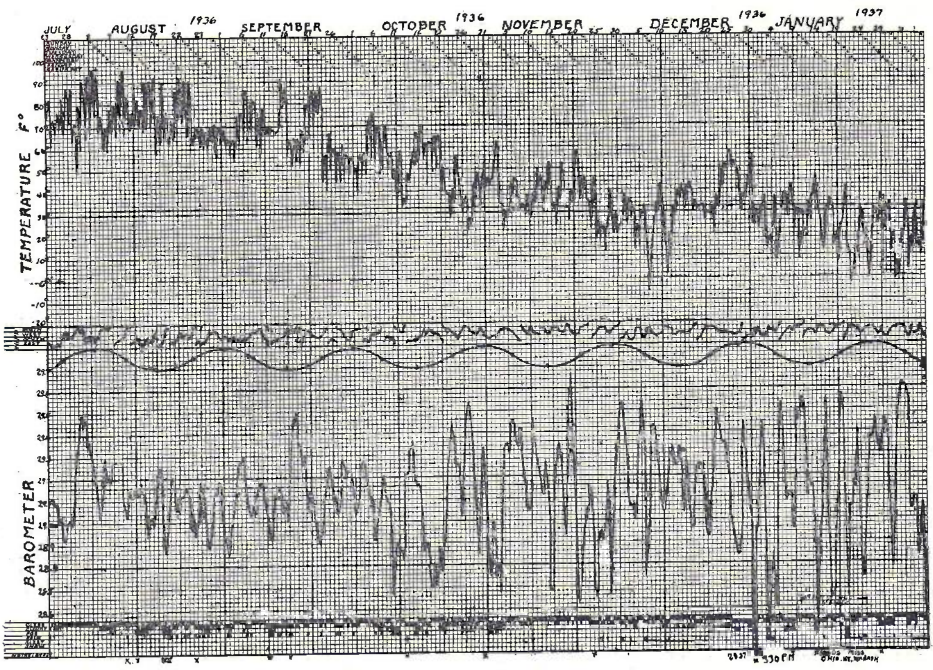
Considering the inadequate immediate knowledge of actual weather conditions over the entire northern hemisphere, so far as the amateur astronomer is concerned, considerable success has been met with the application of plain mathematics to existing conditions in determining what the weather will be like as much as one month hence. This application, however, is based upon experience gained from observation of actual conditions covering a number of years.

Not all of the actual conditions have been thoroughly observed, especially those relating to the continuous changes taking place on the sun. Of the importance of solar activity in relation to changes in our own atmosphere, there is no longer any doubt.

Much knowledge remains to be gleaned from the sun however, before its changes can be translated directly into predictable effects on our own atmosphere.

Oceans, mountains and plains influence the weather in varying degrees according to their arrangement with respect to each other, and according to the amounts of radiation each receives from the sun. The forces that they exert are never in complete balance with each other; consequently there is a constant pushing of the atmosphere to and fro and up and down.

These changes occur slowly and are readily observed and measured. Indeed, there is a sort of leisurely rhythm to be noted from day to day in the changes in barometric pressure, the temperature and the winds. When we plot the barometer readings for a period of a month or two on a single sheet of paper, as shown in the accompanying illustration, we note that the line rises and falls



Author's Continuous Weather Record for Milwaukee, Wisconsin, U. S. A., July 1936,

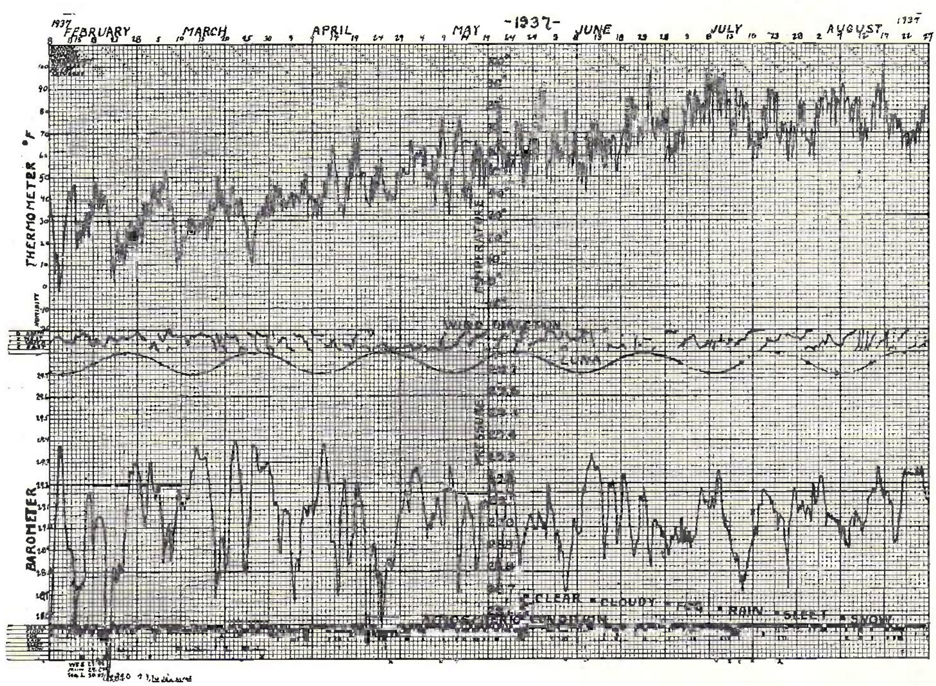
every few days with surprising regularity. When the temperature is plotted on the same graph, it will be noted that the two seem to work in opposition to each other; that is, as the barometric pressure rises the temperature falls. When we add the direction of the wind to our chart we find that as the barometer rises the wind switches toward the northwest and as it falls the wind swings to the south and east. This holds generally true for the central United States. Other localities have characteristics of their own that are readily discernible from the amateur's record of the weather.

It has been found that a record of readings taken morning, noon and night together with any supplementary observations during periods of particular interest has been generally satisfactory. As the record grows, the more apparent are the trends in the rhythmic cycles. One begins to see ahead.

Have you ever heard the old adage, "If it rains on Good Friday it will rain for six weeks more"? It happens that the short barometric cycles during March and April are of approximately of 7 days' duration; consequently, if it storms on a week-end late in March or early April, it is apt to rain or snow on several succeeding Fridays until the barometric cycle falls out of step with the seven day week. Now, since we are prone to judge the weather by what happens over the that prevailed during the middle of each of these weeks. Thus we look back on this particular spring as a rainy one. week-end, we forget the clear weather The amateur weather forecaster can discern from his chart at what time the weather swings into the seven day cycle, and from then on for a month or more, keeping his finger on the pulse, he knows the weather probability days in advance.

A continuous stretch of six or eight months of the barometric curve will reveal not only a host of two to seven day cycles, but a rhythmic rising and falling trend of the curve as a whole. It resembles an irregular picket fence that goes up over a hill and down the other side, occasionally dropping into a deep river valley. The distance between these hill tops in winter may be from one to three months. In summer the distance shortens to about 20 days. In fall and spring the period is nearer 30 days, oftentimes coinciding with the lunar cycle for several months at a time.

Let us refer to the accompanying record of Milwaukee's weather for a period of a year.



to August, 1937 (not official).

On Oct. 10, 1936, it will be noted that with the first splash of freezing weather, the barometer awakes with a start and with ever larger sweeps it spreads its curve over a large arching band that does not settle down again for two or three months. Generally there are two or more of these long cycles during the winter. It will be noted that visibility is usually good as the barometer nears the top of its upward sweeping. Frequent rains or snows may be expected as it approaches the bottom. During May it may be seen that the barometer tires of its violent winter exercise, and settles down to a rather small overall change with still smaller day to day changes apparently giving only short notice of approaching local showers. In summer, a persistent downward trend for several days in the barometric curve with the wind blowing from the nearest ocean is almost certain to bring a general rain. Here at Milwaukee rain usually falls just before the barometer reaches bottom, and continues until a short way up the other side of the curve. We may expect beautifully clear blue skies from then on up to the top of the curve, and part way down the other side which slants off gently like the trailing shoulder of the surf.

In winter the same general sequence is noted, but with lower temperatures. When the long arching pressure curve that usually starts in October reaches its peak in late November, and looks as though it would reach bottom sometime early in January, the last few weeks of the cycle are apt to be unseasonably warm, resulting in the "midwinter thaw."

Following this period of mild foggy weather, the wind begins to blow vigorously from the southeast. As it swings from the southeast to northeast, rain turns to sleet or snow. As the wind veers toward the northwest, the temperature drops rapidly. The curtain of snow and scurrying clouds is drawn aside revealing the limitless depth of a clear blue sky. The worst storms of the winter and the lowest temperatures usually form the milestone of a new barometric cycle. Of course there are the minor, intermediate storm periods with corresponding fluctuations of the barometer, but the beginning and end of these long period cycles provide the highlights of the year's winter weather.

Just what causes these lengthy trends in atmospheric pressure I am not in a position to say. Certainly "tennis weather" in January calls for some explanation. Perhaps the coincidence of the lunar tidal cycle with some other rhythmic force of longer period results in an occasional combined disturbing force that gives extremes of heat and cold.

Astronomers know, of course, that the sun's radiation is anything but cons

A tree ring calendar has been assembled that indicates a marked similarity between periods of drought in southwestern United States and known years of great sun spot activity. A 35 and an 11-year solar storm cycle are fairly well recognized. Perhaps the sun's radiation of heat, light and electrical energy has shorter and somewhat regular periods of intensity that may be comparable to fluctuations in our weather.

Some practical means of coordinating all three, and perhaps other of the sun's radiations, is certainly much needed. It is important that we learn as much as is useful about the location, frequency, intensity and duration of the solar "storms." Is the sun entirely immune to the gravitational attraction of its neighbors, Mercury and Venus?

The radiation from some of the sunspots seems to have a decided "directional effect," those occuring toward the center of the disc having the greatest effect upon the earth's atmosphere. Inequalities in geopraphical distribution of this radiation upon our atmosphere may cause the electrical unbalance coincidental with displays of the aurora borealis.

Changes in atmospheric electrical tension may have some bearing on the release of great masses of cold air from the polar region. It is a well-known fact that as long as a difference in potential exists between two bodies, there is a proportionate attractive force acting to bring them together. And since the difference in potential between the earth's surface and the upper atmosphere may at times be measured in millions of volts, any great disturbance of the electrical potential, as by an auroral discharge, might well produce a measurable change in that attractive force. Now, the intervening air resists this electro-attractive force just as it supports the upper layer of air against the pull of gravity. The combined forces are exerted at the earth's surface as barometric pressure. Changes in the potential of the upper atmosphere resulting from solar radiations would therefore soon increase or decrease the apparent air pressure at the earth's surface.

Whether or not this correlation between solar activity and polar barometric pressure is true remains to be proved. Should tests made in the polar regions confirm this relationship, and should they show the resulting barometric changes to be measurable. the amateur astronomer might be able to time the arrival of pressure waves here from his observations of the sun, allowing, of course, for the length of time required for such waves to travel from the polar region to the observer's location.

This information would, of course, have to be correlated with other conditions prevailing in the observer's immediate locality. It is assumed that he would become readily familiar with local conditions such as would be characteristic of immediate proximity to mountains, flat areas and large bodies of water.

It may be seen from the foregoing that a continuous record of the sun, its heat, light and electrical radiation would be of great value for comparison with contemporary atmospheric data.

It is hoped that observations such as those being made by observers for the Smithsonian Institute may be recorded by amateur astronomers in widely scattered parts of the world so as to insure a sufficiently continuous and reliable basic record.

For the time being it is suggested that some attention be given to practical means for the amateur to measure the sun's various radiations, and to [illegible] a photographic record of the sun's surface as well as to acquire any other data which may form a basis for comparison or projection into the future.

The author will be glad to learn of data already obtained by those interested and will welcome any suggestions as to methods of correlating the material. It is hoped that further results of this study may appear from time to time in this publication. Communications may be addressed to the writer.

2738 N. Prospect Ave.,
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Vulcan

LEWIS L. DOOLITTLE
Director of Godfrey Observatory

How often have we read in various books of the last century of the existence of an intra-Mercurial planet, given the name Vulcan! During the last two centuries many people have reported "seeing" this planet in transit across the face of the sun. Among the ancients of the old school was Democritus who stated that there were certain planets invisible and unknown to the commoner sort of observers of his day. Pythagoras and others said it was a matter of common knowledge that there were "ten fiery circles" instead of seven, as in exoteric doctrine. Among these 10 was the planet Vulcan. Among the published works of Weston on this subject we find the following list of recorded "observations" of transits:

Mar. 27, 1720—Dr. Alischer, Faure, France (O. S.)
Mar. 15, 1721—Dr. Alischer, Faure, France (O. S.)
Mar. 25, 1784—Fritch, Madgeburg, (Bode's Almanac)
Oct. 10, 1802—Fritch, Madgeburg, Germany
Oct. 9, 1819—Stark, of Augsburg
Oct. 11, 1847—Schmidt, Germany
Mar. 12, 1849—Lowe and Sidebotham, England
Jun. 11, 1855—Dr. Ritter, Hanover, Germany
Mar. 26, 1859—M. Lescarbault, France
Feb. 16, 1897—Astronomers at Stuttgart, Germany
Feb. 4, 1898—Astronomers at Weibaden, Germany
June 25, 1907—Captain Isbester, Long. 136° W.

Concerning the observations of Captain Isbester, the following is quoted from Weston (published 1920):

"The British ship Dalgonar, from Hamburg to Portland, Oregon, Captain Isbester master, was in longitude 136° west and latitude 46° north on June 25, 1907. This is about 250 miles off the northern California coast. The weather was clear and sultry, and when the captain took the noon observation for declination with the sextant he noticed a very large spot on the disk of the sun. The spot was of immense size and the captain was much surprised at its general appearance, for it was unlike the commoner sun spots which he had seen almost daily for many years. It had a singular motion and the captain in trying to describe it said 'it looked like an inverted balloon.' It moved with easily noticeable speed and passed off the sun's disk late in the afternoon.

" . . . Now that is just the shape Venus appeared to have at ingress and egress at the transits of June 5, 1761, and June 3, 1769.

" . . . Isbester appears to have concluded that the 'spot was on the sun from noon until late in the afternoon,' say fully four hours, being perhaps longitudinally central near noon. This is the same duration of transit that Lescarbault noted, 4 hours."

With this and considerably more material at hand which is supposed to "prove beyond a doubt" (?) the existence of this hypothetical planet nearer the sun than any yet discovered, it is no wonder that astronomers have tried many times to look for it. Many efforts have been made, particularly during total eclipses of the sun, to photograph possible intra-Mercurial planets, but always with negative results. Special efforts were made in this direction by the Lick Observatory expeditions in 1901, 1905, and 1908, whose photographs, covering a region extending 12° east and west of the sun, show great numbers of stars (506 on the plates of 1908, most of which are too faint to be seen by the unaided eye); however, there is not a single object on the plates which cannot be identified as a known star! Therefore, in 1902 Perrine, then of the Lick Observatory, wrote that if any intra-Mercurial planets exist they must be fainter than 7.7 magnitude, and measure less than 35 miles in diameter, comparable with the smallest of the asteroids (this is not completely in accord with "the spot of immense size" seen by Captain Isbester!)

Further work of Lick astronomers establishes the fact that no intra-Mercurial planet brighter than the photographic magnitude of 9.5 exists within the region of 8.5 degrees of the sun.

Be that as it may, the writer's interest in this subject arose when he met Harry Haskin of Stony Creek, Conn., this past summer and discovered that through his knowledge of mathematics to quite a fair degree he had been asked by a friend, Mrs. Josephine Sheffield of New York City, to compile a daily ephemeris of Vulcan from 1859 to 1937, to be used in astrological (oh, oh!) calculations. Accompanying this request was a copy of L. H. Weston's booklet, "The Intra-Mercurial Planet Vulcan." From material supplied by Mr. Haskin and data owned by the writer, a third source of information was added, a memorandum on Vulcan, by T. R. Hedengren. With this information the present article is being written.

While the majority of astronomers scoff at the mere mention of the existence of Vulcan, there are a very few of the minority who still believe that it *mi* exist. Among the amateurs holding this belief is Mr. Haskin. But first let us look over the elements of the hypothetical planet as given by Weston, combining the heliocentric and geocentric tables:

- Mean siderial time (period—18.58415 days)
- Mean synodic period—19.5804 days
- Annual motion of the nodes—16° 42′ 21″ helioc.; 16° 48′ geoc.
- Descending node June 25, 1907—102° 55′ heliocentric; 2° 23′ Cancer
- Semi-major axis—0.13744
- Mean distance from the sun—12,-753,000 miles
- Max. from the sun at elongation—8° 17′
- Longitude of perihelion (1907)—10° (Newcomb)
- Eccentricity—.019 (Newcomb)
- Mass (Newcomb)—1:37,000,000

The first task undertaken by Mr. Haskin was to secure additional mathematical knowledge necessary for the job—so books on spherical trigonometry, analytical geometry and calculus were used in an endeavor to find the necessary formulae to calculate the required tables. According to the request, Mr. Haskin went under the assumption that the planet did exist in making up the tables, and secured all the material he could supporting this viewpoint; even so, the material secured was not a very great amount.

After gaining some information on figuring the orbit of the planet, Mr. Haskin found a few differences in his calculations as compared to those of Weston. The latter figured the eccentricity to be somewhat less than that which Newcomb had obtained thoretically when he was trying to find some intra-Mercurial planet to account for unknown perturbations of Mercury, but Mr. Haskin found that a figure greater than this "worked out far better," not alone with previous "transits" as given above but also to be in better agreement with the doctrine of combustia. A few other differences resulted but in a much less degree. These are:

- Eccentricity—.103 831 91
- Semi-major axis—.137 342 34
- Inclination to the ecliptic, June, 1937—7° 7′ 27″.14
- Movement of perihelion—18′ 27″ per century
- Elongation, maximum—8° 52′ 10″.4
- Elongation, minimum—7° 11′ 27″.9

The following is quoted from an article by Mr. Haskin concerning his figures:

"The above value of semi-major axis works out even better than that given by Weston with the third law of Kepler, wherein the constant of the solar system is 1333413, the result of squaring the periodic time divided by the cube of the mean distance. This value goes from 133294 for Jupiter to 133422 for Uranus. To obtain the mean for Vulcan, its mean distance would have to be .137308, whereas the value given by Weston gives 133026 for the 'constant.'

"The perihelion movement was figured simply from the formula $3v^2/c^2$ wherein the v = the velocity of the planet and c = that of light. This formula, in brief, is from Einstein's theory of relativity, which in full accounts for most of the perturbations of Mercury which prior to this were about 43″."

These figures of Mr. Haskin are compiled *theoretically* on the assumption that the planet does exist. Therefore the material should be taken as theoretical only.

Continuing these figures, further calculations showed a possible transit of Vulcan in August, but it was supposedly almost on the upper limb of the sun and not to be seen until near sunset; and when the actual day arrived clouds interfered with any possible sight of a transit here in Connecticut. However, another prediction is made for a possible transit on Jan. 14, 1938, at about 11:32 A. M., EST; as a transit of Vulcan is supposed to last about four hours maximum, anyone interested might be on the look-out from 9:00 A. M. to 2:00 P. M. Theoretically, it should be about half way between the center and the northern edge of the sun and last about three and a half hours.

Many other conflicting arguments arise when working on this subject, only a few of which will be mentioned in this article. One law states that any planet within 8½° of the sun becomes combust, burnt up. Vulcan's distance from the sun is supposed to be 8° 17′ according to Weston.

Also, with a body so close to the sun, transits must occur frequently. Why are they not seen? And why has the planet not been seen when it has so often been searched for during periods of total eclipses? Weston tries to explain this by saying that the planet is a thin, flat disk of matter, about the density and toughness of the best vanadium steel. Since the axial rotation would throw its poles nearly at right angles with the ecliptic we can never see the planet at any time because the thin edge is always presented to our view. But occasionally Vulcan captures masses of matter that rush in near the planet, and this material, generally in a cloudy form, appears as a globe surrounding the planet; the great axial velocity of the planet soon throws this cloudy matter out into a thin sheet which finally streams into the sun and is there consumed or lost in the great aggregation of the sun's mass. While the clouds are around Vulcan at the time of the transits, it may be seen, but as the clouds are thrown off in a few days, there may be years together when the planet can not be seen. If it is observed once, it is probable that it can be seen again just 353 days later, but if divested of the cometary clouds before it gets around to the node again, it will remain invisible. In reply to this Mr. Hedengren states:

"I thought Thales of Miletus exploded that 'theory' anno 640 B. C. In our days I really do not know of more than one certain gentlemen in a neighboring city who still holds that the earth is flat. Unless Mr. Weston will have us believe that Vulcan is unique among the planets in this respect."

Unlike the professional stronomer who is restricted to definite boundaries of research work, the amateur may study in what fields he so desires; the entire known universe awaits his gaze and admiration. In this case with Vulcan, he may pursue with diligence a study of a data available on the subject; yet this does not necessarily mean that he believes in its existence. The writer by no means wishes to advance the belief that he considers Vulcan actually to exist; neither will he say definitely without a word of doubt that it cannot exist.

So. Norwalk, Conn.

AMS Meteor Notes

WISCONSIN-NORTHERN ILLINOIS REGION

L. E. ARMFIELD

Many apologies are due the faithful contributors to the meteor observers in this region for this belated acknowledgement of their good work during 1937 in both the Olivier-Hoffmeister program and shower meteor watches As the reports published in these notes between January and May, 1937, were devoted primarily to observations made prior to and including 1936 it will be impossible to publish all observations accumulated during 1937 in this report. It will be necessary, therefore, to include in the columns below the O-H observations only, leaving the shower meteors and radio work until the January report.

OLIVIER-HOFFMEISTER PROGRAM OBSERVATIONS

Observer	Location	Month	Minutes	Meteors
Abrahams	Milwaukee	February	205	10
		April	450	45
		October	270	17
		November	360	13
Diedrich	Milwaukee	December (1936)	60	5
		January	60	4
		July	365	12
		September	60	11

Haertlein, Jr.,	Milwaukee	September	135	51
Karl	Chicago	August	60	6
		September	120	15
Keuziak	Milwaukee	July	185	8
Knott	Milwaukee	August	62	4
Scovel	Chicago	August	120	12
Swensson	Evanston	August	120	7
8 Observers			2632	220

Haertlein, Jr., Karl, Scovel and Swensson are new recruits in the ranks of meteor observers and we wish to extend a sincere welcome to them. While we have called them recruits we must hasten to add that all their reports are as neat and complete as those received from veteran observers. Karl, Scovel, and Swensson are members of the Chicago Amateur Astronomical Association.

Regretfully, we announce the resignation of Miss Mary E. Trimmier as leader of the Chicago Amateur Astronomical Association's meteor section. Miss Trimmier is one of the most accurate meteor observers in the country, a faithful, diligent worker and inspiring leader. We trust sincerely that the time consuming activities in which she is at present engaged will permit her to continue observing meteors even though she is unable to carry on the duties section leadership entails. While we regretfully announced the resignation of Miss Trimmier, we are equally happy to inform the readers of the appointment of Joseph E. Boehm as the new leader of the CAAA's meteor section. Mr. Boehm is a skilled meteor observer and is happily endowed with the qualities required for leadership.

1410 N. Marshall Street,
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Variable Star Section

D. W. ROSEBRUGH, Director

213843 SS CYGNI

Last month it was shown that, while this star is highly irregular, some slight signs of law and order have been detected by the statistical studies made by Prof. Leon Campbell, AAVSO recorder, and Dr. T. E. Sterne, and published in the Annals of Harvard College Observatory, Vol. 90, Nos. 3 and 6.

SS Cygni is ordinarily of about $11^m.9$ but every 50.48 days on the average it increases in brightness to about the $8^m.6$ on the average, where it may remain for from one to 20 days, after which it returns to $11^m.9$. At this brightness, or faintness if you prefer, it spends 78% of the time.

Four different types of maxima have been found to occur. In brief, type A maxima are those in which the star brightens rapidly in about two days and usually reaches $8^m.3$. Ten different type A maxima have been recognized, classes A1, A2 to A5 being narrow maxima not lasting more than five days, while classes A6, A7 to A10 may last from eight to 12 days. Type B maxima resemble type A maxima closely but the rise to maximum is slower, consuming about four days, and the brightness achieved in some cases does not exceed $9^m.0$. Classes B1 and B2 are narrow maxima lasting from three to five days while classes B3 and B4 last eight and 10 days respectively. The star takes about six days to reach the top of a C type maximum and in some cases C type maxima reach only $9^m.6$. Six different C type maxima are recognized lasting from one to six days. When the star undergoes a class D maximum it rises still more slowly to maximum brightness; the maximum is apt to be irregularly shaped and occasionally the star reaches only 10^m.

One might well imagine that it would be impossible to draw any conclusions as to the laws which govern the variations in brightness of such a highly irregular variable star as SS Cygni, but Prof. Campbell and Dr. Sterne have d certain conclusions by a statistical analysis. These results are briefly summarized herein.

Two-thirds of the maxima are of type A, 9% are of type B, 18% are of class C and 9% are of class D. In general there are about as many wide maxima of each class as there are narrow maxima. A narrow A type maximum followed by a wide A type maximum seems to be the commonest occurence, but this semblance of regularity may be interrupted by the occurence of B, C, or D maxima. Occasionally also two narrow A type maxima or two wide A type maxima may occur in succession.

The length of time, or period, between maxima of SS Cygni varies between 20 days and 105 days in length. The mean period between maxima is 50.48 days but the length of any particular period is largely a matter of chance and cannot be predicted in advance any more than one can predict the height in inches of the next person one is going to meet on the street, though one can say with certainty that the person will be over 20 inches tall (a baby) and less than 105 inches tall (a circus giant) and the balance of probability is that the person will be somewhere near the normal height (assumed to be 50.48 inches in this illustration).

However, by a studv of SS Cygni's actions in the immediate past, more accurate predictions can be made than merely that the next maximum will occur within 105 days and not before 20 days and that on the average it will occur 50.48 days hence. For instance, it may be possible to state with some degree of assurance that the next maximum will occur 60 days hence but in any case that it will occur within 72 days but not sooner than 48 days, if one includes in one's calculation allowances for the magnitude which the star reached at its last maximum and the number of days which it spent at this maximum. The reason that it is possible to predict the date of the next maximum somewhat more closely than merely to say "it may occur 50.48 days from the last" is because it has been found statistically that the brighter a maximum is the longer it will be before the next maximum; in addition the longer a maximum lasts the longer will be the following minimum, which must elapse before the next maximum can occur. Therefore, the the consideration of these two factors probably increases the accuracy of our prediction to some extent.

The curves plotted in the article, "Properties of the Light Curve of SS Cygni," illustrate some curious properties of the star. The greater number of maxima are from five to 10 days long, but nearly as many last from 12.5 days to 17.4 days, while very few maxima last 10, 11 or 12 days. Why should the star prefer either long or short maxima but shun those of moderate length?

SS Cygni shows a strong predilection for rising to between $8^m.4$ and $8^m.5$ at maximum. However, it never spends its time at maximum between the magnitude limits of 9.2 and 9.3. It does, however, undergo an appreciable number of maxima of about $9^m.6$. Once more the question arises, "Why should the star prefer extremes to the middle way?"

There is a tendency for the star to pass through a series of relatively long cycles between maxima. This series may last 25 or 30 cycles or about 1500 days, and then a series of relatively short cycles may occur, but after about 60 cycles, or eight years, long cycles will again recur. However, this sinuous variation in the length of the star's cycles is broken by conspicuous irregularities. For instance, maximum No. 252 which occurred on J.D.26468 was only 20.9 days in length, the next cycle was 22.2 days in length while cycle No. 254 was 102.0 days in length. This was a surprising change from one of the shortest to the longest cycle on record during the course of five months.

Some other associations of interest have been found. For instance, when the star rises rapidly to maximum the maximum tends to be bright. Also, when a long period elapses since the last maximum the star tends to rise steeply to a bright maximum which is apt to last for a relatively long period. These associations have been noticed by many of us who have followed the star closely. In addition, a wide maximum tends to be followed by a narrow one and a bright maximum tends to be followed by one a little fainter.

Several other certain associations and correlations have been discovered by Prof. Campbell and Dr. Sterne, but it is hoped that enough has been said in these two articles on SS Cygni to further the fundamental aim of this column, which is to promote the making of more and better observations on variable stars. The newcomer to variable star work cannot help but make the acquaintance of this astonishing star, while the skilled observer will find the pleasure of his work enhanced by learning of some of the remarkable truths which expert astronomers have wrested from observations thereon, to which the members of the AAVSO have contributed in part.

Further hints on observing. (1) The writer has done some observing recently with an 8x32 prismatic monocular which cost only a fraction of the price of binoculars. Stars of the $8^m.4$ can be seen with the monocular as compared to $8^m.7$ stars with a similar binocular. To all intents and purposes the monocular is as useful for nova search work and bright variable stars such as R CrB and R Scuti as binoculars. It is much lighter and can be carried in the pocket. (2) One of our experienced observers, Robert E. Millard, Portland Ore., published an interesting article on the use of the zenith prism in variable star work in the Aug.-Sept. 1937 issue of *Popular Astronomy*. This article is commended to our readers. In answer to the writer's inquiry Mr. Millard states that he has a 4-inch Bausch & Lomb equatorial with which he can see $13^m.0$ to $13^m.5$ stars using the zenith prism. This is fine work.

Personal notes. (1) Our enthusiastic member, Miss Louise Ballhaussen, after having spent the summer at Lake George, where she interested Mr. Spelman in variable star work, has taken the position of astronomy and general science teacher at the University high school, Oxford, Miss. While we shall miss her at the AAVSO meetings, we are sure that she will continue her missionary work for the association in Mississippi. (2) While in Toronto on his vacation, the writer dropped in to see R. S. Peterson, one of our new Canadian members. Mr. Peterson is swinging into action with his recently acquired 3-inch refractor which will prove very serviceable for variable star work.

Comments on observations made. The writer has begun to receive comments on the phenomena witnessed by our members, and wishes to thank them.

Franklin W. Smith, Vineland, N. J., says that R Aql, 190108 apparently reached its maximum before the predicted date of J. D. 8769, for on 8741 it was 6.0 while on 8786 it had fallen to 7.7.

Hartmann says that R Scuti dropped to an unexpected minimum of 6.9 on J.D. 751 while by 774 it was back at its more customary brightness of 5.6 Nova Lacertae is gradually decreasing and reached 11.1 at 777, while R Aqr, which has recently been fairly faint, has brightened to 10.4 at 760 (8.7 at 806).

The author recently noted an unusually bright maximum of SS Cygni, 8.0 at 793. It is these unexpected developments which keep all variable observers at their eyepieces.

We thank Neil McNabb, Acton, Ont., for his observations submitted in the old manner.

We suggest that new observers try their hands on *o* Ceti which will be well placed and fairly bright at the time this article appears in print. We hope to discuss this star in our next article.

3 Yates Boulevard,
Poughkeepsie, N. Y.

Calendar of Events

GEORGE DIEDRICH

(All Time C. S. T.)

JANUARY, 1938

1 Sat.—Best wishes for a bigger and better astronomical year. New moon at 12:58 P.M.

1-4 Quadrantid meteor shower. Maximum on the 2nd. (AMS shower)

3 Mon.—Earth closest to the sun (91, 345,000 mi.).

6 Thu.—Conjunction of Mars and the moon at 6:09 P.M. Mars 6° 23′ south.

9 Sun.—First quarter at 8:13 A.M.

13 Thu.—Occultation of 3rd magnitude Zeta Tauri. Immersion 9:25 P.M. Emmersion at 10:32 P.M. Position of immersion 126°, of emmersion 243°.

14 Fri.—Minimum of Algol at 6:50 P.M.

15 Sat.—Full moon at 11:53 P.M.

20 Thu.—Mercury at greatest elongation west (24° 17′).

23 Sun.—Last quarter at 2:09 A.M.

29 Sat.—Conjunction of Mercury and the moon at 7:09 A.M. Mercury 3° 28′ south. Conjunction of Jupiter and the sun.

31 Mon.—New moon at 7:35 A.M.

FEBRUARY

2 Wed.—Conjunction of Mars and Saturn at 1:15 A.M. Mars 2° 1′ north.

3 Thu.—Superior conjunction of Venus and the sun.

7 Mon.—First quarter at 6:32 P.M.

14 Mon.—Full moon at 11:14 A.M.

Phenomena of Jupiter's Satellites—January 9, at 4:36 P.M. Sat. IV (Callisto). Disappears in occultation.

Due to the proximity of Jupiter to the sun no other data on this planet will be given until April.

(Data from the "Handbook" of the Royal Astronomical Society of Canada.)

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Eastbay Astronomical Association, Oakland, Calif.
Long Island Telescope Makers, Wantagh, N. Y.
Louisville Astronomical Society, Louisville, Ky.
Madison Astronomical Society, Madison, Wis.
Metropolitan Astronomical Society, New York, New York.
Milwaukee Astronomical Society, Milwaukee, Wis.
New Jersey Astrophysical Society, Woodbridge, N. J.
Norwalk Astronomical Society, Norwalk, Conn.
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Send all communications to the above address

Norwalk Astronomical Society

WARREN PREECE, Sec'y

The November meeting of the Norwalk Astronomical Society was held on Nov. 27, at the Norwalk Inn. This date gave us an opportunity to have our college members present.

The speaker of the evening was Richard Hamilton, a student at Trinity College. He described the annual meeting of the AAVSO which he attended at Harvard Oct. 14-16. Miss Swartz and Mrs. Hamilton were also present. Those of us who had not had the good fortune to attend this convention enjoyed a complete and vivid picture of this meeting and its accomplishments.

Robert Fleisher told of his astronomical courses at Harvard. He also told of the special work which he is doing at the observatory.

At this time the Society congratulated and praised Miss Margaret Wilson, one of the NAS members, for her fine work in bringing astronomy to several hundred school children of Norwalk. Miss Wilson is librarian of the Norwalk Public Library, and she has noted during the past year the eagerness of children to read of the stars. Through her efforts, Book Week, Nov. 15-20, was observed this year in the Norwalk Public Library as "Star Week." Throughout the library were silver stars and blue pennants on which were figures representing the various constellations. Each day classes from the public schools and St. Mary's parochial school visited the library. These classes ranged from senior high school groups to third grade classes. Each class heard a talk on some phase of astronomy. Lantern slides were used also. The speakers of the week were: Miss Margaret Wilson, Miss Marion L'Hommedieu, Miss Helen Swartz, Cleveland Bronner, Mrs. Alexander Hamilton, Lewis Doolittle, assisted by Harry Haskin, and Mrs. Harold Martin. Many books on astronomical subjects, suitable for young people, have been added to the Norwalk Library.

2 Roland Ave.,
E. Norwalk, Conn.

Tri State News Notes

AMATEUR ASTRONOMERS' ASSOCIATION OF PITTSBURGH

WILLARD A. MacCALLA, Correspondent

Pittsburgh smog ["smoke" plus "fog" makes Pittsburgh "smog" Ed.] lay so thick over this region during the past month that autoists were compelled at times to use headlights even at mid-day. One can well imagine how much starlight would reach our telescopes under those conditions. When the smog blanket finally lifted, Old Man Winter took hold with a vengeance. Your correspondent once attempted to do some observing with the thermometer registering 20° F., but became thoroughly frozen in 15 minutes and vowed to draw the line next time comfortably above the freezing point. Apparently a lot of other Pittsburghers feel the same way for, beset by smog and cold weather, observers in this area have hibernated in the warmth of their workshops.

Seldom have we had the opportunity of hearing such a splendid talk on spectroscopy as that given by Miss Mary Warga at our Dec. 10 meeting. Miss Warga, who is instructor of spectroscopy at the University of Pittsburgh, has studied under Dr. Keivin Burns at Allegheny Observatory, and was, therefore, well qualified to speak on that subject. Following a lucid explanation of the fundamentals of this interesting science, Miss Warga cited examples of the application of spectrum analysis to industrial problems as well as to stellar research; slides were used to illustrate. Miss Warga explained that by means of the spectrograph we learn the materials of which a star is composed, the type of star, whether it is a giant or dwarf, its motion or rotation, and the state of matter inside the star, such as its pressure and temperature.

In the general discussion that followed, Dr. Charles S. Palmer, retired professor of chemistry at the University of Colorado, spoke on the historical development of the spectroscope, coloring his comments with interesting anecdotes drawn from wide acquaintance with noted scientists. At the close of the meeting much interest was shown in Dr. Palmer's pocket spectroscope as well as in Leo Scanlon's demonstration box with which spectra of a number of gaseous elements may be observed.

Valley View Observatory,
Pittsburgh, Pa.

Milwaukee News Notes

M. N. FISHER, Corespondent

Observers of the Milwaukee Astronomical Society envy Pittsburgh its tropical observing weather of 20°. In observing the Geminid meteor shower with the temperature at zero, our stalwarts did not deign to bother about such trivial things as frozen fingers and noses!

The shower was disappointing in the Milwaukee region. Only eight meteors were plotted. Again the society's two-way radio communication system was set up. Oakley was stationed at Milton; the others at the Waukesha farm site. After a time the radio proved unsatisfactory and all observers reverted to code.

George Diedrich, energetic junior, has been conducting an open house observing night at the Milwaukee State Teachers' College in co-operation with Mr. Thorne of the school. One student has completed a 6-inch telescope and the eighth grade as a group has likewise finished a 6-inch. On Dec. 10 scores of Wauwatosa children came in cars for an observing period of two hours. Later in the month a post-dance crowd from the school stopped on the way home to observe Jupiter, Venus, Sirius and the moon through the telescopes.

L. E. Armfield's 13-inch telescope is undergoing an extensive reconditioning in the winter quarters of the society—R. D. Cooke's basement. Here the instrument is getting a careful overhauling that almost approaches rebuilding—an overhauling from alpha to omega, as one of the local wits put it. The workers at present: Cooke, Edward Halbach, C. M. Prinslow, Albert Albrecht.

Speakers around town during December were Halbach (president of the Milwaukee group) at North Division High school and at Custer High school; Cooke and Prinslow at the Masonic club of Hales Corners on Dec. 13. The topics: general astronomy.

Earl Needham has recently finished a 4-inch reflecting telescope. It has a focal length of 60 inches and was built at a cost of about $5. The moon, planets and double stars show up nicely and the ring nebula in Lyra can also be seen. Earl is connected with the circulation department of the Milwaukee Journal and now has 30 of his newsboys started on the making of telescopes.

817 N. 28th St.,
Milwaukee, Wis.

Calendar of Events

CARL GROSSWENDT, Jr., Secretary

On Saturday, Nov. 27, 1937, the Optical Division held its first annual dinner with a distinguished company of amateurs as guests. Although the night was cold and rainy, it did not stop one of the members from coming, but did stop that scribe on amateur telescope making who lives just across the river from us. One of those Jersey commuters, you know.

Those who finally did honor themselves and us with certain well-placed remarks were A. W. Everest and wife, J. R. Haviland, W. S. Von Arx and other known and unknown T. N's. The guest of honor was Charles Federer, who found us our home in the Hayden Planetarium, and, of course, Rufus Guenon, the monkey of supernatural powers, who dominated all.

It seems that Leo Scanlon does not think much of our *coup d'etat Rufus*, namely that we took it out of Everest's cellar when he was not looking; Scanlon claims that that is what Everest wanted us to do.

Well, let it be known that A. W. and his gang originally swiped it from McAdam of Hastings on the Hudson, and the Boston group swiped it from them. They got it back all right, but we've got it now. It seems to us that Leo is just plain jealous and his disclaimer is just to hide his own chagrin of having muffed his chance the day before we got it.

Well, who is the next lucky one? We shall return Rufus with due reverence and ceremony next August at Stellafane.

44 W. 8th Street,
New York, N. Y.

LATIMER JAMES WILSON

(Continued from page 1)

mer Wilson began his famous mosaic picture of the Milky Way, later published in PA. This project occupied three years of leisure time, during which the writer made his acquaintance by applying for information on celestial photography. His voluminous correspondence on the subject, his patient answering of elementary questions, and his many practical suggestions and sketches of apparatus will always make the writer feel indebted to a hobby which produces such fine characters as Wilson, and morally obligates him to give to others the wealth of instruction he received.

During the total eclipse of the sun in New England in 1932, Wilson began a series of astronomical lectures at the Watkins Institute of Nashville, Tenn. Their interest is attested by the fact that the series never ended—high praise indeed for the ability of an amateur who can hold his audience for more than four years! That the ability is genuine is borne out by the fact that during the present year he was appointed first Director of Brainerd Observatory at Chattanooga, Tenn., a directorship which he chose to relinquish after successfully launching an active program of activity and instruction at great personal sacrifice and inconvenience.

In the annals of American amateur astronomy, the name of Latimer James Wilson will ever be remembered for his keen sighted observations, his painstaking photographic accomplishments, but most of all for his patience and generous instruction of all who applied for assistance; their names are legion—and we salute you!

Leo J. Scanlon,
Valley View Observatory,
Pittsburgh, Pa.

AMATEUR ASTRONOMY

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By Godfrey!

By LEWIS L. DOOLITTLE
Director, Godfrey Observatory

With this initial article is inaugurated a new series of notes on astronomical patter originating from a little Connecticut village situated on the shores of Long Island Sound, with a population of about 500 (it triples in the summer); a third class post office, five miles from the nearest town and twelve miles from the city of New Haven; no glare of lights and an unlimited view in all directions for seeing; three stores, two gas stations, and the Stony Creek Deluxe Candy Shoppe, rivaling the post office as a meeting place!

From the inception of *Amateur Astronomy* in January 1935, until the summer of 1936, the writer had the pleasure of inserting notes in the capacity of secretary of the Norwalk Astronomical Society. During the past year and a half, a lot of water has passed under the bridge, as the saying goes. The course of events include a year's studying at Syracuse University, with finances hindering continuance at Wesleyan as planned.

Last summer while vacationing at Stony Creek with my father, I had occasion to meet Harry Haskin who, it was soon discovered, had made quite a study of mathematics in connection with computing planetary orbits. Friendship soon increased until it was planned that we would reside together in the Creek.

The 8-inch reflector on loan from the AAVSO was transported to Stony Creek and set up. Besides this, I had received the gift of an excellent 2-inch refractor, and started construction on a 4-inch richest-field. My 3-inch refractor had been loaned to John Fisk of Darien for variable star observing. A heated shack in which Messrs. Haskin & Doolittle nocturnally "saw wood" was cleaned up and transformed into an astronomical "studio" with a good display of astronomical photographs, star maps, globes, etc. The entire set-up has been named the Godfrey Observatory with the "staff" (numbering the same two) classed plainly as students of astronomy only. In endeavoring to work out an active observing program, the following fields will be covered as much as possible considering facilities at hand:

A meteor observing program in conjunction with the New Haven Astronomical Society which is in turn working with Vassar and Mt. Holyoke Colleges and the Skyscrapers Astronomical Society of Providence.

Variable star observing, with a view to keeping a close check on about 30 stars for light curves.

Sun spot and weather observing in an endeavor to study a theory postulated by the late Rev. Dr. Calthrop of Syracuse, N. Y., in which his weather predictions are said to have been about 95 per cent correct. Many of his observations are missing and the 10 fundamental laws set down by him do not give sufficient information without further investigation (more of this in a future issue)

But one must also provide an income for existence; this I am doing by giving illustrated astronomical lectures in the private schools and high schools of this section of the country. At present the list is within the boundaries of Connecticut only, but after only three months it is already proving very successful. Many school groups and other interested parties have visited the observatory for star gazing. The 8-inch mirror has been resilvered and will soon be aluminized.

For many years it has been a dream of the writer to publish a news magazine in astronomy, similar to the *Reader's Digest* in the literary world, *The Stargazer*, the first issue of which has just come from the printers (to be continued monthly if the much hoped for support deems it possible) is the realization of this dream. A copy may be secured on request.

All report blanks and other materials have been obtained from Dr. Brouwer of Yale to start occultation observing in the near future.

The observatory is named for the late Dr. Charles Godfrey of Bridgeport, who left the 8-inch to Harvard upon his death.

The magazine is being published, along with other bulletins on popular astronomy and amateur observing, under the name of *Star Publications.* It is with great pleasure that the writer looks forward to placing notes in this magazine each month concerning the activities astronomical in the little Connecticut village situated on the shores of Long Island Sound. Nuff sed!

Godfrey Observatory, Stony Creek, Conn.

Book Review

By ELIZABETH WIGHT

"THE NATURE OF VARIABLE STARS" By Paul W. Merrill

The Macmillan Co., 1938—$2.00

This is a volume which should be the first of a series of books on technical astronomical subjects written by the professional for the layman. There are plenty of general texts where all subjects of astronomical study are by necessity only touched upon; we have also detailed technical treaties uninteresting to and unread by the beginner. The book in question is half way between the popular and the technical and gathers the most recent information with a historical background that few other books on this or similar subjects can offer. The author says in his Preface: "In preparing this little book my purpose has been not only to outline our knowledge of variable stars, but also to assist the non-technical reader to a comprehension of the general nature of modern astrophysical studies. I hope it will help him to understand the sort of thing with which astronomers are occupied, and why their work has so many points of contact with other sciences."

His Contents contain the following headings: Introductory. The Nature of Stars in General. Varieties of Variable Stars. Discovery and Cataloging. Light Curves. Physical Properties. New or Temporary Stars. Motions. Variable Stars and the Stellar System.

The most practical book heretofore written on variables is Furness' Introduction to the Study of Variable Stars, published in 1915. Since then nothing similar has been brought out. Although Dr. Merrill does not give up-to-date detailed directions on how to observe, which are found in Furness' work—an omission which we as amateurs are sorry to note because such practical suggestions might inspire more amateurs to the use of the telescope—the book is the last word on the theory of variability written in a concise, clear and readable manner.

The author has been an astronomer at Mt. Wilson observatory since 1919. The book contains 134 pages and includes simple tabulations, typical light curves, diagrams and spectra.

Note on the Predicted Transit of the Hypothetical Planet — Vulcan

E. P. MARTZ, Jr., Director, Planetary Section

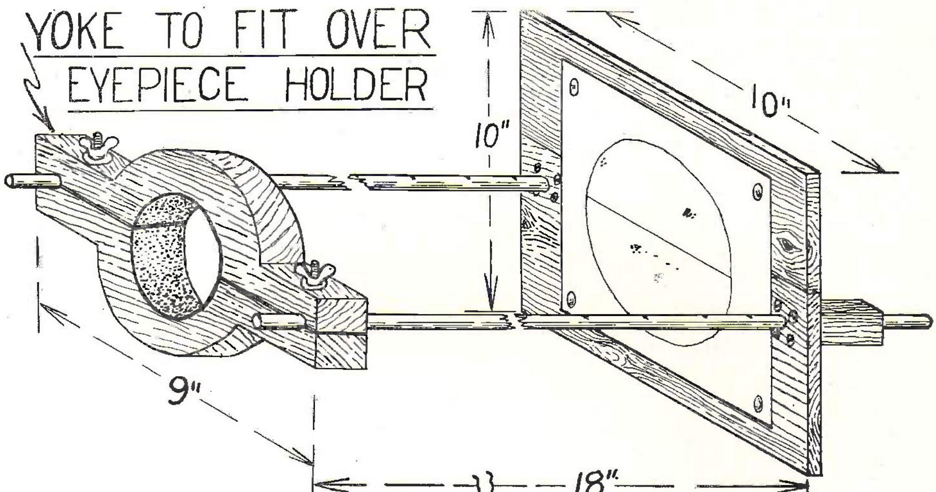
The writer carefully scanned the entire disk of the sun for one hour, Jan. 14, 1938, between 5^h30^m G.C.T. and 6^h30^m G.C.T., in an attempt to detect the transit of the hypothetical intra-Mercurial planet Vulcan, predicted by H. H. Haskin, *Amateur Astronomy,* January, 1938. Aside from two very fine large groups of sun spots at opposite limbs of the sun, several smaller spot groups, and extensive calcium flocculi, nothing unusual was observed. As the limiting times of the transit, as predicted by Haskin, were from 2^h00^m G.C.T. to 7^h00^m G.C.T., if any body had transited the sun, it would have been well on the disk and easily observable during the time of observation. Clouds prevented observations earlier and later than the times indicated above. The instrument used was the 6½-inch Warner-Swasey refractor of the students' observatory at the University of Chicago. A polarizing solar ocular was used, with magnifications of 50X, 100X, and 200X, and various color filters. Close examination was made of the smaller sun spots in which no definite spot structure could be resolved, but no irregularities of motion were observed. The seeing fluctuated rapidly, but was extremely good at times, often reaching grade 4 on a daytime scale of 5 as perfect. There can be no doubt but that the predicted transit did NOT occur.

Would-be discoverers of an intra-Mercurial planet should remember that the solar disk has been photographed throughout the day every day of the year for a number of years at Greenwich, Mount Wilson, and other observatories; and that if any unusual body has been transiting the sun, it would have been discovered before now. Very few of the reported transits listed by Weston have been observed in an accurate and definite enough manner to accept as data from which to derive an orbit for a body revolving about the sun. In addition, there is no justification for either Weston or Haskin to compute elements for Vulcan to an "accuracy" of six or eight digits, as they have done (i. e.: eccentricity: 0.10383191, semi-major axis of orbit: 0.13734234, etc.) Apparently only 12 visual observations of reported transits have been used in the computations, and none of these can hardly be more accurate than to one

(continued on page 17)

Where Is the Sun's Equator?

MAUDE S. WIEGEL



In making records of sunspots, whether by projection or by photograph, the true solar equatorial line must be established, to make your work valuable as a true record.

The method used in projecting the sun's image on a white card or paper is simple. A collar is made to fit over the eye-piece holder of the telescope with two projecting rods that hold upright a firm back upon which a card or paper is held by pins or rubber bands.

To make this projecting frame, use a block of sturdy wood nine inches long, four inches wide, and one and one eighth inches thick. In the center of the block mark out a circle the same diameter as the eye-piece holder of your telescope or the tube. Then draw a line along the length of the block exactly through the center of the circle. Cut the block in two along this line and cut out the half circles, glue felt over the concave surface to prevent marring the tube or holder and also to prevent slipping. Cut down each of the four ends to about one inch, and bore holes to take bolts so that the yokes may be clamped over the eye-piece holder.

After curving the sides over the circle to give it a nicer appearance, you are ready for the projecting rods. Choose firm rods one eighth inch in diameter, bore a hole to take a very small bolt in one end and after making a depression in the lower yoke about one inch from the end, place the rod in the depression and bolt down so that the rod is sunk just below the level of the upper surface of the lower yoke. Secure rods firmly, one at each end.

Now you are ready for the back to hold the white card upon which the solar image is to be projected. For this back, a piece of firm but light weight plyboard is best and should be ten inches square. A hole one eighth inch in diameter is bored at each side at the center for the rods, and to make the back stand firmly upright, place at its back, one on each side, two blocks three inches long and one and one eighth wide and high, through which is bored a hole along its length to allow it to slip rather tightly over the rods. Screw the plyboard to the blocks. Make light notches every eighth inch along the rods so that the back is evenly placed from the eyepiece, as a guide in focussing.

The next step is to prepare a sheet of this white paper to fit the back and upon it draw a 6-inch circle and a horizontal line through its center. Place upon back and secure with pins or rubber bands, clamp the frame to the telescope using wing nuts on the bolts. Do not clamp tightly for the frame is to be turned on the tube.

If your telescope has motions do not use them at present, but rack the board with the paper backward or forward until the 6-inch circle is just filled with the sun's image. Then focus correctly and allow the solar image to pass off the sheet. Did the spots follow parallel with the horizontal line? It is not likely. Turn the wood yoke or collar around the eye-piece until a small spot near the sun's equator runs along the horizontal line like a small spot near the sun's equator runs along the horizontal line a bead on a thread. Now if your telescope does not have motions you will need to guide by hand and sketch in the spots carefully, paying more attention to size of spots than to their shape, as the latter may be corrected visually later.

This acomplished, you have found the true solar equator, and in photographing the sun, the same principal is observed. A horizontal line across the space to be occupied by the plate or film must be established to orient the solar equator correctly.

In using a plate camera the ground glass will serve. Better still, place a ground glass in the space to be later occupied by the plate and cut an opening through the partition in the plate-holder. This, of course, does not provide a line on the negative, and while it does place the sun's image in a position where the solar equator is in a true horizontal position, allowing you to see the spots in their correct relation with the solar equator, it leaves much to be desired in the way of a guiding line to show the exact equator.

If -our telescope is equipped with slow motions, and you at liberty to spend a few moments in checking the spots on a six inch circle of paper by the projection method, a very scientific record of spots can be made, and if we had several persons in various parts of the country, in case of clouds in one place, regular sunspot latitudes and longitudes could be published in *Amateur Astronomy*.

Twin Elms Observatory,
Elizabeth, Pa.

Variable Star Section

D. W. ROSEBRUGH, Director

VARIABLE STAR MISCELLANY, SOMETHING FOR EVERYBODY

Because of the description of the AAVSO meeting at Harvard, Oct. 16, which appeared in the November issue, and the fact that the two articles on SS Cygni which were published in the December and January issues were written long in advance of their publication, it is now many months since the last technical article on variable stars was written. So much material in the way of hints and comments on the actions of stars has been received from our contributors since then that the promised article on Omicron Ceti or some other long period variable star must be postponed.

Review of Scientific Papers

At the annual meeting of the AAVSO Miss Alice Farnsworth of Mt. Holyoke college reported that the photographic drop in magnitude of the eclipsing variable star, Zeta Aurigae, at the time of its minimum last spring was approximately half a magnitude. It was interesting to receive this confirmation of the predicted behavior of Zeta Aurigae during its minimum as given on p. 107 of the June-July *Amateur Astronomy*.

The following details as to how the Rev. Mr. Kearons of Fall River, Mass., takes his superb photos of the sun will be of interest to those who may wish to try this work. Mr. Kearon uses a 4-inch Clark telescope with an eyepiece. The camera is independent of the telescope, and the lens is removed from the camera. The enlarged image of the sun, which is about 3 inches in diameter is then focussed on the ground glass of the camera which uses a 5x7 inch plate. The exposure with a Compur shutter is 1/25 second, which is increased to 0.1 second when a red filter is used.

Notes on Instuments

Roy A. Seely, 16 Sutton Place, N .Y., has kindly furnished the details of his "richest-field" reflector which he uses for variable star work when his 10-inch reflector is not available. The primary Pyrex mirror is 4½ inch in diameter and of 15½ inch focal length. This is used with a 1-inch micrometer focussing eyepiece with 16 threads to the inch. The telescope is made of 5-inch aluminum tubing with an aluminum cell and weighs only five pounds. A diagonal of 1¾-inch on the minor axis is required. The field is 3 degrees or an entire (b) chart in size and 9.5 magnitude stars are visible. The telescope is held in one's arms with the mirror cell gripped between the knees as one sits on a chair. However, Mr. Seely says a simple mounting and a gun sight finder would be advantageous. When it is desired to see eleventh magnitude stars a ½-inch eyepiece is used.

It is interesting to compare the results achieved with this reflector with those secured by an approximately equivalent refractor. In answer to a request, Harold B. Webb, 9251, 173rd St., Jamaica, N. Y., who was my mentor as regional advisor for metropolitan New York State when I first took up variable star work, has given the following information: Webb uses Busch 24x54mm. F6 binoculars for observing when his 5½-inch refractor is not available. These binoculars have a field of two degrees and Mr. Webb can see eleventh magnitude stars with them and can separate ninth magnitude stars which are one minute apart for observational purposes. He states that comets and star fields show to better advantage in these binoculars than in any other instrument he has used including refractors of from 1½-inch to 5½-inch aperture and reflectors of 6 and 11-inch diameter. Mr. Webb remarks that binoculars must be focussed with extreme care and that they are therefore essentially "one man instruments." Mr. Seely also points out the necessity for micrometer focussing with his RFT.

Charles M. Paulus, 124 South Tenth St., Reading, Pa., has very kindly furnished some information as to how he has inproved his telescope eyepieces and binoculars for use with spectacles. He says that he has increased the circular diameter of the openings at the eye end of his eyepieces, which gives him a wider field of view than he could otherwise secure while wearing glasses, although the edges of the field are a little distorted. Mr. Paulus has also filed off the eyecups on his binoculars to within 1/16 inch of the lens which enables him to place his eye close to the eyepiece despite his spectacles. This enables him to secure the full field of 150 yards at 1000 yards of his 8x30 mm. Zeiss binoculars. He points out that both Bausch & Lomb and Zeiss make binoculars with special flat eye-cups for the bespectacled. These practical comments which are in answer to the October article in *Amateur Astronomy* are of great value to our readers, and we hope to receive more like them from other readers.

Matters of General Interest

D. F. Brocchi, Seattle, chairman of the chart committee, writes that his committee will make no report this fall. However as announced at the Oct. 16 meeting the following new (d) charts are available.

062105	SW	Mon	Mag. 9.1 to 10.6	
181631	TU	Lyr	Mag. 9.3 to 10.3	
193428	BG	Cyg	Mag. 10.4 to 12.1	(Phot.)

Mr. Brocchi has had his 12-inch objective resilvered preparatory to following many a U Gem type variable star to its depths as these stars are his special favorites.

Charles H. Brockmeyer, Jr., Fredonia, Ky., writes that the brilliant aurora of Oct. 7 which was visible in Milwaukee, New York, Nantucket and Poughkeepsie was also visible in Kentucky where it was tinged with purple. The next day the sun showed six large sunspot groups.

Comments on Variations Noted in Stars

Mr. Hartmann, Walter Scott Houston, Franklin W. Smith and Neil McNabb, Jr., have contributed many observations on variable stars which may be summarized as follows:

The long period variable star 0214*03* Omicron Ceti apparently passed its maximum of about 4.3 at J. D. 8840. Two years ago it was much brighter at maximum, having reached about the second magnitude. 015912 S Arietis, which is another long period variable, was at 10.5, or, approximate maximum on 838. T Draconis 175458a experienced an unusually bright maximum of 8.5 during September. 2338*15* R Aqr. has been unusually bright lately having reached 6.7 mag. about Nov. 1.

R Scuti, 1842*05* was quite irregular before it became lost in the sun's rays about Dec. 10, having varied between 5.3 and 5.9 for some weeks.

Z Ursae Majoris, 115158, an RV Tauri type star was at a rather faint maximum of about 7.8 all November.

213843, SS Cygni, the U Gem type star, was at maximum of 8.3 in 8791 and experienced a faint maximum of 10.4 on 8841. Little does this star realize that it is so popular on this earth that one of the prominent AAVSO members used a portion of its (d) chart very effectively as a Christmas card motive. Does he suspect it of being an old nova which might have caused the Star of Bethlehem tradition by blazing up 1937 years ago? (No years 0, remember. No one had invented zero in those early centuries.) Probably not, but less plausible explanations have been advanced more seriously to explain the Star of Bethlehem. U Gem, 074922, the type star, reached 9.0 on J. D. 8833. The irregular star 081473, Z Cam, which is perhaps akin to the U Gem type, was at 11.0 on 818.

R CrB, 154428 still shows no signs of fading, having been 6.0 on 8880. The R CrB type star T Orionis 053005a, which is very prettily embedded in the Orion nebula, has been about the tenth magnitude or at approximate maximum lately. SU Tauri, 054319, which is of the same type, also has been at maximum of about 9.7. RY Sagittarri, 1910*33* was also about at maximum when last seen in the twilight.

3 Yates Blvd., Poughkeepsie, N. Y.

(continued from page 14)

minute of arc, if indeed that small an error is allowable. The apparent "accuracy" of the elements, as published, is misleading, and computation on the available data to more than three places can have no significance. Similarly, in the lack of any observations whatever as to the physical nature of the supposed planet, any hypothesis is to the shape of the body, and its capacity for capturing and rejecting "clouds" of meteoritic matter, is decidedly premature.

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AAVSO Nova Program Report

L. E. ARMFIELD

From time to time it has come to the attention of the nova search committee that participants in the search for novae have questioned the necessity for sending in monthly reports of their observations of the regions assigned to them. It might be well to stress the importance of all observations being recorded and forwarded to your scribe monthly. While the primary aim of the visual search for novae is the early discovery of novae and comets, nevertheless, over a long period of years, the negative value of the search becomes increasingly valuable from a statistical point of view. The committee, therefore, appeals to all participants to record and forward ALL observations to the writer in order that they may be kept on file for future study.

Earl Cherryholmes, Columbus, Ohio, a colleague of Franklin Lewis of that city, contributed his initial report of observations made during the month of November. Excellent reports were received from De Vany, Friton, Halbach, Karl, Lewis, Moore, Perkinson, Rosebrugh and Simpson.

The reports received during November and December are extremely gratifying and appreciation is hereby tendered to all contributors.

				Magnitude of faintest star reviewed								Total
Observer	Region	Location		9	8	7	6	5	4	3	2	Nights
Cherryholmes	7	Columbus	(Nov.)	....	....	4	3	....	....	....	....	7
	93			....	....	1	3	1	....	....	....	5
Diedrich	43	Milwaukee	(Nov.)	....	....	....	11	6	....	....	....	17
	43		(Dec.)	....	....	....	5	4	1	1	....	11
De Vany	** **	Davenport	(Nov.)	....	50	....	....	....	....	....	....	10
	*1P		(Dec.)	10	....	....	....	....	....	....	....	10
	*2P			10	....	....	....	....	....	....	....	10
	*3P			10	....	....	....	....	....	....	....	10
	*4P			10	....	....	....	....	....	....	....	10
	*5P			10	....	....	....	....	....	....	....	10
	*6P			10	....	....	....	....	....	....	....	10
	*7P			10	....	....	....	....	....	....	....	10
Friton	9	St. Louis	(Sept.)	....	....	12	2	2	1	....	....	17
	10			....	....	12	2	2	1	....	....	17
	9		(Oct.)	....	....	11	1	1	1	....	....	14
	10			....	....	11	1	1	1	....	....	14
	9		(Nov.)	....	....	14	....	2	1	....	....	17
	10			....	....	14	....	2	1	....	....	17
Halbach	49	Milwaukee	(Nov.)	....	....	....	2	4	3	....	....	9
	50			....	....	....	2	4	3	....	....	9
	71			....	....	....	1	2	3	1	....	7
	99			....	....	....	1	1	2	2	....	6
	49		(Dec.)	....	....	....	2	4	1	....	....	7
	50			....	....	....	2	4	1	....	....	7
	71			....	....	....	1	2	3	....	....	6
Hanna	11	New York	(Nov.)	....	....	2	2	1	....	....	....	5
	62			....	....	....	....	2	....	....	....	2
	84			....	....	....	....	1	....	....	....	1
	11		(Dec.)	....	....	....	5	1	....	....	....	6
	62			....	....	....	....	....	1	....	....	1
	84			....	....	1	4	1	....	....	....	6
Jones, E. H.	14	Goffstown	(Oct.)	....	....	....	....	2	1	....	....	3
	14		(Nov.)	....	....	....	....	4	5	....	....	9
	14		(Dec.)	....	....	....	....	3	1	....	....	4
Karl	13	Chicago	(Oct.)	....	2	8	3	1	....	....	....	14
	14			....	2	7	3	1	1	....	....	14
	24			....	....	1	6	1	....	....	....	8
	27			....	....	3	6	....	....	....	....	9
	29			....	....	1	2	3	....	....	....	6
	13		(Nov.)	....	2	4	2	2	1	....	1	12
	14			....	2	4	1	3	1	....	1	12
	24			....	....	2	3	3	1	....	1	10
	27			....	1	4	2	3	....	....	1	11
	29			....	....	....	1	4	1	1	1	8

			Magnitude of faintest star reviewed								
Observer	Region	Location	9	8	7	6	5	4	3	2	Total Nights
Kirkpatrick	61	New York (Nov.)	....	....	2	1	1	....	....	....	4
	92		....	....	1	....	2	1	....	....	4
	92	(Dec.)	....	....	1	3	....	....	....	....	4
Lewis	2	Columbus (Nov.)	....	....	3	4	2	2	....	....	11
	31		....	....	2	2	2	....	....	....	6
	42		....	....	....	8	1	2	1	....	12
	46		....	....	1	6	4	1	....	....	12
	55		....	....	....	3	....	....	....	....	3
	73		....	....	....	1	....	....	....	....	1
	84		....	....	....	1	1	....	....	....	2
	2	(Dec.)	....	....	3	4	....	....	1	....	8
	31		....	....	....	5	1	1	1	....	8
	42		....	....	....	4	1	....	2	1	8
	46		....	....	....	6	....	....	2	....	8
	55		....	....	....	1	1	....	....	....	2
	84		....	....	....	1	....	....	....	....	1
Loreta	17	Bologna (Nov.)	....	....	....	4	1	....	....	....	5
	112		....	....	....	2	1	....	....	....	3
	17	(Dec.)	....	....	....	4	1	....	....	....	5
	112		....	....	....	1	1	....	....	....	2
McNabb, Jr.	8	Acton, Can. (Nov.)	....	....	1	....	....	....	....	....	1
	72		....	1	....	....	....	....	....	....	1
	77		....	....	....	2	....	....	....	....	2
	78		....	....	....	2	....	....	....	....	2
Moore	26	Milwaukee (Nov.)	....	....	....	4	10	2	....	....	16
	54		....	....	....	2	8	3	2	....	15
	26	(Dec.)	....	....	....	1	5	2	1	....	9
	54		....	....	....	3	9	....	....	....	12
Perkinson	34	Fresno, Cal. (Nov.)	....	....	1	10	....	1	....	....	12
	34	(Dec.)	....	....	3	8	....	....	....	....	11
	101		....	....	3	7	....	....	....	....	10
Rossbrugh	1	Poughkeepsie (Nov.)	....	....	7	10	1	....	....	....	18
	52		....	....	8	8	....	2	....	....	18
	1	(Dec.)	....	....	3	....	2	....	....	....	5
	52		....	....	4	....	1	....	....	....	5
Seely	31	New York (Nov.)	....	....	....	2	2	1	....	....	5
	31	(Dec.)	....	....	....	1	3	....	....	....	4
	71		....	....	....	1	....	....	....	....	1
Simpson	7	Webster Groves	....	....	....	35	....	....	....	....	35
	8	(Jan.	....	....	....	34	....	....	....	....	34
	11	thru	....	....	....	34	....	....	....	....	34
	19	Sept.)	....	....	....	35	....	....	....	....	35
	20		....	....	....	35	....	....	....	....	35
	98		....	....	....	27	....	....	....	....	27
	99		....	....	....	27	....	....	....	....	27
Topham	75	Toronto, (Nov.)	....	1	....	....	....	....	....	....	1
	91	Can.	....	1	....	....	....	....	....	....	1
Waitkus	17	Pittsburgh (Nov.)	....	....	....	1	....	....	....	....	1
	18		....	....	....	2	....	....	....	....	2

18 Observers 43 different regions 4300 square degrees of sky reviewed.

1 Observer 7 photographic regions approximately 2800 square degrees of sky reviewed.

*Photographic regions for which numbers have been assigned tentatively.

The following observers used binos or low powered finders to review their regions: Cherryholmes, DeVany (Schmidt Camera), Friton, Hanna, Karl, Kirkpatrick, Lewis, Loreta, McNabb Jr., Moore, Perkinson, Rosebrugh, Seely, Topham and Waitkus.

Appreciation is again tendered to the following observers for summarizing their observations on the report blanks as described in these columns in the October 1937 issue of *Amateur Astronomy*: Diedrich, DeVany, Halbach, Karl, Perkinson, Rosebrugh, Seely, Simpson and Waitkus.

1410 N. Marshall Street,
Milwaukee, Wisconsin

Planetary Report No. 26

MARS, 1937—V

By E. P. MARTZ, Jr., Planetary Section Director

THE ATMOSPHERE (Continued)—Comparisons of the three distinct types of atmospheric "cloud" phenomena present in the Martian atmosphere this past opposition, and enumerated in Planetary Report No. 25, including the three different sizes of dust particles hypothesized at the end of that report, indicate the following considerations:

A—Atmospheric phenomena of type 1, bright areas reflecting blue and green light (3700-5200 A. U.), brighter than the surface of the planet can be explained by dust particles of case 2 whose diameters are smaller than the wave-length of light, hence obey the Rayleigh law and so return scattered blue and green light, which may become brighter than the reflecting substances on the Martian desert surfaces.

B—Phenomena of type 2, dark areas absorbing blue and green light (primarily 4800-5200 A. U.), possibly reflecting some light of the longer wave-lengths are explainable by dust particles of case 1, which are larger than the wave-length of light, hence reflect their own color, which is that of the dust arising from the planet's surface (red, brown, yellow) and form a strong obsorbing medium to blue and green light. As observed, these large particles cannot reflect more brightly than the surface of Mars itself.

C—Obscuring phenomena of type 3, differential haze reflecting blue light (3700-4800 A. U.), often difficult to penetrate by red and yellow light, may be explained by dust particles of case 3, which is a mixture of large and small sizes (as cases 1 and 2) and intermediate sizes. The large particles absorb and diffusely reflect long wave-length light, making surface detail difficult to delineate; the small particles reflect blue scattered light, causing the atmospheric layer to appear blue, misty, hazy.

Therefore, if the dust suspension hypothesis is correct, we may understand the various Martian atmospheric phenomena as being primarily manifestations of local condensations of dust particles (though often covering a whole hemisphere of the planet in the case of C above) of varying sizes, as outlined previously, suspended at different layers in the troposphere of a not overly convective atmosphere. This hypothesis is, of course, merely a preliminary suggestion of the writer and its success or failure rests upon further quantitative analysis which he is now undertaking and also upon observational, photometric and spectrographic tests which he shall suggest at a later time.

The dust suspension hypothesis is further fruitful in giving a satisfactory explanation of a fourth type of atmospheric "cloud" on Mars, which the writer did not observe or photograph during this opposition and thus did not include in his list, but which has been noted by many observers in the past, including Pickering, Lowell, Slipher and Wright. Professor Wright in 1926 called attention to small areas reflecting red and yellow light brighter than the surface of Mars and apparently ovelying it. (*Lick Observatory Bulletin*, No. 389, pp. 56-57.) He pointed out that if the clouds were due to dust particles large enough to reflect their own yellow color it would not be possible for them to appear brighter than the planet's actual surface. They could only reflect more brightly than the surface if they were particles smaller than the wave-length of light, giving rise to Rayleigh scattering, which would produce blue light; yet the bright clouds were yellow.

Therefore, Wright proposed that the objects were not dust clouds but were of an aqueous nature and hence would be blue-white and brighter than the surface of Mars. To produce a yellow color, he assumed an effective filter agent in the atmosphere of the planet composed of a blue obsorbing atmospheric constituent lying above the water clouds and making them appear yellow to us, as seen through a yellow filter transmitting only the longer wave-lengths. The exact nature of this atmospheric absorbing constituent he declined at that time to suggest.

The writer proposes to revert to the dust particle hypothesis again and explain the basic unscreened cloud as being composed of particles small enough to produce Rayleigh scattering and return blue-white light toward space. Now, overlying these blue-white clouds of small dust particles brighter than the surface of Mars, we have an upper atmospheric layer, free of violent currents, which suspends a more uniformly diffused component of dust particles. However, at times because of convection and other currents, this upper layer becomes composed of dust particles which are larger than the lower Rayleigh scattering dust. Mrs. Rudnick has shown (*Astrophysical Journal*, 83, 1936, p. 394) from the work of Mie and Goetz, that such relatively large particles with diameters of the order of magnitude of 300-60 millimicrons, do not obey the Rayleigh scattering law, except for the longer wave-lengths, and deviate from it as the blue-violet end of the spectrum is approached, thus giving rise to absorption of the yellow-red spectral wave-lengths.

Although this reasoning was developed to explain the reddening of certain B-type stars by such an interstellar absorbing medium, it appears to the writer that we may justifiably apply the analyses to the Martian atmospheric problem in hand as well.

Thus we have our yellow-red "color screen" in the Martian upper atmosphere, at times causing some of the bright blue-white clouds in the lower troposphere to appear yellow to us when viewed through this blue absorbing layer. Objections to the concept of larger particles in the upper atmosphere with small particles underlying them closer to the surface of the planet, may be met by recalling the frequent presence in our own atmosphere of the relatively large ice crystals composing the very high cirro-stratus clouds which are buoyed up by nothing more substantial than the gaseaus-aqueous mixture between them and the earth's surface, five or ten miles below.

In pursuit of the analyses of scattering and absorbing agents in the Martian atmosphere, based upon the photographic and visual observations of this and previous oppositions, the writer finds the work of Schoenberg in *"Handbuch der Astrophysik,"* Band II and VII, on planetary and nebular photometry to be of the greatest possible value. Further, the numerous papers in the *Astrophysical Journal* since 1933 by Struve, Henyey, Keenan, Elvey and Roach on reflection and scattering in diffuse galactic nebulae are eminently applicable to this problem of planetary atmospheres. Thc appearing in 1936-37 should not be neglected by anyone interested in the planets and satellites.

The University of Chicago,
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Chicago, Ill.

Calendar of Events 2

GEORGE DIEDRICH

(All time C. S. T.)

FEBRUARY, 1938

2 Wed.—Conjunction of Mars and Saturn at 1:15 A. M. Mars 2° 1′ north

3 Thu.—Superior conjunction of Venus and the sun.

7 Mon.—First quarter at 6:32 P. M.

9 Wed.—Occultation of Omega Tauri (Magnitude 4.8) at 11:57:24 P. M.

12 Sat.—Moon 226,200 miles from the earth (in perigee).

14 Mon.—Full moon at 11:14 A. M.

16 Wed.—Conjunction of Mercury and Jupiter at 11:00 P. M. Mercury 1° 23′ south.

21 Mon.—Last quarter at 10:24 P. M.

23 Wed.—Moon 251,400 miles from the earh (in apogee).

26 Sat.—Minimum of Algol at 7:00 P. M.

MARCH, 1938

1 Tue.—New moon at 11:40 P. M.

8 Tue.—Superior conjunction of Mercury and the sun.

9 Wed.—First quarter at 2:35 A. M.

10 Thu.—Neptune in opposition with the earth (2,714,000,000 miles from us). Occultation of x^2 Orionis (Mag. 4.7) at 11:34:30 P. M. Position angle 112°.

15 Tue.—Full moon at 11:15 P. M.

(Data from the "Handbook" of the Royal Astronomical Society of Canada)

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Send all communications to the above address

METEOR RADIANTS

FRANKLIN W. SMITH

The following meteor radiants are now available and may be added to our list (the last section of which appeared in the November 1936 issue of *Amateur Astronomy.*)

Serial No.	Date	R.A.	Dec.	No. of meteors	Length of watch (mins.)	Total No. of meteors	Observer
16	Dec. 13, 1936	112°	33°	7	50	8	FWS
17	Aug. 10, 1937	46	56	5	60	10	FWS
18	Oct. 25, 1937	34	2	7	60	11	FWS

We should like to take this opportunity to call the attention of meteor observers to the importance of the determination of radiants. The recent very excellent book *Die Meteore* by C. Hoffmeister (who, as our readers will recall, is using the results of our Olivier-Hoffmeister Program observations in his studies) again points out very clearly the limitations and defects of much of the previous work in this field. The need for a new and careful investigation is therefore evident.

In order to gain a better insight into the problem let us consider for a moment the structure of a meteoric stream. It must first be realized that even at best a meteor swarm is much more diffuse than the comet from which it was ultimately derived. It may help us to visualize the comet orbit by comparing it to a wire hoop which has been somewhat flattened so that it is elliptical rather than circular. To extend the analogy to the case of the meteor stream we must imagine that our wire is a covered one but that unlike an ordinary insulated wire there is an air space between the wire and its covering. Dust particles scattered through this tubular space are then analogous to the meteors. If we imagine that the particles are scattered uniformly throughout this entire space, we have an illustration of a stream like the Perseid which furnishes a shower regularly every time that the earth intersects it (i. e., annually), but if we consider the particle to be concentrated in a single group which occupies only a small fraction of the length of the tube and keeps this compact formation as it moves along, we have a representation of a stream such as the Leonids which give a good shower, not annually, but only at intervals of the period of revolution of the dense cluster. With this review of the characteristics of the two types of major meteor streams, we pass to the question of the minor meteor streams. We are tempted to think of these as being similar to the major streams just discussed except that they are less dense (that is, that the distances between their individual particles are greater). But at best this is a mere first approximation for the individual particles are neither uniformly distributed throughout the tubular space nor are they concentrated into a single compact group; rather they are found in a number of different groups of varying degrees of compactness. If we revert to our analogy of the tubular space about the wire we should find these groups all within the tube but not uniformly oriented with respect to the central wire. The wire may still be considered to represent "the orbit" of the whole stream, but it is not rigorously the orbit of any one subgroup of which that stream is composed; it is rather a sort of average of them all.

If this represents the structure of a minor meteor stream, how shall we expect it to manifest itself to the observer? First, it is clear that predictions of the appearance of a particular minor shower for a given time are entirely useless. It is true that the earth will pass through the general region of the stream annually, but at the present state of our knowledge we have no way of determining whether the particular portion of this region which is encountered will be empty or whether it will be occupied by one of the subgroups of which the stream is composed. Second, we must not expect the positions of the radiants of a minor shower obtained on different occasions to agree exactly. The showers observed on these different subgroups of the meteoric particles, and, as we have seen, these do not have rigorously the same orbit and hence cannot show rigorously the same radiant.

It may be mentioned in passing that this scattering of the individual radiants belonging to the same general stream is probably one factor in the controversy which was current a number of years ago as to whether the radiant of a meteoric stream moved on the celestial sphere or was sationary. By selecting certain radiants an observer could find a regular progression of position from one night to the next by selecting other radiants another observer could make out an equally strong case for "stationary radiation." A case for the latter could be made out for example by comparing radiants No. 8 and 15 of our list (RA 340°, Dec. —17° July 28 and RA 345°, Dec. —12°, Aug. 17) but if we also consider No. 5 (RA 345°, dec. 0°, Aug. 23) we find the situation immediately complicated.

Finally we must warn the observer not to attempt to force one or more radiants out of every night's observing. It may well be that on the particular night when he is working no minor radiant which stood out sufficiently above the background of stray meteors was active. Failure to obtain a radiant on a given occasion does not imply wasted effort since even a negative result may be valuable, and sooner or later the observer's vigilance will be rewarded by obtaining a radiant which by reason of its relative concentration s real beyond reasonable doubt. Number 18 of our list is a case in point. Over half of the meteors seen during the period of observation conformed to it, and of these, five appeared during a single ten-minute period.

The Training School, Vineland, N. J.

Tri State News Notes

AMATEUR ASTRONOMERS' ASSOCIATION OF PITTSBURGH

WILLARD A. MacCALLA, Correspondent

After reading the Milwaukee News Notes in January "*Amateur Astronomy*", we feel that the Milwaukee "Eskimos" deserve much commendation for their sub-freezing observing activities, and have set an example for all "warm weather" observers. Incidentally, Leo Scanlon has found that a hooded jacket such as used by football bench warmers proves an excellent protection from wind and cold.

Many Pittsburgh amateurs were present at the Academy of Science and Art lecture on Dec. 16, when Dr. Harlow Shapley gave an illustrated talk on "Exploring the Galaxies." Besides being packed full of interesting information, Dr. Shapley's talk was most entertaining. A reception dinner prior to the lecture was attended by the officers of our organization.

Other recent activities include a radio address by Leo Scanlon. Joe Goin reports that he and the other member of our "Optical Twins", Larry Scanlon, have been completing an ambitious mirror-making program preparatory to beginning a second attempt at making a 4-inch refractor. Their first glass was shattered during the final stages of edging due to internal stress . Glass and tools are on hand for the new undertaking.

More than 50 members and guests attended the Jan. 14 meeting at which we were privileged to hear a talk, "Celestial Exploring for the Amateur," by Dr. N. E. Wagman of Allegheny Observatory. The talk was illustrated by more than 100 beautiful lantern slides. Another feature of the evening was a demonstration of various methods and equipment for solar observations by projection, given by Mrs. Maude S. Wiegel, AAAA solar director. The use of Stonyhurst disks was also explained.

Thrilled by his first observation of Uranus, Will MacCalla devoted his regular planetary committee report to selling the audience on seeing this beautiful greenish-hued object for themselves. It developed that only three amateurs in the group had ever seen the planet!

Valley View Observatory,
Pittsburgh, Pa.

Chicago News

CHICAGO AMATEUR ASTRONOMICAL SOCIETY

MAX M. FEINSILBER, Secretary

The first meeting of 1938 was held at the Adler Planetarium Sunday afternoon Jan. 9.

The first business of the day was the election of officers for the coming year. The following men were duly nominated, elected, and inducted into office:

President, George Warner
Vice-President, G. E. McCord
Secretary-Treasurer, Max M. Feinsilber
Corresponding Secretary, Jos. Longman

The president expressed the hope that in the coming year the society as a whole would increase its observational work while continuing the splendid work it has been doing in making and mounting mirrors of all sizes. Many good ideas have been formulated by this group in the past year and the society will endeavor to continue on this high plane.

Many small gatherings are planned in the outlying sections of the city for every month. This will help bring the members together more frequently and enable them to discuss subjects that can not be covered in the short time of the regular monthly meeting.

Section leaders are to be appointed to coordinate the work of the members in each field of astronomy. With favorable news notices the society hopes to increase its membership to include all those interested in our common hobby. The officers hope that this will be accepted as invitation to all those "nuts" who live in or near Chicago to attend our meetings and become active in our "gang".

6602 S. Francisco Ave., Chicago, Ill.

Chicago News

H. C. TORREYSON, Former Secretary

George Warner has what every glass polisher has wished that he might have, a grinding and polishing machine that operates with practically no attention for hours at a time. It has been perfected to the point where it can be set to work in the morning and still be operating efficiently in the evening and without attention. You can be sure that there will be many who will try to copy it.

Although he is not at present an officer of the Association the one who is responsible, perhaps more than any other, for its continued existence and success is William Callum. Wherever amateur astronomers gather, he is there. Never one to press a point yet, invariably he is right. For years his home has been the meeting place of the association.

3738 N. Richmond Street,
Chicago, Ill.

Milwaukee News Notes

M. N. FISHER, Correspondent

The sounds that mirror grinders make at their work—a vibrant wo-osh-wo-osh—were heard at the January meeting of the society at the extension division of the University of Wisconsin. The workers were S. A. Thorn's students at the Milwaukee State Teachers' College. The audience closed around the students, watching and asking numerous questions. Later Mr. Thorn told of the astronomical work at the school. and a motion picture demonstrating the welding of the 200-inch telescope was shown through the courtesy of Mr. Stoever, of the Westinghouse Manufacturing Company.

* * * *

Scores of Milwaukeeans trailed through the hobby show at the Boston Store in January. The Milwaukee Society, as a member of the hobby council, used a center for its exhibit a photographic mural of its new observatory in Waukesha County. The photograph was made by Jim Conklin of the Milwaukee Public Museum. Other materials displayed: patrol camera mounts, a grinding machine, telescope, other photographs.

* * * *

Harvey Seibel has offered to grind a 6-inch mirror for the society. He is now at work on a 4-inch.

817 N. 28th Street,
Milwaukee, Wis.

NAS Star News

NORWALK ASTRONOMICAL SOCIETY
MARY C. HAMILTON, Secretary

At the December meeting, Harold Martin, vice-president, gave an interesting and instructive lecture on meteors. At its close he called upon student members home for the vacation to give five minute talks upon what they had been doing. Ruth Fleischer told of her work at the University of Wisconsin. Richard Hamilton, of Trinity College, said he had attended some interesting lectures and spoke especially of one by Dr. Stetson on sun spots. Robert Fleischer spoke of his work at Harvard and said he had been making slides at the observatory. Our members are especially interested in making slides and are planning to make a set from photographs of illustrations in books.

At the election the following officers were chosen:

President, Miss Helen M. Swartz; Vice-president, Harold Martin; Secretary, Mrs. Alexander Hamilton; Treasurer, Mrs. Harold Martin.

4 Union Park,
Norwalk, Conn.

Long Island News

LONG ISLAND TELESCOPE MAKERS
E. H. CHRISTMAN, Correspondent

In keeping with a change in the aims and activities of our group, we have changed our name. Henceforth we will be known as: "The Long Island Astronomical Society."

In explanation, may we inform the AAAA fraternity that it is now our hope and desire to use the telescopes, observatories, and equipment which we have made, and may other TN's do the same.

A photographic mapping program has been started and is now engaging the attention of most of our members. We welcome a chance to compare notes with anyone who has taken astronomical photographs.

Seaford, Long Island

Optical Division of the Amateur Astronomers Association

CARL GROSSWENDT, Jr., Secretary

Work on the 21-inch has proceeded smoothly. We have obtained the correct curve at last and are now smoothing it up preparatory to edging and perforating. The curve has ground very evenly out to the edge so we have now a telescope of about 20¾-inch effective aperture.

Hayden Planetarium,
81st Street and Central Park W.
New York City.