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Solar Activity and Magnetic Disturbances

MAUDE S. WIEGEL, Solar Director

Meteoric showers of recent years may be a disappointment to the astronomers, but the sun is not. The sun is surpassing in activity the last maximum and gives promise of the greatest activity since 1870. Bright chromospheric eruptions have been numerous, with the subsequent magnetic storms, sometimes mild, sometimes setting up great disturbances in our atmosphere.

One instance, especially interesting, concerns a pilot of an airliner who was flying over South America and receiving radio signals from his base at Lima, Peru, and a radio operator at Seattle, Washington in touch with vessels at sea; both men found their communications suddenly cut off. They were receiving on high frequency and contact was not reestablished in either case for more than an hour. These two widely spaced points were not the only spots to feel the effects of the magnetic disturbances. Workers at an observatory at Huancayo, Peru, maintained by the Carnegie Institution and conducted to record the strength and direction of the earth's magnetic field, also the currents in the earth's crust and the electrical state of the upper atmosphere, noticed at the same time that the earth's magnetic field suddenly increased in intensity. It also shifted its direction a little and the currents in the earth's surface became unsteady. The disturbance was noticed throughout the central portion of the sunlit hemisphere.

While this wide-spread interruption was in progress a brilliant sunspot eruption was taking place. It was first seen on a hydrogen spectroheliogram taken at 1:58 p. m. E.S.T. No observations were available for an hour preceding this time. Successive exposures taken at four minute intervals show the flocculi decreasing in brightness until about 2:22 p. m. E.S.T. when again the region appeared normal. Did the eruption and the fade-out occur simultaneously? It does not seem unreasonable to assume that the outburst may have begun about 1:30 since 28 minutes later it definitely was on the decline. It has become a well-known fact that solar and magnetic effects are accompanied by radio fade-outs.

The question now arises, what factors are at work in the ionosphere surrounding the earth that allow the sun to influence terrestrial magnetism and radio transmission. Research into the electrical state of our upper atmosphere only will answer that question.

Radio now supplies some knowledge of the ion density. By sending a radio pulse of one or two ten thousandths of a second duration upward, the heighth of the reflecting level is learned by the length of time sequence for the reflection to return.

Radio waves travel with the velocity of light, 186,000 miles per second, consequently the echo time is very short. It requires only one thousandth of a second for the wave to travel to the height of one hundred miles and back.

The height at which a radio wave will be reflected depends upon the characteristics of the wave transmitted. Supposing a wave is sent directly upward on a low frequency such as 900 kilocycles; it will be reflected when it encounters a density of 10,000 electrons per cubic centimeter directly above the transmitter. If waves are sent out on a higher frequency, these waves pass through the reflecting layer of a lower frequency wave to one higher up. For instance, a wave transmitted on a frequency of 9,000 kilocycles encounters 1,000,000 electrons before it is reflected, and if such a high density does not exist the waves pass into outer space and are lost. Then for each frequency there is a definite number of ions which will reflect the wave at normal incidence. A wave is reflected when it encounters the value of ion-density which corresponds to that frequency, so the height of this ion-density is determined.

In measuring the density of ions in the upper atmosphere, higher and higher frequencies are used. The time is checked as the echo comes in until a frequency is reached so penetrating that it passes all the way through. This is termed the "critical frequency", and when all frequencies are combined, the heights of layers of various ion-density and the distribution of ionization throughout the upper atmosphere, are found.

Earlier methods of measuring the distribution of ionization were necessarily slow and tedious and the ionosphere may have undergone changes while a measurement was in progress. Later methods were wonderfully improved and now four complete records are available each hour.

The ionosphere is not a simple structure. Experiments show that two regions exist and that the outer one of the two under certain conditions divides into two regions of ionization; thus at times three distinct regions exist. The region closest to the earth is known as the E region, the next higher the F_1 and the highest, the F_2. The E region is about 60 miles above the earth. F_1 and F_2 are about 125 and 180 miles respectively. In making records of the reflected waves, it was noticed that there was a displacement of the curve on the record similar to the Zeeman effect; this characteristic is said to exist because of the presence of the earth's magnetic field in the ionosphere.

Let us suppose that we could travel upward at noon time in some conveyance that might carry us to the outermost border of the atmosphere. As we left the earth we would pass through a thin ion layer of possibly a few thousand ions per cubic centimeter, due to cosmic rays and other sources. At about 15 to 40 miles we would travel through a region of which little is known concerning the ionization from actual experiment, but the ionization is thought to be relatively low. As we reach the 40 mile height, the density of ionization gradually increases and at 60 miles the density increases very suddenly. At about 65 miles the maximum density corresponds to about 180,000 electrons per cubic centimeter and we have reached the E region. The increase in density at this level is so great that it is usually known as "layer." The ionization now decreases a little, it is believed, and then increases rapidly until a maximum is reached somewhat above 130 miles. Here the density corresponds to about 330,000 electrons per cubic centimeter; this is the F_1 region.

Now as we travel upward the ionization remains nearly constant, varying a little at times until we reach the 180 mile point, where a sharp increase occurs. The ion density here may reach as much as 1,000,000 electrons per cubic centimeter. We have now reached the F_2 region.

It must be remembered that this distribution is for a particular time of day, season and year, and may vary under certain conditions. The regions E and F_1 are present always, but F_2 has a more transient existence. It is one with F_1 except when beneath the direct rays of the sun—when it seems to bulge while separating from F_1. Its high point, directly below the sun becomes F_2, and if we move away from the sun in any direction, the height of this upper region falls until it finally merges with the region below. The separation between the two regions is scarcely distinguishable where the sun's altitude is less than about 45°.

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Variable Star Section

D .W. ROSEBRUGH, Director

Editorial Note: Although the February, 1938, issue of *Amateur Astronomy* contained a brief review of this book, Dr. Merrill's welcome addition to the all too scant literature on variable stars in book form, the publication committee deemed it advisable to include the following detailed review:

The advent of a new book about variable stars is nearly as exciting to the variable star observing brethren as a nova, more especially when it is written by one of our "elder brethren."

The author of *The Nature of Variable Stars* which can be secured from the MacMillan Co., New York, at $2.00, is an astronomer at the Mount Wilson Observatory and an honorary member of the AAVSO. While the book will prove fascinating reading to any serious minded student of the stars, variable star observers of course will find it of the greatest value.

Beginners in variable star observing will probably find Chapter III the most immediately interesting as it gives the history of the discovery and early observations of many interesting variable stars such as o Ceti, Chi Cygni, R Hydrae, R Leonis, R Coronae Borealis and R Scuti. After reading this chapter it is to be hoped that many amateur telescope makers will be inspired to start observing variable stars. If they have trouble in locating them they may derive courage from the fact that Sir William Herschel had difficulty at times in locating o Ceti. With our modern AAVSO charts the newest observer will find it much easier to locate and follow o Ceti through its cycle than the foremost astronomer did in 1780!

When the beginner has done some actual observing he will turn with great avidity to Chapter IV which describes the light curves of cepheids and long period variable stars. These curves are very largely based upon AAVSO observations as compiled by our beloved recorder Leon Campbell.

By this time Chapter II, dealing with varieties of variable stars, will take on a new meaning to the enthusiastic tyro and he will doubtless review it in the light of his increasing knowledge. The classification of variable stars into novae, long period variables ,irregular variables, cepheids and eclipsing variables proposed in 1880 by Director E. C. Pickering of the Harvard College Observatory, is of historical and sentimental interest to the members of the AAVSO for Prof. Pickering was one of the founders of the AAVSO in 1911 . Although Prof. Pickering's classification is largely superseded by Ludendorff's classification which recognized 10 different types, it is my understanding that Ludendorff's classification will be superseded in the not too far distant future by newer classifications based upon the spectra of variable stars.

By the time the new variable star observer has observed several stars and studied the book this far, Chapter V on physical properties will give him some idea as to what the long period variable stars he has been observing are really like. With some previous knowledge of astrophysics, one will have no difficulty in interpreting the spectra shown in this chapter, in comprehending the Harvard classification of stars by their spectra as shown on page 75, or in following the table showing the percentage of a star's radiation lying in various spectral regions as given on page 83. Those of us however who were taught physics about 1915 when Ganot's *Physics* and the Bohr atom were *le dernier cri* and who wish to grasp Chapter V in its entirety might do well to refer first to pages 536, 606 and 724 of Russell, Dugan and Stewart's *Astronomy* or to Dingle's *Modern Astrophysics* for the energy curves of a black body, the spectral sequence, and the "Russell diagram."

Chapter VI, dealing with new or temporary stars, will be of especial interest to new observers who did not start work until the two recent bright novae, DQ (Nova) Herculis 1934 and Nova Lacertae 1936, had already faded. Those of us who watched these lonely stars "flame and die," probably have been curious enough about what we saw to ferret out this information for ourselves ere now.

Chapter VII deals with the relative velocities of variable stars compared with the sun. It is pointed out that RR Lyrae stars (short period cluster type) and long period variables move rapidly but that cepheids move slowly. A possible explanation for this is advanced on page 125.

In Chapter VIII the places occupied by long period variables, cepheids and RR Lyrae stars on the "Russell diagram" are shown. RR Lyrae stars are blue stars with a temperature of about 8,000°K and an absolute magnitudes of zero or about 100 times the sun's brightness. Cepheids are yellow stars of about 6,000°K and absolute magnitudes oscillating about —2 or 600 times brighter than the sun, while long period variable stars are red with temperatures of about 2,800°K which vary in absolute magnitude from plus 3 to —1. These three types of variable stars lie in the giant star branch of the Russell diagram and some possible theories for explaining their variations are given. The pulsation theory of Dr. Harlow Shapley, im mediate past-president of the AAVSO is described in some detail in Chapters VII and VIII as it comes the closest to explaining the available facts. The thought is voiced that possibly these pulsating stars, which are large and diffuse, may be stars in the early stages of development in which the force of gravity has not yet gained sufficient control to subdue the matter in the stars to a steady diameter.

The book does not deal with irregular variable stars such as the U Geminorum and R Coronae Borealis types to any extent, but concentrates its attention principally on periodic variable stars.

The book is 134 pages in length and the typography is excellent. It is well illustrated with diagrams, and numerous tables give much information in a compact form.

In our own monthly series of descriptions of different types of varaible stars we have reached the time to discuss periodic variable stars and it is hoped to start next month. In the meantime the following article which Arthur L. Peck, 1332 N. 14th St., Milwaukee, has kindly written for our readers will serve as an introduction to this fascinating subject.

Variables for Maxima Ovservations

In reviewing the light curves of many of the variables we see that the maximum brightness varies from one period to another. Also among many of the variables the period changes from time to time. Therefore, it is important that careful observations be made of the stars as they reach their maximum stage. Every possible effort should be made to observe the star so as to get the time of its greatest brightness. Many of the light curves are very fragmentary, and observations are needed at the maxima phases as well as on the ascending and descending branches of the light curve. Neither should we be content with one or several complete curves, for it takes the means of many observations and many light curves to base any conclusions.

It is thought, that inasmuch as the maxima of nearly all stars listed in the accompaning table reach a magnitude well within the light grasp of the smaller telescope, and as many of the fields are comparatively easy, the beginner in variable star observation, especially, might easily adopt several of the stars as a program.

Column three of the accompanying table gives the predicted day of the month on which the maximum should occur. That does not necessarily mean that it will or must occur on that date. It undoubtedly will occur within a few days before or after the date given. However, we can reasonably expect that some will occur on the given date. Observers should bear this fact in mind when observing. Also the maxima as given on the AAVSO charts must not be taken as final.

In the accompanying table, column 1 gaves the Harvard designation; column 2, the star; column 3, the predicted date of the given month for the maximum; column 4, the maximum as given in the AAVSO catalogue of March 15, 1937; column 5, the maximum from Schneller, 1938; the last column gives the observed mixamum as published in the Harvard College Circular 418, 1935. It will be noted in this column that those variables having more than one maxima during the year reach various degrees of brightness. Undoubtedly we would find upon investigation that the periods from one maximum to the next would vary several days, while the mean period is given on the AAVSO charts. In column 4, the maximum as given in the AAVSO catalogue of March 15, 1938 is to be considered the mean of many observations. Any maximum may be either fainter or brighter than the magnitude as given in this column. In column 5, the maximum from Schneller, 1938, on the other hand gives the brightest observed maximum as reported.

Designation	Star	Predicted Date of Maximum in March 1938	MAXIMA According to AAVSO Catalogue	According to Schneller	As Recently Observed
011208	S Psc	18	9.6	8.2	8.3
021024	R Ari	24	8.2	7.3	8.0—8.3
022150	RR Per	21	8.9	7.9	—
0228*13*	U Cet	17	7.5	6.6	7.7—6.8
032335	R Per	2	8.6	7.9	8.3—9.2
035124	T Eri	18	8.3	7.4	—
043274	X Cam	27	8.2	7.3	9.6—8.2—8.8
0455*14*	R Lep	22	7.3	6.0	6.7
050022	T Lep	8	8.4	7.5	8.3
050953	R Aur	12	8.0	6.5	7.7
064030	X Gem	30	8.2	7.7	8.2
102900	S Sex	19	9.0	9.2	9.0
115919	R Com	20	9.3	7.3	8.5
1228*03*	Y Vir	28	9.4	8.5	8.8
123160	T UMa	4	8.0	5.5	7.8
1322*z0*	Y Vir	10	8.6	8.0	9.0
133273	T UMi	2	9.1	8.4	9.3
140113	Z Boo	24	9.3	8.3	9.3
1532*15*	W Lib	27	11.1	9.0	—
154536	X CrB	25	9.0	8.1	9.0
155229	Z CrB	2	10.0	8.9	10.1
1605*19*	W Sco	17	10.8	10.0	—
162807	SS Her	22	8.9	8.0	9.6—8.6
170627	RT Her	15	9.8	8.8	9.6
180531	T Her	22	7.8	6.9	7.8—7.6—7.8
180565	W Dra	25	9.6	8.7	9.0
185032	RX Lyr	19	11.7	11.0	12.5
190941	RU Lyr	12	10.6	9.7	9.9
200812	RU Aql	30	9.3	7.9	—
201437b	WX Cyg	6	9.4	8.7	—
203816	S Del	26	9.0	8.4	9.0—8.9
2105*16*	Z Cap	5	9.3	8.9	9.9
2109*03*	RR Aqr	21	9.2	8.6	9.7
211614	Z Peg	6	9.3	8.8	9.6
230759	V Cas	22	7.8	7.0	7.8—8.3
233956	Z Cas	9	9.4	8.6	9.9
235350	R Cas	25	7.1	4.8	6.0

We find that there is only one maximum listed for the star 233956 Z Cas for the year 1938. Every effort should be made to watch this star just before and after the predicted date for this maximum. Referring to Prager, 1934 we find that this star has been well observed in the past by members of the AAVSO as well as by other observers. *Popular Astronomy* vol. 34 p. 142 publishes a short note by Waterfield on the chart of this variable. The star seems to have a well defined period of 493.0 days with maximum = $9^m.8$ ($8^m.5$ — $11^m.1$), minimum = $14^m.7$ ($14^m.0$ — $15^m.4$). Prager gives the spectrum as M7e from Ludendorff. Being an M type star it should be red, like Betelgeuse and Antares. Also stars of this type show prominent calcium lines and lines of other metals. In addition there are dark bands in the green and blue regions of the spectrum which show obsorption by compounds, such as titanium oxide. The surface temperature of the M stars measured with a thermocouple is in the neighborhood of 2600°k. While this is a "cool" star as star temperatures go, we see that it is much hotter than any earth temperature.

Comments on Observations Made

Owing to the poor weather, only a few comments upon the recent variations in stars have been received but Ferdinand Hartmann writes that the R Coronae Borealis type stars, T Orionis and SU Tauri, have been fairly steady at about the 10th and $9^m.5$, respectively. The irregular star Z Cam reached a maximum of 105 on 896 while the long period star R Aqr which has lately been rather irregular is declining having reached 88 on 922. The long period star S UMi had faded to 88 on 908 and S Ceph was at minimum of 111 on 897. T Ceph is rising having reached 109 on 914.

SS Cyg is reported at minimum on 897 and the writer found it at an unusually low minimum of 123 on 925. By peering around the corner of a cloud bank U Gem was found at a maximum of 89 on 932. Of the five special red stars which are under observation with red filters, only RS Cyg and R Lep are bright enough to be seen through the filter as the other stars are in the 11-12 mag. range at present. DQ (Nova) Herc and Nova Lacertae continue to fade, the latter having reached 118 on 925.

The weather has been too cloudy for the writer to assist Edwin E. Friton, 6542 Smiley Ave., St. Louis, with the AAVSO asteroid work, but it is to be hoped that observers elsewhere have been able to help him. The charts which he prepared for the asteroids visible during the winter were well drawn and would have been of greater use with clearer weather.

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AAVSO Nova Program Notes

L. E. ARMFIELD

Good reports have been received for the months of December and January in spite of the miserable observing conditions which have persistently prevailed throughout the country. We welcome again the renewed activity of Inouye and Swensson, whose names have not appeared recently in these columns. Special mention must be made of the excellent reports submitted by Cherryholmes, Schmidt-Cameraite De Vany, Lewis, Inouye of Japan, and Swensson. Waitkus of Pittsburgh, in addition to reviewing his regions visually, is beginning a photographic patrol of certain areas. The interest being shown by all participants in the search for novae and comets is exceedingly gratifying and their efforts are becoming increasingly valuable to the professional astronomers. In confirmation of the importance placed upon the work being done in this program by the novae searchers, a letter has been received recently from Dr. Strattin of Gonville & Caius College, Cambridge, England, who wishes to stress before the International Astronomical Union the need for the organization of nova programs throughout the world similar to that of the AAVSO. All participants may well feel proud of their pioneering efforts which have broken the trail for others to follow in increasing the amateur astronomer's scope of helpfulness to the professional members of the science.

Observer	Region	Location	9	8	7	6	5	4	3	2	Total Nights
			Magnitude of faintest star reviewed								
Cherryholmes	7	Columbus (Dec.)	----	----	5	3	1	----	----	----	9
	83		----	----	4	4	1	----	----	----	9
	7	(Jan.)	----	----	5	6	----	----	----	----	11
	83		----	----	8	3	----	----	----	----	11
	70		----	----	3	----	----	----	----	----	3
	82		----	----	3	----	----	----	----	----	3
	81		----	----	3	----	----	----	----	----	3
De Vany	*1P	Davenport (Jan.)	7	----	----	----	----	----	----	----	7
	*2P		7	----	----	----	----	----	----	----	7
	*3P		7	----	----	----	----	----	----	----	7
	*4P		7	----	----	----	----	----	----	----	7
	*5P		7	----	----	----	----	----	----	----	7
	*6P		7	----	----	----	----	----	----	----	7
	*7P		7	----	----	----	----	----	----	----	7
Diedrich	43	Milwaukee (Jan.)	----	----	----	2	----	----	----	----	2
Halbach	49	Milwaukee (Jan.)	----	----	----	1	6	1	1	----	9
	50		----	----	----	1	6	1	1	----	9
	71		----	----	----	3	1	2	0	----	6
Lewis	2	Columbus (Jan.)	----	----	4	2	1	----	----	----	7
	31		----	----	2	3	1	----	----	----	6
	42		----	----	----	1	3	----	----	----	4
	46		----	----	4	1	1	----	----	----	6
	55		----	1	3	1	1	----	----	----	6
	84		----	----	1	2	----	----	----	----	3
Inouye	27	Tokyo, Japan (Aug.)	----	----	----	1	9	3	----	----	13
	28	(Sept. Nov., Dec.)	----	----	----	1	9	3	----	----	13
	34	(Aug.)	----	5	1	1	2	2	----	----	11
	35	(Nov., Dec.)	----	**6	----	1	2	1	----	----	10
	80	(Nov.)	----	----	----	----	3	2	----	----	5
McNabb, Jr.	8	Acton, Can. (Jan.)	----	----	3	2	----	----	----	----	5
	72		----	----	2	1	----	----	----	----	3
Moore	54	Milwaukee (Jan.)	----	----	----	2	11	----	----	3	16
Perkinson	34	Fresno, Cal. (Jan.)	----	----	4	----	----	----	----	----	4
	101		----	----	5	----	----	----	----	----	5
Rosebrugh	1	Poughkeepsie (Jan.)	----	----	5	----	2	----	----	----	7
	52		----	----	6	1	----	----	----	----	7
Swensson	25	Evanston, Ill. (Dec.)	----	----	----	----	1	----	----	----	1
	26		----	----	----	1	1	----	----	----	2
	36		----	----	----	2	3	1	----	----	6
	37		----	----	----	2	3	1	----	----	6
	38		----	----	----	2	2	1	----	----	5
	36	(Jan.)	----	----	----	8	2	1	----	----	11
	37		----	----	----	8	2	1	----	----	11
	38		----	----	----	8	2	1	----	----	11
Waitkus	36	Pittsburgh (Jan.)	----	----	----	1	----	----	----	----	1
	83		----	----	----	3	----	----	----	----	3
	92		----	----	----	1	----	----	----	----	1
	94		----	----	----	2	----	----	1	----	3
	110		----	----	----	----	1	----	----	----	1

11 Observers 34 different regions, 3400 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.

**Two-thirds of area reviewed to magnitude 8.5; one-third to magnitude 6.0.

The following observers used binos or low powered finders to review their regions: Cherryholmes, DeVany (Schmidt Camera), Lewis, Inouye, McNabb, Jr., Moore, Perkinson, Rosebrugh, Swensson and Waitkus. Appreciations are 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;* Cherryholmes, De Vany, Halbach, Rosebrugh, Swensson and Waitkus.

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Milwaukee, Wisconsin.

Announcement

Due to the pressure of academic duties, Franklin W. Smith, has tendered his resignation as director of the AAAA's meteor section. The Association sincerely regrets the loss of Mr. Smith's services as he was exceedingly well qualified for the duties entailed. It was difficult to find a capable successor but the American Amateur Astronomical Association is happy to announce the appointment of J. Wesley Simpson, 629 Lilac, Webster Groves, Missouri, as director of the meteor section, effective March 1, 1938.

Mr. Simpson is regional director of the American Meteor Society's Missouri-Southern Illinois region and is one of the outstanding meteor observers in the country. The Missouri-Southern Illinois region, under Mr. Simpson's supervision has contributed 37,000 meteor observations to the American Meteor Society during the past seven years. Truly, a remarkable achievement. The Association expresses its appreciation to Mr. Simpson for accepting the responsibilities of the meteor section directorship and extends its sincere best wishes for a long and successful career.

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Calendar of Events

GEORGE DIEDRICH

(All Times C. S. T.)

MARCH, 1938

1 Tue.—New moon at 11:40 P. M.
5 Sat.—Conjunction of Mars and the moon at 8:51 A. M. Mars 2° 57′ south.
8 Tue.—Superior conjunction of Mercury and the sun at 6:00 A. M.
9 Wed.—First quarter at 2:35 A. M.
10 Thu.—Opposition of Neptune and the sun. Neptune 2,714,000,000 miles from the earth. Occultation of X? Orionis at 11:34:30 P. M. Position angle of 112°. Magnitude 4.7.
15 Tue.—Full moon at 11:15 P. M.
17 Thu.—The three planets Venus, Saturn, and Mercury form a right-angled isosceles triangle with Venus at the 90° apex and above (north) of the other two. Saturn is 2° east of Mercury on the imaginary hypothenuse. Saturn and Mercury will be about 8° above the horizon at sundown, leaving little time for observing this ususual proximity of the planets.*
18 Fri.—Minimum of Algol at 8:50 P. M.
19 Sat.—Conjunction of Mercury and Venus at 11:00 P. M. Mercury 1° 17′ north.
21 Mon.—Sun enters Aries. Spring breezes in at 12:43 A.M.
23 Wed.—Last quarter at 7:06 P. M.
28 Mon.—Conjunction of Jupiter and the moon at 1:13 A.M. Jupiter 6° 6′ south. Conjunction of Mars and Uranus at 4:00 P. M. Mars 0° 44′ north.
29 Tue.—Conjunction of Saturn and the sun.
31 Thu.—New moon at 12:52 P. M.

APRIL, 1938

1 Fri.—Conjunction of Mercury and the moon at 11:51 P.M. Mercury 0° 11′ north. Conjunction of Venus and the moon at 5:22 P. M. Venus 3° 39′ north and of mag. —3.3.
2 Sat.—Mercury at greatest elongation east (19° 5′). Most favorable elongation of this year due to decided northern declination.
3 Sun.—Conjunction of Mars and the moon at 1:46 A. M. Mars 0° 42′ south.
7 Thu.—First quarter at 9:10 A. M. Minimum of Algol at 9:30 P. M.
8 Fri.—Conjunction of Mercury and Venus at 7:11 A.M. Mercury 3° 52′ north.
14 Thu.—Full moon at 12:21 P. M.
15 Fri.—Conjunction of Venus and Uranus at 2:15 P. M. Venus 0° 9′ north.

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

*Information from *Popular Astronomy* Feb. issue.

3333 W. National Avenue,
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The Long Island Astronomical Society

E. H. CHRISTMAN, Correspondent

At one of our recent meetings, F. K. Schmid simultaneously made a suggestion and a job for himself. He suggested that a library should be organized in order to obtain, as a society, books, periodicals, magazines and maps which would not otherwise be available to individual members.

This bit of co-operative effort is giving promise of accomplishing much. It has created and stimulated an interest in astronomical literature. Brother Schmid is the librarian, and a committee of three is covering the task of reviewing, purchasing, and collecting likely additions to the small nucleus with which we are starting.

The mapping program is reporting progress. Three enlarging machines have been built for the purpose of making the final copies of the photographic map.

Seaford, Long Island.

Celestial Globes

Through the kind suggestion of an officer of the Chicago Amateur Astronomical Association, the Mid-West Geographical Association has courteously offered members of the AAAA an opportunity to obtain a celestial globe. The globes are offered in two styles, "The Orion" and "The Leo". The globe itself in either style is nine inches in diameter. "The Orion" has a heavier base and is equipped with a horizon ring. Both globes show the brightest stars as well as the mythological figures. Quoting the descriptive circular, "the stars are bright yellow on a midnight blue background with the constellation figures and names in light blue." A 30 page booklet, "An Introduction to the Stars" describing the use of the globe and including some elementary astronomy accompanies each globe.

The regular price for "The Orion" is $5.00 and for "The Leo" is $3.50 plus postage in each case. However for a short time only the Mid-West Geographical Association offers the members of the AAAA a discount of 35 per cent from the regular price.

We suggest that any member desiring a globe send their order to the Mid-West Geographical Association, 608 S. Dearborn Street, Chicago, Illinois, at once. The membership list of the AAAA has been forwarded to the association to insure your discount.

Milwaukee News Notes

M. N. FISHER, Correspondent

Now that spring is coming over the horizon, good observing weather (we hope) is finally on its way. The skies in this area were leaden most of the winter, although the lack of work at the eyepiece was made up by a goodly amount of paper work and, more importantly, by the formation of a new astronomical unit, The Waukesha Astronomical society.

The Milwaukee society and the AAAA cordially welcome this new group and wish the members every success.

It was on Jan. 31 that 12 men and women met at the Waukesha Y.M.C.A. to formulate preliminary plans for the society-to-be. Prof. Vincent Batha, chairman of the department of physics at Carroll college, was elected chairman pro tem. L. E. Armfield, secretary of the Milwaukee group, explained some of the requirements that go along with work in an astronomical unit.

The second demonstration meeting of the Milwaukee society was held Feb. 3 at the extension division of the University of Wisconsin with R. D. Cooke speaking on occultations, E. A. Halbach on meteors and the methods of handling the observations, and with Herbert W. Cornell speaking and showing slides on the recent solar eclipse expeditions.

E. P. Martz, Jr., came up from Chicago early in February for an all too short visit with Milwaukee members.

Speakers during January and February: Halbach, before a church group, on the immensity of the universe; Armfield, likewise before a church group, on general astronomy.

817 N. 28th Street,
Milwaukee, Wisconsin.

Norwalk Astronomical Society

MARY C. HAMILTON, Secretary

Members were asked to bring items of interest to the January meeting. Naturally there was duplication, but everyone had so many clippings that each person was allowed only 10 minutes to read them. The subjects included, asteroids, meteors, sun spots, the aurora borealis and the Springfield planetarium. A lively discussion followed.

Mr. Martin and Mr. Fleischer told of their visit to the New Haven Society meeting at which Prof. Barton of New York gave an illustrated lecture on his trip to Peru last June to view the eclipse.

Several guests were present, some of whom expect to join the Society.

4 Union Park,
Norwalk, Connecticut.

Tri State News Notes

AMATEUR ASTRONOMERS' ASSOCIATION OF PITTSBURGH

WILLARD A. MacCALLA, Correspondent

Proving that a treasurer can not only collect and disburse funds with the greatest of ease, but also can do a fine job of pinch-hitting when both president and vice-president are absent, Joe Goin admirably conducted our Feb. 11 meeting.

At that meeting our group went on record as favoring a proposal of the Pittsburgh city council for creation of a non-salaried board to supervise the work of the bureaus of parks and recreation. By that change it is believed that we shall be able to make better use of our parks for the entertainment and instruction of the public in the subject of astronomy. It will be remembered that last summer Fred Garland conducted weekly classes on astronomy and constellation study at one of the city parks.

The main topic of the February meeting was entitled, "What Sun Spots Are Doing to Amateur Radio Transmission." The speaker, Paul B. Korneke, Jr., is a student at the University of Pittsburgh and owns and operates station W8NEX. Testifying to his activity are cards from amateurs all over the world, confirming two-way communications. Joe Goin reports that the ceiling and walls of Mr. Korneke's radio room are literally papered with these cards.

According to the speaker, there is an ionized region extending upward from about 68 miles above the earth's surface. This is known as the Heaviside layer, and is actually composed of five or more independent layers, each having the property of reflecting radio waves of certain high frequencies. The ionization is caused by the sun's ultra-violet radiation. This is proved by the partial de-ionization of the Heaviside layer during a total eclipse of the sun.

The ability to transmit certain radio waves depends upon the height and density of the Heaviside layer which in turn varies according to the intensity of the sun's ultra-violet radiation. Long radio waves such as used in regular broadcasting are affected by magnetic rather than by light conditions, magnetic storms having the property of dispersing the intensity of the radio signals. Position and intensity of the sun's spots cause variations in the earth's magnetic conditions. Thus radio broadcasting experiences cycles corresponding to the rotation of the sun spots as well as to the familiar 11 year cycle of sun spot activity.

At least two other heavenly bodies besides the sun affect radio transmission. Meteors are believed to set up clouds of ionization which reflect waves that penetrate the Heaviside layer. The moon, on the other hand, causes a gravitational pull on the layer, and there is probably also some ultra-violet reflection from the moon's surface. Following Mr. Korneke's talk a friendly discussion arose between the TN's and the visiting RN's (radio nuts) as to whether astronomy is the basis for radio or vice versa.

A mirror clinic followed the lecture. "Doctors" Scanlon, Goin, and Scanlon prescribed cures for mirrors suffering from ingrown toe nails, flat feet, carbuncles and adenoids. Among the "victims" were B. E. Knauss' 6-inch mirror, and C. A. Atwell's 12-inch, now in the "600" stage. Our old friends, the Optical Twins (Larry Scanlon and Joe Goin) are developing a new rapid polishing technique, and it is reported that they actually brought a mirror from the 2F stage to completion in four hours!

Valley View Observatory,
Pittsburgh, Pa.

Optical Division of AAA New York

ROBERT BLAKEMORE, Correspondent

About 30 members of the Optical Division of the AAA met in their workshop under the Hayden Planetarium on Friday, Jan. 28. Kodachrome movies and stills of the Peruvian eclipse and the country en route to the observer's station were shown. At the business meeting afterwards, favorable progress was reported on the 21-inch mirror being ground in an alcove in the Planetarium theatre. The center of curvature has almost been reached. Members agreed to help grind every week-night, assuring even more rapid progress. The tentative plans for the observatory which will house this young giant were on view. It is an enviable achievement and should be the Mecca of amateurs and professionals not only from this country but from abroad. Already several valuable offers of land for the site have been received from Connecticut, New Jersey and Westchester County (part of suburban New York City). A start has been made towards having a machine shop, with several members offering sundry tools for metal work. Incidentally, it looks as though the Bell Telephone company will investigate new worlds with which to establish communication. No less than nine telephone men have recently become members and are making creditable mirrors ranging from 6-inch to 12.5-inch Cassegrain!

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

AMATEUR ASTRONOMY

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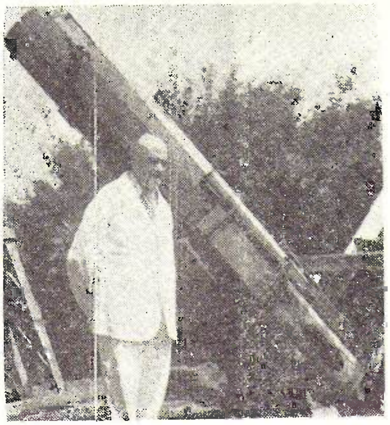
Prof. William Henry Pickering

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



W. H. PICKERING
With Calver Reflector, Jamaica, 1937

On January 17, amid the tropical beauty of the island of Jamaica in the British West Indies, there passed away at the age of 80 one of the few remaining astronomers of the school of Flammarion, Schiaparelli, Lowell.

William Henry Pickering was born in Boston just before the Civil War of a well-known Massachusetts family. He received the Bachelor of Science degree from the Massachusetts Institute of Technology in 1879, and taught physics there until 1883. He was early called to nearby Harvard by his brother, Prof. Edward C. Pickering, the Director of Harvard College Observatory, and in 1887 was made assistant professor of astronomy there. Throughout this early period and in later life, William Pickering was an ardent amateur photographer, and did much to develop the application of that science to astronomy. Following successful photographs of the great nebula of Orion with a small camera attached to a telescope, he suggested to his brother Edward the application of photography on a large scale to an astronomical survey of the sky. The suggestion was acted upon, and resulted in the great Harvard photographic survey now containing over 400,000 plates of both hemispheres. W. H. Pickering developed much of the early technique and the methods used in his brother's astronomical photography and stellar photometry.

In 1888, with the 13-inch Boyden refractor, Pickering obtained some of the earliest successful photographs of the planet Mars, and two years later began extensive visual observations and drawings of the planet with the 12-inch Gerrish polar telescope and the famous 15-inch refractor in Cambridge. This work seems to have determined much of his future trend.

In 1889, after testing a number of sites in the western United States, he established the first Harvard Observatory branch on the peak of Mount Wilson in southern California, and instituted work in astronomical photography there with the Boyden telescope. It was not until years later that Dr. George Ellery Hale established the present Mount Wilson Observatory on the same site. As it was desired to establish a station still further south than Mount Wilson, in 1891 Pickering with A. E. Douglass, set up the 13-inch refractor and other instruments in the mountains above Arequipa, Peru, in South America. There, in the course of extended photographic observations, Prof. Pickering discovered the great whorls of diffuse galactic nebulosity enveloping the whole constellation of Orion. In 1892 he and Douglass discovered visually the numerous so-called "lakes" or "oases" on the planet Mars, and also established the existance of "canali" crossing the dark regions, or "maria", thus proving that the latter are not "seas", as had previously been suspected.

After returning to Boston, in the winter of 1893, Pickering met Percival Lowell, who, besides being a member of the well-known New England mill-owning family, was an ardent amateur astronomer. Lowell became interested in the work of Schiaparelli and Pickering on Mars, and commissioned Pickering and Douglass to build an observatory for him in the western United States to be devoted to the study of that planet. Flagstaff, Arizona, was chosen as the best site, and in 1894 Pickering and Douglass mounted an 18-inch Brashear refractor and a 12-inch Clark on the same polar axis for the first Lowell Observatory, and observations of Mars and Jupiter III were begun. Though Prof. Douglass remained at Lowell Observatory for several years, Pickering returned to Cambridge to work at Harvard

Observatory.

In 1899 he discovered on Arequipa photographs the ninth satellite of Saturn, Phoebe. A few years later he reported a tenth Saturnian satellite, but the discovery has not yet been confirmed. In the same year he undertook the first Harvard expedition to the island of Jamaica in the West Indies, to test the astronomical seeing and sky transparency with an excellent 5-inch Alvan Clark refractor. He found both very fine, and in 1900-1901 returned to Jamaica to spend seven months photographing the moon with a 135-foot focus 12-inch horizontal telescope. The resulting lunar atlas is published in his book, *The Moon,* and in *Harvard Observatory Annals,* Vol. 51.

In the small space we have available here, it is hopeless to attempt a comprehensive summary of the work of Prof. W. H. Pickering, but we will note a few of the subjects that occupied his interest for the next few years . He early suggested the rocking-mirror method for determining the velocity of meteors, which was used with such success by the recent Harvard meteor expedition to northern Arizona. He was the first person to develop the theoretical interpretation of the rapid changes in the spectra of novae that is today accepted as correct, though it is often attributed to other astronomers. He published an extended investigation of most of the known cometary orbits. In a number of trips to Alaska, Canada, Hawaii, and the Azores, investigations were undertaken of volcanic craters and their similarity to the craters of the moon.

The year 1911 marks the founding of the Jamaica branch of Harvard Observatory, where Prof. Pickering was to spend much of his later life. The primary instrument in use at "Woodlawn", Mandeville, Jamaica, was the excellent 11-inch photo-visual Clark refractor loaned to Harvard by Mrs. Henry Draper. Constant visual observations of Mars, the moon, and Jupiter's third satellite, Ganymede, were continued for many years with it and other telescopes. In 1914 the first of the classical "Mars Reports" was published by Pickering in *Popular Astronomy.* These analyses of observations and drawings of the planet by a number of cooperating observers ran through 44 numbers and were continued until 1930.

In 1924, at the usual age of 65 years, Pickering was retired by Harvard. He decided to retain the estate at "Woodlawn" as a private observatory, and in 1925, after the Draper telescope was returned to Harvard, he bought a 10-inch reflector and later a 12.5-inch Calver reflector for observations of the moon and Mars. A few years earlier, Prof. George H. Hamilton, who had been observing Mars at Lowell Observatory and elsewhere, came to Jamaica to work with Prof. Pickering until his death in 1935.

It is impossible to give here an adequate discussion of Prof. Pickering's work in relation to the trans-Neptunian planet. Suffice to say that he predicted positions for it as early as 1907 before Lowell's famous paper of 1916, and that when Pluto was discovered by Clyde Tombaugh at Flagstaff in 1930, Mount Wilson Observatory found it on their own plates taken in 1919, close to the position predicted at that time by Pickering. The earlier plates had not been examined for faint enough objects in 1919, as Pluto turned out to be much fainter than predicted by either Lowell or Pickering. Though Lowell and Pickering by different methods reached solutions quite close to each other, most modern orbit computers do not feel that the very early observations of perturbations of Uranus and Neptune from their "true" paths upon which each based his analyses, were sufficiently accurate and justifiable data from which to compute an orbit for a trans-Neptunian planet. Undoubtedly, the primary credit for the discovery of Pluto goes to the energetic staff of Lowell Observatory, for the long and successful photographic search which they conducted for such a planet.

In 1935, after several trips abroad and to the States, Prof. Pickering had with him on Jamaica for several months the present Lunar Section Director of the AAAA, Walter H. Haas. The next year the writer also had the pleasure of studying and observing under Pickering from Jamaica, as described in *Amateur Astronomy* and elsewhere.. It is worthy of note here that another member of the AAAA organization, Latimer J. Wilson, was also closely associated with Prof. Pickering for many years in his many contributions to the "Mars Reports."

W. H. Pickering published over 450 papers and at least two books in the course of a very prolific life. He was a member of a number of scientific societies, and had several medals and awards conferred upon him in addition to being an associate of the Royal Astronomical Society of Great Britain. It is of interest that, though not primarily a solar observer, he observed at least six total eclipses of the sun: Colorado in 1878, Granada, West Indies in 1886, California in 1889, Chile, South America in 1893, Georgia in 1900, and New England in 1932. Surely an enviable record for any solar astronomer, let alone one whose major efforts were concentrated on the planets! Though his work covered a broad range, embracing astronomical photography, photometry, novae, eclipses, meteors, comets, planetary and satellite astronomy (planetology), orbit computing, vulcanology, and other fields, his influence is felt primarily in the study of Mars, the moon, and Jupiter III. Though he never seriously considered the basic "theories" of lunar and Martian "vegetation", which he was the first to develop, as more than mere "working hypotheses", his suggestions formed the primary impetus to the work of Percival Lowell and many others.

It has not been the writer's intention to attempt to give in this all-too-brief survey a description of the personal characteristics of Prof. William H. Pickering aside from those obvious traits that can be inferred from such a long and exceedingly prolific life. I will leave for another, who is better fitted than I, the task of relating amusing anecdotes and pleasant sidelights on the life of this unusual and inspiring man. However, I cannot help but recall one of many cherished afternoons in 1936, when we were sitting with our tea on the veranda at "Woodlawn", watching the exquisite tropical twilight and dusk fall gently but swiftly over the valley below. Deeply moved, I recited aloud that haunting, yet invincibly brave annonymous couplet that marks the resting place of John and Phoebe Brashear in the base of Allegheny Observatory in Pittsburgh. The Professor chuckled softly, and said he liked it too, and he knew who had written it. Though I never did learn from him who was the author of these words, there can be no more fitting final comment on the life of any astronomer who has given so many years devotedly to his work as did William Henry Pickering:

"We have loved the stars too fondly
to be fearful of the night.

726 N. Elmwood Ave.,
Oak Park, Ill.

Solar Section

MAUDE S. WIEGEL, Director

(Continued from the March issue)

CORRECTION: An incorrect statement was made inadvertently in my article "Where Is the Sun's Equator?", which appeared in the February 1938 issue of *Amateur Astronomy*. Please delete the first paragraph on page 16 which begins with the words, "This accomplished . . . . " and insert the following: "This accomplished, you have projected, approximately, the earth's equator across the disk of the sun and the motion of the spot parallel to the line is a reflection of the earth's rotation. The same principal is observed in photographing the sun, i.e., a horizontal line across the space to be occupied by the plate or film must be established to orient correctly the projection of the earth's equator on the disk of the sun. The spots may now be marked on the paper, and later, with the aid of the American Ephemeris, the correct latitude and longitude of the spots determined.

"The paths of the spots across the sun's disk usually appear ellipitical,and are most curved early in March and in September. Twice a year, early in June and in December, they become straight lines. This indicates that the sun's axis is not perpendicular to the ecliptic. From a great number of careful measurements the astronomers have found that the sun's equator is inclined 7° 10′.5 to the ecliptic."

THE IONIZATION OF THE EARTH'S OUTER ATMOSPHERE

When the F region subdivides, as it does when directly under the sun, forming the two layers, F_1 and F_2, resembling an immense bulge occupying probably about 0.3 of the sunlit hemisphere, the upper layer or F_2 region is the most highly ionized. As the earth turns, bringing different points on the earth's surface beneath this bulge, these localities are affected so far as radio reception is concerned. The outer atmosphere revolving with the earth, resumes its original appearance of one layer, as it passes from beneath the sun.

Owing to the earth's tilt of 67° to the plane of its orbit, the geographical areas directly beneath the sun vary greatly from summer to winter, so that the divided F region, while quite distinct in the summer at Washington, D.C., where the sun reaches an altitude of about 78° at midday, are entirely merged in winter for then the sun's highest altitude is only about 28° at midday.

Further study discloses the fact that the sun is an important factor in the changing characterization of the ionisphere. The E region is low in ionization at nights and the F_1 region does not appear until after sunrise, when it increases rapidly until noon and then decreases rapidly. Generally the strength of ionization is proportionate to the amount of sunlight received. Seasonal changes, too, are a real factor, ionization in winter being lower than in summer, not only in one hemisphere but in both.

The solar eclipse in 1932 was a critical test, even here in North America. At Washington, D. C., the eclipse was not even total; nevertheless, ionization over that place decreased steadily until nearest totality, later increasing proportionately.

The results of tests made at that time

(Continued on page 43)

Variable Star Section

D. W. ROSEBRUGH, Director

WAVES

"How looks Appledore in a storm?
I have seen it when its crags seemed frantic
Butting against the maddened Atlantic."

James Russell Lowell

Those who love Nature will be well repaid if they read "Ocean Waves and Kindred Geophysical Phenomena" by Vaughan Cornish, published by the Cambridge University Press. The writer's boyhood was spent by the Great Lakes and the North Atlantic and Mr. Cornish's descriptions of the mechanism by which waves are created, the heights to which they rise and the speeds at which they travel bring to his mind countless happy hours spent in close communion with the waves.

On Georgian Bay waves are short and choppy. Life can hold no greater pleasure than to breast them in a small sailboat on a sunshiny summer day with a crisp wind blowing out of the west. Artistically waves are at their best when one walks along a great beach, such as Sable Island or Cape Cod, where the waves break in fast moving walls of green water and rush madly up the sand, leaving strange forms of marine life at one's feet. But, of course, waves are most spectacular when they charge upon a rock bound coast. When one watches such waves the game is to pick out from the cliff on which one stands the advancing wave which will dash highest up on rocks. This big fellow looks good for 80 feet, but no, 70 feet above sea level is as high as it reaches. Here comes a whopper, and its topmost spray drenches the observers 100 feet above the sea, but the next wave, which is apparently even bigger, is checked by its predecessor's backwash and only laps angrily some 60 feet up the cliff side towards the watchers on its top.

Besides ocean waves there are many other rhythmic phenomena in nature such as alternating currents, the seasons of the year, the beating of the human heart and the fluctuations of periodic variable stars which undergo wavelike changes in brightness. It would be a hard matter to decide which is the more beautiful sight, an ocean wave or a variable star field, particularly in the Milky Way, but fortunately a beneficient Nature gives us both, so let us enjoy both stars and waves to the full.

In our studies of different kinds of variable stars we have learned about irregular R Coronae Borealis and U Geminorum type stars. In our emphasis on the unusual and dramatic, it should not be overlooked that the greater number of variable stars seem tolerably regular in their variations, and doubtless these stars are of greater importance to science than the "freaks" such as R Coronae and U Geminorum. It is true that circus "freaks" draw more attention than do the "normal" people watching them, but a study of a "normal" human being will prove more generally useful in determining the characteristics of mankind than a study of the "freaks", and the same is doubtless true of variable stars. We will, therefore, turn our attention towards periodic variable stars for the next few articles. These, however, will not deal with eclipsing variable stars, since a star of this type, namely Zeta Aurigae, was described very fully in the June-July 1937 issue of *Amateur Astronomy*.

Periodic variable stars vary in brightness with considerable regularity, far exceeding the regularity of size and frequency of ocean waves. First, such a star is faint, then it gradually grows bright, following a curve not unlike the well known sine curve which we studied in trigonometry. After reaching a maximum it gradually fades again to its starting point and then repeats this performance time after time with considerable regularity both with regard to its range of brightness from minimum to maximum and with regard to the time it takes to go through its cycle from faint to bright and back to faint again.

Several different kinds of periodic variable stars have been clearly recognized: (a) cluster type (b) cepheids (c) long period. It was formerly thought that these three classes were distinctly separate from each other but it is now believed that they are all of essentially the same character and that they merge into each other.

Cluster type variable stars are mostly found in globular clusters. They have been used to determine the distance of these clusters in a manner that will be described in the second article of this series. However, a considerable number of these stars belong to our general galactic system. RR Lyrae and RS Bootis are of this type, and cluster type variable stars are, therefore, frequently referred to as RR Lyrae type stars and sometimes as "short period cepheids." Cluster type stars vary through a range of about one magnitude and their average period is about half a day from minimum through maximum to minimum again. However, some of them take as little as two hours while others take as long as 22 hours to complete their cycle. Merrill states that in 1935 six hundred and twenty of these cluster type variable stars were known.

Cepheid stars are known after their prototype, Delta Cephei, which was discovered by Goodricke in 1784. Those of us who watched Nova Lacertae in 1936 no doubt often gave Delta Cephei an occasional side glance as it lay nearby. If the light curves of cepheids are plotted, they resemble those of the cluster type variable stars, but it takes them longer, namely 5 or 6 days on the average, to complete their periods, though some take as little as 3 days while others take 32 days to go through their cycles. Their range is about 0.8 magnitude in brightness, and 287 such stars were known in 1935. These stars have been used to establish the scale of our Milky Way system and to measure the distance to other galaxies. Cepheid stars are sometimes subdivided into: cepheids, which rise rapidly to their maxima in a quarter of the time of the whole cycle and then fall leisurely to their minima, taking three-fourths of their cycle for this purpose; and geminids, named after Zeta Geminorum, which follow nearly a pure sine wave and spends about half the time rising to maximum and half the time declining to minimum.

Long period variable stars are those to which the members of the AAVSO devote a large portion of their attention, as these stars vary enough in brightness so that their light curves can be well determined by eye. Some of these stars take only 32 days for their cycle, some take as long as 560 days or longer while the average is about 280 days. Unlike the cluster type and cepheids, long period stars change several magnitudes in brightness. On the average they vary four and a half magnitudes, but Chi Cygni, which will soon be visible again in the northeast, has an extreme variation from 3.5 magnitude at maximum to 14.5 at minimum. 2144 of these stars were known in 1935 and our old friend *o* Coeti is commonly considered the type star, though Leon Campbell points out in *Variable Comments*, Vol. 1, No. 4, April 1925, that these long period variable stars may be subvidided into classes by the shapes of their light curves in somewhat the same manner that cepheids are subdivided into cepheids and geminids. These long period variable stars are beginning to be used to determine the distances of remote galaxies, in a manner which will be outlined later in this series.

This brief outline of the different types of periodic variable stars and the scientific uses to which they are put gives an idea of the importance of this subject. Before we are finished with these stars we hope to discuss their physical characteristics, their spectra, with comments on the five special red stars which are being studied by the AAVSO and some possible theories as to the causes of periodic variables.

Next month we hope to describe cluster type variable stars and perhaps cepheids more thoroughly, as a review of these stars is a useful ,and perhaps necessary, prelude to a more intensive study of long period variable stars to which many of us devote much of our time at the telescope.

Franklin W. Smith, Vineland, N. J., remarks that R Leonis, which is a long period variable, is now declining after reaching a maximum of 6.1 on about 8926. U Orionis is also declining after a rather extended 7 mag. max. Schneller's catalog predicted that it would reach 5.4 mag. and that R Leonis would reach 5.0 mag., which illustrates the uncertainty inherent in these stars. Walter Scott Houston, instead of submitting observations, wants information. "What" he asks "can the Milwaukee observers do to combat 27 days of clouds in a row?" If this is all that is troubling him he should consult Leo J. Scanlon of Pittsburgh, who is one of our AAVSO councillors.

Surely Scanlon's "cloud-piercing" eyepiece which he showed us at the Springfield Telescope Makers' convention at Stellafane in 1932 is just the solution, more especially when cluster type variable stars are about to receive our attention. This remarkable eyepiece, fitted into the Stellafane turret telescope, showed a brilliant greenish star cluster, purporing to be that in Hercules. Cluster type variable stars could be seen flashing into sight and disappearing with remarkable rapidily, even changing their locations within the cluster itself! A rapid calculation based upon the observed phenomena indicated a distance of 0.00 light years for this beautiful object. Yes, it was a spinthariscope!

74 South Randolph Ave.,
Poughkeepsie, N. Y.

Variables for Minima Observations

Arthur L. Peck

In the March issue of *Amateur Astronomy* we discussed a list of stars for maxima observations. While this is very important, and is a program that can be followed by those possessing telescopes of only smaller aperture, there is very important work to be done by those possessing larger telescopes. Many stars are followed on the descending line of the curve to the limit of the telescope at hand and then lost to view to all those except the observer possessing the larger telescope. On looking over the light curves of many of the variables we find that there is quite a gap from the descending side until we find observations on the ascending side. In this way the minimum is lost. The AAVSO is very anxious that these gaps be filled. Anyone possessing a large telescope should make every effort to observe the minima of as many of the stars on the list as possible. Nor should the possessor of a smaller telescope lose hope, for there are several stars on the list that are well within the range of a three or four inch aperture.

The table is the same as in the March issue except that the minima are given instead of the maxima. Column 1 gives the Harvard designation; column 2, the star; column 3, the predicted date of the given month for the minimum; column 4, the minimum as given in AAVSO catalogue of March 15, 1937; column 5, the minimum from Schneller, 1938, and the last column gives the observed minimum as published in Harvard Circular 418, 1935. In column 4, the minimum as given in the AAVSO catalogue of March 15, 1937 is to be considered the mean of many observations. Any minimum may be either fainter or brighter than the minimum as given in this column. One notices in the last column that many of the observations recorded are shown simply as less than a given magnitude. While these observations are perhaps better than none, yet it does not give the true value for the minimum of the star. Almost all, if not all of this list of stars are visible in the larger telescopes of the members and observers of the AAVSO. It would be well worth the time spent to make every effort to obtain a true value for each minimum observation.

MINIMA APRIL, 1938

Designation	Star	Predicted Date	MINIMA AAVSO Catalogue	Schneller	Recently Observed
0019*09*	S Cet	21	14.8	13.9	(13.9
004047a	U Cas	27	15.0	14.5	(13.9
004958	W Cas	19	12.3	11.0	....
0101*02*	Z Cet	5	13.7	13.1	(12.8
010940	U And	6	14.2	14.0	(13.5
012350	RZ Per	11	13.7	13.3	(13.1
020448	RV And	17	10.3	11.4	10.7
0214*03*	*o* Cet	25	10.1	9.2	9.3
0346*25*	U Eri	11	15.4	13.5	(13.6
042209	R Tau	17	15.0	14.2	11.3—11.4
081635	T Lyn	30	12.0	12.0	....
084803	S Hya	4	13.0	12.8	(12.4
1214*18*	R Crv	22	14.0	13.0	(13.2
122532	T CVN	13	12.8	12.3	11.4—11.4
1324*22*	R Hya	29	10.1	(14.0	....
142584	R Cam	2	14.5	(13.1	12.5
143227	R Boo	27	12.8	12.3	12.5—(12.3
1506*05*	Y Lib	2	14.0	14.0	(13.7
1530*20*	X Lib	19	14.6	13.8	....
1602*21*a	X Sco	27	14.0	14.2	(13.1
163172	R UMi	8	10.6	10.5	10.5
1643*19*	RR Oph	26	14.5	13.2	14.9—(12.9
1702*15*	R Oph	1	13.9	13.8	(12.4
172809	RU Oph	21	14.2	13.6	(12.6—14.0
175654	U Dra	4	14.6	14.1	(13.2—13.5
1910*19*	R Sgr	13	13.3	12.7	(12.5
200212	SY Aql	7	14.7	14.4	(13.2
200812	W Cap	9	(14.5	(14.5	(14.5
202954	ST Cyg	7	14.5	13.9	13.9
203422a	RU Vul	10	10.8	11.0	10.9
2039*05*	Y Aqr	24	15.0	13.6	(13.3
2056*27*	RR Cap	25	15.0	15.0	....
205923a	R Vul	18	13.6	12.6	(12.4—13.6
2105*04*	RSAqr	5	15.1	13.8	(14.1
210812	R Eqr	26	15.0	14.2	(14.1
235053	RR Cas	25	13.7	13.7	(13.9—(14.2

Mira, *o* Ceti, is predicted to be at minimum on April 25th. Beyond any doubt this is the best known of the long period variables. It has been under observation since 1596. In fact, it is supposed to have been discovered in August of that year when Fabricius, a German clergyman, noticed that it was brighter than Alpha a yellow star of magnitude 2.2. Soon after it was lost to view and, according to the record, it was not seen again until Fabricius observed it in February 1609. Chapter IV of Merrill's, *The Nature of Variable Stars*, gives a very good account of the observations made by William Herschel. Because of the star's wonderful sight changes, it was given the name, *Mira*, meaning, "The Wonderful." It has an average period of 331 days, and in this period its radial velocity also varies. Joy found that the spectrum of the star varies from M6e to M9e, and predicted the existence of a companion star because of the peculiarities in its spectrum when the star was at minimum brightness. The existence of this companion was verified by Aitken with the 36-inch telescope on October 19, 1923. At that time the variable was at minimum brightness (visual magnitude). The companion is of tenth magnitude, is bluish-white in color, and is invisible except when Mira is comparatively faint. These two stars certainly form a binary system, for Mira has a proper motion of 0".239 in 179°.5 (Boss). The more distant companions are merely optical.

Visually the star varies from a mean maximum of $3^m.4$ to a mean minimum of $9^m.3$. Maxima vary from $2^m.0$ to $4^m.9$, while the minima vary from $8^m.6$ to $10^m.1$. Photographically the star varies from a mean of $4^m.9$ to $10^m.2$. Beyond all doubt this star is one of the most interesting variables on the AAVSO observing list. Its minima are well within the light grasp of the smaller telescopes.

1332 N. 14th Street, Milwaukee, Wis.

(Continued from page 39)

assures us that sunlight having such a major effect must be the main source major effect must be the main source of ionization during the daytime, especially of the two lower regions.

Since we know that the sun radiates light of different wave-lengths (in comparison we may refer to them as frequencies, for wave-length and frequencies are directly related), it is not difficult to learn which portion of the sun's light is active in ionizing these regions of outer atmosphere. The amount of sunlight that we might observe for each frequency, if the sun were a perfect radiator, can be calculated for any assumed temperature. The frquency of radiation determines the color of light; for example, a light frequency of perhaps 80 thousand million million cycles per sec. appears as a violet, while a much lower frequency appears as a red color. Higher and lower frequencies than these are invisible to the eye, yet they may be measured. The calculated curve tells us how much energy we should expect from the sun at each frequency.

The calculated curve and the actual curve match very well except in the far ultra-violet where the observed light-curve drops suddenly to zero and none of the higher frequency radiation which we should expect is actually observed at the earth's surface. We may conclude then that the difference between the observed and the calculated curves must be energy which has been absorbed in the earth's outer atmosphere, and a part of this energy is available for the ionization.

There is a law of quantum-physics which states that the energy in a photon of light is proportional to its frequency and that the higher the frequency the greater the energy involved in a fundamental quantum of light. Thus the far ultra-violet light is of very high energy and the photons of such light involve very high frequencies. When a photon of this high energy reacts upon a molecule, it not only can separate it into its constituent atoms, but it can also ionize these atoms by ejecting an electron. Such a process is believed to occur in the ionization of the earth's outer atmosphere by the far ultra-violet light of the sun.

Let us examine further the F½ later or the bulge, which appears only when the sun is high over head. This layer does not act in the same fashion as the lower regions and is subject to violent fluctuations in ionizations within a few hours' time, also changing from day to day.

Seasonal change is also evident, June being quite different from December, while great dissimilarity occurs at each of the observing stations which are widely separated over the earth.

While the ion density shows marked changes at the various stations, such changes must be of solar origin since they occur with the period of the solar day. The F½ layer here again shows its dissimilarity to F¼ layer inasmuch as it shows the ion density at, say, three different stations to be alike for the same season even though the stations are in different hemispheres.

Observations of the F½ layer at the time of solar eclipse seems to show little variation as it appears separated from F¼, however as they merge, some change

(Continued on page 46)

The New Meteor Section Of The AAAA

J. WESLEY SIMPSON, Director

The task of co-ordinating the efforts of a large group of observers scattered over a number of states is no easy one and necessitates the formulation of a definite but simple routine.

It is safe to say that among the many observers scattered throughout the United States, there is quite a variety of methods of observing. Each observer who advocates his particular type feels that it will stress the particular phase or phases which he believes are the most important. He will logically feel that voluminous records covering points and observations not stressed by him, while having some value, waste time which could otherwise have been spent in determining the results or making additional observations of the kind which he has stressed.

Obviously, we can not hope to use these many systems of filing and observing, and it is with this thought in mind that your writer asks of a regular monthly report of a most elementary nature. These reports are not intended to conflict in any way with the established routine for submitting reports to the regional directors of the AMS or to Dr. Olivier but are requested only in the spirit of helpfulness so that this section may serve more fully the American Meteor Society. *Amateur Astronomy* reaches many amateur astronomers who are not yet members of the AMS and therefore do not have access to AMS publiactions in which meteoric astronomy is discussed, consequently, it is the desire and wish of the AAAA to stimulate amateur participation in the observing programs of the American Meteor Society through its meteor section and the columns of *Amateur Astronomy.*

The reports requested by this section will consist of nothing more than a brief report of the following facts: The date of each observation, using the double date system, i.e., if you observed on the evening of March 15, you would record the date as March 15-16, 1938, while if you observed on the morning of the 15, the date would be recorded as March 14-15, 1938; the time you started and ended observing on each date; the total number of minutes observed; the total number of meteors seen during the recorded period; a description of the condition of the sky; and remarks describing any obstacles to your vision such as trees, houses, street lights, fog, moonlight, et cetera. Any additional notes concerning unusually bright meteors or any other phenomenon observed during the observing periods will also be greatly appreciated. It might be well to stress two important points at this time, namely, 1) never observe for less than sixty consecutive minutes on any date as this is the minimum amount of time necessary for the determination of rates. 2) record all observations, be they counts, plots, photographic, telescopic, few or numerous.

A time saving blank, designed for the purpose of recording the above outlined information for the records of the AAAA meteor section, can be obtained from me in care of the Locksley Observatory, Webster Groves, Mo. A few of these blanks will be mailed also to those regional directors of the American Meteor Society who may desire to distribute them to their observing members together with the regular AMS blanks.

The various types of meteor observations and review of methods used and advocated by such an authority as Dr. Charles P. Olivier will be discussed in a series of short articles. To some, these articles will not contain much new material, but it is good to have the procedure of observing and recording advocated by various authorities placed in print for future reference by old and new members.

The aims of the meteor section may be briefly summarized as follows: To stimulate and encourage participation in the observing programs of and membership in the American Meteor Society to train new observers and increase the accuracy of all observers; to publish articles of lasting interest pertaining to all phases of meteoric astronomy, to publish quarterly, or oftener, if possible, brief summaries of observations made; to give full credit to each contributor for his or her work, hoping thereby to further stimulate interest and activity, to render all aid possible to the solution of individual or group problems, and, last but not least, to stimulate greater co-operation between individuals or groups and the American Meteor Society.

The success of this program hinges on three important factors, namely, your 100% whole-hearted co-operation in every way possible, good observing weather to make observing possible, and the ability of your writer to understand and cope with the problems of the members as individuals and the section as a whole.

The AAAA and its various sections have established a most enviable record of achievement and it is our obligation to become a strong and permanent part of the association's ideals and achievements. Let us not fail.

Locksley Observatory, Webster Groves, Mo.

AAVSO Nova Program Notes

L.E. ARMFIELD

Names appearing for the first time in these columns are Robert Clyde, Jr., 1362 Putnam Ave., Brooklyn, N. Y., and Don D. Zahner, 142 W. Cedar St., Webster Groves, Mo. We are very happy to welcome them to the ranks of active observers and trust that they will continue the good work. Reports of exceedingly poor observing weather have been received from all parts of the United States. The value of having a program of this nature on a continental basis was again illustrated by the excellent report received from Neil McNabb Jr., whose observations reflect the good use he made of the of the clear weather in the Acton, Ontario, Canada, region.

The following observations were received for the month of February:

Observer	Location	Region	Mag. of faintest star reviewed 8	7	6	5	4	3	Total Nights
Clyde, Jr.,	New York	18	....	....	1	....	1	....	2
		71	....	....	1	....	2	....	3
Diedrich	Milwaukee	43	....	....	....	....	1	....	1
Halbach	Milwaukee	49	....	....	....	1	....	1	2
		50	....	....	....	1	1	1	3
		71	....	....	2	1	1	....	4
Karl	Chicago (Dec.)	13	....	....	....	1	....	....	1
		14	....	....	....	1	....	....	1
		91	1	....	....	....	....	....	1
		92	1	....	....	....	....	....	1
		101	1	....	1	....	....	....	2
	(Jan)	91	1	5	2	....	....	....	8
		92	1	5	2	....	....	....	8
		101	1	5	2	....	....	....	8
Kirkpatrick	New York	92	4	1	1	....	1	....	7
McNabb, Jr.	Acton, Can.	8	....	5	3	....	....	....	8
		36	....	....	8	....	....	....	8
		37	....	....	8	....	....	....	8
		38	....	....	8	....	....	....	8
		58	....	....	2	1	....	....	3
		72	2	4	3	1	....	....	10
Moore	Milwaukee	54	....	....	3	4	....	....	7
Perkinson	Fresno	34	....	2	1	....	....	....	3
		101	....	2	1	....	....	....	3
Rosebrugh	Poughkeepsie	1	....	3	1	....	....	....	4
		52	....	2	2	....	1	....	5
Seely	New York (Jan.)	31	....	....	1	....	1	1	3
		71	....	....	3	....	....	....	3
	(Feb.)	31	....	....	....	....	1	....	1
		71	....	....	2	1	2	....	5
Swensson	Evanston	36	....	....	1	2	....	....	3
		37	....	....	1	2	....	....	3
		38	....	....	1	2	....	....	3
Waitkus	Pittsburgh	110	....	....	....	1	....	....	1
Zahner	Webster Groves	21	....	5	3	....	1	....	9
		36	....	2	1	3	....	....	6
13 observers	23 different regions	2300 square degrees of sky reviewed							

The following observers employed binos or low powered finders in reviewing their regions: Karl, Kirkpatrick, McNabb Jr., Moore, Perkinson, Rosebrugh, Swensson, Waitkus, and Zahner. Appreciation is again tendered the following persons for summarizing their observations: Moore, Perkinson, Rosebrugh, Seely, Swensson, Waitkus and Zahner.

1410 N. Marshall Street, Milwaukee, Wis.

Calendar of Events

GEORGE DIEDRICH

(All Time C.S.T.)

APRIL, 1938

1. Fri.—Conjunction of Mercury and the moon at 11:51 P. M. Mercury 0° 11′ north.
   Conjunction of Venus and the moon at 5:22 P. M.
   Venus 3° 39′ north and of mag. —3.3
2 Sat.—Mercury at greatest elongation east, 19° 5′. (Most favorable elongation of the year due to its northern declination.)
3 Sun.—Conjunction of Mars and the moon at 1:46 A. M. Mars 0° 42′ south.
7 Thu.—First quarter at 9:10 A. M. Minimum of Algol at 9:30 P. M.
8 Fri.—Conjunction of Mercury and Venus at 7:11 A.M. Mercury 3° 52′ north.
14 Thu.—Full moon at 12:21 P. M.
15 Fri.—Conjunction of Venus and Uranus at 2:15 P.M. Venus 0° 9′ north
21 Thu.—Inferior conjunction of Mercury and the sun at 4:00 P. M. Maximum of the Lyrid shower. (AMS shower.)
22 Fri.—Last quarter at 2:14 P. M.
24 Sun.—Conjunction of Jupiter and the moon at 8:07 P. M. Jupiter 6° 23′ south.
29 Fri.—New moon at 11:28 P. M.

MAY, 1938

1 Sun.—Conjunction of Venus and the moon at 1:04 P. M. Venus 0° 57′ north.
  Conjunction of Mars and the moon at 6:38 P. M. Mars 1° 27′ north.
4 Wed.—Maximum of the Eta Aquarid meteor shower, (AMS shower.) Uranus in conjunction with the sun.
6 Fri.—First quarter at 3:24 P. M.
7 Sat.—Venus in conjunction with Mars at 5:00 P. M. Venus only 0° 2′ north. (For comparison—components of the double star Epsilon Lyrae are about 4′ apart.)
14 Sat.—Full moon at 2:39 A. M. Total eclipse of the moon begins at 2:18 A. M. Middle of eclipse at 2:44 A.M. Total eclipse ends at 3:09 A. M.

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

(Continued from page 43)

in ionization occurs. More eclipse observations are needed in both hemispheres before any conclusions can be reached.

The above data were mostly taken from the work of I. V. Berkner of the Department of Terrestrial Magnetism, Washington, D. C., and further discussion of the outer atmosphere as effected by solar eclipse will appear soon.

Twin Elms Observaory, Elizabeth, Pa.

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Astronomical Society of Rutherford, N. J.
Amateur Astronomers Association of Pittsburgh, Pennsylvania.
Astronomers Guild of Jamestown, New York.
Chicago Amateur Astronomical Association, Chicago, Ill.
Eastbay Astronomical Association, Oakland, Calif.
The Long Island Astronomical Society, 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.
Optical Division of the AAA, New York, N. Y.

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Send all communications to the above address

Phenomena of Jupiter's Satellites

(In C.S.T.)

APRIL, 1938

Day	Time	Satellite	Phenom.
2 Sat.	4:08 A.M.	I	S e
7 Thu.	3:32 A.M.	III	O D
9 Sat.	3:17 A.M.	II	S e
9 Sat.	3:45 A.M.	I	S i
14 Thu.	3:12 A.M.	III	E D
16 Sat.	3:00 A.M.	II	S i
17 Sun.	2:49 A.M.	I	E D
18 Mon.	3:33 A.M.	I	T e
25 Mon.	3:14 A.M.	I	T i
MAY, 1938			
2 Mon.	2:57 A.M.	II	E D
4 Wed.	1:55 A.M.	I	T e
4 Wed.	3:04 A.M.	II	T e
7 Sat.	2:33 A.M.	IV	E D
10 Tue.	3:00 A.M.	I	E D
11 Wed.	1:34 A.M.	I	T i
11 Wed.	2:32 A.M.	I	S e
11 Wed.	2:53 A.M.	II	T i
11 Wed.	3:02 A.M.	II	S e
16 Mon.	12:58 A.M.	IV	T i

Explanation of symbols:

E—Eclipse T—Transit
S—Shadow O—Occultation
D—Disappearance
i—ingress e—egress

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

3333 West National Ave.,
Milwaukee, Wis.

Optical Division of AAA New York

R. WALLACE, Correspondent

With a growing membership—now forty, including another employee of the Telephone Company, making ten in all—our group has had to enlarge its workshop in the Hayden Planetarium. A more progressive spirit has animated our society to still greater accomplishments than in the past. For example, we made a fortunate purchase of some machinery which will be installed soon in our shop in the Planetarium building. This machinery includes two lathes, two drill presses, and a milling machine. The work of grinding the 21-inch mirror with a subdiameter tool is progressing, and plans for the mount and observatory which were recently drawn are receiving careful consideration and some revisions. The site of the observatory has not yet been decided upon as it is rather premature to do so. On Monday, Wednesday, Friday and Saturday afternoons our workshops are like a beehive and nearly every workstand is occupied by budding astronomers making mirrors of various sizes in different stages of development. There is also a real spirit of brotherhood, and green members especially are given individual instruction and advice by more experienced hands. We recently installed a blackboard—a fine idea—on which experienced men can illustrate and answer a member's questions intelligently and dramatically regarding curve of mirror, focal lengths, figures, etc. It is our plan that new members will follow the footsteps of those of our group who have already contributed something tangible to the science.

On Feb. 25, Dr. Harlow Shapley, director of the Harvard College Observatory, gave an illustrated lecture on "The Debt of the World to Optical Science." Our members also attended an illustrated lecture by Dr. Karelitz, Columbia University's consulting engineer on the 200-inch telescope, on "The Mechanical Difficulties of the 200-inch Telescope."

Prof. George Van Biesbroeck of the Yerkes Observatory on a recent visit to the Hayden Planetarium was so impressed with not only our workshops and the quality of work members are turning out, but also with the 21-inch mirror we are grinding, that he asked whether we had ever considered making a 21-inch Schmidt telescope! Our hats are off to the Chicago group, for their Schmidt telescope must have made a big impression on Yerkes.

Optical Division of AAA,
Hayden Planetarium, New York City

Norwalk Astronomical Society

MARY C. HAMILTON, Secretary

The practical side of astronomy was shown in a lecture by Clinton Hubbell at the meeting Feb. 24th. His subject was, "The Use of Astronomy to Establish Boundaries." He said that civil engineers now use more scientific methods than in the past, measuring from a certain tree or rock. For the more important boundary lines, such as those between countries, they take their measurements from the stars. He gave as an illustration the dividing line between Alaska and Canada. His lecture was interesting and instructive and greatly enjoyed by the large number present, including one new member and several visitors.

Miss Swartz gave a brief talk on the life and work of Dr. Hale.

4 Union Park,
Norwalk, Conn.

Milwaukee News Notes

M. N. FISHER, Correspondent

Dr. George A. Parkinson, of the University of Wisconsin Extension Division, gave one of the regular talks offered the citizens of Milwaukee by the Public Museum on March 2. His subject was "The Realm of the Nebulae."

Four of our members spent an unforgettably happy day with the Chicago "nuts" on March 13. Messrs. Halbach, Armfield, Hedengren and Prinslow drove down the 90-mile stretch to the Planetarium, returning home at the usual hour of 2 A. M. Chicago News Notes of the month give a more detailed account of the meeting. Our members say "Thank you so much" to the Chicago friends for their enjoyable day.

Our March meeting had two speakers, Messrs. Hedengren and Armfield. The former read a paper on "The Story of Vulcan" as a supplement to the article on that subject which appeared in the January issue of *Amateur Astronomy*, and he went into interesting as well as amusing historical detail. Mr. Armfield's scholarly paper on "Some Elemental Aspects of Variable Stars" reviewed characteristics of variables and their spectral analysis.

The 13-inch telescope is being installed at the new observatory which was built last summer. It will be ready for use in a few weeks.

817 No. 28th Street,
Milwaukee, Wis.

Tri State News Notes

AMATEUR ASTRONOMERS' ASSOCIATION OF PITTSBURGH

WILLARD A. MACCALLA, Correspondent

Recent activity in this area might be characterized as "spreading the gospel" of our hobby. For instance, Joe Goin gave an illustrated talk on the principles of telescope making at the Ligonier high school a few weeks ago. Following the talk, Fred M. Garland described many of the celestial objects which may be seen through home-made instruments. Mr. Garland, who is well known for his series of astronomical lectures at the Wissahickon Nature Cabin last summer, is also scheduled to address the Wilkinsburg high school students on March 28th.

As a result of the generosity of Dr. H. S. Kane, Jr., of the Carnegie, Pa., Rotary Club, in presenting the boy scouts of that city with a small refracting telescope, a nucleus of interest in astronomy has been founded in that community. In an effort to further that interest which, it is hoped, will lead to the construction of amateur telescopes and a scout observatory, Will MacCalla gave an illustrated talk before the Carnegie Rotary Club, describing the pleasures and benefits of astronomy. A number of other such talks have already been scheduled for the coming month.

Your humble correspondent wishes to commend to every amateur astronomer the vivid article, "Signs of the Zodiac" by Fred Garland, published in the Feb. 1938 *Popular Astronomy*. Fred has the happy faculty of making a seemingly dry subject really live. In his article he deftly weaves a little yarn around each of the signs of the zodiac so that the reader will easily associate each symbol with its proper constellation.

Inasmuch as Joe Goin's recent promotion with the Westinghouse Electric and Mfg. Co. will necessitate his being out of town much of the time, he feels compelled to relinquish his office of treasurer of the Pittsburgh AAA. Will MacCalla has consented to take over the books during the remainder of Joe's term.

At our March 11 meeting of the Association, we had the pleasure of listening to a very competent member of our group, past president C. B. Roe, on the subject of "History of Astronomy." Mr. Roe described the development of astronomy through the philosophical era beginning with the construction of Egyptian temples and the earliest Babylonian and Chaldaean writings of 5500 B.C. The narrative continued with the advent of the so-called scientific era in the 5th century B.C. when Eudoxus built the first observatory. From that point, Mr. Roe brought the story up to the time of Copernicus in the 16th century.

It is noteworthy that despite the crude instruments available up to that time, latitude and longitude had been invented, trigonometry developed, the earth's circumference fairly accurately determined, and star catalogs had been compiled. The eccentricity of the moon's orbit and precession of the equinoxes were known, the first nova and comet had been discovered, and regular planetary observations were being made. Mr. Roe's talk was so well received that a continuation of this historical discussion is being planned.

Valley View Observatory,
Pittsburgh, Pa.

Chicago News Notes

MAX M. FEINSILBER, Secretary

The meeting of March 6, 1938 was more than a great success. A very goodly number appeared to hear four astronomical "nuts" from Milwaukee who traveled over icy roads to get here.

The meeting was begun with a talk by Ed. Martz, one of our own members, who told us how to observe, and what to do with planets. Then the Milwaukee "nuts" took over: T. R. Hedengren, the "parlor" astronomer, told us how to spend an enjoyable stormy evening studying the structure of the Milky Way; Ed. Halbach, regional director of the American Association of Variable Star Observers, told us the what, why and way, of observing meteors; he was followed by L. E. Armfield, regional director of the American Meteor Society, with an instructive talk on variable stars. The last speaker was evidently tired by his long and arduous ride because he delegated part of his talk to William Callum, one of Chicago's active variable star observers, who explained the use of variable star charts.

C. M. Prinslow, director of the Milwaukee Society's observatory, told us about its state of construction and the Society's future plans for it, the building being practically complete. Many pictures of various stages of construction were shown, making us believe that they have been hiding their achievement under a bushel. Best wishes for continued success from all of us.

The meeting was then transferred to one of Chicago's leading restaurants, where we continued to discuss our subjects of mutual interest. When the dinner broke up, a few of us under the direction of Ed. Martz, accompanied the visitors to view the University of Chicago students observatory, which is being put into first-class condition.

Evidently our visitors arrived home safe and sound, since we have heard nothing to the contrary. Many thanks, fellows.

6602 S. Francisco Ave.,
Chicago, Ill.