The M A S Bulletin

Published monthly by the Milwaukee Astronomical Society

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THE LUNAR ECLIPSE

R. D. Cooke

There will be a total eclipse of the moon on the evening of July 15th, visible in all parts of America, barring clouds. Although lunar eclipses are visible over almost half of the earth's surface and are of moderately frequent occurrence, it is a rare individual who has witnessed more than three or four in a lifetime. This makes it an occasion worth making an effort to see, and members of the Milwaukee Astronomical Society will want to be prepared not only to watch the eclipse as a spectacle but to make detailed observations of every kind for their possible scientific value.

This eclipse will have some unusual features. It is almost exactly central, the moon passing through the center of the earth's shadow and giving one hour and forty minutes of totality, the theoretical maximum. Again, the total phase is completed before midnight with the moon well up in the sky, making it a conspicuous event even for persons not interested in astronomical things.

Observers using telescopes are urged to watch for and observe faint occultations. The moon will be passing through a region of Sagittarius where faint stars are plentiful. In observing these occultations it will be necessary to determine the position angle of disappearance for each star as well at the time. This will be necessary to aid in identifying the stars later.

Other points to be observed and recorded are the exact times of first, second, third and fourth contacts, the color of the moon and changes in color if any occur, and the degree of visibility of features of the moon's surface.

The moon will enter the penumbra at 8:15 P.M. Central Standard Time. This phase will not be apparant to any extent and if so only by a very gradual lessening of the brightness. The moon enters the umbra (first contact) at 9:12, the shadow first appearing at a point 79° east of the north point. Totality begins (second contact) at 10:09, the middle of the eclipse occurs at 11:00, and the end of totality (third contact) at 11:49. The moon leaves the umbra (fourth contact) at 12:47 A.M. with the angle of contact 109° west of the north point and leaves the penumbra at 1:43 A.M.

For the convenience of those who want exact data on all the phases of the eclipse the following table is given.

	Moon enters Penumbra	Moon enters Umbra	Total eclipse begins	Middle of eclipse	Total eclipse ends	Moon leaves Umbra	Moon leaves Penumbra
Greenwich Civil Time	$2^h\ 15.3^m$	$3^h\ 11.8^m$	$4^h\ 9.4^m$	$4^h\ 59.6^m$	$5^h\ 49.7^m$	$6^h\ 47.1^m$	$7^h\ 43.1^m$
Central Std. Time	8 15.3	9 11.8	10 9.4	10 59.6	11 49.7	12 47.1	1 43.1
Local Siderial Time	15 55.3	16 51.9	17 49.7	18 40.0	19 30.3	20 27.8	21 24.0
The moon's Apparant Right ascension	19 33.6	19 35.5	19 37.3	19 38.8	19 40.3	19 42.1	19 43.8
Apparant Hour angle	-3 38.3	-2 43.6	-1 47.6	-0 58.8	-0 10.0	0 45.7	1 40.2
Apparant Declination	-22° 40	-22° 34	-22° 28′	-22° 21′	-22° 13′	-22° 04′	-21° 54′

6811 Cedar Street
Wauwatosa, Wis.

The official monthly publication of

The Milwaukee Astronomical Society

2046 So. 59th St., Milwaukee, Wisc.

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Ten cents per copy, $1.00 per year. Contributions are solicited but cannot be paid for. Their publication, either in whole or in part, is solely at the discretion of the committee on publications. Address all communications to the secretary of the society at the above address.

Unless otherwise notified the regular meetings of the society are held on the first and third Thursday evenings of each month, at 8 o'clock, in room 603 Extension Division, University of Wisconsin, 623 W. State Street.

During the summer months there will be only one meeting of the society a month. This will be the popular meeting. Notices will be mailed to all of the members. A series of very entertaining meetings are being arranged. Plan to attend hese meetings.

Nova Herculis

Harvard College Observatory announcement card 339 carries the following announcement. "The following telegram was received yesterday (July 4th) from Dr. Wright of the Lick Observatory: "Kuiper finds Nova Herculis close double July 4. Position 134°: distance 0".2. Magnitude difference 0.6."

Dr. Menzel of the Harvard Observatory makes the following comment: "Dr. Kuiper's interesting observation of the present duplicity of Nova Herculis is reminiscent of an analogous discovery in the case of Nova Pictoris. The spectrum of the nova indicates that most of the light comes from the nebulosity and Dr. Kuiper's observation probably refers to the nebulous envelope rather than to the star itself. Duplicity of the envelope, it should be noted, is quite in accord with the theory of ejection of nova material, proposed by Mrs. Gaposchkin and Dr. Menzel to account for the spectral appearance of Nova Aquilae, 1918. The ejection was supposed to take place symmetrically with respect to the star's equator. The present separation of the components would indicate a parallax of the order of 0".002, which is of the order of magnitude suggested by Struve."

Occultations

With this issue of the BULLETIN we are giving the predictions for July and August, and hereafter they will appear one month ahead. This has been made necessary by the fact that the lunar month now begins before the appearance of the BULLETIN. The occultations in this list are peculiar in the fact that all of them occur near the meridian and are well placed for observation in spite of their low declination.

Date	Star	Mag.	Immersion	Pos. Angle
July 9	87 Virginis	5.8	8:27 PM	80°
July 11	153B Librae	6.3	7:05 PM	120°
July *12	alpha Scorp	1.2	8:15 PM	126°
July 12	116B Scorp	6.2	12:52 AM	72°
July 15	126B Sagitt	5.8	6:07 PM	154°
Aug. 8	48B Scorp	5.1	8:55 PM	10°
Aug. 9	118B Ophiuc	6.2	1:03 AM	10°
Aug. 13	sigma Capr	5.5	9:08 PM	180°

* Antares—Emersion 8:22 PM 265°

Mr. Philip Lindsay of Los Angeles has responded to our appeal for new workers in the field of occultations and has undertaken the reduction of a group of observations. It would give us a cozy feeling to have a few volunteers nearer home.

R. D. Cooke,
6811 Cedar Street,
Wauwatosa, Wis.

A Photographic Section for the A. A. A. A.

By Lynn Matthias

Undoubtedly there are a good many amateurs who are interested in astronomical photography. Perhaps some are interested only in taking pictures of various interesting astronomical objects, while others may be interested in doing serious astronomical photographic work, but do not, in the absence of a definite program, know how to go about doing anything of value. Those who are interested in taking astronomical photographs of pictorial value only, will likely soon tire of this interesting diversion and long for a more serious program of scientific value.

It is consistently stated that most modern astronomical work is carried on by photographic means, yet at present there seems to be no provision to correllate amateur activity in this field. Is this because the amateur lacks the ability to master the technique of astronomical photographic methods, or is it simply that there has been no encouragement of this branch of amateur activity? We believe the latter to be the case. Hence, we propose the organization of amateurs for the purpose of cooperative research on astronomical problems by photographic methods.

If you are interested in doing your part in a branch of amateur activity that has barely started—if you are interested in contributing accurate observations of high scientific value, will you please correspond with the writer and find out how this program will enable you to assist in a professional class of astronomical activity.

2121 East Capital Drive
Milwaukee, Wisconsin

Variable Star Section

Hans D. Gaebler, Leader

This month we have an article that was addressed to German Amateur Astronomers. It should be of interest to the readers of this Bulletin. It is planned that similar articles translated from different languages will appear as part of the Variable Star Section.

The following are the number of observations for the month of May: Armfield 171, Diedrich 32, Gabris 8, Halbach 72, Houston 5, Knott 40, Loepfe 4.

We recently learned that Mr. E A Halbach, our able meteor section leader, has been asked to write an article describing at length the construction and use of the occult-timer such as he built for our society. This is to be included in a new issue of Amateur Telescope Making.

The Milwaukee Astronomical Society has recently received copies of the publications of the New Zealand Astronomical Society. This monthly magazine, Southern Stars, carries many interesting articles. The May issue has a fine article of interest to those interested in planetary observing.

Prof. H. Zimmer of the Bamberg, Germany Observatory, has announced the discovery of the astronomical tables used by Christopher Columbus on the voyage which led to the discovery of America. The tables were those of Johann Muller, a Koenigsberg scientist, and were entitled "Regionmontanus."

—*Monthly Evening Sky Map*

The largest sun dial in the world is in the yard of E. H. White, Macon county, Tenn. It weighs over ten tons and the shadow bar is twenty-five feet long.

—*Monthly Evening Sky Map*

The Hobby of Astronomy

(Translated from the German: "Vom Liebhabertum der Astronomie")
Die Himmelswelt, Berlin, 1924, 55-57

By R. Ruf, Cologne, Germany

Astronomy is a study which always commands a wide range of interest. No branch of learning wins devotees more quickly, who, however, little suspect that they all will be halted abruptly, far from the portals of knowledge, and be ruthlessly forced back into the commonplace. The laity are, after all, only friends of science, and who questions that friends always like entertainment and sociability? In this vein our many associations function with their publications and journals, and finally each believes that the number of its readers is forthwith proof of its social value and that this value becomes a standard. This attitude, we feel, is open to criticism, not only constructive to our associations but uttered with deepest sincerety.

We may become friends of astronomy from many motives. It might be well to remember, that for some the mathematical, teleological formal interest, for others the aesthetic, speculative, philosophical interest in nature study are the motives. Thus the attempt is made with characteristic enthusiasm to fathom the outermost bounds of knowledge. From this the purely curious are automatically excluded. Our numerous cheap "book-agent" books on astronomy contribute to stifle interest because of their everlasting sameness. We involuntarily ask ourselves, what are the chief requisites for realizing our aims? To this question we glean a great diversity of answers from the now bulky mass of amateur literature, of which, however, several seem to be correct. The one mentioned most frequently is mathematics, it being the basis of theoretical astronomy; then comes the field of practical men, who, equipped with precision instruments, promise results in proportion to the size and quality of the instruments and thus involuntarily form a separate group. This latter practical division with its restricted field forms the basis of a historical view of our activities. If, therefore, Mädler, Littrow, Argelander, Konkoly, Klein, Heis, and others are as a rule invoked as the patron saints of our hobby, they no less have us to thank for their abiding popularity. We really believe that our society in particular, (V.S.P.) considering its origin, is ever mindful of this historical development and realizes that a recognition of such perspectives alone assures lasting gratification. Thus, first of all, the observational side of our hobby is fostered, which today is in danger of losing out on account of the almost universal interest in the mechanics of telescope making. Just as in medicine today a prognosis based upon physiological and psychological observation is demanded in addition to a technical prognosis, so our little army of amateurs will in the future see to it that a contact with nature is maintained. A one-sided tendency toward technique needs the more to be held in check by a contact with nature.

With all their limitations these are already far reaching aims. If, furthermore, mathematics be given some leeway in methodically working up the data, then much indeed must be offered to our friends of science to keep their interest from waning. Let us not forget that these avocations entail much sacrifice and are, therefore, entitled to the greatest consideration. It would be surprising to discover how many of our friends, despite the extreme material views of their neighbors, secretly practice this hobby like some forbidden pursuit, and have been obliged long ago to abandon all hope of finding kindred spirits. Here, then, our modern methods of organization would be helpful. People in large cities find it increasingly difficult to get together. The days of classic repose lie far behind us. The routine of living did, in times past, permit the formation of closely knit social groups since nothing remained unstudied but what soon found people interested in the matter. In this way voluntary personal contacts and association of those of mutual interest developed, and many a friendship of that period rose to proverbial fame. The ground was cleared; with self determination the individual differentiated himself from the complexity of community life. The era of the humanities valued moral and intellectual restraint: friends became co-workers.

315 9th Street,
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The M A S Bulletin

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THE MOST DISTANT VARIABLE STARS

By Helen Sawyer Hogg
Council Member A.A.V.S.O. 1933-35.

Most of the variable stars which are being observed by members of the A.A.V.S.O. and other amateur astronomical organizations are relatively bright and nearby, though the individual observer may not think so, when he is hunting in vain for an elusive variable. They are at distances of a few hundred, or at most a few thousand light years. But if an astronomer with a three-inch telescope can follow the light variations of a star like Mira Ceti, at a distance of two hundred light years, can astronomers detect changes in light in much fainter stars when they turn some of the world's giant telescopes to them?

The answer is, most emphatically, yes. Variable stars are found as faint as the working limits of the telescope, no matter how large it may be. And they are being sufficiently well observed that the periods may be determined. In fact, the distances of many stellar systems are determined from a study of the variables which they contain. This work has been carried on mainly at the Mt. Wilson, Harvard, and Dominion Astrophysical Observatories.

In this note we shall not consider the variable stars in our Milky Way star clouds, though many of these variables are at distances of many thousands of light years. But we shall limit ourselves to discussing three types of systems, separated from our Milky Way clouds.

Nearest among these three systems are the globular star clusters, numbering nearly a hundred, and forming a fringe of beautiful globes above and below the central plane of the galaxy, at distances ranging from ten thousand to one hundred and seventy-five thousand light years. The first variable stars in these, of about the twelfth magnitude, were found forty years ago, and large numbers are still being discovered at present. About a thousand variable stars are known today in globular clusters, and the periods have already been determined for three hundred of these. Most of the variables are Cepheids, with periods ranging from a third of a day up to thirty days. Long period variables are found only rarely. The maximum magnitudes of the variables range from the eleventh magnitude in nearby clusters to the seventeenth in the more distant.

Secondly there are the Large and Small Magellanic Clouds, outliers of our own galactic system at distances of about ninety thousand light years. They are actually the nearest of the irregular extra-galactic nebulae, and are logically classed with the third group of objects, but their relative nearness to us places them rather in a class by themselves. They are fairly scintillating with variable stars, for nearly four thousand have already been found in them, about equally divided between the two clouds. Periods of several hundred of these variables have been determined. Most of the variables in these clouds appear to be typical Cepheids, with some long period variables. So far no period has been found under a day, presumably because the fainter variables have the shorter periods, and the fainter stars have not yet been investigated.

Lastly we come to the most distant systems we know, the extra-galactic nebulae. The nearest spiral nebula is Messier 33 in Triangulum, at a distance of about eight hundred and fifty thousand light years. It is only in the last ten years that variable stars have been found in these nebulae in any number. About two hundred variables are now known in the Andromeda and Triangulum nebulae, and the curious little irregular nebula N.G.C. 6822. Many of these variables are long period Cepheids, while many are novae. In the Andromeda nebula alone eighty-five novae have been discovered. As the investigation is carried to other systems, more variable stars are found.

Since there are thousands of extra-galactic nebulae, there is apparently no limit to the number of variable stars scattered throughout the universe. Thus far astronomers have probed successfully for variables to a distance of a million light years. But the extra-galactic nebulae extend many times farther than that.

But while it is exhilarating to think of these possibilities, it is well also to think of the difficulties involved in working with these distant variables. Some of the variables already found are at maximum one hundred and fifty thousand times fainter than the faintest stars we can see with the unaided eye. The problem taxes the capacities of even the world's greatest telescopes.

David Dunlop Observatory
Richmond Hill,
Ontario, Canada.

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There will be but one regular meeting of the society during August and September. The popular and technical meetings have been combined for August and the annual banquet is scheduled as usual for September.

The Publication's Committee hereby wishes to acknowledge and apologize to Mr. Cooke and the readers for the errors appearing in the immersion times for the stars being occulted as listed in the Occultations Section of the M A S Bulletin on page 22 of the July 1935 issue. In order that the necessary corrections may be made to the aforementioned table, we are republishing the July and August predictions and have included them with the predictions for September in Mr. Cooke's article on Occultations which will be found below.

NEWS NOTES

Mr. Russell Bautz, 4046 N. 15th Street, has recently completed a four inch reflecting telescope which will enable him and Mrs. Bautz to enjoy a bit of observing until the completion of a ten or twelve inch.

Mrs. Russell Bautz is progressing very nicely with an English tranlation of the German treatise:— The Introduction of the Study of Variable Stars lby Kar Schiller.

This is indeed a task of great magnitude and will be a most valuable contribution to the society and to the variable star section in particular.

Frank L. Dieter has finally found a suitable location for mounting his newly completed 10 inch, Bailey Split-Ring type telescope. It will be mounted and housed a few miles west of the city on the Watertown Plank Road. Incidentally, it is of interest to know that Frank is the first to reproduce this type of a telescope in this section of the country and it is a most excellent instrument.

Dr. H. W. Hein, 2631-A Kinnickinnic Avenue, has recently completed a 12 inch mirror which he has placed in a Springfield mounting in the front yard of his summer home in Lake Denoon. Dr. Hein is a new find, so far as the society is concerned, but is a veteran amateur as he completed his first telescope for observational purposes some ten or twelve years ago. *(continued on page 82)*

OCCULTATIONS

OCCULTATIONS FOR SEPTEMBER 1935

Date	Star	Mag.	Immersion	Pos. Angle
Sept. 7	126B Sagitt	5.8	8:24 PM	100°
Sept. 9	nu Capr	5.3	6:07 PM	133°
Sept. 10	lambda Capr	5.4	11:19 PM	115°

During the total eclipse of the moon, July 15th, E. A. Halbach using the 13 inch telescope observed fifteen occultations. Two of these were also observed by Mr. Albrecht. These stars were all fainter than 8th magnitude and it is possible that some of them have not had their positions determined with sufficient accuracy to be used for reductions. However this is a fine piece of work and is a credit to Mr. Halbach and indirectly to the Society.

Errata

Date	Star	Mag.	Immersion	Pos. Angle
July 9	87 Virginis	5.8	9:08 PM	180°
July 11	153B Librae	6.3	8:27 PM	80°
July *12	alpha Scorp	1.2	7:05 PM	120°
July 12	116B Scorp	6.2	8:15 PM	126°
July 15	126B Sagitt	5.8	12:52 AM	72°
Aug. 8	48B Scorp	5.1	6:07 PM	154°
Aug. 9	118B Ophiuc	6.2	8:55 PM	10°
Aug. 13	sigma Capr	5.5	9:08 PM	10°

*Antares—Emersion 8:22 P.M. 260°

R. D. Cooke,
6811 Cedar Street,
Wauwatosa, Wis.

Astronomical Use For Hand Cameras

A convenient way to get started at astronomical photography is to adapt your hand camera to the purpose. The camera may be fastened rigidly to your equatorially mounted telescope, and the telescope, with its polar axis in accurate alignment with the pole, may be used for guiding.

An eyepiece for guiding may be constructed from any positive eyepiece, by fixing cross wires so they appear sharply in focus thru the eyepiece. Cross wires may be made from single silk fibres, waxed to a cardboard ring which is inserted in the eyepiece to the proper distance.

With the camera mounted on the telescope, a fairly bright star is selected near the center of the field to be photographed. The image of this star is brought to the intersection of the cross wires of the guiding eyepiece by moving the telescope properly. The camera shutter is then opened, and an exposure is taken with the camera focus set at infinity, the guide star being kept on the intersection of the cross wires by manipulation of the telescope's slow motions during the exposure. It will be found that a very accurate adjustment of the camera focus is necessary to obtain sharp images of the stars, and several trials may be necessary before a satisfactory result is obtained. However, once found, it is never necessary to change the focus adjustment since all celestial bodies are far enough away to be classed as at infinity.

A small hand camera can do exceptional work in patroling the sky. The object of a photographic patrol is to discover novae, asteroids, comets, and any unusual changes which may occur. Small cameras usually cover a large angular field, and although the star images may not be good over the entire field, a comparatively large field can be covered satisfactorily for patrol work if the camera has a good lens. A large diameter lense is of course desireable, altho even small lenses will do surprisingly well; e. g. a lens with a 1″ effective aperature will record 9th magnitude stars wih a 10 minute exposure on a clear night using fast photographic emulsions. The procedure to be followed in a photographic patrol will be to assign several sky areas to each observer. The observer will photograph these particular areas once each night or as often as possible, always using one particular guide star for a particular area. The exposure time, type of emulsion, development, etc. of all negatives of a particular area should be identical in order that accurate comparisons can be made between negatives.

Two negatives of the same area may be compared by superposing them so that the star images are almost in coincidence. The negatives are then gone over with a magnifier, image by image, comparing the new negative with the original one. If any obvious changes are noted, they should be noted and the proper persons notified immediately that a discovery has been made. One should be cautioned, however, in announcing a discovery from a single negative since occassionally defects will appear in the emulsions due to dust, pinholes, scratches, faulty development etc. Hence, it is better to withhold announcement of a discovery until two negatives definitely indicate that a change has taken place in the sky. Try your hand camera on the stars. The results may surprise you and will certainly encourage you to further effort in this new field of amateur astromical activity.

Lynn Matthias
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Milwaukee, Wisconsin

Nova Program Notes

The nova program has received a most valuable stimulus through the efforts of Mr. Frank Preucil, President of the Joliet Astronomical Society. The writer has but today received a beautiful set of negatives of the Norton Atlas Charts which were made by Mr. Preucil and graciously loaned for the purpose of reproducing copies of these maps for distribution to persons participating in the novae program.

The above is not the only contribution Mr. Preucil has made, for he also informs us that sixteen of the members of the Joliet society are already at work on the program and have been for quite some time. This is indeed splendid and Mr. Preucil and his group are hereby heartily congratulated for the initiative they have shown in this new program.

It is hoped that a report of the observations made by the Joliet group will be available for publication in our columns next month.

The necessary maps will be reproduced as soon as possible and it is hoped that they will be available in the very near future along with provisional recording sheet for reporting the observations monthly.

L. E. Armfield
2046 S. 59th Street,
Milwaukee, Wis.

VARIABLE STAR SECTION NOTES

STUDY OF NOVAE

"Investigation of Nova-Like Variables" by Kukarkin and Parenago, Veraenderliche Sterne, Mai 1, 1934, P.251. (Verein von Freunden der Astronomie in Gorki—Formerly Nishui-Novgorod.

Digest of Parenago and Kukarkin's Article by H. D. Gaebler.

U Geminorum variables and novae have certain characteristics in common. Sudden rise to maximum with slow fall in brightness to normal minimum. Continuous spectrum at maximum and bright lines at minimum. The question asked by these Russian astronomers was why there were short intervals of maxima of U Geminorum variables and single outbursts of novae. Is there some connection between intensity of outbursts and length of cycles?

The relation between the length of cycles and the heights of maxima have been well studied in the case of SS Cygni for 35 years, yielding 250 cycles. These showed a correlation between length of cycle and amplitude. SS shows a variety of maxima, sometimes flashing up like a nova (1901 Pers.) or with a slow rise and fall like Nova Pictoris 1925.

If the variation in U Geminorum variables and the appearance of novae only differ in scale then outbursts of novae should be regarded as periodic. The mean amplitude of novae is about 11.5^m, the corresponding length of cycle being of the order of ten thousand years, therefore, it is rather hopeless to seek proofs of periodicity in historical records.

A survey of novae shows that some have small amplitudes, less than 9^m but the majority are larger because they were detected when the light was already falling and the maximum was not observed. Peltier found RS Oph. to be about 6^m but the real maximum occured a day and a half before and was brighter by about two magnitudes. For J CrB the lenght of the cycle should be between 60 and 100 years and the outburst is probably yet to come.

If the outbursts of novae consist in throwing off of superdeveloped chromospheric envelopes with accompanying readjustments within the core, then intensity of outbursts are probably to be determined by mass, temperature or density. More must be known about absolute magnitudes and spectra.

The establishment of relations between physical properties and light variations of nova-like stars may be a step to understanding the evolutions of nova-like variables and stars in general.

That the subject of the Parenago and Kukarkin article aroused great interest is evidenced by the fact that the famous German variable star observer, Friederich Lause also published a digest of it in the September number of the 1934 Journal "Die Sterne", P. 201.

He calls attention to the fact that only some seven of the three dozen U Geminorum variables known have been sufficiently observed to be of value for this comparison. Some of those forming the connecting link with novae are T Pyxidis, a star of the 13th magnitude which rose to 7th in 1890, 1902 and 1920. Also the star RS Ophiuchi, a 12th magnitude star which rose to 9th in 1898 and again in August 1933. Those of us now living may not see a nova rise again except perhaps Nova J CrB (1866) which has an amplitude of 8.3 magnitude and Nova No. 3 Saggitarii with an amplitude of 7.1 magnitude.

The following observations were received for the month of June.—Armfield 136, Diedrich 79, Knott 18, Halbach 10, Loepfe 5, Gaebler 5, Stosick 4, Sidoff 3, Keusiah 2, Katz 2.

101½ Main Street H. D. Gaebler
Watertown, Wis.

(NEWS NOTES—Continued)

The unique and interesting film depicting the art of amateur telescope making; made by H. R. Stamm of the Milwaukee Astronomical Society and presented at a recent meeting, was shown at the Herman De Vry Summer School of Visual Education at the Francis Parker School in Chicago on June 21, 1935. It was received very cordially and is now to be reprinted for use on the Visual Education Circuit of the University of Wisconsin.

We are very happy to announce that Walter Houston, who has been severely ill with a gland infection is now well on the road to recovery.

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Telescope Making in the West Allis High School

H. R. STAMM
Science Instructor West Allis High School

"Make a Telescope", seems to be a favorite phase in "A" Physics Course at the West Allis High School. The making of a four inch telescope was introduced as a project to create an interest in the study of text book chapters dealing with light and optics.

The two major problems encountered were: First:—to create an interest in the project, Second:—to bring the price of an instrument within the reach of the student.

Our first problem was solved by displaying in the class room a model of a telescope and by showing slides depicting the building of a telescope and showing heavenly bodies as might be seen with such an instrument.

The second was overcome by being able to make these telescopes for the minimum cost of a dollar and a quarter. Although constructed at such an extremely low cost, this instrument is not a toy; newspaper headlines can be read through it at one half mile distance, and stars of the 12th magnitude have been seen by a trained observer.

Our project was started by two boys, John Luczka and Edward Legel, to whom were given four glass casters, which heretofore had been used as paper weights and were admirably suitable for use as disks for the making of mirrors. These boys proceeded to grind the casters in the class room, one full period being spent on this work, each of the other students taking his or her turn in grinding. When the students found this task, so seemingly difficult, comparatively easy, they were eager to make their own telescopes. Forty students joined in this project.

With such interest in evidence, it was apparent that large quantities of materials would be needed to complete the work. Consequently, orders were placed for the needed grades of carborundum in pound lots, pure pine pitch was purchased in 20 lb. lots and bee keepers were robbing hives for the urgently required honey comb foundation. We scouted around for rouge to do the polishing and we ended up with a 90 lb. barrel of it. With these accomplishments we were ready to begin production on a large scale. Small packages of the above materials were made up, enough to complete a mirror, and sold for twenty-three cents. Some of this work was done in the laboratory and much of it at home in spare time.

The focal length was set at 48 inches for the four inch mirrors; giving a ratio of aperture to focal length of e.12. The customary candle test and template were used for determining the required radius of curvature as the rough grinding progressed.

In order to know when to change the grade of abrasive, microscopic examinations of the ground surfaces were made and microphotographs were taken and projected on a screen to show a comparison of the surfaces with various stages of grinding. With 80 carborundum, the surface of the glass looked as though it had been gouged out by a steam shovel. When the surface was uniform in structure the student changed to the next finer grade. With the completion of the fine grinding, polishing and figuring were next in order; this was done on a pitch lap upon which a strip of honey comb foundation had been placed. One or two of the students mastered the Foucault knife edge test, and through their efforts many of the mirrors were figured to a fine degree of perfection.

The completed mirrors were then silvered and mounted in tin cells made of coffee cans and the like, which were suitable and readily adjustable for the purpose. The tube of the telescope was constructed from rain spouting and other five inch tubing of the desired length. Scrap auto parts, bearings, front wheel tie rods, and odds and ends found about the home were ingeniously matched together to form the polar and declination axes. They were mounted on a tripod or pedestal of the desired height and stability to complete the telescope. Eyepieces were made from old opera glasses or lenses viewed at dim stars and fitted together to give the equivalent of 1.5 centimeters. Pieces of plate glass were silvered and mounted on spiders for use as secondary mirrors to reflect the light gathered by the primary to the side of the tube.

As a result of this project many of the completed telescopes, of which 10 were ready for use at the close of the school year, were placed in service by the students who showed their families and neighbors some of the beauties of the sky. Others have made formal observations of variable stars which have been

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The official monthly publication of

The Milwaukee Astronomical Society

2046 So. 59th St., Milwaukee, Wisc.

Dr. Charles P. Olivier Visits Milwaukee

Dr. Charles P. Olivier, Professor of Astronomy at the University of Pennsylvania, Director of Flower Astronomical Observatory, Upper Darby, Pennsylvania, President of the American Meteor Society and author of "Meteors" was guest of the Milwaukee Astronomical Society and the Milwaukee Alumni of the University of Pennsylvania on Friday August 9. He attended a luncheon given in his honor by the Alumni at the City Club; visited the Milwaukee Public Museum and Dr. S. A. Barrett in the afternoon, was dinner guest of Mrs. William W. Wight, and presented an illustrated lecture on meteors to the Astronomical Society in the evening. He returned to the Wight's after the lecture and departed for Chicago the following morning.

In his lectures, Dr. Olivier showed slides of two most beautiful meteor trails, one caught photographing the Great Nebula in Andromeda and the other in a photograph of the North American Nebula. He showed trails that depicted sudden increases in magnitudes—the reason for the brightening unknown. Other pictures caught meteor trails the direction of which could not be determined as they began and ended outside the field of the plates.

Several photographs of fireballs were shown, one group of the same object pictured it approaching head on, as well as the long enduring trail which remained luminous for a long period of time after its passage. He made sketches of another fireball trail observed while in the Catskill Mountains during a meteor shower. While the trail remained in the sky its shape changed from a straight line to bends and curves as the air currents and winds of the upper atmosphere struck it.

Photographs of meteorites were shown, mostly of those now in the American Museum of Natural History in New York City. This group included slides showing the beautiful etched structures found in iron meteorites which have been polished and treated with acid.

Still another series of slides showed the Meteor Crater in Arizona, and the group of craters in Siberia, the latter being fringed by trees which had been singed of all foliage and bark, all lying pointed away from the center of the area.

The Milwaukee Astronomical Society is deeply appreciative of Dr. Olivier for his courtesy in coming to Milwaukee and giving us this most interesting talk, and we sincerely thank him for his interest in the society.

Walter Scott Houston, Director of Astronomy, Y. M. C. A. Camp Minikani, Hubertus, Wisconsin, and member of the M A S, has recently completed an observatory for educational purposes during the summer sessions of the camp. The building is a domed structure and houses a ten inch, German type mounted reflecting telescope of his own making. This is indeed a fine piece of work and we are pleased to know that Scotty has contributed his bit toward perpetuating the study of Astronomy by the youthful campers at Minikani.

OCCULTATIONS

The following three occultations are predicted for October:

Date	Star	Mag.	Imm.	Pos. Angle
October 4	67B Sagitt	6.4	4:21 PM	97°
October 6	Sigma Capr	5.5	7:22 PM	58°
October 8	18 Acquarii	5.5	12:31 AM	41°

After a few months of failing ambition, the work of computing occultations is going on again. With the assistance of a few enthusiastic volunteers we have hopes of completing the 1934 data soon and submitting them to Yale University Observatory for publication.

R. D. Cooke
6811 W. Cedar Street,
Wauwatosa, Wisconsin.

Focus Adjustments For Astronomical Photography

Those who have tried using their hand cameras to photograph the heavens may have encountered difficulties in obtaining an accurate focus of the star images. The infinity setting of hand cameras is not always accurate enough for astronomical purposes. A simple way of making a focus adjustment is to take an exposure of say five minutes duration with the camera fastened to the guiding telescope. The camera shutter is then closed and the camera is moved slightly; enough so that the images are displaced about ½ m.m. on the negative. The focus adjustment is changed to a new value and another five minute exposure is taken, using the same guide star as for the first exposure. This is repeated for five or six trial adjustments, the displacement of the camera being made twice the previous value for the last exposure in order to identify which image corresponds to a certain focus adjustment. An accurate record must be kept of the focus adjustments for the various exposures in order to correlate them when the negative is developed.

Strictly speaking, the plate should be moved instead of the camera so that the change in off axis aberrations of the lens do not also influence the appearance of the images. However, the distortion of the images, due to this cause, will be small if the images are separated by only ½ m.m. and, if only five or six trials are made on the same plate.

The images on the developed negative are gone over with a magnifier and the smallest image in a group is selected as the corresponding correct focus adjustment. A table or chart should be made of the best adjustment for images at various distances from the center of the plate. From this table it will be easy to decide if the plate is square with the lens and just how much displacement is necessary to correct it. Generally, it will be found that the images in the center of the field are not in focus at the same adjustment as those at the edge. The usual procedure is to use the focus adjustment which gives accurately focused images in a circle one-half to two-thirds the width of the plate in diameter.

Lynn Matthias
2121 East Capitol Drive,
Milwaukee, Wisconsin.

Nova Program Notes

A modest and slowly increasing interest in the Nova Program was anticipated at the time it was announced in the June issue of Amateur Astronomy as a proposed function of the A.A.A.A. The whole response from amateurs in all parts of the country to our request for volunteers has almost left us speechless. Nevertheless we take great pleasure in listing below the names of those who have so willingly offered their services for this new but worthwhile activity during June, July and August.

Ed. Martz, Oak Park, Illinois; Charles Jordon, Oak Park, Illinois; E. J. Rohn, Milwaukee, Wisconsin; Ada Rohn, Milwaukee, Wisconsin; Wm. Weifenbach, Milwaukee, Wisconsin; Geo. Diedrich, Milwaukee, Wisconsin; Eino Kinunen, Milwaukee, Wisconsin; John Luczka, Milwaukee, Wisconsin; J. Loepfe, Milwaukee, Wisconsin; E. F. Legel, Milwaukee, Wisconsin; Luby Sidoff, Milwaukee, Wisconsin; M. Keuziah, Milwaukee, Wisconsin; Russell Bautz, Milwaukee, Wisonsin; A. Kozlowski, Milwaukee, Wisconsin; Eugene Bonacker, Milwaukee, Wisconsin; E. A. Halbach, Milwaukee, Wisconsin; Richard Abrahams, Milwaukee, Wisconsin; Roy Seely, New York, New York; Frank Preucil, Joliet, Illinois; J. M. English, Madison, Wisconsin; Wm. Binney, Madison, Wisconsin; Mrs. Wm. Binney, Madison, Wisconsin; Walter Scott Houston, Milwaukee, Wisconsin; Ann Bautz, Milwaukee, Wisconsin; Wm. Callum, Chicago, Illinois; Hans D. Gaebler, Watertown, Wisconsin; Joe Boehm, Chicago, Illinois; A. L. Peck, Milwaukee, Wis.

Observations received during July and August will be published in the October issue of this bulletin.

L. E. Armfield
2046 So. 59th Street,
Milwaukee, Wisconsin.

To What Extent Do Foreign Amateur Journal Records Help Us?

While the following test was confined to a single variable, RT Cygni (194048) it may be said to be true for any of the more common variables.

Over a period of forty one consecutive days chosen at random (Julian Days 2327225-265) only twenty of them were to be found recorded in the AAVSO records, seven in the Norwegian (Nordisk Astronomisk Yiddskrift) and five in the French (Bulletin de l'Association Francaise d'Observateurs d'Etoiles Variables) exclusively. On seven of the forty one days no observations were recorded in any of the three journals. Seven appeared in both American and Norwegian, three in American and French, two in French and Norwegian, and none in all three simultaneously.

The period covered in this case showed RT Cygni on the rise from magnitude 12.6 to magnitude 8.4. By consulting the two foreign records, only seven instead of twenty one days of the period were left blank. Possibly the inclusion of the British and other foreign records might have yielded a complete consecutive record. As for the German and Russian amateur records, they do not seem to include this star.

Two observers, Chandra and Loreta, report to both the French and to the American variable star societies. In the period covered, Chandra sent one to the AAVSO and Loreta, two to the French society. Strangely enough Chandra's estimate was about half a magnitude out of line for the one observation he made.

It will be readily seen that if other variables and other periods are recorded that the amateur may approach consecutive sequence much more completely by also consulting foreign amateur records than by limiting himself to the AAVSO alone. These foreign journals may be had at any of the larger observatory libraries.

Observations for July

We are proud indeed of our record this month of 1217 observations, but particularly because George Diedrich, President of the Junior Auxiliary of the Milwaukee Astronomical Society contributed 303 observations. We doubt whether there is any other sixteen year old observer with such a record.

We welcome also the contributions from Mr. William Callum, Secretary of the Chicago Telescope Makers, whose excellent observations were made with his 8 inch reflector.

Unique also is the remarkable record of observations of SS Cygni made by Mr. L. Armfield, Secretary of the Milw. Astronomical Society. He followed the vagaries of this star from magnitude 12.3 (J.D. 28996.7) to 8.2 (J.D. 28003.7) and back again to 10.2 (J.D. 28015.8). We feel certain that this complete curve of SS Cygni will be welcomed by the professionals.

Following are the number of observations: Armfield 535, Callum, 42 (June) 78 (July), Diedrich 303, Gallogly 2, Gaebler 2, Guenther 7, Halbach 89, Loepfe 6, Katz, A. 24, Katz, Y. 10, Keuziah 35, Knott 61, Schmid 21, Sidoff 2.

Hans D. Gaebler
101½ Main Street,
Watertown, Wisconsin.

A most enjoyable time was reported by the thirty odd members who attended the Society's Second Annual Picnic held at the home of Mr. and Mrs. Boyd in Pewaukee. The Juniors challenged the Seniors to a baseball game, which, after an exciting tussle ended in a 10 to 7 victory for said Seniors. President Parkinson starred for the oldsters with his error-less work at 1st while Diedrich, Legel, Keusiah and Sidoff did their best to win for the youngsters.

Bathing, meeting and eating followed each other in rapid succession in order that the group might get an early start for Lake Geneva to attend a meeting of the Amateur Telescope Makers of Chicago at the summer home of Mr. J. E. Boehm, a mutual member of A.T.M. and M A S. Mr. Boehm placed at our disposal his recently completed 14 inch reflector, through which M13 and other interesting objects were viewed in all their glory.

Following a most pleasant evening with Mr. Boehm and other members of the Chicago society the group returned to Pewaukee in acceptance of the Boyd's most gracious invitation to breakfast. Just as the dawn was beginning to outline buildings and trees in sharp relief the group started their chilled motors and headed for home. Tired? yes, but with their minds too happily filled with memories of a pleasant day to notice the drugging effects of fatigue.

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included in the regular reports in turn submitted to the AAVSO by the MAS. Still others have entered the photographic field and many photographs of the moon and sun have been taken and sent in to the leader of the planetary section of the A.A.A.A.

1627 So. 60th Street,
Milwaukee, Wis.

The M A S Bulletin

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Meteoric Finders Are Not Keepers

HERBERT W. CORNELL
Secretary, City Service Commission

Contrary to the ordinary belief, a meteorite observed to fall and recovered by the observer does not belong to him. It belongs to the owner of the land, and can be recovered by him in an action at law, even from a scientist who has purchased it in good faith from the finder or from a dealer.

This principle was laid down by the Supreme Court of Iowa in the leading case of Goddard vs. Winchell, 52 Northwestern Reporter 1124. On May 2, 1890, a sixty-six pound iron meteorite passed over Iowa and landed on a farm owned by John Goddard, but rented by him to another farmer named Eleckson. It was seen to fall, and dug up, by a neighbor named Hoagland, who, with the consent of the tenant-farmer Eleckson, removed it and sold it to Dr. H. V. Winchell, at the time one of the foremost geologists in America. The price was $105, which leads us to suspect that Dr. Winchell drove a sharp bargain. Goddard, the owner of the land, brought suit against Dr. Winchell for the meteorite, and, despite the fact that the tenant-farmer had conceded the ownership to the finder, and despite the fact that Dr. Winchell had paid out his good money in good faith, it was taken from him and given to Goddard. The Supreme Court of Iowa confirmed the decision. The Court held that the unusual nature of the meteorite did not call for a different rule of law than obtains in the case of other minerals; that glacier-borne boulders unquestionably form a part of the real estate and can be recovered by the owner of the land from anyone who removes them, and while the origin of the glacial boulder may be less mysterious, it, too, is "a telltale messenger from far off lands" and has its scientific value.

There is one other case in a supreme court involving this question, namely, Oregon Iron Co. vs. Hughes, 81 Pacific Reporter 572, decided by the Supreme Court of Oregon in 1905, and the circumstances were much more extraordinary. The defendent, Hughes, discovered a great iron meteorite seven by ten feet across the top and four and a half feet thick, on land belonging to the plaintiff company, and removed it without the company's knowledge or consent. When the company brough legal action for the meteorite's recovery, Mr. Hughes's lawyer interposed a surprising defense. He doubtless recognized that the Winchell case would be a precedent which the court would probably follow, but drew a distinction between the two cases by claiming that the meteorite was an Indian relic. An aged Indian named Susap, about the last of the Klickitat Tribe, was called to the witness stand and testified that when he was young he had been told by an old medicine-man that the rough mass of iron with its many cavities had come from the moon, and that when it rained the rain-water collected in the pot-holes and exterior cavities, and the Indians would gather and go through a ceremony of washing their faces with this water and putting their bows and arrows in it, in the belief that it would give them a magical power in time of war.

Whether the meteorite was actually seen to fall by the Indians, and whether the fall was such that it appeared to come from the moon, may be doubtful but not inprobable. It was argued by the lawyer that the action of the Indians in regarding the meteorite as a supernatural object and using it in their ceremonies, and, probably, enlarging the natural cavities to suit their purposes, would cause it to lose its characteristics as a part of the real estate and would cause it to become an archeological relic. The argument was really a good one. There is no doubt that Indian arrowheads belong to the finder, even though he is a trespasser on the land. The distinction is that the arrow-head is an object that has already been in human possession. An archeological relic, established as such, would not go with the real estate. The Supreme Court of Oregon held, however, that the evidence was not sufficiently strong to establish definitely that the Indians had used the meteorite as an object of worship and had altered it or fashioned it for their own purposes by enlarging the natural cavities, and in view of the meager and uncertain character of the testimony the Court followed the precedent set by the Supreme Court of Iowa in the Winchell case, and ordered the meteorite turned over to the company owning the land on which it was found.

Both these meteorites have been acquired by the American Museum of Natural History in New York City, and are on display in their Meteorite Room immediately within the main entrance.

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The official monthly publication of

The Milwaukee Astronomical Society

2046 So. 59th St., Milwaukee, Wisc.

R. D. Cooke, President
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L. E. Armfield, Secretary
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Committee on Publications
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Ten Cents per copy, $1.00 per year. Contributions are solicited but cannot be paid for. Their publication, either in whole or in part, is solely at the discretion of the committee on Publications. Address all communications to the secretary of the society at the above address.

We welcome the following new members to the society: Miss Ada Rohn, 2958 N. 2nd Street.; Mr. E. J. Rohn, 2958 N. 2nd Street; Mr. Eugene Bonacker, Route 9, Box 303; Mr. Nathan Pereles Jr., 739 N. Broadway.

Hans D. Gaebler,

Walter Houston is touring the south and southwest visiting the major observatories.

H. William Liebscher, pleasantly surprised his colleagues in the MAS by dropping in for a few days visit. Bill has been engaged in the Forestry Service for the past six months and is, at present, Forestry Service Editor for the "War Vet," a magazine published semi-monthly by the camp with which he is associated.

During the ensuing year it is planned to continue publishing the predictions in substantially the same form as has been used in the past. We shall use every effort to secure at least one observation of each occultation and thus keep up the past record of complete data.

The question is still open as to whether this activity is of sufficient interest to the society to warrant the existence of a working section and the assignment of space in the bulletin. We feel this should be submitted to the membership for discussion.

Report of Occultation Section 1934-35

R. D. Cooke

The occultation section has continued to furnish predictions for occultations visible at Milwaukee throughout the year. These are published monthly in the Bulletin for the next succeeding month. All observable occultations have been observed by at least one observer, and to that extent the achievement has been the highest possible under the circumstances. The total number of observations has been 46 since Sept. 1, 1934, including 17 taken during the total eclipse of the moon on July 15th. The active observers have been Armfield, Albrecht, Cooke, Halbach and Knott.

Reductions of data have been completed on 22 of the above observations. In addition to these about 60 additional reductions were made of observations from other observatories, data for which were furnished by Dr. Dirk Brouwer of Yale University Observatory. Some of these last were made in duplicate with the assistance of Mr. Feinsilber.

We are now holding 25 reduced observations dating from July 1934, in the hope that there can be developed among the members of the society enough assistance to perform check computations before submitting them to Yale. Recently one member of the Missouri-S. I. group, Mr. Felker, and a member of the Chicago group, Mr. Warner, have volunteered to help in this work and appear to be seriously interested. I feel a certain amount of embarassment for the Milwaukee group, that with all our talent and enthusiasm there has not been someone willing to become active in this phase of astronomical work.

The following occultations are predicted for Milwaukee and vicinity during November. The last one is scarcely worth considering as it is practically at the time of full moon, although technically a dark limb immersion.

Date	Star	Mag.	Immersion	Pos. angle
November 6	16 Piscium	5.6	6:46 PM	0°
November 7	19 Piscium	5.3	12:36 AM	56°
November 8	136B Piscium	6.5	12:40 AM	116°
November 8	101 Piscium	6.2	11:21 PM	120°
November 10	Mu Arietis	5.7	3:13 AM	86°

6811 W. Cedar Street
Wauwatosa, Wisconsin

Third Annual Report of the Photographic Section of the Milwaukee Astronomical Society

LYNN MATTHIAS

A good many photographs were taken during the latter part of last year for the Cepheid variable program which was undertaken in cooperation with Harvard. These were measured and reduced and the star SU Cygni was found to be a double, whether optical or physical, has not yet been determined. The light curve of this Cepheid also showed anomolies which may disappear on further study. However the original light curve obtained indicated it to be approximately of the Beta Lyrae type. Other Cepheids of which light curves were obtained by photographic means are CD Cygni and X Vulpeculae.

The modified Schilt Microphotometer has been in operation during a good portion of the year and the measures of the Cepheid plates were made with it. Measures of 2½ hour plates of M31 show the extension of this nebula considerably beyond its apparent diameter as reported Stebbins using a photo-electric photometer. This is simply a photographic check of Stebbin's work and is really an indication of the sensitivity of the microphotometer rather than a measure of the quality of the photographs.

Two similar 3 inch cameras are now ready for mounting and will be used to take simultaneous photographs in two colors for variable investigations, etc. This will permit an accurate evaluation of color index as the star passes through its cycle, and also permit an estimate of the star's color temperature.

An additional camera with a 1½ inch lens which covers a large angular field is to be mounted separately and will be used for patrol work.

An effort is being made to interest the amateurs of the A.A.A.A. in astronomical photography. In order that amateurs may get started in this branch of the work without a large expenditure for equipment the use of hand cameras is being encouraged for a sky patrol. The possibilities of this program are immense, since a relatively few interested amateurs could patrol the entire sky nightly down to perhaps the 9th magnitude, and it is doubtful if any important changes in the sky would be missed by a continuous program of this sort.

The establishment of a photograph section of the A.A.V.S.O. may mean a great increase in the number of observers doing variable work by photographic means. At the present moment it is planned that all plates will be sent to Milwaukee for measurement with the Schilt microphotometer. However, the plans for the photographic section of the A.A.V.S.O. are not complete at present and its scope will not be determined until after the fall A.A.V.S.O. meeting.

The photographic program for the ensuing year, then, consists of:

1. Further investigation of the light curves and variation of color index of Cepheid variables.

2. Further observation of eclipsing binaries for the investigation of the Nordman-Tickoff effect.

3. Organization of the Patrol Program for amateurs who wish to use hand cameras for astronomical work.

4. Measurements of the plates and direction of the A.A.V.S.O. photographic program. This will include those amateurs equipped with cameras suitable for work on variable stars.

With this as an outline and with a sufficient number of interested observers the next year should see amateur astronomical photography established as a worthwhile activity.

2121 East Capitol Drive,
Milwaukee, Wisconsin

METEORIC FINDERS ARE NOT KEEPERS

(continued from page 33)

Thousands of people walk by them every day, dismissing them with a casual glance, and probably not one in a thousand knows of the remarkable legal battle which have raged around them.

So, if you find a meteorite, be sure to make it right with the owner of the land. For finders aren't keepers, when meteorites are involved.

4117 N. 15th Street,
Milwaukee, Wisconsin.

History the Handmaid of Science

Hans D. Gaebler

The question of whether the span of history, or so much of it as includes records of stellar magnitudes, i.e. about two thousand years, is enough evidence of stellar evolution is discussed by two German writers.

Dr. E. Zinner (Bamberg) in "Die Sterne" (H. 7, Juli 1930) attempts to show that a comparison of star catalogues of Hipparchus as embodied in that of Ptolemy (137 A. D.) and Al Sufi's (960 A. D.) showed evidence of evolution along the main sequence of the Russell diagram. He reduced the ancient magnitudes to the P.D. scale and by using the modern (1894) photometric estimates his comparison with the ancient ones showed still further that giant stars show an annual increase and dwarfs an annual decrease in apparent brightness, and that the effect increases regularly from B to M stars.

While this thought is a fascinating one to contemplate and captivates the imagination of the astronomer there seem to be some serious objections to its plausibility, as shown by Dr. B. Sticker in an article in "Die Himmelswelt" (Mai 1934) in which he looks for a true explanation of the facts deduced by Zinner.

Sticker doubts that the change in the magnitudes as recorded by Ptomely and as determined by modern photometry (of stars of known parallax) is evidence of their evolution from giant to dwarf. He shows that even present day measurements are based on arbitrary norms. If a Ptolemy magnitude 6 is now 5.5 it might be possible to determine statistically that there is a secular change in brightness for some groups of stars from giants to dwarfs. But we cannot determine with accuracy their magnitudes because of changes in the earth's atmosphere and possible interstellar absorption which are varying factors. If our sun is a middle aged star whose age might be ten years to the ninth power, can the age of a dwarf star be observed within a span of two thousand years? He shows that during such a period there would be a change of apparent magnitude of two hundred thousandths, but can this be measured? The distance of the stars from the sun is itself not constant and radial velocities amounting to one percent of their distance in two thousand years would of itself result in a change of apparent magnitude of some two hundredth of a magnitude. Such considerations must enter into any attempt to determine historically the evolution of a star. Zinner claimed that Ptolemy judged colored stars relatively fainter than white ones. Our modern photometers are a hundred times more efficient than the ancient determinations and over a period of several decades it should be possible to check these magnitudes with greater success. Variation in the earth's atmosphere and interstellar absorption are factors which are too great to overlook.

We welcome the addition of another observer, Mr. G. F. Kernan of Chicago who is using an 8" reflector. Following are the observations for this month: Armfield 240, Callum 37, Diedrich 132, Halbach 146. A. Katz 22, Y. Katz 10, Kernan 20, Keuziah 23, Knott 44, Loepfe 5, Peck 15, making a total of 679.

We take pleasure in presenting below the annual report of the Variable Star Section of the Milwaukee Astronomical Society, which was kindly submitted by Herbert L. Grunwald, 2431 N. 46th St., Milwaukee, Wis.

Although the work has progressed and large numbers of accurate observations were recorded the personnel of the group has changed but slightly. Last September we reported that about ten members were interested in the work and such a report must again be given. One or two new observers have been added but an equal number have discontinued active observing.

The year yielded about 9.320 observations starting June 1st 1934 and ending the same month in 1935. The summer season, when climatic conditions are more favorable naturally was the most fruitfull. An average of 1400 observations were recorded during July, August, September, and October last year. During the remaining months with their cold cloudy weather average observations numbering 300 were made.

The activities of the group were detailed in the monthly issues of the M A S Bulletin together with articles of interest on the subject of variable stars. Beginning with the May issue at which time the A.A.A.A. was introduced the work of supplying the bulletin material was taken over by Mr. Hans Gaebler of Watertown, who is also regional director of the AAVSO. Mr. Gaebler translated several articles of German Origin for publication in the monthly issues. Such subjects included "The Hobby of Astronomy" by R. Ruf, Cologne, Germany, and "Investigation of Nova like Variables" from Kucharkin and Parenago.

By way of summary it might be said that during the year our work has lost the aspect of hap-hazard, free lance observing to be supplanted by systematic pursuance of definite assignments.

101½ Main Street,
Watertown, Wisconsin.

The M A S Bulletin

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Measuring the Peripherical Velocity of the Rotation of the Earth along the 43rd Parallel.

M. J. W. PHILLIPS
Head Science Dept., West Allis High School.

This problem was suggested by a group of students in the West Allis High School who were interested in observational astronomy, as a means of finding the answer to the question: "How fast do points or cities along the 43rd parallel travel in miles per hour?" Being attempted by amateurs it was necessary to make it as elementary or simple as possible. The method can best be described by quoting from some of the correspondence which was carried on between West Allis High School students and the students from other high schools which were selected along the 43rd parallel.

Quoting from a first letter sent by West Allis to the high schools at Pocatello, Idaho, and Batavia, New York, both on the 43rd parallel:

> "We are attempting to carry out a project in our High School, namely, that of 'Measuring the Rotational Speed of the Earth along the 43rd Parallel of Latitude'. We need the assistance of another point of observation. After a careful study of maps, we found that Batavia is most favorable, being a fairly large city at a convenient distance from West Allis on the 43rd parallel.
>
> "We are asking you to co-operate with us on this project by measuring the exact time of the 'sun-noon' at your city during the week of May 20, 21, 22, 23 and 24. We will take observations here in West Allis on the same days.
>
> "This can be done quite easily with the aid of a very few materials An instrument should be used to determine the exact time of 'sun-noon'. This instrument which is known as a 'sun-transit' or gnomon, casts a shadow on a base board. The 'sun-transit' we are using is very simple in construction and was built at a cost of a few cents. Enclosed you will find a photograph of our instrument with the committee measuring the time of a transit.
>
> "In order to obtain accurate readings, two things are necessary:
>
> (1) The transit must be lined up properly, that is, the gnomon must be vertical and the observation line must be directly north and south.
>
> (2) The time must be accurate. Accurate time can be obtained from the radio 'tone-signals' broadcast from radio stations connected on the network of the National Broadcasting Company. A watch adjusted to these signals, having a second hand should be used to check the time of the transit of the sun.
>
> "The time of 'sun-noon' varies slightly from day to day, so do not average your observations, but send us one for each of the days mentioned.
>
> "Our committee has agreed to take observations for five days, because the chances are less for cloudy weather on a series of days than on one.
>
> "We will exchange observations with you and then make the computations of the speed of any point such as West Allis or Batavia along the 43rd parallel, in miles per hour. This will complete our project."

Pocatello, Idaho did not reply to this letter, but Batavia, New York did. Hence we were able to use only one point of observation and not able to make a check. Quoting from the letter received from Douglas Harvey, a Batavia High School student, under date of May 15, 1935.

> " . . . . . First of all I wish to ask a few questions. You stated in your letter that the transit line must be north and south Are you using the magnetic north or true north? For accurate results of course it would be best to use true north, would it not? From your picture, I take it that your apparatus is simply a board with a line lengthwise and a dowel rod perpenducular to one end of the line. Is that all? I will correct my watch to WBEN, Buffalo. This station as you know has half hour 'peep' signals giving correct time to the second. I shall be glad to hear from you concerning my questions and any you may wish to ask."

Considerable correspondence of this type passed between the group at West Allis High School and this boy of the Batavia High School. Quoting a portion of another letter from Batavia, the read-

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Keep Accurate Records of Your Astronomical Photographs

LYNN MATTHIAS

Undoubtedly the most important or valuable part of an astronomical photograph is the record that must accompany it. A negative may be excellent photographically speaking, but to be of scientific value it must be supported by pertinent data recorded at the time the photograph was taken. One should make it a rule to make a record of all astronomical photographs that are taken; for one can never tell in advance whether a negative will be of great value or not, and one cannot afford to find later that an otherwise valuable negative is worthless due to a lack of data. Even negatives which are taken for purposes of adjustment should be carefully recorded with the same care that one would use if he knew that the negative would show the initial outburst of a nova. It is so easy to be careless in the matter of keeping a record that one should be careful to take the data only at the proper times. Do not anticipate the data, but record exactly what is done immediately after it is accomplished, e.g. when you close the shutter of your camera, record it. Do not record when you expect to close the shutter. If the data is to be used for scientific purposes it must be as accurate and as complete as it is possible for you to make it. It is almost impossible for a record to suffer from too much data; but it is unfortunately true that a good many observations suffer from a lack of completeness in the data.

A form of keeping data when taking astronomical photographs which is both convenient and complete enough for amateur work is that given in the book "Celestial Photography" by A. S. King. The column headings given are as follows: Instrument, Date, Plate number, Object photogaphed, Right ascension, Declination, Start time, Observed Hour angle, Observed declination, Focus, Condition of sky, Stop time, Length of exposure, Plate type, Remarks. It is well to provide a book in which to keep these data exclusively. A bound data book is usually more satisfactory for this purpose than a loose leaf book since the sheets are always in the proper order and the possibility of misplacing or losing a sheet is avoided. A data book is subjected to hard usage and it should be quite substantial.

When the plate holder is removed from the camera, after an exposure has been made, the plate holder slide is drawn about a quarter of an inch. The number of the plate and the position of this edge of the plate (north, east, etc.) is written on it with a pencil using a moderate amount of pressure. This of course, must be done in the dark to avoid exposing the plate. The pressure of the pencil on the emulsion leaves a mark which will develop in the usual manner. By thus identifying the plate and recording the details of the exposure in a data book it is possible at any future date to refer to the plate with complete confidence.

2121 East Capitol Drive
Milwaukee, Wisconsin.

Measuring Velocity of Earth

(continued from page 37)

er will note the method used and the preparations made with the attendant care, to observe the transit of the sun.

". . . . . I set my apparatus as follows: I constructed, by sighting a meter stick along a surveyor's compass, a line due magnetic north. Since the declination at the Batavia Fair Grounds is 8 degrees, I constructed an 8 degree angle on a piece of paper and by points laid off on the magnetic line as one side. Thus I obtained true north."

The observations of the transit of the sun taken with this home-made instrument, in West Allis and Batavia follow:

Date	West Allis	Batavia
May 20th	Cloudy	Cloudy
May 21st	11:48:23 CST	12:13:45 EST
May 22nd	Cloudy	12:14:30 EST
May 23rd	11:49:30 CST	Cloudy
May 24th	11:49:53 CST	12:15:30 EST

To find the total elapsed time between the transits of the sun in West Allis and Batavia, it is necessary to change the CST (Central Standard Time) of the West Allis observations to EST (Eastern Standard Time) on May 21st and 24th, the days when the sun was visible at the time of the transit in both cities.

West Allis	Batavia	Total Elapsed Time
May 21st		
12:48:23 EST	12:13:45 EST	34 min. 28 sec.
May 24th		
12:49:53 EST	12:15:20 EST	34 min. 33 sec.

The mean elapsed time was 34.5 minutes.

The distance along the 43rd parallel between West Allis and Batavia, taken from maps, is approximately 463 miles. This distance was covered in 34.5 minutes or about 13.42 miles per minute.

The calculated circumference of the earth along the 43rd parallel is about 18, 192 miles. Points along this parallel cover this distance in 24 hours or about 12.63 miles per minute. The observed speed is 13.42 miles per minute or 0.79 miles per minute more than the calculated speed, or about a 6% error.

West Allis, Wisconsin

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Variable Stars

Record of Variable Star observations for the month are as follows:

Armfield 337 Diedrich 98, Halbach 99, Keuziah 3, Knott 6, Loepfe 2, Peck 132. A total of 775 observations.

The April number of Variable Comments, the AAVSO bulletin, will be of interest to our observers because it contains light curves of variables, a continuation of those published in October 1933, containing among others our old friends V Bootis and O Ceti.

Annual Meeting of the AAVSO

The twenty-fourth annual meeting of the AAVSO was held at Harvard College Observatory on October 18 and 19, 1935, and our M A S Secretary, Mr. Luverne Armfield, was fortunate to be present.

Dr. Harlow Shapley of Harvard presented various programs which he hoped the Association might carry out, as follows:

1. olution of the publication of the AAVSO observations in The Harvard Annals four times each year, with narrative reports in Popular Astronomy ten times each year. This change of frequency of publication was due to the increased number of observations made by members of the Association which were impossible for Popular Astronomy to continue publishing.

2. Encouragment of the manufacture of photographic apparatus by amateurs for patrol work. (The latter is now being done by our Lynn Matthias.)

3. The use of the Harvard photographic collection of plates taken during the past forty years, including long period variable plates to be compared with visual observations.

4. Development of red sequences for a special group of long period variables.

5. Encouragement of computations of occultations.

Dr. Shapley announced that the AAVSO was depending on the new organization, the "Quadruple-A" ("4-A" to us), to help carry out the above program.

At an afternoon session, Dr. G. B. Kuiper talked on Binary Stars, stressing in particular the association between ordinary binaries and variable stars.

At the business meeting of the AAVSO Mr. Armfield was elected a member of the Council, and when the Council met to appoint officers, he was chosen second Vice President. This is a signal honor, and our Milwaukee Society has won its spurs. Other officers for the ensuing year are: Dr. Shapley, President; C. W. Elmer, 1st Vice President; William Tyler Olcott, Secretary; Percy W. Witherell, Treasurer; Dr. Leon Campbell, Recorder.

The Association held a banquet meeting, at which Mr. Armfield was honored by being asked for a few words, and he spoke briefly on various phases of the work of the M A S. Present at the banquet were the following specially invited guests: Drs. King and Brown of Yale, Young and Farnsworth of Mt. Holyoke, Shapley, Campbell, Cannon, Whipple, Sterne, Kuiper and Brouwer of Harvard.

Members of the Association and guests were invited to a luncheon given by Dr. and Mrs. Shapley in the Observatory Residence. Following the luncheon there was opportunity to inspect the recently erected spectrohelioscope on the grounds of the Observatory.

The Association was more than kind to give special recognition of the modest work of the M A S, especially of our Mr. R. D. Cooke's occultation work, Lynn Matthias' photographic investigations and Ed. Halbach's electrical recording timer. Special greetings were brought by Mr. Armfield to our Society from the AAVSO, the Harvard College Observatory, Drs. Shapley, Campbell, Cannon, Mrs. Helen L. Thomas, assistant to Dr. Campbell, Miss J. Mohr, assistant to Dr. Shapley, and Miss Anne Young of Mt. Holyoke College.

OCCULTATIONS

R. D. COOKE

Change from 5" to 3" in the Reduction of the Occultations Observed in 1936

The following notice was received from Ernest W. Brown of Yale University, with the request that it be inserted in the M A S Bulletin:

Beginning with the first lunation of 1936 (New Moon, 1935 December 25) it is requested that 3″ be added to the moon's mean longtitude instead of the 5″ used during the past three years. This is equivalent to the addition to $0.00152^{\Delta a}$ $0.00152^{\Delta\delta}$, where $^{\Delta a}$, $^{\Delta\delta}$ are the variations of the moon's position per *hour*. (the variation per minute being no longer printed), or to that of $0.^{h}00152 = 0.^{m}091 = 5.^{s}5$ to the time at which the moon's position is obtained from the Ephemeris.

The American Ephemeris and the British Nautical Almanac for the year 1936 give for the first time an additional list of occultation stars between magnitude 6.6 and 7.5. The positions of these stars were obtained from a catalogue of zodiacal stars prepared by J. C. Hammond from observations made during the years 1927-1930 with the six-inch transit circle of the Naval Observatory at Washington. For the brighter occultation stars the positions published in the British Nautical Almanac are obtained from this same catalogue. It is suggested to computers of reductions of occultations observed during 1936 that the positions of the brighter stars as given in the British Nautical Almanac be used, in preference to the positions obtained from Hedrick's Zodiacal Catalogue.

It is also suggested that in future publications of occultation reductions the angle χ as well as χ-ρ be given in order to facilitate computations of the effects of altered star positions.

Ernest W. Brown, Dirk Brouwer
Yale University, New Haven, 1935 September

(We are publishing herewith a tabulation of the occultations observed by members of the Milwaukee Astronomical Society during 1934, together with the reductions. The symbols under 'Obs" refer to the observers: A—Armfield, C—Cooke, H—Halbach. Shortly after the first of the year the occultations for 1935 will be published in similar form.)

Obs.	Star	Date	G. C. T.	χ	χ-ρ	$\sigma' - \sigma$
			h m s	° ′	° ′	″
C	26 Arietis	Jan 23	11 41	98 18	27 36	—2.8
C	48 Leonis	Mar. 1	2 04 12	119 53	3 20	+6.8
A	87 Virginis	Jul. 20	2 18 04	181 50	69 57	—1.5
C	43 Ophi	Aug. 20	2 00 25	95 22	4 41	—1.0
A	43 Ophi	Aug. 20	2 00 23	95 24	4 43	+ .6
C	χSagitt	Oct. 14	0 00 17	150 25	62 41	+1.8
C	19 Caps	Oct. 17	3 29 28	102 22	33 9	—1.2
A	19 Caps	Oct. 17	3 29 34	102 32	33 19	—1.6
C	BD-8° 5873	Nov. 15	2 45 24	32 16	—32 3	—0.6
C	29 Caps	Dec. 11	0 24 02	62 56	— 4 47	—4.2
A	29 Caps	Dec. 11	0 24 06	63 3	— 4 40	—5.5
H	29 Caps	Dec. 11	0 24 03	62 51	— 4 52	—4.5
C	BD-15° 5938	Dec. 11	1 13 21	21 26	—46 9	—2.9
C	BD-2° 4728	Dec. 14	2 03 17	65 50	2 6	—3.5

NOTE: Star positions are from The American Ephemeris and Nautical Almanac, except No. 9, 13, and 14, which were supplied by Yale University Observatory.

Occultations for December are as follows:

Date	Star	Mag.	Immersion	Pos. Angle
Dec. 3	kappa Piscium	4.9	10:25 PM	81°
Dec. 3	9 Piscium	6.4	10:41 PM	156°
Dec. 9	62 Tauri	6.2	5:10 AM	50°

The M A S Bulletin

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Astronomy For Children

By Helen Pillans, B.S., M.S.

This Fall a group of fourth, fifth and sixth grade children needed a teacher for their Astronomy Club. Their former leader had not been able to continue this year, hence when I was asked to take his place, I accepted since Iwas interested both in astronomy and in the teaching of children. The group meets for only an hour once a month, so that our progress has not been very rapid, and this paper will necessarily have to be more a statement of what I hope to do than of what I have done.

During the years that their former leader had the club, they did no work on the constellations, nor, with the exception of looking through his telescope for one evening, they made no actual observation of the sky. Therefore, for a while I plan to emphasize the constellations by spending part of our hour together outside, by encouraging them to look for constellations alone, and by telling some of the myths and stories connected with the stars. Carlyle's oft repeated plea: "Why did not someone teach me the constellations and make me at home in the starry heavens which are always overhead and which I don't half know to this day!" gives one justification for taking this line of action.

My other big objective will be to lead them to as correct a conception as possible of stellar sizes and distances and the astounding relationships of earth to sun, sun to solar system, solar system to galaxy, and galaxy to supergalaxy. Then eventually, if I can be with them long enough, I hope to go to the other extreme and open the world of electrons and protons and the wonders that are revealed through light.

So far we have had two meetings—one in October and one in November. The evening of our first meeting we fortunately had beautifully clear weather with remarkable attendance on the part of the children. In order to get some idea of the phases of the subject with which they were already familiar, I asked them to tell me what we might talk about in an astronomy club. The following list gives ample proof both of their interest and of the excellent work of their former leader. The list was: moon, satellites, sun, planets, planetoids, meteors, comets, eclipses, orbits, distances, constellations, stars, nebulae, observatories, telescopes, magnetism and light. Naturally the fourth graders would know almost nothing about any of these subjects, whereas many of the sixth graders would have fairly well defined concepts of them all.

If the children are to get as correct and as lasting an impression of stellar sizes, distances and motions as possible, I feel that at every meeting I should either dramatize or vividly tell some one thing by which they can better visualize our relationships to the rest of the universe. With this thought in mind, I took a ball one inch in diameter to the first meeting, and if I had been really prepared would have had a ten inch globe in the room. As it was, I held up the little ball, told them that it had a diameter of one inch, and asked them to imagine it to be the world upon which we live. Someone next told me, when I asked, that Jupiter was the largest planet, and, although I had not provided myself with the globe, they had all seen one and could picture Jupiter to be a sphere ten inches in diameter. Finally I paced off ten feet before them, and asked them to imagine the sun to be a large ball of that diameter. Such a demonstration does not give accurately the relative sizes of earth, Jupiter and sun, but it does dramatize the order of magnitude of these objects, and the "ahs" and "ohs" which spread throughout the room showed that most of the children had grasped the full import of these tremendous size differences.

For our constellation study of this first evening, I took the big dipper and Cassiopeia. Before we went out, I told them a little about the constellations, drew the configurations on the blackboard,and showed them where to find the North Star and the horse and rider. I also told them approximately where to look for Saturn and Mars, which were in the sky at the time. Outside, I unfortunately had not provided myself with a whistle; however, although they were noisy, practically all of the children with a little help were able to find the two constellations and the North Star. They particularly enjoyed looking for and finding the horse and rider. When they came in, I passed out papers and pencils, and the children drew what they had seen. Many of them succeeded in making really recognizable maps of the northern part of the sky. Just before they went home, I told them briefly, while they took notes, where they might find the following constellations and what their main configurations would be: Lyra, Aquila, Pegasus and Cygnus.

At our second meeting in November we had a regular blizzard so that there was no opportunity to learn any more constellations. However, since the Leonid meteors were due at the end of that

(continued on page 42)

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week, we spent the hour discussing meteors and meteroites. We talked about what they were, where they came from, their relationship to comets, what made them shine, why they had pitted places in them, and the number that hit the earth every hour. While we were talking of these things, I showed them pictures of meteor trails, large meteorites, and of Meteor Crater in Arizona, and when the discussion touched upon the Leonids in particular, I read them a southern planter's account of the 1833 shower and Sir Robert Ball's description of the 1866 shower.

In much this same way I hope to continue my future meetings, gradually taking the children beyond the solar system into the marvelous variety of our own galaxy, then cut into the depths of space where millions of other galaxies are moving, changing and evolving to no one knows what.

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Photographic Section Notes

LYNN MATTHIAS

The photographic patrol program of the AAAA was outlined briefly in the August issue of "Amateur Astronomy". This program which is also encouraged by the AAVSO, allows the amateur to do photographic work of great value with modest equipment. All that is necessary to cooperate in this work is a small camera that can be mounted rigidly to the amateur's telescope. A complete hand camera is not a necessity, in fact it is generally more satisfactory to mount a good camera lens in one end of a box, at the opposite end of which is mounted the guides for the plate holder. Provisions of course must be made for adjusting the focus, and for aligning the plate perpendicular to the optical axis of the lens. A home made arrangement of this sort can easily be made more rigid, and with more stable adjustments than the average hand camera. The telescope on which the camera is mounted is used for "guiding", i.e. for keeping the camera centered on some star while the photographs are being taken.

The object of the patrol program is to detect changes in the apparent brightness and position of astronomical bodies. The specific results anticipated are the early discovery of novae, comets, etc. It is estimated that from ten to twenty novae brighter than the ninth magnitude appear each year. Very few of these are ever discovered, simply because an adequate patrol is not maintained. Here is the great opportunity for the amateur interested in photographic work since even a small camera can record stars of this magnitude with a comparatively short exposure, e.g. a camera equipped with a lens of about one inch effective aperture will record stars of the ninth magnitude with a 10 minute exposure using fast plates.

The procedure followed by the amateur taking part in this program is to take plates of his assigned areas on every clear night under definite standardized conditions. He compares the finished plates with plates taken of the same area with the same camera. If an obvious change is noted in one of the star images an additional plate is taken as quickly as possible to confirm the change, and if corroborated, the writer, or AAVSO headquarters is notified immediately.

If you are interested in cooperating in this program, communicate with the writer for more complete details of the equipment desirable, the procedure to follow in taking patrol photographs, and for assignment of areas.

* * * * *

We wish to congratulate Mr. Latimer Wilson of Nashville, Tenn., on his appointment as the Regional Director of the Photographic Section for the Tennessee group. We are certain that Mr. Wilson with his long experience in astronomical photographic work is in a position to advise the members of his group authoritatively. We wish him every success in this new field.

* * * * *

We also wish to acknowledge the excellent work done by Mr. J. L. Woods of Baltimore, Md., and Mr. Watson who is cooperating with him in the photographic investigation of the light curve of cepheid variables. Mr. Woods is using a camera with a lens of F/4.5 relative aperture and a focal length of about 16". He has also taken many remarkably good photographs with his 12" reflector.

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Milwaukee, iWs.

Dark Nebulae

Digest of talk given before the Milwaukee Astronomical Society on Thursday evening, November 7, 1935, by

DR OTTO STRUVE
Director Yerkes Observatory

The study of dark nebulae is receiving special attention at the Yerkes Observatory. Ever since the time of Herschel, the structure of the universe has been the object of attention of astronomers, involving accurate determination of the distances of stars. Dark nebulae cut off the light of stars, making them appear further than they really are, but how much obscuration they cause is a matter of difference of opinion. Hence the emphasis on the examination of this eclipsing matter.

The ancient Egyptians and Chaldeans thought of the earth as the center of the universe and the stars hanging from or fastened into the dome of the sky; Ptolemy demonstrated his epicycles, and for centuries one or all of these or similar theories held the belief of the world until Galileo, pointing the telescope for the first time toward the solar system, introduced an entirely new conception of the universe.

Herschel was the first astronomer to make systematic observations of the stars through a telescope and the first to notice dark spots in the Milky Way. He told his sister that they were holes in the sky and that explanation of them astronomers accepted until the time of Dr. Edward E. Barnard of the Yerkes Observatory.

Dr. Barnard protographed the Milky Way and made a special study of the socalled "holes". He wondered, if those were openings, why all of them should be directly in the line of sight of our solar system, as otherwise we could not see through them. He also considered the striking similarity between dark and bright nebula there is a nearby star sion that these dark markings were opaque matter between us and the stars, and that they cut off the light of the stars behind them.

Dr. Edwin P. Hubble of Mt. Wilson Observatory made a special study of nebulae, and in 1922 called attention to the fact that in almost every case of a bright nebula there is a nearby star which causes its luminosity and without which it would be dark. Messier 8 is an example, as the star which lights it up is clearly visible through it; and the North American nebula is probably made luminious by Alpha Cygni. Hubble's spectroscopic examination of nebulous light proves it to be the same as the light from the corresponding illuminating star, hence the nebulae are merely diffusing screens.

The "horse head" nebula in Orion is an object of special study. Heretofore it was considered a dark body silhouetted against the bright nebula behind it, the two entirely unrelated physically. But the "head" is clearly outlined by a band of light. Rigel is the star causing the brightness of another nebula, at a distance of 12½°; hence, if seen from the nebula, it would appear as a star of the -3 apparent magnitude. A piece of white paper if placed at the same distance from Rigel would have the same luminosity. The question is, why are some nebulae dark and some bright?

The problem at the Yerkes Observatory is to determine the real brightness of the night sky, so as to obtain a standard of luminosity with which to compare the luminosity of objects, or their lack of it. We receive four-fifths of all measured night light from three sources: 1. zodiacal light; 2. chance auroras; 3. permanent auroras. The remaining one-fifth comes from the total light of faint stars. It has been computed that all four sources of light would brighten one square degree of space so that its apparent magnitude would be 4½; hence that magnitude per square degree is the average luminosity of the night sky. Paradoxical as it seems, on this basis the apparent magnitude of the whole sky, or 41,253 square degrees, would equal a star of -7 apparent magnitude.

The following points were brought out in the questions asked Dr. Struve after his talk:

One source of nebulous matter is novae, which give off nebulous matter as they fade away. Nova Herculis now shows spectroscopically that it is nebulous.

Nebulae are made up of dust and gas, and should not be confused with the dark sodium and calcium clouds.

Spectra of stars show lines denoting interstellar matter—the further the stars from us the stronger these interstellar lines.

Although light from a point lessens by distance, the surface brightness of an area of appreciable size does not.

Some Interesting Short Period Variables

Hans D. Gaebler

It is of considerable interest to all observers of Delta Cephei type variable stars to find out what range the fluctuations assume. This is fairly well determined in the case of periods of about 50 days which seem to resemble stars of the RV Tauri type and which thus form a connecting link with the long period variables.

In his article in "Die Sterne", Jan-Feb. 1935, Dr. C. Hoffmeister, of Sonnenberg, Germany, gives the following account of extremely short period variables.

The very rapid variables show a tendency to have periods of from 9 to 15 hours, the so-called Cluster Variables, similar to RR Lyrae, with steep rise to maximum and gradual decline and quite flat minimum. This is not true of Delta Cepheids, however. Flattened curves are found in variables of six to eight hour periods.

In 1904 Mrs. Ceraski discovered XX Cygni to be a very rapid short period variable, having a range of 11.4 to 12.5 magnitudes with "A" type spectrum, and a period of three hours fourteen minutes giving a kind of RR Lyrae type light curve. But the missing link between RR Lyrae type and XX Cygni type has not really been found as yet. For 27 years XXCygni was credited with being the shortest period known, until van Gent discovered a faint variable on Johannisberg plates (Constellation Argo) VVPuppis with a range of 14.5 to 15.8 magnitude and a period of about 100 minutes. Some observers of this star found a fifty minute rise and steep decline of one magnitude in ten minutes, with a flat minimum of forty minutes duration. When photographed with a red sensitive plate the rise was more sudden than the decline but the curve is itself variable and is not at least in its initial progress to be classed as RR Lyrae type.

In the fall of 1934 a still faster variable was discovered. It has fluctuations as regular as clock work and is bright enough to be seen in a small telescope. The discovery was the result of a plan by Professor Guthnick to make a systematic survey of the heavens by photography. It was the star BD 04900 located R.A. 22h 30m 22s (1855) Dec. -0° 47' .9. On August 5th this star was observed all night long by Jensch at intervals of a few minutes and he found it to have regular fluctuations of 90 minutes each Until October Jensch obtained a total of 1371 observations. The star is now known as 391 1934 Aquarii. Its rise takes about 10 minutes, its decline about 30 minutes and its flat minimum lasts 40 minutes. Aside from this nothing seems to be known about the star, spectrum, color index, parallax or proper motion.

Thus within the span of a few minutes a complete light curve may be determined and it is for this reason that it is of interest to the amateur. Another feature, though of no practical value is the possibility of using its rapid fluctuations for measuring the velocity of light, much as Roemer used the eclipses of Jupiter's satellites. An experienced observer can determine a maximum with ease, according to the author of this article and it is suggested that those of our members who might want to venture out on this experiment might get in touch with Dr. C. Hoffmeister, of Sonnenberg, Germany.

Betelgeuze

With a period of five to six years, this star was long in doubt as a variable, perhaps because of the difficulty in observing such a red star. Osthoff (Himmelswelt 1929 S 183) compared it with Rigel and Aldebaran in 683 estimates and concluded that the great differences of the observers were due to personal equation. Whether this explanation also holds for the following is left for our readers to decide:

Plassman (Himmelswelt 1929 S 238) speaks of a letter written by one of the Grimm brothers of literary fame in 1825. In this letter Grimm describes the constellation Orion very carefully to a friend, and, strangely enough, he describes Rigel and Bellatrix as the brightest stars in it and not Betelgeuze. For us nowadays, Betelgeuze, if not the brightest in Orion, is at least brighter than Bellatrix (Gamma). Plassman concludes that Grimm must have seen Betelgeuze at one of its deeper minima, and Herschel announced this star to be a variable only a few years later.

Star observations for the month are as follows: Armfield 66; Callum 45; Diedrich 60; Halbach 42; Knott 6; Loepfe 3; Luczka 8; Peck 133.

Watertown, Wisconsin

Occultations

R. D. Cooke

The following occultations are predicted for Milwaukee and Vicinity during January, 1936.

Immersion	Pos. Angle	Date	Star	Mag.
5:20 PM	68°	Jan. 3	mu Arietis	5.7
9:29 PM	83°	Jan. 4	104B Tauri	5.5
1:40 AM	116°	Jan. 6	315B Tauri	6.3
9:37 PM	100°	Jan. 6	132 Tauri	5.0
2:09 AM	115°	Jan. 7	412B Tauri	6.0
7:20 PM	100°	Jan. 27	19 Piscium	5.3
6:58 PM	26°	Jan. 31	66 Arietis	6.1