A A V S O   A B S T R A C T S

Edited by R. Newton Mayall

PAPERS PRESENTED AT THE WOODS HOLE MEETING, 9-10 OCTOBER 1964

The 53rd Annual Meeting of the AAVSO was held in Woods Hole, Massachusetts, on 10 October 1964. While the northern part of New England was putting its fall finery away, the southern part on Route 28 and Route 3, was displaying Mother Nature's finest goods. The color was beautiful. Crossing the Cape Cod Canal we began to see what cranberry bogs and the small growth of the Cape could do; then on down to Falmouth and to Woods Hole, which is at the very end of a peninsula where the Coast Guard has a Station for maintaining buoys; and the Institutes of Oceanography and Biology are located here.

Our hotel, the Nautilus Motor Inn, was a pleasant place overlooking Little Harbor and the Coast Guard Station. A five minute walk brought us to the center of town and the wharf where the boats for Nantucket and Martha's Vineyard dock. It will be hard to find a more ideal place for our meetings. Everything was there -- dining room, and a very comfortable meeting room complete with projectors. It is a most picturesque place. The cool crisp autumn weather was refreshing, and everyone thoroughly enjoyed the meeting, the place, and the town -- about 75 came.

The Goods, Miss Williamson and Constantine Papacosmas, and DeKinder from Montreal were there, also the Diedrichs and the Stokes from Ohio, the Buckstaffs from Wisconsin, Rosebrugh from Florida, and the Fernalds from Maine and Florida. We were sorry to learn that Mrs. DeKinder was in the hospital with a broken shoulder. We hope she has a speedy recovery.

Woods Hole is a scientific community, and Dr. William Von Arx, of the Oceanographic Institute and Massachusetts Institute of Technology spoke to us Friday evening (see Abstracts). The Director of the Institute made it possible for us to visit the famous research ship Atlantis II, and we had a wonderful time scrambling over her decks. We were shown the various equipment used and the manner in which the ship operates.

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GEON ---- A NEW SYSTEM OF CELESTIAL NAVIGATION*, by Dr. William S. Von Arx

Oceanographic research work requires that a research vessel's position at sea be accurately known to an order of magnitude greater than conventional sextant sights can provide. Thus it has become important to devise entirely new navigational systems, and such a system is "GEON", an abbreviation for "Gyro Erected Optical Navigation".

The GEON instrument is basically a high-speed (8,000 RPM) gyroscope, mounted in gimbals, which continuously controls the position of a reference table in the plane of the horizon regardless of any motion of the ship to which the gimbals are attached. By placing the axis of the gyro slightly off center from that of the gimbals system, the gyro is given a pendulous motion simulating the swing of a pendulum whose length approximates the radius of the earth. The axis of swing is initially to the N.-S. meridian, and has a period of 84 minutes, thus continuously establishing the position of the observer's meridian and zenith.

A small equatorially mounted telescope is attached to the gyro table, allowing 19 objects to be sighted in the daytime and stars down to 9th magnitude at night. The accuracy of setting the telescope is plus or minus 3 seconds of arc, which approximates 300 feet on the earth's surface, a distance shorter than the length of many ships. Continuous sighting on one celestial object with the GEON instrument, compared with a series of simultaneous sextant sights on the same object, show that GEON is accurate to within 1/10 of a mile while the best sextant fixes are good to about plus or minus one-half mile.

Of considerable astronomical interest was a set of excellent Milky Way photographs taken with a camera using an f/2 Biotar lens attached to the GEON table. Time-lapse movie films showing the steadiness of the horizon compared to a ship's motion were very striking. Also shown were interesting time-lapse movies showing mirage effects at the horizon which had been taken in an effort to detect the theoretical tilt of ocean water due to the rotation of the earth.

* Invited Lecture given at the Marine Science Auditorium of the Woods Hole Oceanographic Institution. (Reported by Clinton B. Ford.)

A STUDY OF BV 382, by Arthur Stokes

This paper is the result of a joint effort by John Ruiz and myself in a study of the variable star designated BV 382. Our attention was first drawn to this star by an article in the November 1963 issue of Sky & Telescope entitled: "The Bamberg Search for Bright Variable Stars". In this article Dr. W. Strohmeier presented a preliminary light curve and set of light elements for BV 382. I have reproduced this data and show the light curve. (BV 382 (1900), $21^h\ 29^m.7 + 70^\circ\ 23'$)

The points shown were taken from photographic plates covering a period of about 30 years. This paper stated that BV 382 had not yet been observed photoelectrically. Of course this immediately intrigued us, so we decided to make some observations. From the data and light elements presented, we calculated the times of several expected minima and set out to observe them.

I have shown a few stars in the field of the variable. Our choice of comparison stars was narrowed down to the three shown and for the most part to the one comparison HD 204087.

Starting about the middle of July, we attempted to observe the calculated minima but with no apparent success. Nothing much seemed to happen. Certainly from the light curve given, something should be happening every few hours. Finally, after several runs of dusk until dawn we began to get some minima. These still did not occur anywhere near the predicted times. I finally decided to calculate a new set of light elements from a few of the minima we had found and obtained the value 0.468 days for the period. For the epoch I chose a very good minimum that John Ruiz had observed on 29 July 1964.

At this point we were beginning to feel that we knew what was happening -- at least we felt some confidence in knowing when a minimum would occur.

This drawing shows a minimum which John and I happened to run on the same night. Also about this time I remarked in one of my letters to John that something was wrong with this system, inasmuch as the only minima we had found fell in cycles of 0.468 days. Where was the secondary minimum? So we went after the middle part of the curve, and after many runs of parts of this curve we concluded there was no secondary minimum within limits of error of measurement.

I have a very good 8 hour run that John made through the center of the curve. Two minima were put in the proper phase position to show what we believe to be the correct light curve for BV 382. At the present time we are using the period value of 0.4681 days which seems to fit very closely to the observed data.

The eclipsing variable type that Dr. Strohmeier had assigned to BV 382 is that of W Ursa Majoris. If this is a W Ursa Majoris system, possibly the period should be two times the value assigned. The depths of the minima seem to be identical within limits of measurement.

It might be of interest to note the entire curve is only about 1/2 magnitude in depth. We were making measurements in 1/100ths of a magnitude and I think John Ruiz has a few comments on some of these measurements and the equipment used. (John Ruiz showed some plots. Arthur Stokes showed a transistorized amplifier and power supply that could be strapped on the telescope. Both are very small and light.)

DELTA LIBRAE, by Marvin E. Baldwin

For the observer working with a pair of binoculars Delta Librae is probably the most challenging of the bright eclipsing variables. Due to its long eclipse time (13 hours) and its location in the southern sky, an observer located in the United States must plan carefully to obtain meaningful data.

An observer in the western USA may expect to observe eclipses of Delta each Friday morning starting in early March 1965. Each week the eclipse will come about 25 minutes earlier and by early June the eclipse can be observed Thursday evenings. The East Coast observer will find it most difficult to obtain sufficient data for a good determination of time of mid-minimum. Two or three hours each side of minimum is to be preferred.

The following tabulation is the result of my 1961 and 1964 data. The observed J.D. Minimum, the number of cycles elapsed since the initial epoch and the O-C are included.

J. D. Min	E	O - C
7458.8375	1290	+0.0095
7472.7953	1296	+0.0032
7479.7754	1299	+0.0015
7486.7470	1302	-0.0092
7500.7270	1308	+0.0067
8468.9043	1724	+0.0051
8475.8912	1727	+0.0100
8496.8334	1736	+0.0060
8503.8151	1739	+0.0056
8517.7741	1745	+0.0005
8524.7604	1748	+0.0048

Assuming the absence of systematic errors I proceed to compute the probable error for each season's mean.

Year	Mean O-C	Probable Error	No. of minima
1961	+0.002	±0.002	5
1964	+0.005	±0.001	6

The resulting probable errors of the mean O - C for each season points out the better quality of the 1964 data. I attribute this mostly to Delta's better placement in the sky during the 1964 observations, and the fact that I was able to obtain observations of a greater portion of the light curve for each of the 1964 minima.

The 1964 data definitely indicate a deviation from the predicted minima, which appear to be late by some six to nine minutes.

CURRENT DATA ON VARIATIONS IN TOTAL VISUAL LIGHT PER CYCLE FOR R CYGNI AND RT CYGNI, by Clinton B. Ford

The integrated visual light per cycle received from 193449 R Cygni (Se) and 194048 RT Cygni (M2e) has been measured with a planimeter and plotted against time, using data from the AAVSO and other sources. The methods of measuring the light-curves' areas, and of computing the total light values, are described in detail. Earlier studies using the same methods, last reported in these Abstracts for October 1955, have been extended to June 1964, covering a new total of 53 measurable cycles for R Cygni and 94 cycles for RT Cygni.

The additional data now available suggest that a long-term cyclical variation of the integrated visual light from R Cygni exists with a period of about 59 years. For RT Cygni, a similar cyclical variation of total light is suggested, but only about one-half of one cycle has so far been observed, the suspected period being about 68 years.

As in the earlier studies reported in 1951 and 1955, the range of variation of integrated light from its mean value is shown to be much wider for both stars (plus or minus 25%) than the corresponding observed range of variation of maximum and minimum light (plus or minus 15%).

The light curves of several other long period variables which show conspicuous changes in total light are under investigation (notably 001838 R Andromedae, an S4e star), and the results may show that long-term cyclical variations of integrated visual light are fairly common among such stars. In particular, it is noted that only by continuing visual observations for at least another 50 years can these suggested cyclical changes be verified.

LONG PERIOD VARIABLES IN SAGITTARIUS, by Nancy Hartsock

During the summer of 1964, I worked in the Maria Mitchell Observatory on Nantucket, under the direction of Dr. Dorrit Hoffleit. Most of the work done in this observatory consists of measuring and calculating the periods of variable stars.

All the stars assigned to me were red stars, which appeared to have large magnitude variations. I measured five stars, and was able to obtain periods for three of them. Observations were made on plates taken over a period of 40 years, from 1924 to the present. Although about 500 plates were measured, some 300 to 350 measurements were useful for the calculation of periods.

For star DH 136, (183418) the first star I measured, I obtained a period of 312 days. Minimum was 15.8, the maximum approximately 13.7. (The maximum of DH 136 was brighter than the brightest comparison star.) The average maximum was 13.9, and average minimum was 15.1. The rise from minimum to maximum is 65 days; the descent is 115 days. During the remainder of the period, 132 days, the star seems to remain constant at minimum.

DH 136 had a faint companion, magnitude 15.3, which was only resolved on the best plates. In addition, another faint companion, at a greater distance, magnitude about 15.8, was more often resolved. This meant that often the combined light of three different stars was measured. Especially at minimum, this affected the light curve, and seems to account for the flat bottom of the curve.

Variable NH 73 (182524) also was a long period star -- period 199.6 days. It is a red star, but somewhat unusual in that its variability was discovered as a result of its spectrum. NH 73 had a maximum amplitude of 2.2 magnitudes, with an observed maximum of 13.7, and minimum of 15.9. The average amplitude is 1.3 magnitudes,from 13.8 to 15.1.

The curve of NH 73 appears similar to that of DH 136: the rise from 15th magnitude to maximum is 45 days, and the return to minimum is 90 days. The flat bottom of the curve indicated that there was a faint companion, which was only resolved on a few of the best plates.

Variable DH 142,(182422) a long period red variable, was found to have a period of 225 days. Maximum amplitude was 2.7 magnitudes, from 13.9 to approximately 16.6. (DH 142 was fainter at minimum than the faintest comparison star.) Average magnitude at maximum was 14.1, and at minimum, 16.1. The rise from minimum to maximum is 70 days, the return to minimum about 85 days.

DH 142 was a difficult star to measure. There were two faint stars very near it, and the comparison stars on many Nantucket plates, and on some MF and B plates appeared blurred together, as a straight line.

Perhaps the most interesting of the stars I worked on this summer was a star I call DH 137a (183619) or perhaps NCH 1. This star is near 137. DH 137a appeared bright on some plates, and not at all on others. It had an amplitude of at least 3 magnitudes. At one time, it attained a brightness comparable to that of the brightest comparison star, and at other times, it was fainter than the faintest comparison star.

This particular maximum, observed on Nantucket plates, from JD 2430000 + 7520-7580, had a range from 14.8 to 13.1. The average magnitude at maximum was 14.6, and at minimum less than 16.1. The star rises very rapidly from this minimum and then descends more slowly. This sudden and spasmodic action suggested the possibility that this might be an SS Cygni or U Geminorum star.

VARIABILITY CONFIRMED IN FIVE RED STARS, by Bonnie B. Kime

The variability of five red stars suspected of variation by Dr. Dorrit Hoffleit was confirmed at the Maria Mitchell Observatory in the summer of 1964. The stars DH 448 (182424), DH 224 (183525), DH 105 (183225), DH 274 (182225), and DH 45 (182021) are all located in VSF 193 in Sagittarius and were designated as red stars by Miss Nancy Houk. Investigations into their variability were made primarily on the over 300 NA

(Nantucket) plates taken at the Observatory. Magnitudes of these stars were measured by using an eyepiece and standard or specially adapted sequences of comparison stars. All stars varied a magnitude or less, and their mean brightness was about 13.5. The light curves were generally quite irregular, at times showing large daily variations, and sometimes having almost no change. Portions of the curve of DH 224 seemed quite systematic, while others ruled out possibility of a definite period. Variable DH 105 did seem to indicate cycles of 366 days, or possibly 92.5 days. These values are suspiciously close to the yearly cycle. Sharp peaks in the curve of DH 448 may indicate flare activity not uncommon in red stars. All of the stars definitely are variable.

DH VARIABLE 405 IN VSF 193, by Nancy Remage

The determination of a period for DH Variable 405 (181823) in VSF 193 follows the normal procedure of plate measurement, computation, and graphing.

Magnitude estimates for DH Variable 405 are taken from plates in the collection of the Maria Mitchell Observatory on Nantucket. It has noticeable variation, with maxima about 14 and minima about 16.

Initial investigation indicates that $1^{d}.005$ represents a good approximation of the period. The period $1^{d}.0048$ (reciprocal .9952) actually makes the points in groups of a thousand days duration fall into neat curves, but these curves are out of phase; i.e., the maxima of the groups are not together. Graphs and computations indicate that the period lies between $1^{d}.0043$ (rec. .9958) and $1^{d}.0058$ (rec. .9942). In the attempt to pull all points into a curve, sixty-five periods from this group are plotted. For the period $1^{d}.004488$ (rec. .995532) magnitude readings graph into two fairly neat curves, one from 2,424,019 J.D. to 2,433,858 J.D., the other group from 2,436,073 J.D. to 2,438,252 J.D. These groups, however, are two tenths of a day out of phase. Computations show that reciprocal period .9957 or reciprocal period .995[illegible] should correct this phase shift, but in practice neither works.

This promising but untidy period looks very much like a spurious period, related mathematically to the true period. However, the application of the spurious period* formula fails to reveal a true period.

The final period of $1^{d}.004488$ is not altogether satisfying. Not only is the curve broken into two groups of points but it also has quite a lot of scatter. No other period, however, brings as many points together.

Periods of one day are rare but not unknown. In the Cepheid sequence, RR Lyrae stars have periods ranging from one and a half hours to one and a half days, which makes it possible that DH Var. 405 is an RR Lyrae star. Its location and light curve support this conclusion. DH Var. 405 has a two magnitude light variation, which is within the range of known RR Lyrae stars.

The magnitude measurements of DH Var. 405 seem to fall into the curve of an RR Lyrae star with a period of $1^{d}.004488$.

*(The formula is $P = \dfrac{P_1}{nP_1 - 1}$, where P is the true period, P_1 is the spurious period, and n is any integer, usually 1, 2, or 3.)

THREE VARIABLE STARS IN CLUSTER M 28, by Joyce Pascoe

As of 1963, according to Helen B. Sawyer in her Second Catalogue of Variable Stars in Globular Clusters, there were sixteen variables known in cluster M 28 in Sagittarius. No definite periods were known. (Designation of M 28 = 181824)

This past summer some five hundred plates were examined at the Maria Mitchell Observatory for three variable stars in this cluster, one of which (variable 365) had been listed in Helen B. Sawyer's Catalogue, and the other two of which (variables 301 and 416) were new variables found by Dr. Dorrit Hoffleit.

Variables 365 and 416 appear to be RR Lyrae type with best periods of .2651088 days and .57808 days. Variable 365, with the short period, seemed to indicate a secondary period of around 2,300 days. The amplitude of variable 365 was from 15.8 to 16.5, and that of variable 416 was from 15.4 to 16.4, giving mean apparent magnitudes of 16.15 and 15.90. The known absolute magnitude of RR Lyrae stars is +0.5, and the known distance modulus for the cluster as a whole is 15.62, so the expected apparent magnitude for an RR Lyrae in the cluster would be 16.12. This agrees reasonably well with the observed mean apparent magnitudes for the two variables indicating that they are members of the cluster M 28.

The third variable star, 301, has a somewhat irregular period in the range of 50 to 75 days, and an average apparent magnitude of 13.6. Five definite narrow minima were found where the magnitude went below 14.0 and sometimes as far down as 14.8 where it could no longer be observed due to its position on top of the general image of the cluster.

An exact period could not be found by taking the differences in minima. Three of the better periods tried by this method were 51.85 days, 52.07 days, and 55.93 days. These all predicted the five main minima correctly, but did not agree with all the lesser variations.

Several different methods were then used to get a range for the period assuming it was not quite regular. Smooth curves were drawn through the definite maxima and minima first, and then similar curves were drawn where possible through other points The periods of these curves as drawn were then measured and found to range from 50 to 60 days. Because most of the definite maxima and minima covered less than a whole period an approximate half-period was found by measuring the number of days between the peak maximum and the minimum. These were found to range from 25 to 35 days giving a period range of from 50 to 70 days.

These periods are within the realm of an RV Tauri type variable which has a characteristic period of 75 days, but tends to be somewhat irregular. An RV Tauri star is characterised by alternate deep and shallow minima, and amplitude of two magnitudes, and a spectrum of G or K. Variable 301 agrees with this as its range is from 12.8 to 14.8, an amplitude of two magnitudes. The color indicates that the spectrum is late, possibly G or K.

Cluster M 28 is near the nucleus and due to the relative position of variable 301, it was strongly suspected of being a member of the globular cluster. Some RV Tauri stars have been found in globular clusters before. The difference between the absolute magnitudes of RR Lyrae variables, 0.5, and RV Tauri variables, -2, is 2.5,and the difference between the mean apparent magnitudes of variables 416 and 365 and the RV Tauri variable 301 is 16.05 minus 13.6, equal to 2.45. This agreement indicates that variable 301 is also a member of cluster M 28.

A NEW OBSERVATIONAL PROGRAM FOR V SAGITTAE, by Margaret W. Mayall

Papers about the variable V Sagittae have been on our program nearly every Meeting for a number of years. As long ago as 1955 we reported that several members strongly suspected extremely rapid changes. Many people doubted the validity of these sudden flashes, but later more precise observations have proved their reality.

Dr. George Herbig of the Lick Observatory, with several co-workers, is publishing a lengthy paper on V Sagittae in the Astrophysical Journal Supplements. In it he describes the complex light variations, which are resolvable into 3 apparently independent activities: (1) a strictly cyclic variation produced by an eclipsing binary system, with primary minima occurring at JD 2437889.9154 ($\pm$ 0.0015) + $0^{d}.514195$ ($\pm$0.000004) E; (2) an occasional major and very sudden brightening of as much as 3 mag.; (3) minor fluctuations with a time scale of a few days. When the system is faint, additional minor rapid fluctuations with a time scale of about one hour are present. He mentions that the cycles of about 17^{d} found by the early observers correspond to the resonance between the day and the eclipsing period of V Sge.

Dr. Herbig concludes that it is clear that in the future, random or inaccurately timed observations of V Sge will be of little value. Therefore, we are asking our observers to use the following method of observation:

Observations made at 10 minute intervals over a period of at least 1, and preferably 2 to 3 hours. Each observation should be accurately timed with short wave radio time signals. The method of timing and its estimated accuracy should be reported with the observations.

The Table below lists the revised magnitudes for the comparison star sequence marked on the AAVSO charts, types b (1940) and d (1945). The new magnitudes were measured photoelectrically by J. Smak. The first column is the mag. as marked on the AAVSO charts, and V is the revised visual magnitude.

REVISED MAGS FOR 201520 V SAGITTAE
To Be Used By All Observers After 1 January 1965

Old Mag	V	B-V		Old Mag	V	B-V	
7.8	7.13	-0.02		11.0	10.92	+0.86	NE of var
8.3	8.21	+0.81		11.0	10.95	+1.27	SW of var
8.6	8.37	+1.03		11.5	11.69	+1.00	
9.4	9.16	+1.71		12.4	12.31	+1.59	NW of var
9.7	9.91	+0.22		12.4	12.60	+0.45	NE of var
10.5	10.68	+0.24	Std	13.0	13.10	+1.34	
10.8	10.68	+1.12		13.4	13.94	+1.13	

Since the color of V Sge is never far from B-V = 0.0, it is suggested that the very red comparison stars be avoided. Observers should also note that there is a companion of mag. 14 at $9''.7$, 267°

The old comparison stars 91, 108, 113 NW of var, and 139 are not to be used.

PLEASE OBSERVE TELESCOPIC METEORS, by Richard Vodra

Every once in a while when you are at a telescope, you see a meteor streak across the field. Do you ever report this event?

In 1963 only 9 of the top 147 American AAVSO observers bothered to send in any telescopic meteor reports. Only two foreign observers sent any such observations to the American Meteor Society. Right away two questions appear: first, Why should anybody worry about it? and second, why me?

Telescopic meteors are almost a total mystery. Is there a "least magnitude" for them? Are sixth magnitude meteors more prevalent than ninth magnitude ones? Are they associated with major or minor showers? Do they form "showers" of their own? All of these questions will remain unanswered until more observations are accumulated.

Why you? AAVSO observers always know exactly where they are in the sky. They also can estimate brightness very well. Another valuable fact is simply that they are at a telescope more than almost anyone else. Thus the chances of a variable star observer, YOU, being able to make good observations is astronomical.

When you see one, this is what you should note:

1. Number for the year.
2. Month, Day, and Time (also include the type of time).
3. Magnitude to the nearest one-half.
4. Right Ascension and Declination.
5. Position Angle; that is, the direction the meteor was going.
6. The color of the meteor.
7. The telescope and size of the field.
8. Any other comments, such as a meteor train being left, or an unusually fast or slow meteor.

At the end of each year, send all of your observations to the AMERICAN METEOR SOCIETY, % Dr. Charles P. Olivier, 521 N. Wynnewood, Narbeth, Pennsylvania.

If you make up a chart with the above headings, reporting a telescopic meteor takes less than a half-minute. The AMS has printed forms for this purpose, and Dr. Olivier would be overjoyed at sending them out to AAVSO members if he knew that they would be returned with observations at the end of the year. So the next time you see a telescopic meteor, record it and send it to the AMS. It takes almost no time, but it would help another branch of astronomy greatly.

GRAZING OCCULTATIONS, by David Dunham

Before discussing grazing occultations, I would first like to say a few words about regular occultations. It is always interesting to observe these phenomena, the abrupt disappearance or reappearance of a star at the moon's edge, especially if the star is fairly bright and the dark limb is visible by earthshine. Accurate timings of these events are very useful. H.M. Nautical Almanac Office at the Royal Greenwich Observatory, now in Herstmonceux Castle, England, collect observations at the end of the year and reduce them to determine valuable information about the moon's orbit and irregularities in the Earth's rotation. (They should be sent through the AAVSO Occultation Division Chairman: Roy A. Seely, 1060 Amsterdam Ave., New York 25, New York. Ed.)

It is always interesting to observe these phenomena (occultations). By using a telescope, a stopwatch, and a short-wave radio for accurate time signals, some amateurs are making useful timings of occultations. Timing occultations does not take much time. About eighty are predicted per year for a given place, and normally most of these would be invisible due to unfavorable weather.

One problem is calculating predicted times for a given location from the standard station predictions, such as listed in the November issues of SKY & TELESCOPE. Mr. Evans in China Lake, California, will supply predictions computed for any location within two or three hundred miles of the California, Massachusetts, Toronto, and Illinois standard stations. Soon this service will also be available for all other standard stations in the United States and Canada. Anyone interested in receiving predictions should contact me. Also, I will give out detailed information on making observations.

Grazing occultations observed within a mile or two of a predicted northern or southern limit are especially interesting events. At no other time is the moon's motion more dramatically seen. The star provides a pinpoint reference for the eye and the moon can be seen to move at a speed of over 1,000 m.p.h. past it. The star appears to do the moving and looks like some sort of space craft coming in for a landing as it skims over and flashes on and off among mountains in the lunar polar areas. Events like this which are observable are rare; a person staying at one location would see, on the average, only one in about fifty years. Three or four are normally visible within a hundred miles of a given place in a year.

After seeing two near-misses, one of Aldebaran, in 1961, I decided to try to compute the southern limit of another occultation of Aldebaran on March 11, 1962.After working out the formulae, it took some 36 hours, using a desk calculator, to compute several points in the limit. Unfortunately, this was finished only an hour before the event and my line lay south of San Jose, about 50 miles away. I tried,but did not make it there in time. There will not be another opportunity until about 1977.

My original purpose in computing limits was to see a spectacular sight; specifically, the grazing occultation of Aldebaran mentioned. A profile of the lunar mountains near the edge can be drawn, if several observers at various perpendicular distances from a predicted limit accurately time the disappearances and reappearances of the star. The polar areas (where all grazes occur) may be especially important for lunar exploration since a base in the right place could have a nearly constant source of solar energy, while most of the moon experiences a 14-earth-day-long night. Because of this possibility, some mountains near the lunar north pole are called "The Mountains of Eternal Light." Also, the moon's polar diameter can be accurately measured and the observations will be used to check the accuracy of limb correction charts.

The first grazing occultation seen according to my predictions was observed on 17 September, 1962, by a member of the Los Angeles Astronomical Society from a location just north of Castaic Junction, about 40 miles northwest of Los Angeles. The star was 5 Tauri, 4.3 magnitude. From a location one tenth of a mile north of the predicted limit, he saw a two-minute occultation with the star disappearing and reappearing several times among mountains both before and after this interval. Since then, many grazes have been observed in California. A few have been observed in other states, most notable being the graze of Zeta Tauri reported in the December 1963 issue of SKY & TELESCOPE. In February this year, the clouds parted for a few critical hours over southern England and the first observations using my predictions were made outside the United States, only eight miles from H.M. Nautical Almanac Office!

The most successful observations were made during a graze of 434 B Ceti, 6.7 magnitude, reported on page 46 of the July issue of SKY & TELESCOPE. About 35 accurate timings were made.

In December 1962, I made a computer program to do the calculations and am now predicting all limits of occultations listed in SKY & TELESCOPE predictions which cross the United States. Any one or any group interested in observing these events and receiving predictions should contact me.

To conclude, I will show slides taken by Stan Warkoczewski in Kansas City during a grazing occultation of 88 Virginis, 6.6 magnitude, on August 12. The moon was 5 days past new. His location was about ten miles south of the predicted northern limit. His telescope is an f/6, 16 3/8" reflector and he used KXASA64 film. (9 slides showed the disappearance and reappearance of the star. An exceptionally good demonstration of what happens. ED)

THE EYE OF DORA, by David Rosebrugh

Mr. Rosebrugh related the Antics of Hurricane Dora 1964, whose Eye stayed over St. Augustine for three hours. He told of the damage Dora did, particularly to his own place in St. Augustine, where a couple of trees were blown down and quite a bit of water went in the house. It is an ill wind that blows no good -- so, he now has a better horizon for observing. Will the observations grow? (ED)

THE OLCOTT 4-INCH TELESCOPE, by Walter S. Houston

The 4-inch refractor which Phoebe Haas gave to the AAVSO is now on loan to Walter Houston. He has built a small Observatory for it and we hope it will be used regularly. Houston showed slides of the Observatory showing its construction and location.

As an aside, Walter Houston mentioned the Award given to Margaret Mayall by the Astronomical League for her "Outstanding service to the field of Amateur Astronomy". And Casper Hossfield pointed out that Walter Houston received the G. Bruce Blair medal, given by the Western Amateur Astronomers. (ED)

MASSACHUSETTS, FLORIDA, AND MAINE, by Cyrus Fernald

By means of color slides, Cyrus Fernald showed our meeting at Worcester, Mass., in October 1963; the construction of his home and observatory in Florida; his observatory in Wilton, Me.; and the 1963 Maine Eclipse Meeting. (ED)

AAVSO ABSTRACTS - THE FIRST TEN YEARS, by Kenneth Weitzenhoffer

In the fall of 1951 AAVSO members were pleasantly surprised to receive a new publication in their mail. The first issue of AAVSO Abstracts had arrived. In his introduction, Editor R. Newton Mayall stated its purpose: "The papers presented at the 40th Anniversary Meeting have been boiled down and published as Abstracts, so that our distant members may have some idea as to what each paper was about. It is hoped that our absent members will receive this issue kindly, and that it will bring overseas members closer to us." Thirteen years later the cauldron of papers is still boiling merrily under the supervision of chef Mayall. This report covers only the first decade of AAVSO Abstracts; from the fall of 1951 to the spring of 1961.

The first 20 issues contain abstracts of 254 papers by 106 professional and amateur astronomers. This is by no means the grand total of papers presented at the spring and fall meetings. Some of the lectures given at the Friday night sessions were not abstracted. Many talks given at the Saturday night banquets also are not included. Certainly all these should be added into the grand total even though not presented at the formal sessions for papers.

Many professional astronomers have read papers at AAVSO meetings. A partial list includes Carl W. Gartlein, Margaret Harwood, Dorrit Hoffleit, Helen S. Hogg, Andrew McKellar, Dean B. McLaughlin, Paul W. Merrill, Peter M. Millman, Walter O. Roberts, Alan H. Shapley, Harlow Shapley, R. William Shaw, and Carl L. Stearns. It is tribute to the esteem with which the AAVSO is held that so many astronomers have contributed so many professional papers. It is also a source of pride to our non-professional members that our papers have appeared in same publications with those of the professionals.

Now for some interesting facts about the first 20 issues of AAVSO Abstracts:

The greatest number of papers was presented by (and this is no surprise) Margaret W. Mayall. To her total of 16 papers should be added 10 AAVSO Director's Annual Reports and many other off-the-cuff reports given at the meetings.

The second highest number of papers was given by former Solar Division Chairman Harry L. Bondy with 14. In third place with 10 is John J. Ruiz.

The paper with the longest title is "Variations in Total Visual Light Per Cycle for R Cygni and RT Cygni" by Clinton B. Ford. The shortest title is "Questar" by Cyrus F. Fernald.

The paper with the most intriguing title is "Around the World with Mlle. Dedee Lacertae" by (again no surprise) John J. Ruiz. Runner up is probably "Folding Astronomy" by R. Newton Mayall.

The Observing Group of the New York Amateur Astronomers Association contributed 47 papers by 16 authors.

With the 1964 Fall Meeting AAVSO Abstracts starts its fourteenth year. Up to this meeting 346 papers have been included. What will the total be at the 60th Anniversary Meeting when the Abstracts completes its first two decades? This is, of course, in the future. Looking back, the Abstracts have fulfilled editor Mayall's hopes; they have been received kindly. But most important, they have encouraged so many more persons to observe, to think, and to write.

(As soon as it can be prepared, an index of the Abstracts, including the 1964 Annual Meeting will be published. The editor is grateful to Kenneth Weitzenhoffer for doing all the leg work on the index. ED)

JULIAN DAYS - FORWARD AND BACKWARD

Either because you might really "have the need to know", or because you just might want to stimulate some dormant mental facilities, attached hereto is a way of changing from Julian Days to Calendar Days and vice versa. This is good recreational mathematics, and if you don't have a calculating machine, it is a good time killer, and possible way to make mistakes. Anyway, it is fun to fool with.

Now comes the commercial -- for the years from 1957 to 1970 you can find, without extensive calculations, just what days are which Julian day equivalents by referring to Page 11 of Mrs. Mayall's excellent "Manual for Observing Variable Stars".

Pages 12 and 13 contain the rest of the data needed for getting correct Decimals of a Julian Day. This table is for the whole world and contains more figures than I need at any one time and place. Since I do not wish to get my copy of the aforementioned "Manual" full of dew, I usually have glued to my clip-board (and varnished over) a copy of a decimal schedule suitable for my location in the Eastern Time Zone including the decimals for regular E.S.T. and also the summer-time E.D.T. It looks like this (Where 1523 means 3:24 P.M. etc.)

J U L I A N   D A Y   D E C I M A L S

	E.S.T.		Decimal	E.D.T.		
	From	To		From	To	
	1524	1748	.4	1624	1848	
	1749	2011	.5	1849	2111	
	2012	2236	.6	2112	2336	
	2237	0059	.7	2337	0159	
	0100	0324	.8	0200	0424	
	0325	0547	.9	0425	0647	
Next Jul. Day	0548	0812	.0	0648	0912	Next Jul. Day
	0813	1035	.1	0913	1135	
	1036	1300	.2	1136	1400	
	1301	1523	.3	1401	1623	

* * * * * * * *

PROBLEM: To convert a Gregorian calendar day to the corresponding Julian Day.

NOTE: This system holds only for the years 1900 to 1999.

All arithmetic is fixed point - discard all fractions.
All mult. and div. are done before adding or subtracting, except where parentheses indicate otherwise.

General Formula	Sample Problem Using 10-10-64 as the calendar date	
Day = Calendar day Mo = Calendar month Year = Calendar year JD = Corresponding Julian day		
A = MO-3	A = 10-3	7
Test A *	A is 7	
* If zero or negative B = A + 12, and C = Year-1		
* If plus (above zero) B = A, and C = Year	which is plus, therefore B = C =	 7 1964
D = C/100	D = 1964/100 =	19
E = C-100D	E = 1964-(100 X 19) =	64
F = (146097D)/4	F = (146097 X 19)/4 =	693960
G = (1461E)/4	G = (1461 X 64)/4 =	23376
H = ((153B) + 2)/5	H = ((153 X 7) + 2)/5 =	214
JD = F+G+H+1721119+Day	JD = 693960+23376+214+1721119+10 =	2438679.

Hence 10-10-64 = J.D. 2438679.

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Adapted by George Diedrich from an algorithm by R. G. Tantzen.
(Comm. of ACM - Vol. 6, No. 8)

PROBLEM: To convert a given Julian day into the corresponding Gregorian calendar day.

JD = The given Julian day.

Day = The Gregorian day equivalent to that J.D.
Mo = The Gregorian month equivalent to that J.D.
Year= The Gregorian year equivalent to that J.D.

NOTE: This system holds only for the years 1900 to 1999.

All arithmetic is fixed point - discard all fractions.
All mult. and div. are done before adding or subtracting, except where parentheses indicate otherwise.

General Formula

A = JD-1721119
B = (4A-1)/146097
C = 4A-1-146097B
D = C/4
E = (4D+3)/1461
F = 4D+3-1461E
G = (F+4)/4
H = (5G-3)/153
J = (5G-3)-153H
K = 100B+E

Day = (5 + J)/5

Test H *

* <u>If less than 10</u>
Mo = H + 3, and
Year = K

* If equal to or greater than 10
Mo = H-9, and
Year = K + 1

Sample problem
Using JD = 2438679.

A = 2438679-1721119 = 717560
B = (4 X 717560)/146097 = 19
C = (4 X 717560)-1-(146097X19)=94396
D = 94396/4 = 23599
E = (4 X 23599+3)/1461 = 64
F = (4 X 23599+3)-1461 X 64 = 895
G = (895+4)/4 = 224
H = (5 X 224-3)/153 = 7
J = (5 X 224-3)-153 X 7 = 46
K = (100 X 19) + 64 = 1964

Day = (5 + 46)/5 = 10

H is 7

which is less than 10, hence
Mo = 7 + 3 = 10
Year = 1964

Hence J.D. 2438679. = 10-10-64

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Adapted by George Diedrich from an algorithm by R. G. Tantzen.
(Comm. of ACM - Vol. 6, No. 8)

RECORD AAVSO OBSERVING TOTALS, by Curtis E. Anderson

In the course of compiling my paper on AAVSO Observers and their totals which was recently published*, I accumulated a vast amount of statistics. I thought it would be of interest to compile a list of the record totals in various catagories. I further broke down the listing into male and female divisions. In the early years the first names were not always available and sometimes only the initials. Therefore the observer's sex is not always obvious at this late date. However it is hoped the record as here stated is essentially complete. Any additions or corrections are of course welcomed. Perhaps this will spur our observers to increase their output even more. Of course quality should always have priority over quantity. However I really believe the two go hand in hand.

Lifetime Totals

Male			Female		
R.P. de Kock, S.Africa	1934-	132,929	Winifred Kearons, Mass.	1925-51	9769
Cyrus Fernald, Maine	1937-	116,004	Carolyn Hurless, Ohio	1959-	7540
Leslie Peltier, Ohio	1918-	104,199	Anne S. Young, Mass.	1912-44	4157

Annual Totals

D.P. Elias, Greece	1952-53	8363	Carolyn Hurless, Ohio	1963-64	3015
Cyrus Fernald, Maine	1948-49	7654	Carolyn Hurless, Ohio	1962-63	1980
Cyrus Fernald, Maine	1947-48	7504	Winifred Kearons, Mass.	1941-42	1788

Monthly Totals**

D.P. Elias, Greece	May 1953	1158	Carolyn Hurless, Ohio	Sept. 1964	537
Cyrus Fernald, Maine	Sept. 1947	1085	Carolyn Hurless, Ohio	Aug. 1964	529
Curtis Anderson, Minn.	July 1953	1047	Carolyn Hurless, Ohio	July 1964	509

Stars Observed in Single Month

Thomas Cragg, Calif.	Oct. 1959	458	Unknown***		
Thomas Cragg, Calif.	July 1964	448			

* Part IV, The Story of the AAVSO - Fifty year summary of variable star observations received by the AAVSO.

** Many of our foreign and Southern Hemisphere observers send their reports in maybe only a few times a year. Hence some of their reports are very big but represent many months observing. It is hard if not impossible to break these down into monthly totals. The biggest of these were:
Rodrigo de la Vega, Chile 5654 estimates received in August, 1962
Demetrius P. Elias, Greece 3150 estimates received in August, 1953

*** My complete data goes back only to 1951. However it is doubtful if any earlier totals exceed more than 150 stars.

POTPOURRI - After dinner Saturday night, we left the Dome restaurant and returned to our meeting room, where Margaret Mayall explained what went on at the Variable Star Commission meeting of the IAU in Hamburg, this summer. Following that she showed a few slides of the Bergdorf Observatory where the original Schmidt telescope is located. The Volks museum had a display of ancient instruments and books, among which was the 3" Argelander telescope. Mrs. Mayall also showed slides of the Argelanderstrasse in Bonn and Argelander's grave.

Carolyn Hurless sent a movie film and some slides taken at the dedication of the Schoonover Observatory in Lima, Ohio, where our own Tommy Cragg was the principle speaker. The Schoonover Observatory is a brick structure and houses a 12 1/2" reflecting telescope. Following the dedication the Hurlesses were hosts to the members of the AAVSO. Present were the Diedrichs, the Stokes, Clint Ford, John Ruiz, Tommy Cragg, Roger Kolman, Curtis Anderson, Eddie Oravec, Diane Lucas, Dick Wend, Leslie Peltier, and others. From all reports, and the pictures prove it, everyone had a wonderful time -- or as one put it, "We had a ball". A movie of Carolyn putting her beautiful black horse Rigel through his paces was enjoyed by all.

Clinton Ford combined his pictures with those of Eddie Oravec, Roger Kolman, Curtis Anderson and others to show the goings on at Lima. One of the pictures was particularly interesting, for it showed seven of our top observers whose total observations are well over 250,000. Leaving Lima we went west to Mt. Peltier, named after Leslie. On top of the mountain, in a sightly spot, is building the Ford Observatory, named after Clint, which will house Claude Carpenter's 18" reflector. The construction of the Observatory is being done by Larry Bornhurst, Ernie Lorenz, and Tommy Cragg. Clint says that when it is completed and equipped it will be one of the finest observatories in amateur hands for doing serious work. Our best wishes are extended to them. (ED)

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