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

Edited by R. Newton Mayall

PAPERS PRESENTED AT THE CAMBRIDGE MEETING, 8-10 OCTOBER 1965

The 54th Annual Meeting of the AAVSO was held at the Harvard College Observatory in Cambridge, Massachusetts, on 9 October 1965. This year the fall color did not come up to par for the meeting -- it was a little too early, but the weather was fair and pleasant.

The Council held its meeting on Friday afternoon 8 October 1965 in the new Headquarters office -- the new commodious office. In the evening the lecture was given in Phillips Library at H.C.O. by Jack Welch, who had recently returned from a trip around the world, his focal point being the eclipse of the sun in New Zealand 30 May 1965. His talk was profusely illustrated with beautiful color slides, and particularly interesting were those of animals in Africa.

Miss Barbara Welther had set up data on the new Ikeya-Seki comet, and Miss Fisher had set up a small exhibit of new type plates being taken at H.C.O.

On Saturday morning we gathered once again in Phillips Library for the Annual business meeting and papers. Dr. Donald H. Menzel, Director of H.C.O., dropped in to give us greeting and welcome us to HCO. One of the highlights was the report of the Director, Margaret W. Mayall. She announced an all-time high in the number of observers. Whereas we had about 80,000 observations last year, this year we had over 102,000.

More papers were given in the afternoon. Following the paper session everyone was invited to inspect the new Headquarters, just a block away. We didn't take a count, but there were more than 50 persons in the new office at one time, and it was not too crowded.

Our new office is on the street floor and is 1 1/2 times as large as the one at 4 Brattle Street. The Director has her own small office detached from the rest of the space. Seven new grey steel files make the entrance more attractive. Because of the large amount of mailing that is done, a postage meter has been installed. There is much more room for book shelves than we had before. A much needed addition.

We are receiving visitations from more astronomers and others than ever before. We welcome visitors -- professional, AAVSO, and others.

Saturday evening our dinner was held at the Reservoir Club. Barbara Welther livened things up with her guitar; Clint Ford showed slides of the Ford Observatory on Mt. Peltier, and told how he got stranded there in a storm for 3 days; and Margaret Mayall reported on her trip to Bamberg last summer and showed slides of the trip. This turned out to be an especially large meeting, and a gay one.

On Sunday, everyone was invited to the Mayall's home for breakfast -- from 8 am - 8 pm -- the last persons leaving at 7:30 pm! There is nothing like food to provide a relaxed atmosphere for good conversation.

THE LIGHT CURVE OF DH441 IN VSF193 IN SAGITTARIUS, by Nahide G. Gokkaya

The light curve of star DH441 in Variable Star Field 193 in Sagittarius was determined this summer at the Maria Mitchell Observatory in Nantucket, Massachusetts.

Harvard A, MF, and B plates and Nantucket NA plates were measured which covered 15,031 days corresponding with Julian Dates 2423908-2438939. First plate was taken in 1924 at Southern Station of Harvard College Observatory, last one was June 27-28, 1965 at Nantucket.

The magnitude was estimated visually with nearby comparison stars and the magnitude change was found to be between 13.3-15.0 magnitude.

With the first differences and the trial method a period of .644 days was found and the light curve was plotted magnitude vs phase. Following convention the reciprocal period, which is 1.5506 $(\text{days})^{-1}$ was used.

With this period, spurious periods were tried for mean solar day, and for tropical year. For mean solar day, the period refutes the period change, and for tropical year, it corrects the starting period.

$$\frac{m}{P_o} + \frac{n}{P'} = \frac{1}{P}$$

$m = 1;\ n = 1$
P = Spurious period
P' = Observed period
P_o = True period

There exists 0.5 magnitude scatter in the light curve and a dip is found just preceding the rapid increase in brightness, which is no surprise for cluster type variables.

Because of the scatter of the light curve, the deviations of the ascending part of the light curve were tested for changing period. For this, a graph was plotted in Julian days vs observed curve. The graph showed a random scatter, which confirmed the true light curve.

Also taking the means in both coordinates, the mean light curve was obtained.

TWO LONG PERIOD VARIABLE STARS IN SAGITTARIUS, by Catharine Doremus

DH283 ($18^h23^m12^s$, $+22^\circ6'.3$; mag 13.5-15.4) is a long period variable star which shows secular changes in the period for the data available. The results of this study give a period P = 185.2 ± (0.0525) e^2, where $J.D._o$ = 28587^d8. The following explains how this period was determined.

After the magnitude estimates had been made, it seemed evident that the star was undergoing some type of long-period variation. Therefore the magnitudes were plotted on the scale of $100^d/1''$. This plot gave about five good long period curves of about 120 days each. An average period of 123 days was decided upon from examining the plot and from the first and second differences of the minima. The minima were used rather than the maxima since there were more of them, although the few maxima were somewhat sharper in outline. This period was checked graphically over all of the observations for the first twenty years of available data. (This included the MF and A plates.)

For a period of 123 days a fairly good light curve emerged, but the scatter was fairly large and there were points which fell well off the curve. The process of correcting graphically was then used. Periods of $123^d.8$, $122^d.7$, and $126^d.0$ were tried, but, for each one, after about 40 epochs the points would start to move off the light curve.

At this point, another approach was tried. In order to see if the relation for spurious periods would help, the points which were well off the light curve were examined to see what month those plates had been taken in. The results showed that out of eleven bad points, six were between March and May and four were between August and October. This suggested that the initial period might be spurious since many of the plates were taken during the summer months.

Next the spurious period formula was tried:

$$\frac{m}{P_o} + \frac{n}{P'} = \frac{1}{P} \qquad \begin{array}{l} P = \text{spurious period} \\ P_o = \text{true period} \end{array}$$

Since this was for a period greater than 30 days, the perturbing influence was assumed to be the synodic day and the following relation was used:

$$\frac{1}{P_o} + \frac{n}{P'} = \frac{1}{P} \qquad P' = 365.2422 \qquad \frac{1}{P'} = 0.00274$$

m, which represents sub-multiples of the period P, was set equal to 1 since inspection of the graph eliminated the possibility of a sub-multiple period. n was set equal to 1 for the first try. P was taken as $122^d.7$. Therefore:

$$\frac{1}{P_o} = 0.00815 \pm 0.00274$$

This gave two possibilities, $P_o = 91^d.8$ or $P_o = 184^d.8$. From inspection of the graph, $P_o = 91^d.8$ was discarded.

Plotting $P_o = 184^d.8$ gave a much better fit compared to $122^d.7$, although small corrections could still be made. The final best fit for this section of the available data gave $P = 185^d.2$.

There was still a run of observations covering a period of about ten years which began about ten years after the first series ended (the NA plates). Since the star was almost at the plate limit on these plates, less weight had been given to these data points. A separate graph for $P = 185^d.2$ was made from these points. Although the curve was evident, it was not so good as graph 1. Then the two groups were plotted together. This shows that the maxima of the later points fall completely off the maxima of the earlier points.

In order to find out what was happening, work was next done on just the later points. By graphical correction, it was found that the best period for these later points was $P = 188^d.1$.

This period change might be one of several kinds. It was decided that rather than calling this an abrupt change, an e^2 term for secular change of period might represent the period. From the first group of data points, the mean of the epochs was taken as $J.D._o = 28587^d.8$. The correction had to both lengthen the period with increasing epoch number, and move the later epochs to the right with respect to earlier epochs.

From inspection of the graph, it was decided to move the later maxima to the right by 121 days. Thus:

$$0 - C = +121 \text{ days}$$
$$0 - C = e^2k$$
$$\text{so } k = 0.0525$$

Taking e = 0 at J.D. 28587.8, the correction terms ke^2 were computed for each epoch, both positive and negative. A graph was then made of $P_0 = 185^d2 \pm (0.0525)\ e^2$. This shows that the e^2 correction term brings all the available data points onto the same curve. The maxima all move together and the period lengthens to 188.1 days for the later points.

The last step taken was to estimate magnitudes for the maximum and the minimum of the curve. This gave a maximum of $13^m\!.5$ and a minimum of $15^m\!.4$.

It will be interesting to see if DH283 continues to lengthen in period. It is possible that this secular change is actually a segment of a beat phenomenon, but more data will be needed before the type of change can be determined exactly.

DH336 ($18^h22^m27^s$ $-23°16'\!.6$) is a long period variable of period P = 261 days. The best observed maximum is J.D. 33878 days. The maximum magnitude is $14^m\!.1$ and the minimum magnitude is below $15^m\!.5$. (The plate limit)

Most of the data cover 39 cycles from J.D. 23699 to J.D. 33878. However, there are also data points 20 cycles before J.D. 23699. These give an observed maximum at J.D. 18472, compared with a computed maximum at J.D. 18479. Also, there are data points 15 cycles after J.D. 33878. These give an observed maximum at J.D. 37819 to 37851, compared with a computed maximum at J.D. 37793.

SHORT PERIOD VARIABLE WITH A CHANGING PERIOD IN VSF193, by Marilyn Swim

DH Variable No. 403 was investigated on approximately 200 photographic plates of the Harvard A, B, and MF series which were taken between 1924 and 1951. The estimated magnitudes of the star ranged from 14.4 to 15.6. On many plates the effect of blended images was troublesome, and numerous obviously uncertain estimates were rejected, especially those close to the plate limit.

The night runs clearly indicated that this variable was a good short period one. A first approximation to the period was obtained from the first differences of reasonably close maxima, selected from the 19 good maxima in all. The phases of the maxima were calculated with the reciprocal of the approximate period and were plotted against the respective Julian days. Adjustments to the period were made in an attempt to get the phases of the maxima to fall in line with one another. The best period found in this manner was one which worked well only for the first third of the observations. Spurious period relationships were also investigated in the hopes for more information, but no better period was found in this way.

The phases of all the observations were then calculated with this best approximation to the period. Then the phases were plotted against their respective magnitudes, thus forming a light curve for this star. When the light curve was plotted by strips in successive time intervals, it was noticed that the curves degenerated with time and that they did so rather progressively. This occurrence suggested that the true period might be one of a secularly changing nature rather than a constant one.

Going on the assumption that this star had a changing period, a mean light curve was drawn through the ascending branch of the light curve formed with all the observations together. There is one particularly embarrassing minima whose location simply cannot be explained as the result of error scatter. The deviations of the observations from the mean light curve were found and plotted against their corresponding Julian days. The curve thus formed resembles the one expected of a variable with a secularly changing period. The Julian day of the bottom of the curve was estimated by eye. From the number of epochs in the time interval beyond this bottom point and from the amount of the deviation, a correction constant was found. (Perhaps more accurate results could have been obtained by least squares.) This constant is uded in the following formula:

$$\text{Phase in terms of the period} = JD(P^{-1}) - (JD_o(P^{-1}) - E - (k^2P^{-1}E^2))$$

where JD = Julian day of observation
JD_o = Julian day of the bottom of the deviation curve
P^{-1} = the reciprocal of the base period
E = the epoch number
k^2 = constant

for DH Variable No. 403

$JD_o = 28300$
$P^{-1} = 1.957467$
$k^2P^{-1} = 1.3334 \times 10^{-9}$

The new phases of the variable were calculated with this formula and were plotted against their respective magnitudes. The once embarrassing minima shifted out from under the maxima.

COMPOSITE LIGHT CURVE OF CE CASSIOPEIAE, by Jean Warren

CE Cas is a double star both of whose components are Cepheids. Light and color curves have recently been published by Efremov and Kholopov (Astronomical Circular, USSR, No. 326, 1965). A composite light curve was derived showing what would be expected if the two stars had not been resolved. This curve is of interest for comparison with light curves of stars suspected of having multiple periods.

It is proposed that bright variable stars showing similar indications of composite light curves be examined on plates taken with long focus refractors (i.e., "parallax plates") in hopes of detecting elongated images or even duplicity. Both components of CE Cas are 12 mag, their separation 2.5", and their periods 5.14 and 4.48 days.

SEVEN VARIABLE STARS IN SAGITTARIUS, by Jane Turner

Var. #128: This is a long period variable of 215^d. The maximum is $14^m.0$, and the minimum less than $16^m.0$, below the plate limits. We took 45 minute exposures with a 7 1/2" refractor.

Var. #215: This star varies less then $1/2^m$. Considering the errors involved in measurement, this variation is quite doubtful.

Var. #240: This seems to be a semiregular star with a period around 60^d. The light curve is similar to that of UU Herculis, which has a period fluctuating between

45^{d} and 72^{d}. Maximum magnitude of #240 is $13^{m}.5$ and minimum is $15^{m}.5$.

Var. #278: This star shows mostly slow variations; however, it also intermittently displays relatively rapid variations. All the day runs measured were constant. No period was found. Maximum magnitude was $12^{m}.5$; minimum, $13^{m}.8$.

Var. #414: This star seems to be a semiregular one, with period of 23.4^{d}. It is mostly regular; however, there are so far unsolvable inconsistencies. Maximum light was $14^{m}.0$; minimum, $15^{m}.8$.

Var. #420: I found no period for this star. It is possibly a W Ursae Majoris -- this being deduced from the light curves. There were no day runs observed to vary. The range is rather small; maximum magnitude, $14^{m}.0$; minimum, $14^{m}.7$.

For all of these stars, except the long period one, spectral classifications would be most helpful, especially if any turned out to be red stars. Of course, as more plates are taken, some of the problems may also be solved.

The last star is Var. #217. An immediate problem is that on one or two of the larger plates it was observed that this is really two stars. Since there was not enough information, all the other magnitude observations are actually the combination of the two stars, not of the one (assuming only one varied) variable. The range of variation is $14^{m}.0$ to $15^{m}.7$.

Some of the day runs available remained fairly constant; however, some did vary, perhaps more than could be accounted for by observational error. These runs, which varied, were on plates which, at these magnitudes, especially in dense regions (as Sagittarius), can cause trouble.

I made a first assumption that the period was greater than one day -- disregarding the questionable day runs. Taking rather rough first differences of points above $14^{m}.8$ (max.), I arrived at a period around $2^{1}/2^{d}$. Efforts within this area soon failed, however.

Next, I assumed that the day variations were valid. By dividing the first difference by whole numbers to get a common quotient for all under one day, I found an approximation of 0.666^{d}. Then I used the method of multiplying reciprocal periods of Julian Days to get phases, working with groups of about 100 days.

After many calculations, graphs, reestimations of periods, and tests for spurious periods, I found that, although I seemed to be nearing a period for the star, by no means final, an interesting difficulty had arisen.

I had calculated the phases for three different 100 day groups. P = 0.6787 days; 1/P = 1.7734 days. There are two distinct problems here. First, even if the curves coincided vertically, the period is not correct. I have been very liberal in drawing the curves. More importantly, though, is the lack of vertical coincidence.

Perhaps besides having short period variations over a long period, the magnitude of the star is varying. To test this I plotted for all plates observed an average of the maximum and minimum points, in 20-day intervals.

There is a definite variation, roughly around 3500^{d}. This could account for the vertical incongruities mentioned before. The star would then have a long and short period superimposed on each other.

Not enough has been done on this star to reach definite conclusions. Further work should prove interesting.

ONE STAR LEADS TO ANOTHER, by Dorrit Hoffleit

Late in July Dr. S.W. McCuskey at the Warner and Swasey Observatory noted that the spectrum of one of Paul Merrill's emission objects had developed characteristics reminiscent of a nova. Nancy Houk then called me up to ask me to check the star on the Maria Mitchell Observatory plates on the DF Cygni region. The light curve from these plates is peculiar. Fainter than 15.5 mag from 1920, the star showed a mild maximum at 15.0 from 1948 to 1951; a decline to 15.5 by 1963; brightening to 12.8 in July 1964; and remaining close to 12.0 from July 31 to September 17, 1965.

Looking for further excitement, I found that 12 of Merrill's emission objects are within our area, VSF 193. Two prove to be novae found by Margaret Mayall on spectrum plates taken in 1945 and 1946. Looking them up in the Geschichte und Literatur des Lichtwechsels, which ostensibly gives references to "all" variable star literature, I was surprised to find remarks that no light curves or further observations (other than scant discovery data) had ever been published. Moreover, there were two other novae in the region, both bright in 1947, for which the same remark was made. We therefore decided to examine the Nantucket plates as well as the limited number we had borrowed from Harvard. Jean Warren is reporting on the findings.

Meanwhile, Barbara Welther who had been visiting the M.M.O. volunteered to look up what other data might be available at Harvard. Upon Margaret's return from Bamberg, Margaret graciously loaned Barbara her record book. Not only had Margaret made extensive observations on all four of these novae, for one of them, G.u.L notwithstanding, she had published a beautifully complete light curve for the year of maximum, in Popular Astronomy for 1947. The one of the four stars not discovered by Margaret had been discovered by Merrill and Miss Burwell at Mount Wilson. While checking all this, Barbara discovered that Margaret had also observed another (1946) discovered by Miss Burwell, just off the edge of VSF193, with an amplitude exceeding 3.5 mag. about which nothing seems to have been published. It is not even included in the Catalogue of Variable Stars! Something must be done to rectify this. It may be Merrill's emission object MH@304-113, though the positions disagree slightly in R.A.

The star that started all this investigating, MH@328-116, had been classified on a Case plate of 1947 as M-type. It is therefore presumably a "symbiotic star", i.e., one that shows characteristics of both early and late type stars. For comparison, the Warner and Swasey observers looked up Bidelman's list of symbiotic stars. Among 23 stars, only two had not yet been noted as variable. One of the two is on the edge of the Nantucket plates of VSF193. In trying to identify it, I found another variable which may be either long period or U Geminorum type. In nine summers it showed only three maxima and I have not yet succeeded in finding a period to satisfy the three maxima as well as the numerous observations at minimum.

Among the other stars in VSF193 on Merrill's list, one appears to coincide with one of my hitherto unpublished variables, an irregular variable with an amplitude of 1 mag, and for which Nancy Houk found an M5 spectrum on a Case plate. It may be another symbiotic star. Thus, one interesting spectrum or variable star inevitably leads to another.

LIGHT CURVES OF FOUR NOVAE IN VSF 193, by Jean Warren

In the standard bibliography on variable stars, the "Geschichte und Literatur des Lichtwechsels", it is stated that no light curves have been published for the four novae, V928, 1149, 1150 and 1151 Sgr, which fall within the area of VSF 193 (centered at 18^h23^m3 -23°3). All four occurred within the years 1945-48. All had been discovered on objective prism plates, V928 by Cora Burwell at Mount Wilson and the others by Margaret Mayall at Harvard.

After the nova was located, a sequence of nearby compariosn stars was labeled alphabetically, "a" being the brightest comparison star, and "i" or "j" the faintest. This sequence was then used to estimate the brightness of the nova on all of the B plates on which the nova was visible.

All of the plates of VSF 193 available at the Maria Mitchell Observatory were checked to find whether the novae were recurrent. This plate collection includes over 500 plates, dating from 1924 to 1965, approximately 40% borrowed from Harvard, and others taken with the Nantucket $7^1/2$-inch refractor. No evidence of recurrence of the novae was found.

The apparent photographic magnitudes of the comparison stars were found after all of the brightness estimates of the novae had been made. This was done by comparing the brightness of each comparison star with another nearby sequence of stars, for which apparent photographic magnitudes were already known. The magnitude estimates for each comparison star were made from at least three different plates, and the results were averaged.

Finally, the alphabetical brightness ratings of the novae were converted to apparent photographic magnitudes, and were plotted with Julian Day vs magnitude.

The following results were obtained for the four novae:

V1149:

Observed May 16, 1945 to May 30, 1948.
Minimum brightness fainter than $14^m.7$.
Maximum brightness observed: $7^m.4$.
Range observed: $7^m.3$.
Shape of curve: A very steep increase in brightness is followed by a rapid initial decrease. The curve reaches a "plateau" by May 28, 1946; there may be a minimum between August 6, 1945 and May 28, 1946, which does not show because of a gap in the observations. (This gap is due to the impossibility of photographing Sagittarius in the northern hemisphere during the winter months.) Probably this is a classical nova.

V1150:

Observed May 28, 1946 to October 14, 1947.
Minimum fainter than $16^m.1$.
Maximum brightness observed: $13^m.3$.
Range observed: $2^m.8$.
Shape of curve: The initial outburst was not observed because of the winter gap in the plate sequence. Probably the absolute maximum occurred between August 6, 1945 and May 28, 1946. If this is indeed the case,

the observations immediately following May 28, 1946 could represent a "plateau similar to the one in the curve of V1149. V1150 may be a classical nova similar to V1149.

V 928:

Observed July 7, 1947 to March 9, 1948.
Minimum brightness fainter than $14^{m}.7$.
Maximum brightness observed: $10^{m}.2$.
Range observed: $4^{m}.5$.
Shape of light curve: The observed duration of this nova was much shorter than the duration of either V1149 or V1150. Possibly only the maximum was observed, and the brightness during the rest of the outburst was below the plate limit. The four observations plotted indicate that the maximum of this light curve is broader than the maximum of V1149, and that the decrease in brightness immediately following the maximum is slower for V928 than for V1149.

V1151:

(Data not given)

Since they were close to the edge of the plates, the images of V928 and V1149 were enlarged by the coma effect. It was noted that there was a single dark line through many of these (negative) images which did not appear in nearby stars of similar brightness. Perhaps this is due to some unusual property of emission objects in general. Any suggestions to explain this observation would be welcomed.

FOUR NOVAE IN VSF 193, by Barbara L. Welther

This study continues the work that Mrs. Margaret Mayall began at Harvard in the late 1940's. Of the four novae (V928, V1149, V1150, V1151) under investigation in Sagittarius, only two have any published data. For V928 various astronomical publications reported a few estimates of visual and photographic magnitude at outburst in May, 1946 For V1149 Mrs. Mayall published several estimates of photographic magnitude on Harvard plates taken near outburst in 1945 (Popular Astronomy 55, 392, 1947). For V1150 and V1151 Mrs.Mayall recorded but did not publish several magnitude estimates around outburst in March, 1946 and May, 1947, respectively. Therefore, together we plan to publish light curves of these four novae.

With the data obtained by Miss Jean Warren and Dr. Dorrit Hoffleit on plates taken at the Maria Mitchell Observatory, especially from 1957 to the present, we can now extend each light curve beyond the times of outburst in the mid-1940's. In the intervals where the Nantucket and Harvard plates overlap, there is excellent agreement between the sets of observations. One purpose will be to find Harvard plates to fill in the gaps between observations, especially just before and during outburst; another, to determine whether any of the novae had an outburst previous or subsequent to the one in the mid-1940's.

This study has led us to investigate two other novae in Sagittarius. In 1947 Miss Cora Burwell wrote to Dr. Shapley about an emission object. A plot of Mrs. Mayall's magnitude estimates for this object shows an outburst in March, 1946. However, this star is not even recorded in the variable star literature! The other object to be investigated is Nova Sgr 1943 (V1148), which is on the edge of the globular cluster NGC 6553. We plan to present preliminary results for these two novae at the AAVSO meeting, spring 1966.

I want to thank Dr. Dorrit Hoffleit, who suggested this project; Dr. Donald H. Menzel, who has permitted me to use the Harvard facilities; Mrs. Margaret Mayall, who has given me her extensive records; and Dr. Owen Gingerich, who suggested that I investigate Nova Sgr 1943 as part of my work for him at the Smithsonian Astrophysical Observatory.

HEADQUARTERS BUILDING, by R. Newton Mayall

At the Council Meeting in Toronto in May 1965 it was decided to study the feasibility of designing a new building to be adequate for AAVSO Headquarters for many years to come. This has been done, and the space requirements, staff, etc., have been worked out with Mrs. Mayall.

In general, the preliminary study shapes up as follows:

- Basement: Workshop, machine shop, heater, air conditioner, utilities, and garage for the staff.
- 1st Floor: Director's office, conference room (Council meeting room) waiting room, secretary, visitors, 2 staff offices, library, duplicating room, chart file room, stock room, and computing center.
- 2nd Floor: Auditorium (seats minimum of 125,) lounge, records storage, 2 offices.
- 3rd Floor: General storage, Telescope equipment, Radio-Time room, Photo laboratory and dark room, access to roof.
- Roof: Post Telescope, and radio mast. Room for other telescopes on roof.

This, in general, are the space requirements for years to come. Further studies are being made before finalizing the building.

SCIENCE PROJECT, by George Gasparian

This was an exhibit which was submitted and won 4th award in the National Science Fair and won 1st prize in the Rhode Island State Science Fair. It dealt with eclipsing binary stars and was most attractively presented. (ED).

VISIBILITY OF MERCURY, by Edward G. Oravec

For many years one of my interests in observing has been the visibility of various celestial objects under various conditions and with different instruments (to large extent, with unaided eye). Bright stars can be seen in full daylight using telescopic assistance, including the brighter planets. Venus can be seen easily in daytime with the naked eye when favorably located. I have followed Venus for months during all hours of the day and have located it within moments after looking; but one must know how and where to look.

First magnitude stars are generally visible 15 to 20 minutes after sunset. I have seen Jupiter and Sirius at exactly sunset with no optical aid. As for first seeing the new moon, the best record I know of is $14^1/2$ hours (8^o) after new moon. I have seen the moon $19^1/2$ hours after new (10^o) and it is an easy object 24 hours after new phase. It is considerably easier to see some of these objects with the unaided eye when you know exactly where it is located. If you can pick up the object first in binoculars or a low power telescope and relate it to a landmark, it will be considerably easier to see. This is also true for faint stars, if you know their exact location from a chart, they can be seen, but otherwise would be missed.

As for the planet Mercury, there are a number of factors upon which the visibility depends. They are:

1. Brightness or magnitude.
2. Distance from the sun.
3. Inclination to the horizon(and the sun).
4. Altitude from horizon.
5. Amount of sky darkness or twilight present.
6. Clear sky and horizon.
7. Acuity of eyesight.

The brightness and distance from the sun is most favorable from 2 weeks after superior conjunction to elongation in the evening. In the morning, the reverse is true where most favorable conditions prevail after elongation and to within a couple of weeks of superior conjunction. The altitude and inclination are most favorable in the spring months in the evening, and autumn in the morning, from the northern hemisphere.

I have seen Mercury 241 times on 60 elongations over the past 25 years. These are mostly naked eye sightings in the evening sky. The magnitude ranges I have observed are from -1.6 to +1.6. Mercury can range from -1.9 at superior conjunction to 3rd magnitude at inferior conjunction. Once I observed Mercury 7 days (168 hours) after superior conjunction.

The only value to these observations is in training the eye how to discern various objects under all conditions of lighting and darkness. It is helpful for variable star observing in following some of the brighter stars in the evening twilight.

OBSERVATIONS OF SUSPECTED VARIABLE NEAR T CRB, by Roger S. Kolman

While observing 155526, T CrB, during my nightly sessions in the summer of 1964, I noticed the unmarked star in the keystone of the 98, 102 and T Crb formation, seemed to change in relation to the comparison stars. I dismissed this as some kind of optical illusion. After having seen the same thing during this apparition of Corona Borealis, I decided to add this star to my observing program to see if it really was a variable star.

While a list of observations made of this star reveals promising things in that a range of 9.1 to 9.9 cannot be due wholly to observational error, a graph of said star does indicate most interesting things.

155426, -- CrB was covered very well in July and the first half of August 1965. In looking at the curve as a whole and comparing it with curves in Variable Stars, by the Gaposchkins, the type of star is a toss-up among red irregulars, RV Tauri stars, and semiregulars.

The most likely type of variable which it will turn out to be will probably be the RV Tauri class. This is due to the fact that the star appears to be yellowish-white in color whereas the irregulars and semiregulars seem to be reddish in color.

While it is too early to make any judgment on the star, the 36 observations obtained during the 3 month interval during which it was covered this summer do indicate most strongly that the star is indeed a variable. It will take more extensive observations of this star to determine its type and period. (The suspected variable is BD +26°2763, HD 143352, $15^h54^m.8$ +26° 26' (1900), 9.19, F2 (MWM))

TWO UNUSUAL THEORIES, by John Roller

Often in the pursuit of knowledge, scientists have discovered something they cannot explain without radically changing their ideas. Galileo's discovery of Jupiter's moons led to great changes in the idea of the plan of the solar system. New, unexplained problems still crop up. For two such problems, I would like to suggest two rather radical ideas.

The first concerns the planet Mercury. For 80 years astronomers have studied dark markings on its surface. Always the rotation period has been a never-changing 88 days. But last April, the great new 1000-foot radio telescope at Arecibo Observatory was turned on Mercury to find its rotation period by radar. The startling result was a period of 59 days. I quote Sky and Telescope, "If the radar finding is substantiated, the interpretation of the visual surface markings will need critical reevaluation."

Now suppose the dark body we see as Mercury is covered by a clear, transparent liquid -- perhaps some form of lava -- and that over this "sea" floats a clear solid shell -- something like glass or quartz.

In that case, we could see only the innermost layer, the others being transparent, and all our readings before this radar finding would necessarily apply to that layer. However, radar results would apply to the uppermost layer -- the glass cover. The interior or visible Mercury would rotate in 88 days, and the glassy cover in 59 days. The middle layer would probably just move around, rather than rotating uniformly, since after all it would be a liquid.

If this model is correct, then all visual measurements -- size, texture, temperature -- apply only to the lower layer. The upper layer can be studied only by radar. As a check for my theory, Mercury's diameter could be measured by radar. If it is larger than the visual diameter of 3000 miles, that would be one more piece of evidence in favor of a two-layer Mercury. Ultimately, a space probe should be able to check.

If this theory be thought incorrect, I challenge anyone to find another way of accounting for a 29-day discrepancy in the observed rotation periods of this little planet.

The other of my theories concerns the satellite of Jupiter. It begins with an account of an unusual observation reported in Sky and Telescope, January 1964. I quote:

"A peculiar phenomenon was unexpectedly found on October 26, 1962 when the shadow of Satellite I was projected on the disk of Jupiter. When the detector diaphragm was placed to receive radiation from the shadow, a temperature of 184 degrees Kelvin was noted -- more than 50 degrees warmer than the disk. The same effect was noted on December 15, 1962, when a shadow transit of Satellite II was in progress; three measurements were taken, giving 168 degrees, 173 degrees, and 169 degrees for the average shadow temperature. The observations indicated that the area of enhanced radiation was much smaller than the focal-plane aperture, and since the shadow was in fairly rapid motion across the disk, the anomalously warm area must have returned to normal in less than a quarter hour."

Picture the general idea of how a television scanner works -- that is, light striking the screen causes it to emit photoelectrons out the opposite side. Suppose Jupiter's satellites I and II performed a similar act -- always emitting more radiation from their dark sides than sunlight striking them amounts to. Their umbras might be 50 degrees warmer than the surrounding space. When their shadows hit Jupiter, the planet's surface is warmed temporarily, until the shadows pass. This would account for the increased temperature.

Aside from sending a space probe into the satellite's shadows, which is hardly practical, the only check for this theory is to see if these moons are steadily losing mass, as they would be if they ejected particles into their umbras. It may take time, but perhaps it is worth knowing.

In conclusion, I would like to say that we must never think we know all the answers. Theories must be modified to suit facts. And when our old theories fail to suit them, new ones must be devised. If an idea is radical, it is not necessarily false. Galileo showed us that.

COMMENTS ON THE ABOVE PAPER, by George Mumford. One has to be careful with models. Does it explain all the features? Is it physically reasonable in view of all data? In the present case what about the high temperature of Mercury. Glass, over water -- superheated steam -- the glass wouldn't exist.

Does the model predict something that is not observed? If you have glass might you not expect reflection of the solar image. This might be observed for example as a brightening near superior conjunction but isn't.

ASTRONOMICAL ANECDOTES, by Kenneth Weitzenhoffer

Ken read some serious (though funny) astronomical quotations, many of them containing "boners" he has come across in his reading. Typical, of course, is the "new moon rising in the east"; and the moon in the north (?)! ED.

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