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

Edited by R. Newton Mayall

PAPERS PRESENTED AT THE SPRINGFIELD MEETING, 20-22 OCTOBER 1967

The 56th Annual Meeting of the AAVSO was held in Springfield on Saturday 21 October 1967. Again, after 5 years, we met at the Museum of Science at the kind invitation of Mr. Frank Korkosz, the Director of the Museum. The Council met on Friday afternoon 20 October 1967. Friday evening George Mumford outlined the general history of the IAU and showed slides of the XIIIth General Assembly held in Prague, Czechoslovakia. Dorrit Hoffleit described the work of some of the commissions of IAU, and in particular that on astrometry. Margaret Mayall discussed the work of the variable star commission, and then showed slides of the new telescope at Ondrejov, and several views of the old observatory; then she took us on a tour of the city of Prague.

Most of Saturday morning was used up with our business session, and the afternoon was devoted to papers.

Our invited speaker for the afternoon session, was Charles A. Federer, Jr., editor of Sky and Telescope. Mr. Federer discussed the many problems an editor faces in getting out such a magazine as Sky-Tel. We had an interesting look at the policies that govern the contents, and the gripes that an editor has.

Saturday evening we held our dinner which was followed by a tape recording of a speech given by Leslie Peltier at the Western Amateur Astronomers meeting in California. Leslie gave the Morrison Lecture. Everyone enjoyed listening to Leslie's talk. It was next best to having him with us.

Owen Gingerich reinstituted the so-called High Lights in Astronomy during the past year, which Dr. Shapley gave for many years at our Annual meeting. Owen proved himself to be an able successor. His list of Highlights follows in the abstracts.

This was a large meeting, and believe it or not the fall color stayed with us for this meeting, late as it was. We were glad to see many new faces and hope they continue to attend our meetings.

Honors go to Walter Moore, Kentucky; Carolyn Hurless, the Diedrichs, and the Stokes from Ohio as coming the greatest distance.

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TEN HIGHLIGHTS OF ASTRONOMY, OCT 1966-OCT 1967, by Owen Gingerich

1. The Russian Venus IV Probe (October 18, 1967), which parachuted an instrument package through the thick Cytherean atmosphere to investigate the pressure, temperature, and composition of Venus.

2. The US Lunar Orbiter II, III, IV and V missions that have now photographed the backside of the moon (as well as the front) in more detail than we had for the frontside alone, two years ago.

3. The discovery of three comets and recovery of 10 periodic ones to match the previous record for the highest number of comets in a single year, with a two-month opportunity still remaining to break the record; and especially Tomita's feat of recovering four comets on the single night of October 5.

4. The discovery of Janus, the 10th satellite of Saturn, by Dollfus -- found very near the outer edge of the rings when the normal glare of the rings was reduced by

their edge-on aspect near the end of last year.

5. The observation of the oblateness of the sun, 50 parts per million, by Dicke and his colleagues at Princeton, a result that has important consequences both for Einstein's theory of general relativity and for stellar evolution; note, however, that the matter isn't settled because German astronomers at the turn of the century got an answer of only 4 parts per million.

6. The discovery of an infra-red object in the Orion nebula by Kleinmann and Low; its size, low surface temperature (70° K), and immense luminosity suggest that here a group of stars are being born, and that within a relatively short time (by astronomical standards) they will appear in ordinary light as brilliant new stars as their surface temperatures rise.

7. The surprising discovery that the sources of Hydroxyl (OH) radio emission are small objects the size of a solar system (rather than being immense clouds as the hydrogen sources are); this has led to the highly controversial and speculative suggestions that their intensity variations are a form of an interstellar communication network used by intelligent beings elsewhere.

8. The null result in a rocket-spectrographic search for ultraviolet bands of molecular hydrogen; this means that the discrepancy in the mass of our galaxy as determined from star counts compared to dynamical methods cannot be resolved by supposing that immense quantities of hydrogen gas were omitted when tallying the masses of individual stars.

9. The discovery of numerous additional X-ray sources and the optical identification of a few of them, including blue star-like objects at the positions of Sco XR-1 and Cyg XR-2, and also the discovery that the brightest quasar, 3C-273 emits X-rays.

10. The discovery of highly red-shifted absorption lines in the spectra of quasars, together with the discovery that these red shifts (when an unambiguous interpretation is possible) are constant at 1.95 and generally different from the emission red shifts in the same objects; this suggests to some cosmologists the possibility that the red shifts arise from some cause other than rapid recessional motion; and this has added fuel to the debate about the distance of quasars.

REPORT OF 1970 ECLIPSE COMMITTEE, by Cyrus F. Fernald

This is a summary of what has been done so far in planning for the eclipse of Saturday March 7, 1970. Mrs. Mayall has written the Chamber of Commerce in Perry, Florida, and received a very cordial invitation to use the facilities of Perry for whatever meetings seem appropriate to the occasion.

They sent us a list of 25 motels in the area. Four of these (Holiday Inn, Howard Johnson, Perry Motor Court, and Quality Courts) have 60 rooms or more, and appear to be of standard quality. Three others have between 30 and 36 rooms (Bambi, Motor Lodge, and Skylark) and seven others have 20 to 30 rooms. Emily and I stopped at the Holiday Inn on our way to the west in the spring of 1966, and found the motel and the city to be quite adequate. It may well be that next spring Dave and Marion Rosebrugh will accompany us on another exploring trip to Perry, to examine things in more detail.

Perry presumably has just completed a convention hall seating over 3000 people, and featuring small conference rooms capable of accommodating various sized groups. All in all, the more we investigate Perry the better it seems for our needs and the needs of several other groups like ours. It is entirely possible that we will have many professional and amateur groups near us. In talking with Chandler Holton, who is in charge of the Astronomical League's eclipse planning, he mentioned the advisability of their selecting a different location and indicated he was thinking of Waycross, Georgia.

Now on the subject of weather prospects. During the winter months (Dec. - Jan. - Feb.) north Florida weather is greatly influenced by the cool air from the central plains that may be pushed down over the area by cold Canadian air masses. If the winter is a long one the last of these cold waves may come in early March, and the mixture of cool air from the lower Mississippi valley and the warm air from the Gulf produces rain and impossible skies for an eclipse. Such was the case in March 1967 when we would have been completely clouded out on March 6- 7- and 8th. In 1963-4-5 and 6 we would have had good chances of a clear sky at the important time judged by my records for Longwood, as in those years the cool Canadian waves were not bothering us. In border line cases the chances of Perry compared to Waycross or some point in between are about a toss-up. Certainly of those near the central line, Waycross is the only one having adequate accommodations for a group of our size. It may well be that if clouds are prevalent in the morning of the 7th of March that we will consider moving to Jasper or some other place within easy driving distance. Remember Maine in July 1963? We were in luck at Athens. East of us it was almost wholly bad, and west of us it was very spotty.

UV CETI FLARE PATROL, by Howard Le Vaux

At the request of Dr. P.F. Chugainov, Chairman of the IAU Working Group on UV Ceti stars, 2 members of the Astrophysical Institute of Brandeis University contributed the following results during October 1967. On 5 nights, 438.7 minutes, 3 definite and 14 suspected flares. The observations were made with a photoelectric photometer and Blue filter on the Brandeis 24" Cassegrain.

Oct. 3, observer, LeVaux, possible flare at 5:41:15 UT, ΔB = .53 mag; 2 suspected flares at 05:30, ΔB = .34 and at 06:02:30, ΔB = .44.

Oct. 4, observer, J. Broderick, 1 doubtful flare at 04:44:30, ΔB = .5.

Oct. 5, observer, Le Vaux, poor sky conditions.

Oct. 8, observer, Broderick, 1 flare at 05:50:00 UT, ΔB = 1.0; and 5 susp. flares: 05:27, ΔB = 0.7; 05:39:30, ΔB = 0.6; 05:41:30, ΔB = 0.5; 05:47:00, ΔB = 0.5; 05:56:30, ΔB = 0.6.

Oct. 12, observer, Broderick, 1 flare at 04:50:00, ΔB = 0.85; and 6 doubtful flares: 04:10:30, ΔB = 0.3; 04:13:00, ΔB = 0.3; 04:44:30, ΔB = 0.4; 05:05:00, ΔB = 0.3; 05:35:00, ΔB = 0.35; 05:37:00, ΔB = 0.4.

No doubtful flare should be considered unless a confirming observation exists.

A SEARCH FOR NEW STARS (INCLUDING NOVAE!), by Wayne M. Lowder

Anyone (like myself) who has had the opportunity to beg, borrow, or steal a copy of the General Catalog of Variable Stars becomes rapidly aware of the thousands of stars within the range of amateur telescopes that are going almost entirely unobserved. The recent broadening of the AAVSO program to include the observation of eclipsing variables, RR Lyrae stars, and Cepheids is a very significant step in the right direction. A considerable expansion of the AAVSO repertory is also possibie for two other classes of variable stars long familiar to AAVSO observers. These are what I term the red variables (Mira-type, semiregulars, and irregulars) and my own specialty the eruptive variables, in which class I include novae, supernovae, U Gem, Z Cam, Z And, RW Aur, UV Cet, and R CrB stars. The last mentioned qualifies if you look at the light curves upside down! There are probably something like 100 Mira stars that reach 10th magnitude or brighter that are not presently on the AAVSO list or shortly forthcoming from the labors of Clint Ford, and probably several times that number in the semiregular or irregular class. The potential value of the routine monitoring of the eruptive variables need not be emphasized here, and those presently on the AAVSO list form only a very small fraction of the total number potentially observable in amateur instruments.

With this situation in mind, I have been conducting a search of the literature, most of it in very obscure publications, in order to obtain identification charts and sequences for stars in these classes. Preliminary charts are almost ready for all known U Gem and Z Cam stars north of -20° with maxima brighter than 13.5, as well as for a considerable number of stars in the other classes. These will be distributed to active observers for checking of the fields and sequences, and perhaps eventually provide the basis for adding these stars to the permanent repertory.

V1280 SGR BROUGHT UP TO DATE, by Dorrit Hoffleit

At the Fall 1962 meeting of the AAVSO Nancy Houk presented results of photographic observations of the long period variable V1280 Sgr. In Astronomical Journal, Vol. 68, p. 253, 1963 she published her analysis, indicating a primary period of 523 days and a secondary about ten times as long. She stated, "The next observable maximum of the primary period should occur in June 1963, JD 2438191. If the secondary period is real, this maximum, coming close to the time of a (predicted) minimum of the secondary period, should be fainter than the recent maximum at 12th mag."

This summer Dr. Houk supervised Wendy Levins of Vassar College in bringing the light curve, based on Maria Mitchell Observatory photographs, up to date. Indeed, a maximum was found as predicted, and unless the star was brighter in the interval JD 2438169 (14.0 mag) and JD 2438191 (13.3 mag), when no plates were taken, the maximum was also fainter than the previously cited high. Miss Houk's other prediction, namely that times of observed primary maxima should fall early on one side of a secondary minimum and late on the other, is also indicated.

At the beginning of our observing season in 1966 the variable was faintly visible but fading, so that the time of maximum could not be adequately estimated. In 1967, on the other hand, V1280 Sgr was invisible all summer. During the last week in September, on the last plates I could take this season, it brightened -- again on the very day when maximum light was predicted on the basis of a uniform 523 day period. Unfortunately bad weather and the end of the season when Sagittarius, low in the sky, was obstructed by trees and houses, precluded observations through this current maximum. Nevertheless, true maximum unquestionably followed the predicted, whereas the reverse had been true for the cycles just prior to 1963.

THREE CHARACTER STUDIES -- FLARE, SILENT PARTNER, SPHINX, by Wendy Levins

I estimated the magnitude of DH Variable 183, spectral type M8, on Harvard A,B, and MF plates and on Nantucket NA plates. These plates covered a range of Julian Days from JD 2423908 to JD 2433858.

During this time period, I estimated the star to range in magnitude from just below $14^{m}.0$ to less than $15^{m}.9$ but the star appeared on these plates in this range only a very small fraction of the time and was mostly not seen. In fact, its infrequent appearances constituted seven distinct groups of flares, when 183 rose to the occasion just under fourteenth magnitude, seemingly in a matter of hours. The duration of each group of flares, or periods of flare activity, was approximately eighty days, during which time period the star actually ranged from maximum to near minimum, often including both in a day run. This might lead one to suspect a spurious period. Also, the star appeared between these groups of exceptional activity on several occasions, at intermediate magnitudes, again in groups.

The above evidence of volatile personality, with its characteristic rapid ascent to maximum and equally rapid decline within a day and with its large amplitude, suggests that DH Variable 183 is a flare star.

DH Variable 39 announced itself less assertively. I began by estimating its magnitude on Harvard A,B, and MF plates and on Nantucket NA plates and discovered a range in magnitude from $12^{m}.2$ to less than $15^{m}.5$. When I graphed my estimation, a pattern emerged. One set of points remained constant at approximately $12^{m}.5$, while the other set showed periodic variation from $13^{m}.3$ to less than $15^{m}.5$, the typical result of an estimation of a bright, unvarying star with a faint variable companion. On several occasions, this faint companion at maximum could be resolved on the Harvard A plates. Making a first approximation of period graphically and later correcting it with data obtained from a graph of O-C at maximum vs. JD, I arrived at a period of 303 days. There were, however, still several points which did not fall along the predicted light curve. Unfortunately, I did not have the time to recalculate my period in the light of this discordant evidence, little though it was.

The Sphinx on the rock whom Oedipus encountered was a bit more fantastic than DH Variable 211, which I encountered on Harvard A,B, and MF plates and on Nantucket NA plates. Oedipus, it is true, met with more success than I. Yet both the Sphinx of ancient Egypt and Variable 211 posed interesting questions and demanded all the available resources of reason and method in attempting their solutions.

When the A,B, and MF points were first graphed together, the MF points between JD 2424352 and JD 2424431 fell into an exquisitely chiseled curve, with a maximum at $13^{m}.7$, a minimum at $14^{m}.8$, and a period which seemed exactly contained, from minimum to minimum, in that range JD 2424352 - JD 2424431 in which I had observations. That, from the beginning to the end of my investigation, was the lure, the prize, the ideal answer to the Sphinx. But, oh, changeable creature, she, the rest of the points were less lovely. Taking as my starting point the approximate reciprocal period derived from what I estimated graphically to be the period of the ideal, I used it to plot rainbow-colored phase-magnitude diagrams, each diagram covering a strip of the graph, JD range 1000 days, each color representing a group of propinquitous points within this range. First, I separated odd and even phases, on the supposition that this star was really an eclipsing binary system. I then began a series of corrections to improve the positions of the various colors relative to one another on each diagram. Using this method, I arrived at a reciprocal period of $^{-d}.01887$, which satisfied all the color groups of points within 1000 days of the critical JD range 2424352--JD 2424431. This, however, was in great disparity with the reciprocal period of $^{-d}.01829$ which I obtained by the same method from another 1000-day strip. I then tried halving the reciprocal period. This made fairly nice curves in both strips, except in one or two instances. These instances raised a new question, however. My amplitude of slightly over one magnitude could very well be greater than my model showed, if that curve, for lack of data, did not extend deep enough, that is, if the minima were of longer duration. Perhaps these one or two instances and others for which I had tried to correct my reciprocal period of $^{-d}.01887$, which seemed significant, were really only scatter, I could not tell. The Sphinx would not so readily yield up her secret.

I reviewed the diagrams of the halved reciprocal period, $^{-d}.03774$. They indicated a definite shift in phase, from diagram to diagram, of maxima and minima, leading one to conjecture that if this really were an eclipsing binary system, it might have rotating apsidies. In this case, I would need more data.

I turned to the NA plates. When my estimates of these plates were graphed, with several reciprocal periods in turn, the result was practically useless: a thick, almost-straight band of points, whose scatter generally exceeded greatly any discernible trend in an individual color. Although throughout the summer I continued to make corrections such as these, the graphs did not improve after the point reached in estimating various five-decimal reciprocal periods for different strips, and O-C at maximum curves were not helpful in revealing any particular trend. Thus, the Sphinx remains an enigma.

PHOTOELECTRIC PHOTOMETRY AS A CLUB ACTIVITY, by Arthur J. Stokes

For the past few years the Photoelectric Committee has encouraged the use of photoelectric equipment by more amateur observers. Only a comparative few have thus far attempted to build and use the equipment. The reluctance to enter into this type of observing is understandable in light of the two factors of cost and ability to construct the equipment.

I would like to propose that the astronomy clubs consider photoelectric photometry as a club or group project. As a group they are in a better position to undertake a program of this nature than an individual might be. A further advantage that many clubs have is a permanently mounted and housed telescope. Construction of the equipment may be divided among the individual members, and, if necessary, outside help obtained. Once the equipment is set up, the group is not only in a position to do some serious astronomical observing, but also to work together in making the observations and plotting the data. A working team can be made up as follows: one observer to handle the telescope and attached photometer head, a second member to make meter readings and clock readings, another one or two members to do the computing, and lastly someone to plot the data. Obviously the task can be divided up in many ways and the members rotated so each one gets to learn all parts of the operation. In cold weather, only the telescope operator needs to be outside. The others and the electronic equipment could be in any comfortable building. Operating in this manner, it is a real thrill to watch an eclipse of a distant binary system as the points are plotted minute by minute on the light curve.

I would like to cite as an example of this kind of club activity, a recently organized group in Ohio. The Chagrin Valley Astronomical Society has been making photoelectric observations at the observatory of Mr. and Mrs. Larry Lovell. Five members of this small club are also AAVSO members. Although they have been observing only about six months, they have worked on projects including light curves of β Lyrae, Algol, Nova Delphini, and BV 312. Other stars are being added to the observing schedule.

Working together in this manner, the members have not only developed a keen interest in photometry, but have also learned a great deal about the more serious aspects of astronomy. Such things as computing the predicted time of eclipses from a set of light elements, converting light intensity ratios to magnitudes, and plotting light curves are understood and carried out by the group.

I would like to add that a second club, namely the Mahoning Valley Astronomical Society, also of Ohio, is now building equipment for the same type of program. The Photoelectric Committee would like to encourage more clubs to adopt this activity.

VARIABLE STARS AND THE TALCOTT MOUNTAIN SCIENCE CENTER, By Walter R. Hampton

The Talcott Mountain Science Center is a unique educational facility under development on a mountain top in northern Connecticut. The center is located on Talcott Mountain, 17 miles West of Hartford at a site of 1000 feet above sea level at an abandoned NIKI missle base. It is supported chiefly at the present time by Federal funds granted by the Title III Aide to Secondary Education Act. The philosophy of the center is to actively involve students in the use of scientific instruments and techniques and to have them learn by doing. Astronomy is a large part of the educational program at the Science Center. Present instrumentation includes a 12 1/2" Tinsley reflector, a Questar, a Zeiss Coelestat and a spectrograph, a fully equipped dark room, two 8" reflectors, four 6" reflectors and several 4 1/4" reflectors. Amateur astronomers from the newly formed Farmington Valley Astronomy Club are active in implementation of several phases of the educational program.

The author has been involved in presenting a course in advanced astronomy to High School students at the center. The course is still in the developmental phases and at present consists of a series of eight lectures designed to introduce the students to several phases of stellar astronomy, such as stellar distances, magnitude scales, Hertzsprung/Russell Diagram and stellar evolution. The role of variables stars is introduced throughout the course of the series as far as their contribution to the various problems in astronomy. For example, a discussion of stellar distances immediately leads to the discussion of the role of cepheid variables and establishing a distance scale. The initial observing sessions are devoted to constellation identification and in the process the students are asked to rank the major stars in a constellation in order of decreasing magnitude. Having successfully done this, they can see that it is possible to distinguish between stars of small magnitude difference. Following this, the students are presented with "Unknown Stars" and told the magnitudes of stars which bracket the stars and are asked to determine the unknown. Following exercises such as this, the students are introduced to such variables as eta Aquila, delta Cephei and beta Lyrae. They are asked to follow the light changes of these stars over the course of the series and to establish their own light curves. Following this, they are introduced to some of the variables on the AAVSO list, they are introduced to the general technique of making observations and are asked to start an observing program. In inclement weather we rely heavily on laboratory exercises in astronomy, as published in recent issues of "Sky & Telescope". A most valuable laboratory exercise is the recent one devoted to variable stars in the M15 Cluster.

It is felt that the Talcott Mountain Science Center will contribute greatly to the advancement of astronomy in the Connecticut region.

SECOND-HAND NOVA, by George Diedrich

I'm not exactly sure why I selected this title, but I did find a Nova on my sky pictures but, unfortunately, after Mr. Alcock and IAU cards had called my attention to it.

On the night of July 3/4, 1967 it was so clear here in Elyria, Ohio that I just HAD to take out my Polaroid camera and try a few constellation and star trail shots. I often do this to verify some of my brighter variable observations. Also, I take a picture now and then to have a record of my Nova area for permanent file.

Another reason, the one that applied to this picture, is that I occasionally take a picture of Echo I, or Echo II so I can settle the argument that arises now and then about how the satellites are wavering back and forth and/or changing their light output. The particular picture I took at 1967 U.T. July 4.2083 had a nice trail of Echo I on it travelling through Aquila and Delphinus. So when I heard of a Nova in Del you know what happened -- I found it on that picture. So I sent a copy of the picture to Mrs. Mayall with instructions to do whatever she wanted with it -- including chucking it in the round file.

It seems that Clint Ford saw my photo at Headquarters and in a letter to me on July

31st he mentioned that he had seen my "nice fat streak for the Nova". Well, I have a slide of that Photo and I leave it up to you if the Nova is such a "Fat Streak". In fact it is fine enough to estimate the magnitude of the Nova from it and get very close to 5.8 which it later turned out to be that night.

The point of all this isn't that I'm angry at Clint, it is that we missed a chance to "scoop" the rest of the astronomers by divulging at that early date (July 13th or 14th) that the Nova was UNUSUAL, and was bright already on July 4th.

As it turned out a card dated July 14th did have on it some pre-discovery observations but it is sad that at least we didn't have the AAVSO represented in that list.

Curiously enough, some nights later, July 12/13 in fact, I again tried taking a picture of the Nova and this time without being aware of it till I had opened the shutter. I got another satellite on my plate -- Paegos, this time. The night was not clear and dark but the Nova was still there and not much changed in brightness so I knew we had an unusual one on our hands and indeed even to this date the decrease in magnitude is very, very slow. Actually it did INCREASE as you know by now, I presume, to about 4.6 magnitude. (I got 4.7 on Sept. 24).

Here I intend to go into a plug for astronomical photography with a Polaroid Highlander which does have a "Bulb" setting and does have a tripod socket and does use the 3000 ASA film. But I will not bore the reader with these subjective opinions at this time.

THE BRIGHTNESS OF SOME COMPARISON STARS NEAR NOVA DELPHINI 1967,by Herbert A. Luft

When Nova Delphini unexpectedly brightened at the end of August 1967 it was necessary for me to obtain correct magnitudes for comparison stars near the Nova. I consulted various well known star catalogues, however I could not find the wanted information but noted various discrepancies in the magnitudes in the star catalogues, as explained in the following list.

My own observations indicate that the star zeta Delphini is at least 3 to 4 steps brighter than 29 Vulpeculae, using the Argelander step-method. The magnitude of 29 Vul is usually given as $4^{m}.8$ and my observations of zeta Del show that this star is $4^{m}.5$; using this value Nova Del brightened early in September 1967 to magnitude $4^{m}.5$, whereas observations of others quite often gave a much lower figure.

Here are the values in the various star catalogues:

	BS#3	BS#1	BD	SAOC	PPD	GA	Spectral Type
29 Vul BS #7891	4.75R	4.78	4.7	4.8_H	5.04	--	A0
zeta Del BS #7871	4.62R	4.69	4.5	4.7_T	4.74	4.73	A2
$\triangle$	.13	0.09	0.2	0.1	0.3	--	

The differences in the magnitudes of these two stars are given above. It appears and was so confirmed, that these magnitudes are based on various basic different determinations of photometric measurements, indicated and explained below by various letters. It is well known that the Potsdam Photometric Durchmusterung is the most homogeneous photometry in existence, and the difference of $0^{m}.3$ of the 2 stars is in accordance with my own observations with 7x50 binoculars. If we take into consideration the known corrections to bring the PPD to the magnitudes of the Harvard Revised Photometry, in this case being $+0^m.24$ for stars of $4^m.5$ to $5^m.0$ we get the magnitudes of the PPD on the HR scale, as follows:

29 Vul	$4^m.8$
zeta Del	$4^m.5$

which is again in good agreement with my own observations.

I also found some other discrepancies in the magnitudes of other stars in Delphinus, as below:

	BS#3	BS#1	BD	SAOC	PPD	GA	Spectral type
eta Del	5.22_R	5.23	6.0	5.2_T	5.64	6.0	A2
iota Del	4.42_R	5.43	5.0	5.4_T	5 60	5.52	A2 Spectro.binary
kappa Del	5.02	5.23	5.5	5.2_H	5.17	5.89	G5

The difference of $1^m.0$ of iota Delphini in the new BS Catalogue indicates either a misprint or the star is variable.

References: BS #3 - Bright Star Catalogue, Yale University Observatory, 3rd Ed., by Dorrit Hoffleit, 1964
BS #1 - Bright Star Catalogue, 1st Ed., by Schlesinger & Jenkins, 1930
BD - Bonner Durchmusterung, observed 1855/59
SAOC - Smithsonian Astrophysical Observatory Star Catalog, 1966
PPD - Potsdam Photometric Durchmusterung, by Mueller & Mempf, Astrophysikalisches Obs. Potsdam, Publ. Vol. 17, 1907
GA - Goettinger Actinometrie, by Karl Schwarzschild, Abhndl. der Goettinger Akademie der Wissenschaften, 1909

I also tried to obtain the Uranometria Nova Oxenienses by Pritchard, who observed by photometric methods those stars about 1885, but this publication was not available in the New York Public Library. The Coettinger Actinometrie, by K. Schwarzschild only gives stars between +20° and the Equator, whereas the Yerkes Actinometry by Parkhurst was undertaken only for stars between the North Pole and +40°, thus leaving out the zone +20° to +40°, in which 29 Vul is.

The Letter "R" in the BS#3 indicates that these magnitudes have been reduced by Rybka from the HR-magnitudes to the V-system. The magnitudes in the BS#1 are those from the Harvard Revised Photometry. The letter "H" in the SAOC shows that those magnitudes are taken from the Henry Draper Catalogue, and "T" from the HR.

THE VISIBILITY OF NOVA DELPHINI NEAR CONJUNCTION, by Leif J. Robinson

As noted by Luigi Jacchia in Sky & Telescope, November 1967, page 301, Nova Delphini 1967 may be similar to DO Aquilae of 1925, a star that remained near maximum light for about 200 days. If this is the case, the present nova may start to fade in late January or early February, 1968. This is also roughly the time the star will be in conjunction with the sun.

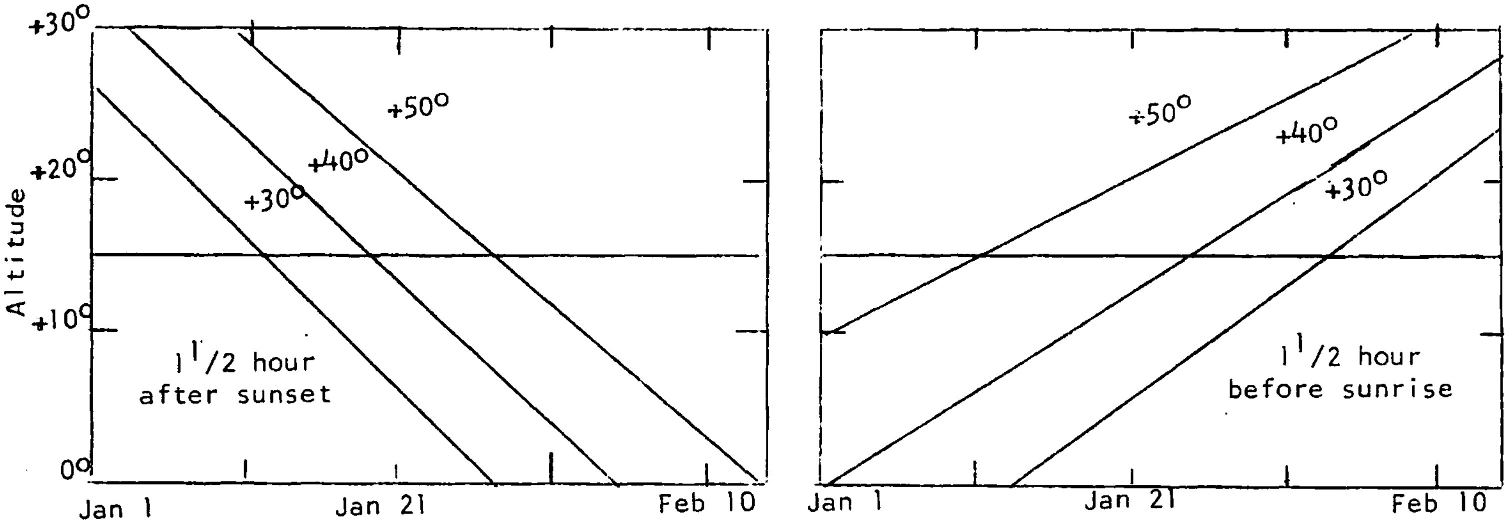
Like many amateurs, I have been making magnitude estimates of Nova Delphini, and wish to obtain as continuous a series as possible. But how difficult will it be for observers in mid-northern latitudes to view the nova as it passes from the evening into the morning sky?

It is first necessary to determine under what circumstances fairly accurate magnitude estimates could be made. I have arbitrarily decided that the nova should be at least 15° above the horizon either 1 1/2 hours after sunset or before sunrise. This is roughly the limits of astronomical twilight for the United States in winter. The following

Table gives for three dates approximate local times of sunset and the end of evening twilight (p.m.); also the beginning of morning twilight and sunrise (a.m.) for north latitudes +30°, +40°, and +50°.

	SS	TE	TB	SR
Jan. 1				
+30°	5:11	6:36	5:30	6:55
+40°	4:45	6:22	5:43	7:22
+50°	4:08	6:07	6:00	7:59
Jan. 21				
+30°	5:27	6:50	5:32	6:56
+40°	5:05	6:40	5:44	7:19
+50°	4:35	6:29	5:54	7:48
Feb. 10				
+30°	5:44	7:05	5:24	6:45
+40°	5:29	7:01	5:30	7:00
+50°	5:08	6:58	5:33	7:21

The accompanying chart was drawn to show the altitude of the nova from January 1st to February 14th. The left half indicates that at latitude +30° Nova Delphini will be fairly well placed in the evening sky until January 12th. The right half shows that morning observations could commence after February 3rd. Hence, there will be an interval of about 22 days when the nova will be very unfavorably placed. Farther north, circumstances improve. At +40°, the duration of poor visibility lasts only six days, while north of about +44° the star can be monitored continuously.



When observing near the horizon, care should be taken to choose (whenever possible) comparison stars that have about the same altitude as the nova. Otherwise, atmospheric extinction may alter the stars' brightness, causing somewhat erroneous magnitude estimates.

ONE SEMIREGULAR AND FOUR REGULAR VARIABLES, by Mary S. Ashman

Six stars were worked on: variability was confirmed for five of them, and conclusions were reached concerning periods for four of these five. Statistical information on the five follows. The numbers of the variables have been kept as they were at the Maria Mitchell Observatory.

A. 159
A regular, long period star, spectral class M.
Period = 202 d, amplitude 14.2 - below 16.1.

B. 400
A semiregular, long period star, p $\cong$ 180 d.

C. 275
A regular, short long-period eclipsing binary with secondary minimum.
Period = 155.2 d.
Evidence for tidal distortion.
Method of period determination: phase - magnitude diagrams.

D. 451
A short-period eclipsing binary (deduced from shape of light curve), with equally deep and evenly-spaced minima.
Interval between successive minima = 3.162953 d.
Method of period determination: phase - magnitude diagrams.

E. 436
Not completed. Short-period, probably around 17 d.

TWELVE VARIABLE STARS IN VSF 193, by Judy Guthrow

For most of the stars I examined (Table I), I was only able to confirm the fact that they were variable stars. Two, however, appeared to be long period variables.

The period of Variable 363 is around 165^d. Comparison stars were selected, letter values assigned, and magnitude estimates made, using them. The amplitude range is approximately 1.8.

Variable 352 also has a long period, somewhere between 158^d and 159^d. The period was derived by plotting Julian date against magnitude, estimated from all available plates, then making a composite graph of the points. The magnitude range is from 14.5-16.3.

Variable GS Sgr, spectral class M6, is another interesting star. Its magnitude range previously had been estimated (I.E. Woods) to be 13.6-16.0. This was confirmed. I was unable to determine a period for GS Sgr, but I concluded that it is irregular, using several previously studied variables in Cygnus as precedence:

Star	Magnitude	Spectrum
V579 Cyg	11.4-12.4	M6
V594 Cyg	13.6-17.0	M6
V626 Cyg	14.3-15.6	M6

Also I attempted to study two variable stars which are in the overlap of our variable star region with the Leiden Observatory's region and for which Leiden has found no periods.

This overlapping region is in the south preceding corner of our plates. After a futile search I was unable to locate the variables, as each of the stars' identification charts, furnished by Leiden, covered only about one star on our identification charts! The region of the stars was just not resolved enough on our plates to be easily visible.

Table on next page.

TABLE

Star	Type	Spectral Class	Approx. Period	Mag. Range	Ampl. Range
363	long period	M8:	165^d	-	1.8
352	long period	-	158^d-159^d	14.5-16.3	1.8
GS Sgr	irregular	M6	-	13.6-16.0	2.4
210	short or irr	-	-	14.2-15.5	1.3
353	irregular	M7	-	14.4-15.1	0.7
454	irregular	M?	-	13.8-14.6	0.8
255	--	-	-	13.1-13.7	0.6
354	--	M6,7?	-	14.3-15.0	0.7
348	--	-	-	15.6-16.4	0.8
349	cluster?	-	-	15.3-16.3	1.0
350	--	-	-	14.7-16.3	1.6
306	--	M?	-	13.7-14.2	0.5

SPECTRAL VARIATIONS OF LONG-PERIOD VARIABLES, by Nancy Houk

Spectral variations of 120 long-period variable stars in Ophiuchus were studied. All were of spectral type M and were classified using Schmidt objective-prism plates covering the infra-red spectral region from 6800 - 8800Å. In spite of the very low dispersion of 1800Å/mm, it is possible to determine the spectral type of stars of type M to within one subtype; e.g., M5, M6, M6.5. The increase in strength of the titanium oxide and vanadium oxide bands with decreasing temperature - later spectral type - is very conspicuous, and these strong molecular bands provide the criteria for classification.

Plates taken between 1957 and 1966 at 18 different epochs, each separated in time by at least a month were used. Half of the 120 variables were classified at 13 or more epochs, and all were classifiable at at least 7 epochs. It can be shown statistically that this number of observations is sufficient for obtaining the total spectral range in most cases.

It was found that almost all the long-period variables having photographic amplitudes (in light variation) of two magnitudes or greater, show large spectral changes averaging 4 or 5 spectral subtypes. All these higher-amplitude variables reach spectral type M6.5 or later during some portion of their light cycle, even though at times they may be very early M. Since long-period variables do cover a large range of spectral subtypes during one cycle, a spectral type determined at a single unknown phase, as is often done, does not have much significance. The spectral type at maximum and at minimum are of special interest.

Periods were determined for about 60 of the variables by means of an electronic computer. Period-spectrum relations were obtained using spectral type at maximum and at minimum. The relations have similar slopes, indicating that the total change in spectral range of 4 subtypes is equivalent to a change of about 450° in effective temperature.

For 40 variables with known periods and appreciable spectral variations, the phases of the spectral observations were computed, and "spectral" curves, i.e., spectral subtypes vs. phase, were plotted and compared with corresponding light curves. Within the accuracy of the observations, earliest spectral type occurred at maximum light and latest spectral type occurred at light minimum. In general, the spectral curves have broader minima than the light curves, indicating that the long-period variables spend much of their cycle near minimum spectral type.

PERIODS FOR 3 VARIABLES IN THE REGION OF SAGITTARIUS, by Diana Welch

Under the direction of Miss Dorrit Hoffleit and Miss Nancy Houk of the Nantucket Maria Mitchell Observatory, I estimated and confirmed the light variation of 15 suspected variable stars in a region of Sagittarius. Of these stars, I wish to present the results of the period determination of 3 stars as representative of the group.

The first is a long period variable (Var 158). Magnitude 13.9-16.2. Spectral class is a late M (M8). The coordinates are RA $18^h\ 22^m\ 57^s$ Dec $-22^\circ\ 51.4'$. What is extremely interesting is that on some plates a faint companion star was observed. The luminosity of this companion flattens the curve and increases scattering-spread. It is suspected that the total amplitude is about 3 magnitudes. The period was determined to be 248^d to the nearest day. Long period variables of the Mira-Ceti type are red M giants, with a regular period of $80\text{-}1000^d$, and with an amplitude 2.5 to)5.0. Thus Var 158 fits the criteria as a Mira-Ceti long period variable.

The second (Var 282) is an M3 star -- coordinates RA $18^h\ 31^m\ 19^s$ Dec $-21^\circ\ 34.2'$; variation 14.3 to fainter than 15.8. Since there was little variation in a day -- it was not suspected to be a short period variable. In the light curve, fairly consistent minima occurred every 150 d. So the period was taken as 150^d. Yet a composite light curve failed to give a smooth variation. It was observed that in some epochs a secondary minimum was distinct. From this it was concluded that the star might be an RV Tauri type variable with alternating large and small maxima. RV Tauri stars are normally G to K stars but a few are M stars. The periods are 30-150 days with an amplitude up to 3 mag. Var 282 is an early M star -- period 150^d with amp. of 1.5 mag. So it is still possible that it is an RV Tauri.

The third star (Var 284) is a suspected short period variable (RR Lyrae). It has a small variation (13.0-14.5). Its spectrum has not been determined. For such a short period, the observations are inadequate because many day-runs are necessary. The integrated light curve for $\frac{1}{P} = 1.2875$ or $P = 0.7767^d$ was made for the years 1957,8,9 and 1962. The 1962 curve seems to fit a pattern but the other years do not superimpose it, thereby indicating that the period is not exact. It is also rather difficult to determine how much variation is real and what is scattering. For determining the period of short period variables is a rather tedious procedure and the period must be carried to 7 or 8 significant numbers and many trial periods must be calculated and the spurious periodseliminated.

ZONES WITHIN THE PENUMBRA, by Lawrence B. Nadeau

Until very recently penumbral lunar eclipses, or the penumbral phase at umbral eclipses, were seldom observed. At best, observers would note when they could first detect the penumbra, and let it go at that. Also, there was relatively little written about the penumbra. A fine series of articles by Alexander Pogo in Popular Astronomy in 1937 established that the visible or unmistakable penumbra extended out to about 30 percent of the radius of the penumbral ring, for an average, inexperienced observer. Edward Brooks, in a 1951 Sky and Telescope article, established limits at about 60 percent for an experienced observer. Fujinami and Yamasaki, in a 1959 Sky and Telescope article, found essential agreement with Brooks.

This brings us to a clear eclipse, that of January, 1963. Even though it was only penumbral, there was no way of telling when the next eclipse of any kind might be favorably visible, so I got out my three inch reflector and observed it.

I had expected to see the penumbra as gradually darkening as the moon approached the umbra. This happened, but not gradually. Instead, the penumbral ring could be divided into three reasonably distinct zones. A report on this eclipse was sent to Sky and Telescope, and the results were integrated with those of other New England and eastern United States observers. It would appear that this eclipse was either unusual or well observed or both, for mention was made of the variations within shadow in the general eclipse article published in that magazine in March, 1963.

As a result of the information obtained at the eclipse in January, 1963, the penumbra ring was divided into three well defined zones. Observations of the zones were made at the eclipses of December 30, 1963, December 19, 1964, and October 29, 1966. Measurements were made of the percent of the lunar diameter eclipsed by each zone in the direction of the axis of the earth's shadow at various times during each eclipse. These percents were then converted into seconds of arc measured from the center of the shadow, and finally expressed in two ways: 1) as a percent of the radius of the entire shadow, and 2) as a percent of the radius of the penumbral ring. Comparisons could then be made between eclipses. The combined measurements of the last three of these eclipses seem to be about as follows:

Zone	Number of Observations	Average percent. radius of whole shadow	Average percent, radius of penumbral ring
I	23	92	83
II	16	80	54
III	9	65	20

Due to the elusiveness of the penumbra, there is quite a bit of scatter in the observations, but I think that this much can be said: the zones do exist.

It is hoped that there will be enough interest in this type of observation to obtain more measurements from observers on the limits and descriptions of each zone. How are the zones characterized?

Zone I is the outermost visible zone of the penumbra, and is recognized on the basis of a contrast difference between that portion of the moon in eclipse as opposed to that outside of eclipse. There is apparently little or no color to this zone.

Zone II is a dull zone, with some slight coloration, usually yellowish. Zone III is a strong dusky zone, where considerable color, usually olive or umber, is noted.

ON MHα 328-116, by John E. Bortle

Over the last two years interest in a faint star in the constellation of Cygnus has been gaining steadily, in professional circles. While at any given moment this star's visual appearance is indistinguishable from that of many of its faint meighbors, its history and actions place it among the most interesting variables in the sky.

It seems that MHα 328-116 was first noticed and cataloged by Merrill and Burwell in their catalog of hydrogen alpha emission objects in 1950 recording it at magnitude 15.5. From that time until the summer of 1965 the star seems to have gone unnoticed, a distinction this star is not likely to suffer again. That summer the Nassau Astronomical Station of Warner & Swasey Observatory detected a hydrogen alpha emission object at a position later determined to be that of MHα 328-116 but instead of a magnitude of 15.5 their photographs indicated a visual magnitude of about 12. As a result, in the following few months, the strange history of this truly outstanding object came to light.

The star appears to have been fainter than photographic magnitude 15.6 prior to 1948 and during the following four years hovered around magnitude 15.0. At the end of 1952 a fading trend set in and continued until 1958 when the star had faded to photographic magnitude 15.6. Up to July 1963 the star remained at this level but by the summer of 1964 it had risen to magnitude 13.0 and still further to visual magnitude 11.7 in the summer of 1965. Though data for the year 1966 was unavailable, it would seem that the star continued to slowly rise as it was noted to be brighter than visual magnitude 11.3 this May.

With the arrival of IAU Circular 2029 announcing that MHα 328-116 had further risen to magnitude 10.8 by June 7, I decided to initiate observation of the object and to prepare a chart with a rough visual sequence. Previous IAU Circulars having noted that MHα 328-116 was located about six minutes of arc south of BD +39° 3965 it was a simple task to locate the star's position with the aid of the SAO Catalog and plot the surrounding field of stars which was complete to about magnitude 9.5. Once the field was located, several positional corrections of field stars were necessary as was the addition of fainter stars near the object completing the chart to about magnitude 12.

It was decided to choose certain stars in the field of MHα 328-116 and make multiple estimates of them using the magnitude sequence of WX Cygni some six degrees distant. Three stars which at present form the main comparison sequence were estimated about two dozen times each over several nights in an attempt to insure high accuracy. In spite of the presumed accuracy of the sequence it is continually being rechecked for errors.

I believe that the sequence for WX Cygni, and thus the sequence for MHα 328-116, is slightly too bright by perhaps two or three tenths of a magnitude. Corrections for this can be made only through a new determination of the sequence of WX Cygni, though such an effort would be better directed in determining an independent sequence for MHα 328-116.

Upon giving a copy of my chart to Mr. Wayne M. Lowder of Scarsdale, N.Y., I found he had been following MHα 328-116 over the past two summers, though without the aid of an actual magnitude sequence. As a result of combining estimates we had made, a drop of one half magnitude was confirmed. This drop occurred between JD 2,439,714 and 731 and apparently was quite rapid in character. Though no further variation has been noted, activity will undoubtedly resume as the light curve seems to indicate that some sort of maximum is taking place. Further brightening of the star may not be likely.

As MHα 328-116 is such an unusual object I appeal to the long time members of AAVSO to add it to their observing programs for it is certainly deserving of our attention.

A COMPUTER PROGRAM FOR THE CALCULATION OF REDUCTION CONSTANTS FOR SUNSPOT OBSERVERS, by Connie Stowe & Polly H. Vanek

In the spring of 1967, at the request of Richard H. Davis, Treasurer of the AAVSO, and member of the AAVSO Solar Division Committee, we wrote a Fortran Program for the calculation of scale and weight factors for the AAVSO Sunspot Observers.

The formulae for the calculation of these reduction factors are given by Alan H. Shapley on Page 17 of his article entitled "Reduction of Sunspot-Number Observations", Publications of the Astronomical Society of the Pacific, Volume 61, February, 1949. The scale factor, k, is used to reduce an observer's observations to a common standard. The weight factor, w, equal to the square of the variance of the logarithm of the scale factor, measures the consistency of the observer. The scheme for the calculation of the American Relative Sunspot Number, described by Shapley, heavily weights the observations of the most highly consistent observers.

A flow chart of the program for the calculation of these reduction constants was exhibited, as was the computer print-out of the actual Fortran program, as finally debugged and used.

A trial run of the program with data for a single observer for a limited period of time, yielded results which checked with results computed by hand by Richard H. Davis. Thereupon, cards were punched for all of the usable observations made during the calendar year 1966 by a total of 29 observers. All observations made under adverse seeing conditions were ignored as were all observations for days on which the American Relative Sunspot Number was less than 11. Processing of data yielded weight and scale factors for each month of 1966 for all observers. These results will be discussed in a companion paper to be given at this meeting.

The program seems to work well. Ultimately a more complicated and versatile program may be written to facilitate the computation of weight and scale factors to be done for all observers on a month to month basis, as well as to facilitate research. However, this program will be used to compute the new reduction constants for the AAVSO Solar Observers based on data for the years 1966 and 1967, which will be used for the calculation for the American Relative Sunspot Number beginning in January of 1968.

The actual writing of this program and the punching of data were done by Connie Stowe as an independent study project, as a Junior at Wellesley College. Supervision of the project was done by Polly Vanek, who was then an instructor in the Astronomy Department of Wellesley College.

The program of the AAVSO Solar Division for the computation for the American Relative Sunspot Numbers is supported by the Environmental Science Services Administration, United States Department of Commerce, Institute for Tele-communication Sciences and Aeronomy, J. Virginia Lincoln, Deputy Chief.

REDUCTION CONSTANTS FOR AAVSO SOLAR OBSERVERS - A PRELIMINARY REPORT, by Polly H. Vanek & Richard H. Davis

The computer program, described in a companion paper, has been used to compute monthly and yearly scale and weight factors for the calendar year 1966 for a total of 29 of the Sunspot Observers who report to the AAVSO Solar Division.

We are, at present, in the process of punching cards with the data reported by all other observers who submitted reports during the calendar year 1966, and with the data submitted by all observers who submitted reports during the calendar year 1967. When cards have been punched for all of these data, they will be processed by means of the computer program, referred to above, thus yielding monthly scale and weight factors for all observers who submitted reports at any time during 1966 or 1967, together with scale and weight factors for that entire two year period.

Although our plans may change when the results for the entire two year period are available, it is our present intention to use these new scale and weight factors in the computation of the American Relative Sunspot Numbers, beginning with January of 1968; to continue the computation of scale and weight factors for all observers on a monthly basis; and thereafter, from time to time, to add or drop standard observers when so indicated by these continuing computations.

Since experience has shown that an observer's scale factor remains remarkably constant so long as the observer makes no significant change in his equipment or technique, or in the geographical location from which he observes, we do not expect to revise an observer's scale factor from month to month, but merely to keep track of the monthly fluctuations in that scale factor, and then to revise that scale factor when and if the continuing computations show a significant change therein.

We have studied the results for the 29 observers computed from the 1966 data only, and our first preliminary conclusion is that weight factors depend upon the level of solar activity during the period for which such constants are computed and that, accordingly, weight factors computed from data for one period of time are just not comparable with weight factors computed for a different period of time. This will mean, of course, that when it is proposed to add one or more new standard observers, it will be necessary to adopt new weight factors for all, then current, standard observers. With the present scheme, whereby weight and scale factors are to be computed for each observer on a continuing month to month basis, this requirement should pose no difficulty.

Our next preliminary result is that the scale factors of individual observers, and to an even greater extent, the average scale factor of all observers, remain remarkably constant. Comparison of the results for calendar year 1966, with the constants presently used (which were computed from data submitted for the period from July of 1957 through December of 1959), indicates that for most observers, there have been no significant changes in scale factors. Although some observers do show significant changes in scale factors, leading us to suspect that they have made unreported, major changes in their equipment or technique, the average of the scale factors for all observers for which both old and new constants were available has remained constant within six parts in a thousand. This remarkable result is a striking demonstration of the validity of the statistical method used for the computation of the American Relative Sunspot Numbers.

Our final preliminary conclusion is merely a confirmation of what has long been known - that major changes by an observer in his equipment, technique, or geographical location will affect his scale factor. In the past, it has always been a strict rule that no change whatsoever in equipment, technique, or geographical location could be tolerated from a standard observer. With this new scheme, whereby scale factors are computed for all observers on a continuing month to month basis, we hope to be able to show that minor changes in equipment, technique or geographical location have no significant effect on the scale factor of a standard observer, and that, accordingly, such minor changes may be permitted even of standard observers. We also hope and expect to be able to detect significant changes in equipment or technique, even though not reported to us by the observer. In such a case, of course, that observer's reports would not thereafter be used in the computation of the American Relative Sunspot Number until such time as a new scale factor, based on a sufficient amount of data, was available.

The program of the AAVSO Solar Division for the computation of the American Relative Sunspot Numbers is supported by the Environmental Science Services Administration,United States Department of Commerce, Institute for Tele-communication Sciences and Aeronomy, J. Virginia Lincoln, Deputy Chief.

POSSIBILITIES OF A VARIABLE STAR SURVEY IN THE COMA REGION, by Sandra Servaas

Our work this summer, at the Maria Mitchell, was the continuation of a variable star project on a specific region of the galaxy (the Sagittarius region) near the galactic center. Such a study will of course reveal certain compositional and periodic peculiarities of stars in the region and has produced myriad different types of variable stars. It would perhaps be of interest to explore entirely different regions of the sky both for the purpose of comparing results with established trends in the galactic center region, for acquiring statistical data for galaxy wide surveys, and for accumulation of evidence on isolated areas to understand their local conditions and dynamics. Specifically, exploring an area such as Coma Berenices would be of particular interest to us as its location near the galactic pole would be in direct contrast to the central Sagittarius region.

With a little research, I found that the Coma region, though it has been intensely studied as an open cluster and extragalactic window, has not been approached with variable stars in mind. However, already known quantities, distance modulus, color-magnitude diagrams, etc., will aid in classifying variables found.

A general method of approach would be similar to one used at Maria Mitchell to search for variables to confirm variability by a systematic program of plate examination, to plot magnitude change values, determine periodic functions, and then type the results. Hopefully this would be complemented by spectral plates of the region which would serve a two-fold purpose (1) to indicate possible variable stars by empirical evidence - M's for example, show a large percent of variability, and (2) to supplement curves which might otherwise give no evidence or ambiguous evidence as to variable type.

Once a region has been determined, the next step for an observer is to study the already known possibilities in order to best plan his observational strategy. Accordingly I discovered the major possibilities to be in the are of supernovae, flare stars, RR Lyrae stars, and miscellaneous other background or foreground Pop II stars, along with classical Cepheids, semiregular and irregular stars, and eclipsing binaries. What have been found are 22 RR's, 5 eclipsing binaries, 2 Mira, 2 irreg., 1 semireg., 1 α Canis Venaticorum, 1 UV Ceti. With such a variety of variables in the area, it is clear that focusing on a specific type as target would be advantageous, otherwise magnitude changes being dealt with would vary from scales of 1 day to 406 days and adequate coverage would require different photographic techniques, from special short-exposure flare-detecting pictures (Baker-Nunn), to regular day runs, to long period sequences, and of course any one special set of plates are more or less independent from the other sets.

The discovery of variables often is found to be approximately proportional to the number of variables already known in the region. However, it would be surprising if this were found to be true here since the Coma region is poor, that is, it has a relatively low number of stars. The advantage of the cluster is its high location, which results in little interstellar reddening, and low obscuration. The importance of such a general variable star survey would basically be to discover what hasn't been found so that general knowledge of distribution of types is secured, and anomalous stars are pointed out. Hopefully this general study would aid theoreticians in explaining physical reasons for the facts that general research has made known.

PROGRESS REPORT ON OLIVIER SEQUENCE CHARTS AS OF OCTOBER 18, 1967, by Clinton B. Ford

Since May 1967 the following charts have been completed in pencil tracing, sky-checked, and copies distributed to the list of sanctum observers noted in the May 1967 Abstracts:

022132	S Tri	d(revision)		201209	RU Del	d
181512	V450 Oph	d		201207	QZ Aql	d
182916	DS Her	d		202512	RX Del	d
190017	V338 Aql	d		202509	RY Del	d
192201	TU Aql	d		203513	SS Del	d
193312a	LS Aql	d		204104	BR Del	d and e
195818	TX Sge	d		210408	Z Equ	d
200716	TV Aql	d				

In addition to these Olivier sequence charts, the following have been prepared and preliminary (black on white) copies distributed to sanctum observers:

041813	AH Eri	e	From "d" by Cragg
181141	NvHer 1963	d	Revision and correction of 1966 chart
183138	LL Lyr	d	From "c" by Cragg

195553	V476 Cyg	f	From existing AAVSO "e" chart
213642	Q Cyg	b and f	"b" from 213843 SS Cyg "b"; "f" from chart in Copernicus magazine (1878)

About 10 of the remaining Olivier fields can be charted by using information at hand, but the balance will require various clarifications.

The production of "e" charts from "d" charts has now been simplified by a special device for enlarging full-scale 8"x10" opaque drawings by a 2-to-1 or larger ratio. A new Gafax 500 copying machine, acquired in October 1967, will facilitate copying and distribution of the preliminary Olivier charts as well as other new tracings and enlargements.

(Mr. Ford demonstrated a gadget he has devised, that is placed in front of his balopticon or opaque projector. When a chart is placed in the projector it may be projected on a horizontal plane at any determined scale. RNM)

PHOTOELECTRIC PHOTOMETRY DONE ON A POSSIBLE FLARE STAR IN AURIGA, by Alice Hine and Katharine Wood

BD +31°1048 is a star in Auriga that was first suspected of varying by the astronomers at the Irish Astronomical Observatory. They detected a considerable increase from the normal brightness of the star on March 1, 1964 and confirmed its variability on several subsequent nights of observing. Their preliminary results are published in I.A.J. Vol. 6 under a "Suspected Flare Star in Auriga."

The star is classified as spectral type B8 in the Henry Draper Catalogue. Because it seemed to vary quite rapidly and its first observed increase in brightness was very spectacular, the Irish observers suspected it might be a flare star. All the known flare stars are of late type spectral classes (i.e. M stars) but are similar to this star in that they show rapid variations with spectacular short time increases in brightness of several magnitudes, every so often. Since the increases last for very short times (often about 15 minutes), probably many stars flare without being observed. Because of its B spectral class, it has been questioned whether BD +31°1048 really is a flare star. If it is not, it is possible that it has a faint M star companion which does flare. In any case, the star is an interesting one to study.

It was observed with a UBV photometer on the Vassar 15-inch reflecting telescope. For comparison stars, two stars which were not listed as variables in the Bright Star Catalogue were chosen: BD +21°947 and BD +32°1027.

We detected no definite positive brightness change in the possible flare star. Our data showed some fluctuations of about 0.2 magnitudes, but we do not feel that we have enough data to say this is real variation. It may be, but is very likely due to random technical errors in our measurements. Though this star did not do anything spectacular while we were observing it, it certainly seems that it did increase suddenly and substantially when the Irish astronomers observed it. Our negative results do not prove that it doesn't flare but only that more work needs to be done.

COUNTING SUNSPOTS FOR FUN AND PROFIT, by David W. Rosebrugh

This paper is not intended to convert all AAVSO members into standard solar observers. It is merely intended to enhance our enjoyment of nature, in one of its most fascinating aspects, the Sun.

Be sure when observing the Sun that it is done in a safe manner.

The Sun will be more active for the next three or four years than it has been of late, or may be thereafter for several years. We should all seize this favorable opportunity to derive pleasure by observing the sun frequently.

An intriguing and sophisticated procedure is to count the sunspots, which are a measure of the Sun's activity. Our daily count can then be compared with the American Sunspot Numbers as reported monthly in Sky-Tel. These daily numbers are published within a few weeks after the event. We must count both the number of spots "f" and the number of groups "g". Our individual Relative Sunspot Number is 10 times the number of groups, plus the number of sunspots or (10G plus f). This is the figure that we should compare with the daily figure in Sky-Tel.

We will probably be dismayed at how poorly our own figures agree with those in Sky-Tel. There are several reasons for the discrepancy, the two major ones being (a) it is hard to determine the number of groups "G". One solitary spot counts as a group. A bunch of spots counts as a group. A large congerie of spots may be one, two or more groups. (b) The American Relative Sunspot Numbers are derived by adjusting the raw observations of the standard sunspot observers statistically to bring them as nearly as may be into line with what an experienced observer would see with an 8cm. refractor of 110cm focal length and 64 power. This is the size of telescope used at Zurich for counting since about 1848.

However despite these causes of discrepancy eventually we may find that our counts bear some reasonable relation to those shown in Sky-Tel. We can also derive some satisfaction from learning how to orient the image that we see of the Sun. Which is north,which is east, where is the equator? Repeated observations and our own commonsense will give us some insight into these matters. The article "Telescope Image Reversal" on page 315 of Nov. 1966 Sky-Tel may help.

As for the profit motive, habitual observations of a spotted rotating sphere may help with the study of Navigation, the understanding of which is based in part upon looking at various views of a celestial sphere seen from the outside. It will help in the observation of Mars, Jupiter, and Saturn where markings appear to change their shape and relative position near the limbs.

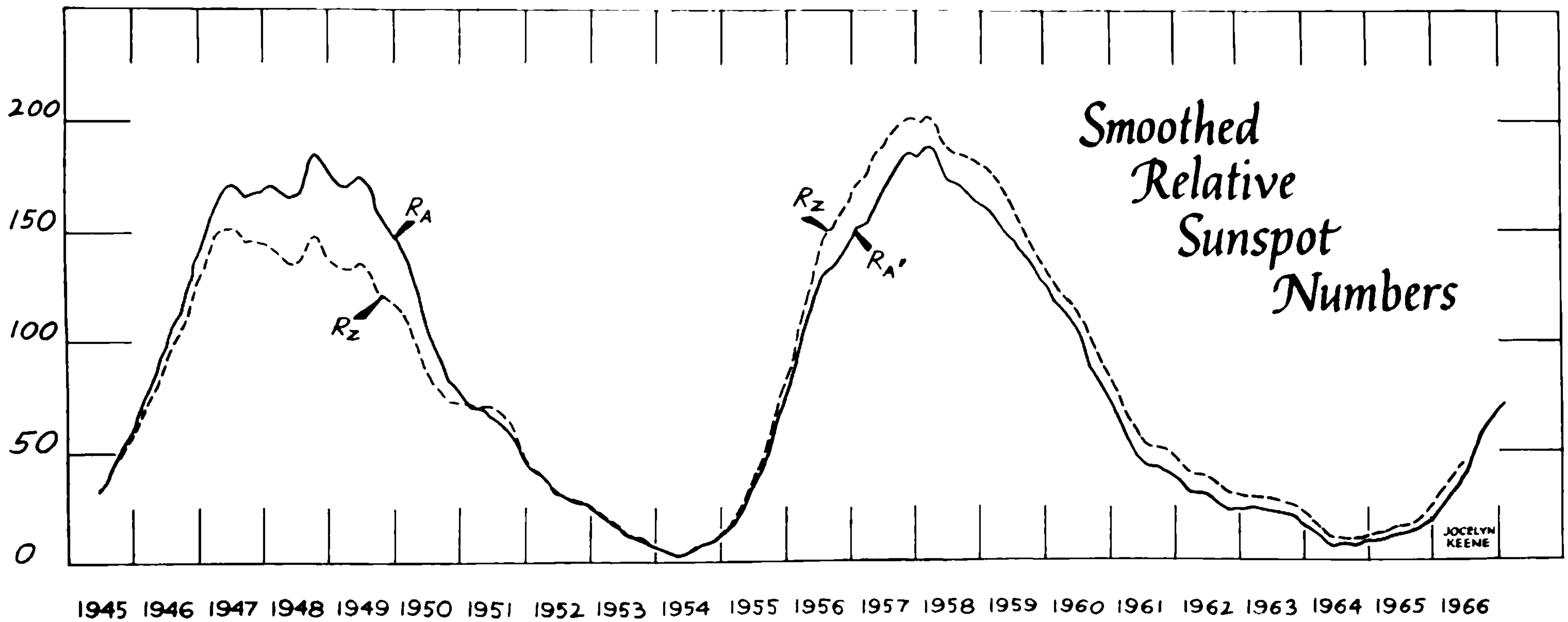
MAXIMA AND MINIMA OF SOLAR ACTIVITY, by Jocelyn Keene

For many years, the Astronomy Department of Wellesley College has plotted the 13 month smoothed monthly means of the American Relative Sunspot Numbers.

Recently, at the suggestion of Dr. Sarah J. Hill, I re-plotted such smoothed monthly means for the period from June of 1945 through March of 1967, the latest date for which such smoothed numbers were available. For comparison purposes, I then plotted on the same sheet the corresponding smoothed monthly means of the Zurich Relative Sunspot Numbers. The resulting plot is shown on the sheet attached hereto.

At the suggestion of Richard H. Davis, I then determined the times of maximum and minimum solar activity from each curve by applying the method commonly used in the determination of the times of maxima and minima for variable stars. What was done was to draw smooth curves through the data points, draw on the graph a series of lines parallel with the "x" axis and mark on the graph the mid points of the intersections of those lines with the curves. Smooth curves were then drawn through the midpoints so marked and extrapolated to intersect the curves. The intersections of the loci of the midpoints with the curves were taken as the times of maxima and minima.

The results of this determination, both for the plot of the American Smoothed Relative Sunspot Numbers and the plot of the Zurich Smoothed Relative Sunspot Numbers, are shown below:


Smoothed Relative Sunspot Numbers
200
150
100
50
0
1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966
R_A
R_Z
R_Z
R_A'
JOCELYN KEENE

	MAXIMA		MINIMA	
ZURICH	1948.3	1958.0	1954.4	1964.8
AMERICAN	1948.5	1958.0	1954.4	1964.8

It should be noted that the times of maxima and minima obtained from the plot of the Zurich Smoothed Sunspot Numbers agree exactly with the corresponding times of maxima and minima obtained from the plot of the American Smoothed Sunspot Numbers, except in the case of the peculiar triple maximum of 1948, and that even in that case, the difference is only 0.2 year.

It is suggested that this method for the determination of times of maximum and minimum solar activity has more significance than the mere selection of the month for which the highest or lowest smoothed relative number is obtained.

I would like to express my special thanks to Mr. George Lovi for his help in preparing the accompanying plot for reproduction, under pressure, but with his usual artistry and competence.

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