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AAVSO ABSTRACTS

Edited by R. Newton Mayall

Papers Presented at the Spring Meeting May 23, 1952

The Annual Meetings of the AAVSO are held in Cambridge, Mass.; but the Spring Meetings are held somewhere else in North America. On May 23, 1952, members from the four points of the compass converged on a small town in upper New York State, near the Canadian border— Potsdam, by name. The focal point was Clarkson College of Technology, our host. Here amid naturally beautiful surroundings the members enjoyed themselves and attended to the business of the meeting without paying too much attention as to where they were. Of all the places where spring meetings have been held, Potsdam, New York, is most interestingly located. Geographically speaking, it is longitude 75° W and latitude 44° 40' N. It is practically midway between the equator and the North Pole, the actual midpoint being not many minutes drive north. Also it is on the standard meridian for the Eastern Standard Time Zone, 5 hours west of Greenwich.

Although fewer in number, papers given at Spring Meetings are equal in quality to those given at Annual Meetings because of their distance from and the time required to make the round trip to Cambridge; ∧ but the changing scene of the Spring Meeting enables many such members to meet other members for the first time and to present their papers in person. Therefore these meetings are looked forward to by all, for new faces appear, new friends are made, and a good time is had by all.

→ Part of sentence omitted 'So few people from USA can attend, etc'.

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RADIO, RADAR, AND ELECTRONICS AND APPLICATIONS TO ASTRONOMY

by

Frank A. Record, Chairman of the Department of Electrical Engineering
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Several of the applications of electronics to astronomy are of interest. Radar location of meteorites permits daytime and cloudy weather observation. Reception of noise from various regions of space at a number of frequencies has led to the construction of the radio telescope. The spatial distribution of the noise signals is a function of frequency. Since observations made with these telescopes must be interpreted in terms of radio and electronic quantities, a consideration of some important ones follow. The parallel resonant circuit, made up of a coil and a capacitor is a basic one. Energy transfer occurs between the electrostatic energy of the capacitor and the magnetic energy of the coil at a rate given by

$$f_o = \frac{1}{2\pi\sqrt{LC}}$$

where f_o = frequency in cycles/sec, L = inductance of the coil in henrys, and C = capacitance in farads. This is the natural frequency of oscillation of the circuit. If the circuit is excited by a battery, damped oscillations appear. If, however, the circuit is excited by the battery once each cycle through the use of an electron tube, sustained oscillations occur at the natural frequency f_o and the circuit is called an oscillator. In radio work another concept connected with this circuit is the band-width, which shows what range of frequencies will be passed by the circuit. This is determined by a quantity called the Q and is defined as

$$Q = \frac{2\pi f_o L}{R}$$

where R = effective resistance of the circuit. The higher the Q the narrower the bandwidth.

If the oscillations from this circuit are modulated or varied by a signal voltage (if amplitude is varied, amplitude modulation results; if the frequency is varied, frequency modulation results) and radiated into space, this becomes the basic radio transmitter. Wavelength of the transmission is given by $\ell = \frac{c}{f_o}$ where c = velocity of light.

If the circuit is used in reverse to detect radiated modulated waves by means of another electron tube added to remove the f_o frequency, thus leaving the modulating signal, the circuit becomes the basic radio receiver. This is also the prototype radio telescope. Detected signals may be displayed by means of loud speakers, recording ammeters, or cathode ray tubes.

NEW COLGATE UNIVERSITY OBSERVATORY, by Harold H. Lane

The new observatory at Colgate University, Hamilton, New York, was opened in May 1951. The new building is the first section of a larger structure planned to house all three of the telescopes on the Colgate Campus. When the plan is accomplished there will be space for the program of auroral study being carried on in conjunction with the work of Dr. Gartlein at Cornell University. The present structure has an 18-foot dome and houses a 12½-inch reflecting telescope working at f/9. It was the gift of Dr. Louis J. Schelter and Mr. George E. Burlingame, who constructed the instrument several years ago, the former making the optical parts and the latter the mounting and drive. A program of photoelectric photometry is in progress. The approximate position of the new Observatory is Lat. 42° 47' N, Long. 75° 32' W, and is at an elevation of 1270 feet above sea level.

AURORAE, by S. L. Boothroyd

Dr. Gartlein established his observatory some twenty years ago, about three miles north of the Cornell University campus in Ithaca, New York. He now has the only observatory devoted solely to auroral research. It is equipped with self-recording instruments which record all the aurorae visible from this observatory, as well as the spectrum of the auroral light, together with much additional pertinent data. The zones of maximum auroral display occur near small circles about 30° from the geomagnetic poles. In eastern North America the region of maximum auroral display is over the southern part of Hudson Bay and eastward across central Labrador. Ithaca is close enough to this region so that all aurorae occurring in the maximum zone can be seen. Aurorae are caused by electrified particles spiralling around the earth's magnetic field as they move in toward the earth with a high velocity. As the particles collide with atoms of the earth's atmosphere, they become ionized and also ionize atmospheric atoms, thereby emitting light of the various atoms which are characteristic of the several excited states of the atoms concerned. The electrified particles come in with velocities of about 2500km per second. A cooperative arrangement between Cornell and

Colgate makes it possible to obtain simultaneous photographs of important auroral displays from both stations. From a pair of photographs it is possible to find the direction of corresponding auroral points as seen from each station. The distance between stations is known, therefore it is possible to find the distance and height of each auroral point that can be identified in the two pictures. The reason for the general idea that aurorae are not seen in the southern hemisphere is because there is almost no inhabited land near the small circle 30° from the south geomagnetic pole. The south island of New Zealand is the only inhabited land near enough to the region of maximum display of Aurora Australis to see many.

THE COMING SUNSPOT MINIMUM, by W. Gleissberg

Since 1947, sunspot activity has been declining. We are now approaching a minimum period. The decrease in relative sunspot numbers began quite slowly in 1948 and 1949, but increased considerably during 1950. The first spotless days occurred in December 1950. Spotless days were numerous during the past months, and will become more frequent in the near future, and a minimum of solar activity is expected in 1954 or 1955.

Observations should not be neglected during the periods of quiescence on the sun. Observations at each sunspot maximum and minimum are important and contribute much to our knowledge of the long (80 year) cycle.

There are good reasons to believe the coming minimum will be an interesting one, and solar activity probably will remain on an unusually high level. If this prediction comes true, we shall experience a sunspot minimum having a higher level of solar activity than all the minima during the past hundred years.

ON OBSERVING SUNSPOTS, by Walter L. Moore

Not having a polarizing monochromator to observe sunspots, I have trained myself to pick out these spots in a group that are physically separated, from those which appear to be separated because of clouds of incandescent material over them, by observing the granular appearance, or lack of it, of the areas between the individual spots. If granulations appear between the spots in a group, I see the spots as physically separated; but if the area is free of granulations I see clouds above the spots. I find it not too difficult to "see" three dimensional effects. These effects may or may not exist in reality, but it is fun to imagine them. My equipment consists of an Herschelian wedge and a No. 10 filter used in arc welding. With this I can, at moments of good seeing, observe the outlines of faculae nearly to the center of the disc of the sun.

VARIABLE STARS IN GLOBULAR CLUSTERS, by Helen Sawyer Hogg

This is a progress report of my work for the past 25 years. In 1939, I published the first catalogue of variable stars in globular clusters. It contained positions for 1116 variables. A second edition is now in progress, which will contain about 1400 variables. The number of new variables is not increasing rapidly because the remaining clusters are difficult; but many of those found are exceedingly interesting objects, such as the eclipsing star in the cluster Messier 71 (NGC 6838) recently moved to the globular list. New period determination has revealed interesting RV Tauri variables in a number of clusters, including Messier 2 and 56.

USING THE BECVAR "SKALNATE PLESO" ATLAS CHARTS FOR VARIABLE STAR OBSERVING

by

Clinton B. Ford

For observers without setting circles on their telescopes, the commonest method for locating an AAVSO "b" chart region is to note or plot the position of the variable star on one of the standard naked-eye star atlas charts, such as Norton's, point the telescope as carefully as possible toward this position, and proceed to identify a "field star" or "key star" (usually the brightest star) which is shown on the "b" chart. In order to make use of the larger and more complete Becvar atlas for this purpose, it is convenient to mount each Becvar chart on a 20 x 27, ¼-inch thick "laminated pressedwood" board, thus leaving enough margin for four holes to be drilled in the corners so that the board can be hung up with the east-west coordinates in either a vertical or horizontal position.

Most "field stars" on "b" charts are indicated by Flamsteed numbers. These numbers are not given on the Becvar charts, therefore it is necessary to insert them where needed, by reference to Norton's or a similar smaller atlas. Because the Becvar atlas goes down to about magnitude 7.5, many more "field stars" are available than with smaller atlases, and the consequent advantages to the observer with modest equipment well repay the effort of mounting the charts in this simple manner.

CANADIAN SUPER-SCHMIDT METEOR CAMERAS, by Peter M. Millman

The third and fourth Super-Schmidt Meteor Cameras, designed by Dr. James Baker, were purchased by the Canadian Government. Their optical performance was found to be excellent. The Super-Schmidt camera utilizes a double thick-glass shell system around a compound correcting plate. The spherical mirror is of Pyrex, and the shells are of boro-silicate crown (BSC-2).

The cameras have an aperture of 12¼ inches, focal length 8 inches, optical focal ratio F/0.65, effective focal ratio F/0.82, and field 55 degrees. The optical system was designed to bring light (3500A - 8000A) from an on-axis star image within a circle .015mm diameter for 50% of the light, and .040mm diameter for 90% of the light. A rotating shutter covers and exposes the film 60 times a second. Although the film is covered 3/4 of the time, the longest exposure possible on a dark night is 12 to 15 minutes. The film is molded to a spherical surface of 8-inch curvature.

The Canadian cameras will be mounted 26 miles apart, one at Meanook and the other at Newbrook, Alberta, at a latitude 54½° N. They will be used on an international program of meteor photography in cooperation with the Harvard Observatory and the Massachusetts Institute of Technology, Cambridge, Massachusetts

REMARKS ON SOME VARIABLES, by Margaret W. Mayall

I have brought with me the light curves of quite a few variables that are of more than passing interest -- some ordinary, some queer. Among the long period variables I have selected RU And, W Tau, RY Leo, V Boo, and VX Sgr, because at various times these stars have not acted according to Hoyle. Of the well known and well observed semiregulars, the curves of R Sct, AF Cyg, and W Cyg are typical; and I have brought curves of three similar stars (X Her, g Her, and TX Dra) that are bright enough to observe with binoculars and deserve more attention on the part of observers with small instruments. Here are two of the same type as SS Cygni that show well-observed maxima, one is U Gem, from which the class derives its name, and the other is CZ Orionis.

Here in Chi Cygni, we have an example of a well-observed regular long period with very little scatter in the observations. On the walls of the room you will see the large plots of Z Cam and Z UMa; SS Cygni for 1951, and T Cas from 1905 to the present. The large scale detail plot of AE Aquarii for 1951 shows individual observations marked with the observer's initials.

I have a series of observations of eta Aquilae made by Mr. Isaak, one of our new young members from Australia. He figured the period from his own observations, and found it to be 7.176 days, which is very close to the published period of 7.176678 days. Sr. Taboada sent observations of the two novae discovered by Sr. Haro of Mexico, Nova Sco 1952 I, and Nova Sgr 1952 I. Probably these are the only visual observations made of these two stars.

STATISTICAL METHODOLOGY IN RELATION TO THE GRANULATION PROJECT

by

James C. Bartlett, Jr.

Some twelve years ago, I became suspicious that the granulation of the solar photosphere varied in a cyclical rather than in a random manner. In order to verify my suspicion I set up a project of daily granulation and spot observations which has since come to be known as the Granulation Program. In the beginning, one of the difficulties was the lack of a simple numerical method of relating observed granular variations to the sunspot curve. In the early years, reports showed whether granulation was present, questionable, or absent, as observed with 2" aperture. At the end of the year, the number of days with granulation visible was compared to the number of days in the year, thus establishing the per cent visibility and invisibility. The two figures were then compared with the corresponding figures for sunspots -- called spot indices. These comparisons indicated that the percentage granular visibility was consistently higher for correspondingly high spot indices and vice versa. But it was a cumbersome method.

Accordingly, I set up a new system of numerical comparison, which was made the official method in 1949. The new system makes use of a series of arbitrary numbers from 0 to 5. Zero represents invisibility, 1 for visible but very fine grained, and so on through 5, which is the coarsest granulation ever observed with the means employed. These are crude granulation numbers. Monthly means are taken which are used to establish the granulation numbers for the year. This is a simple and direct means of comparing granular activity with spot activity as expressed by the Wolf numbers. Due to irregular distribution of observations by quantity, a correction to the crude monthly figures is introduced whereby the means may be brought into comparable relation. The method is not perfect, but granulation numbers, when compensated by this method, yield a curve which is rather reliable and which may be compared directly to the Wolf curve of sunspots.

MODEL OF ECLIPSING VARIABLES, by John J. Ruiz

A model of an eclipsing variable similar to that described by Dr. William Calder in the Sky and Telescope magazine for March 1952 was demonstrated. This model was constructed independently of Dr. Calder's. It consists mainly of two lights, one fixed and the other revolving with a period of one minute. A 931A multiplier tube is placed at a distance and its indications are amplified by a Kron type amplifier and recorded on an Esterline-Angus recorder. A variable of the Algol type was demonstrated, showing the primary and secondary minima; by placing the stationary light off center, the effect of an exaggerated eccentric orbit, such as that of Zeta Aurigae, was shown. The demonstration was marred somewhat by the presence of "noise" or "grass" which was attributed by some of the audience to "bad seeing," but which was traced afterwards to a loose ground connection.

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