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the Spectrum

Editor:
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MAY - JUNE 1978

MAY MEETING: The May 12, 1978 meeting of the BAA will be held in the New Science Building Auditorium of the State University College at Buffalo (Buffalo State) beginning at 8:00 p.m. In a departure from the normal meeting format, a panel of six BAA "experts" on the various aspects of astronomy will field questions from the general membership. Dr. Jack Mack, Ernst Both, Edith Geiger, Ed Lindberg, Darwin Christy, Tom Dessert, and your Spectrum editor will attempt to answer your queries running the gamut from extraterrestrial life to planetary observing to astrophotography to telescopes. Be prepared for an entertaining and educational evening.

JUNE MEETING: The June 9, 1978 meeting is the BAA's annual business meeting. In addition to the traditional yearly reports, election of officers will be held. In order that the true preferences of the membership are reflected in the balloting, it is important that all make a special effort to attend. The meeting begins at 8:00 p.m. in the Buffalo State New Science Building Auditorium.

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NEWS NOTES -

Again this year, the BAA will be an active participant in the annual Southtowns Fair held at the Erie Community College South campus (on Route 20 near Rich Stadium) on May 5, 6, and 7. Astrophotos, drawings, paintings, telescopes and accessories of BAA members will be on prominent display in the main building cafeteria exhibit area.

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SPY AND TELL

Tom and James Pasek are planning a planetarium and observatory trip which will take them to Texas, Arizona, California and Chicago.

Esther Goetz is recovering nicely after a mid-winter illness which hospitalized her on two occasions.

Ken Biggie is preparing to move from Kenmore to West Seneca.

Tom and Marty Dessert are sporting a golden tan as a result of several weeks' vacation in Florida.

An interesting article on Al Ricciuti and his well-known stone house appeared in the Buffalo News Magazine section on March 26th.

Orrin Christy, who has worked at American Optical and Calspan, became employed recently in the research department of Moore Business Forms, Niagara Falls. He will be transferred to the new research center which the company is opening on Grand Island around July.

James Lehmann who teaches Earth Science at Tonawanda Junior High is also in charge of the audio-visual department. He has a Rocket Club for eighth graders where they make and "shoot off" their own rockets. He also schedules a "Night Observation" several times a year for students and their friends, using the school's telescope. Both activities are highly successful.

On June 21st, Fred Price will leave for his home in England where he will stay until the end of August. Joe Provato will visit Fred in the first three weeks in July. They are planning a week-end trip to South Wales, a visit to Greenwich Observatory, and to Hampton Court to see the astronomical clock.

Edith L. Geiger

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METEOR SHOWERS FOR MAY AND JUNE

On the 17th of May the Zeta Herculids will adorn the morning skies. They are a little known shower but contribute to the many showers throughout the year. The duration has been computed to be about 14 days with the radiant lying at 16 h 28 m R.A., 28 degrees N. dec. They produce very fast streaks with a tint of yellow trailing. About seven may be seen hourly, and the average magnitude is only about 4.5.

May 30th gives us a variable shower known as the Eta Pegasids. Their trajectory is slow and short in length. They are deep red in hue which means that they may have a high iron-nickel content. Average magnitude is about 4. The radiant is 22 h 00 m R.A., 28 degrees N. dec. The count may be none this year, but then it could produce as many as 25 hourly.

The Arietids can be seen on the morning of June 8th, at maximum. It is a 12 day shower and is known as a stream. At maximum, 60 have been counted in an hour. They are of the average trajectory with a tint of blue. The radiant is 2 h 20 m R.A., 23 degrees N. dec.

Along with the Arietids on the following morning, June 9th, there are two showers, the Zeta Perseids and Alpha Scorpiids. There will not be too much confusion as to which are which as the radiants are far apart. The Zeta Perseids can produce about 40 hourly from 4 h 8 m R.A., 23 degrees N. dec. Again this is a stream which means that it occurs for 16 days with the maximum on the 9th. The Alpha Scorpiids radiate from 16 h 48 m R.A., 23 degrees S. dec. This is a stream lasting for 15 days. The shower of meteors are about the same as far as speed, color and magnitude. It is a challenge to separate these showers. GOOD LUCK!!

The Ophiuchids occur on the 20th of June and is another stream lasting about 12 days. An hourly count may exceed 10 in rare cases. It lies at 15 h 30 m R.A., 20 degrees S. dec. Most of these showers are little known. Reporting one's observations is valuable for accumulating data on these showers.

On June 28th one of the major showers appears, the Draconids, which are related to Comet Pons-Winnecke 1819. It is an irregular shower where as many as 50 hourly have been counted. Its duration is only 2 days. These are rapid long meteors with an average magnitude of 3. The radiant is 15 h 12 m R.A., 58 degrees N. dec. This shower is not (NOT) to be confused with the Draconids of October 9th which is related to Comet Giacobini-Zinner.

On June 30th the Bet Taurids show themselves for 11 days. Comet Encke is supposed to have left these trails in the skies. 20 may be seen hourly for about three days either side of the 30th. 5 h 35 m R.A. and 19 degrees N. dec. is the radiant. These showers are brilliant white and medium speed with long tails.

On July 6th the Sagittariids give us 12 hourly from 20 h 00 m R.A., 30 degrees S. dec. I have little information on these but am hoping to find more in the near future.

Darwin Christy

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BAA PAST PRESIDENTS

One of the unheralded duties of the Secretary of the BAA is to be keeper of old records. Copies of past Spectrums, minutes, letters and forms fill most of a fair size box.

While rummaging through some of these old papers, I've found a list of past presidents. I thought you might be interested in knowing who they are. This list doesn't include presidents of organizations that were forerunners of our own, such as the "Buffalo Astronomical Society" and, later, the "Buffalo Amateur Telescope Makers" formed in 1934. I assume that 1946 marks the start of our group under its present name. Apparently officers' terms were for one year prior to 1966 and for two years afterwards.

I wonder how many of you remember these names. If you know who the officers were before 1946, let me know and I'll add their names to the archives. That will help fill up the box for the next Secretary!

1.	James McArtney	1946 - 1950	3½ terms
2.	Rudolph Buecking	1950 - 1951	1½ terms
3.	Rev. George Walker	1951 - 1953	2 terms
4.	Dr. Shirley Jones	1953 - 1954	1 term
5.	Jack Ballantyne	1954 - 1955	1 term
6.	Edward Lindberg	1955 - 1956	1 term
7.	Eugene Wallmayer	1956 - 1957	1 term
8.	George Gibson	1957 - 1958	1 term
9.	Herman Elson	1958 - 1962	4½ terms
10.	Ronald Clippinger	1962 - 1966	3½ terms
11.	Fred Price	1966 - 1968	1 term
12.	Richard Zygmunt	1968 - 1972	2 terms
13.	Darwin Christy	1972 - 1976	2 terms
14.	Fred Price	1976 -	

Rowland A. Rupp

THE SKIES FROM THE HONEY-HOUSE, 1977

Viewing from the Honey-House Observatory is not like that from the Orbiting Astronomical Observatory (OAO) in space. We find that there were only eight (8) nights out of 365 in which the Milky Way could be seen with any clarity. January 13th was the first time. Not until July 10, 11 and 24th could one view it again. September 26, November 21, December 3 and 4 were the last of the evenings to reveal the Milky Way.

Throughout the year though, many other nights did afford us a view of the heavens with not too much difficulty. 37 nights were very good; stars as faint as 5th magnitude were visible. One could photograph with exposures as long as 25 minutes. Fourth magnitude stars could be seen on 54 nights without too much eye strain. These are about the average type clear nights around this area. Third magnitude stars and brighter could be observed on 41 nights. These nights are best for observing planets. Telescopic observations of the planets are usually excellent through this type of overcast.

The effort required to brave the lesser clear nights usually convinces one it is time to become an armchair astronomer, but if you wished, you could have seen second magnitude stars on 38 nights. Only first magnitude stars could be observed on 29 nights and the other 158 nights were blanked out by clouds and overcast. These are the times a radio astronomer does not really care what is happening outside. His equipment is still functional.

If you counted the number of nights from good to bad, you will see that 8, 37, 54, 41, 38, 29 and 158 added up totals 365; as simple as that.

The longest run of good observing was from July 4th through July 17th while the worst was from January 27th through February 12th. Remember the Blizzard of '77-??? The best all around month for observing was July and the worst was November. Let's hope this is not what the future may have in store for us in 1978.

Darwin Christy

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PERIODIC VARIABLE STARS

In 1596, several years before the invention of the telescope, David Fabricius, a German clergyman, discovered a "stella mira", or wonderful star--a star of fluctuating brightness in the constellation Cetus. Marvellous though Mira (Omicron Ceti) was, its periodicity was not recognized until 1639 and it remained the only variable star known until 1669 when the changing brightness of the Demon star Algol (Beta Persei) was observed.

Discoveries of variable stars were few and far between (Chi Cygni in 1686 and R Hydrae in 1704) until the last two decades of the eighteenth century when seven more were recorded. Among these was Delta Cephei, a naked-eye star whose variableness was discovered

in 1784 by John Goodricke, a deaf and dumb English astronomer. Only twenty-four variable stars were catalogued by Argelander in 1850 but, by 1854, Pogson had records of fifty-three to include in his catalogue. Hiram Mattison, writing a high school astronomy textbook[1] at this time, considers the variations of brilliance of these stars one of the most remarkable of celestial phenomena.

Mattison also notes that the cause of the periodic variations in brightness was not known and he quotes F. Abbott, who said:

> "Whatever may be the cause, the fact of these variations is perfectly established, and the contemplation of the stupendous changes which must be occurring in those distant orbs overwhelms the mind with amazement. Worlds vastly larger than our sun suddenly appear, and as suddenly disappear. Now they blaze forth with most resplendent brilliancy, and again they fade away, and often are apparently blotted from existence. These worlds are unquestionably thronged with myriads of inhabitants; and the phenomenon which to us appears but as the waxing or waning luster of a twinkling star, may, to the dwellers on these orbs, be evolutions of grandeur, such as no earthly imagination has ever conceived. But these scenes, now veiled from human eyes, will doubtless all be revealed, when the Christian shall ascend on an angel's wing to the angel's home."

Happily, we do not have to wait that long to acquire a fairly good understanding of the nature of variable stars. The astronomers of the past, while awaiting the knowledge that would come upon their ascent into heaven, were amassing new data and advancing various theories to explain their observations--very interesting theories, indeed!

Some theorized that the periodic variations in brightness of the stars were caused by opaque bodies, similar to our Sun's planets, revolving around them and cutting off a portion of their light from the observer. Others thought that the variable stars were moving in huge elliptical orbits; when near, they were bright, when distant, they were dim. Yet another explanation of the variability of certain stars was that they were surrounded with a kind of mist--a nebulous mass traveling through space and which, not being self-luminous, would veil, or even extinguish, the stars in question. A fourth theory was that the distant suns had one luminous and one clouded, or totally dark, hemisphere and that their axial rotations caused the observed variations in brightness. The idea that there were some stars whose forms differed from a sphere and whose rotations thus presented different aspects to observers (such as a thin flat disc seen edgewise or flat side on) was cited by Elias Loomis, Professor of Natural Philosophy and Astronomy in Yale College, in his textbook of 1871.[2] This idea was rejected, however, by Amedée Guillemin in The Heavens (1872) as "not being in accordance with the principles of mechanics which accounted for the figures of celestial bodies."[3]

Variable stars have now been under investigation for more than three centuries and have been intensely studied for about one hundred years. Initially, variable stars were found either by general observation of the sky or in connection with the formation of star charts and catalogues. Guillemin describes a method of determining magnitudes: By successively contracting the aperture of a telescope, stars of all magnitudes can be made to disappear and so by determining at what aperture stars of known magnitude become just extinguished, the aperture at which a star so disappears becomes an index of its magnitude. By determining magnitudes (apertures) of a star over a period of time and comparing these magnitudes with those of other stars in the neighborhood, changes in brightness can be detected.

For the most part, the light of stars was initially studied by such differential or relative methods. Then came photography and spectroscopy which enabled astronomers to detect more easily and investigate more systematically variable stars. Using a blink microscope, the images of hundreds of stars on a single photographic negative or plate can be quickly compared with those of the same region on another plate taken at a different time. This, certainly, facilitates the discovery of variable stars and photometric and photoelectric methods provide magnitude determinations of much greater accuracy than do visual measurements. Shortly after photography became a standard tool of the astronomer, spectroscopy revealed that variables exhibited spectrum changes and, about 1886, Professor E. C. Pickering of the Harvard College Observatory inaugurated a program for the extensive photography of stellar spectra.

Astronomers now classify periodic variable stars, those whose fluctuations in brightness repeat at almost equal intervals of time, in four categories:

I. RR Lyrae - prototype RR Lyrae
II. Cepheid - prototype Delta Cephei
III. Long Period - prototype Omicron Ceti (Mira)
IV. Eclipsing - prototype Beta Persei (Algol)

The eclipsing variables (Type IV) are geometric variables--binary stars whose orbital planes are very nearly in our line of sight and whose two stars thus periodically eclipse one another with consequent periodic changes in the apparent brightness of the system. The period of variation is merely the orbital period in which the two stars revolve about their common center of mass. Their periods are generally short, averaging three days, because small orbits are favored for the occurrence of an eclipse. Usually the system remains at constant brightness, dimming only temporarily at intervals (when the darker companion star eclipses the brighter one). Thousands of such systems are known; most are also spectroscopic binaries, while very few are visual binaries. Eclipsing variables are important because the size, density, and surface brightness of the component stars can often be determined with fair accuracy. They are, however, in an entirely different class from the other periodic variables.

The other three types are intrinsic variables--pulsating stars whose atmospheres undergo periodic expansion and contraction, thus creating changes in brightness. In direct contrast to the abrupt changes in brightness of most eclipsing stars, the pulsating stars exhibit continual changes in brightness.

RR Lyrae variables are all telescopic objects; the first ones were found among the faint stars in the great globular star clusters and were called Cluster Variables. Later, similar variable stars having no connection with clusters were discovered and astronomers began calling these stars RR Lyrae stars after the prototype while others referred to them as short-period Cepheids. They come to maximum light about twice every day with almost clock-like regularity and they probably all have the same mean absolute magnitude (about 0.5). They lie off the main sequence, belonging to Population II, and are of spectral class A2 to F6. They are fairly numerous but are of low luminosity so are not so well studied as the similar but brighter Cepheids.

The long-period variables (Type III) are the most numerous and have been thoroughly studied. Fifty-six long-period variables were known before 1860; now thousands are known. Their periods are long, 270 days being a typical value, and the change in brightness is often great, a typical star being 100 times brighter at maximum than at minimum. Mira, for example, is visible to the naked eye when brightest, invisible when faintest. These stars are cool (about 2000° K) so that most of their radiation lies in the infrared and an increase of even 500°K in surface temperature during contraction shifts much radiation into the visible wavelength band. Although the total amount of radiation emitted by the star increases only slightly, the amount of visible radiation is dramatically increased. Long-period variables have an average magnitude of +1 to -2 and their spectral class is M1 to M6. However, these stars can be somewhat irregular in both period and maximum magnitude.

The Cepheid variables are the most important of the pulsating stars. Their periods average about six days, their average magnitude is -0.5 to -6 and their spectral class is F6 to K2. Cepheids are famous as "yardsticks of the universe" and they will be discussed in more detail in a future article.

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2. Loomis, Elias, Elements of Astronomy, Designed for Academies and High Schools, New York, 1871, pp. 220-222.
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4. Merrill, Paul W., The Nature of Variable Stars, New York, 1938.
5. Smith, Elskė v.P., and Kenneth C. Jacobs, Introductory Astronomy and Astrophysics, Philadelphia, 1973, pp. 273-274, 282-283, 387-393.

Because of limited space in this issue, the "Sky Test" of the Cave 12½-inch Newtonian will be found in the next issue of The Spectrum along with:

-The BAA summer star parties: when and where

-More "Constellations of the Ancients"

-Another BAA member "profile"

STELLAFANE this year will be August 4-5-6. The Deazley family is planning on going, and is interested in contacting any other BAA members who want to attend, or need information about it. Call Bill or Elaine at 652-0986. This is a great opportunity to combine camping and astronomy, and spend a pleasant weekend in beautiful Vermont, with congenial fellow astronomers. Think about it!

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FIRST CLASS