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The Astronomical Password

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Passwords have been the means of access into secret meetings from time immemorial. Astronomy deals with the secrets of the universe, so one need not be surprised that students of this science possess a password. Here it is—SYZYGY. It is rumored that if perchance you should visit the planetarium at Chicago, Yerkes Observatory at Williams Bay, Mt. Wilson Observatory, and use this word; at once, perhaps, you would be invited into the charmed circle, given the exclusive use of the largest telescope for the evening, invited out for dinner, and probably you could strike a loan sufficiently large to enable you to make the journey to the next observatory

Of course, after the publication of this most secret password by Amateur Astronomy, it perhaps will not have the same magical charm that it has had in the past.

Syzygy. This word comes from the Greek. It means joined together as by a cross-bar. At syzygy, the sun, moon, and earth, are nearly in the same straight line, and would be exactly so if the inclination of the earth's orbit were zero.

This condition occurs every time there is a new moon, and every time there is a full moon. At some times when the three bodies are in an exactly straight line, instead of being nearly so, eclipses of either the moon or the sun occur, depending of course on the age of the moon. If syzygy occurs at new moon there is an eclipse of the sun visible somewhere on the earth, and if syzygy occurs at full moon there is an eclipse of the moon. This exactly straight line type of syzygy occurs more often than most people realize, usually occuring anywhere from two to seven times each year. Of course ordinary syzygy occurs twice a month.

OCCULTATION

When the moon passes between us and a star, the star is said to be occulted, that is, darkened. The occultation of Venus on Sunday evening was seen by Madison, Wisconsin, astronomers under perfect weather conditions. The beautiful spectacle will never be forgotten by those of us who had the pleasure of observing it through a telescope.

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ETA AQUARIDS

Members of the Madison Astronomical Society on Friday, May third, had an opportunity to observe the acquarid meteors under most unusual conditions. That morning several inches of snow had fallen and the Monona Golf Course was blanketed with thick snow, out of which stiff trees pointed laden with white. The landscape resembled nothing so much as an evening in middle January were it not for the constellations riding above the southern horizon. Instead of Orion, Lepus, and Sirius blazing down on the snowy fields, the observers saw Scorpio and Sagittarius glittering above the unusual prospect. One is acustomed to think of these last constellations rising above haze bound lakes on soft summer nights when mosquitoes buzz, air is warm, and leaves rustle. Yet here they were in very unfamiliar surroundings, cold air, bare trees, and fields clad in snow and ice.

CELESTIAL PHOTOGRAPHY

Because of the confusion which exists in the minds of some amateurs, concerning the theory of stellar photography, in that the usual laws of snap-shot photography do not apply, the following questions were asked of Prof. Ross of Yerkes, well known for his lens designing.

1. Is is true that the magnitude of a star which can be photographed is a function only of the aperature and not the aperature-ratio (f:ratio)?

2. Is it true that in photographing extended surfaces, like the moon or nebulae, that it is the aperature-ratio which is the controlling factor?

Professor Ross replied, dated May 9, 1934:

> Dear Sir:
>
> Your inquiry of May 3 has been received. It is generally considered that the magnitude of a star which can be photographed is only a function of the aperature, (1) and not of the aperature-ratio. This is not strictly true. Many formulaes have been proposed, but the trouble is that they apply only to certain types of lenses, their degree of correction, and more important, the average seeing conditions. The more perfect the lens, and the more perfect the seeing conditions, the more nearly (1) holds.
>
> In photographing extended surfaces, it is the aperature-ratio which is determinative.
>
> Very sincerely,
> J. E. ROSS

This will seem strange to many amateurs accustomed to thinking of lens-speed as synonymous with f:ratio, but for stars f:ratio is not important, the faintness of magnitude reached depending almost entirely upon the diameter of the lens.

QUESTIONS AND ANSWERS

Question: What is a galaxy?

Answer: A galaxy is a group of many stars. Stars in space seem concentrated in groups, usually in thin, spiral discs, with bright and dark nebulae near the center of the disc. These island universes, or galaxies, as these groups are called, often have a spiral structure when seen from the earth and hence are often called spiral nebulae. Almost all of them are too far from the earth to permit us to see the individual stars in them, but the spectroscope proves their composition. Our galaxy includes all the stars one can see in the sky, and what we call the Milky Way is merely the thicker portions. Its center is in the direction of Sagittarius and the sun is located out in the thin spiral part. The Andromedae nebulae is a galaxy very similar to our own and can be seen by the naked eye on a clear night.

Question: What is a variable star?

Answer: Nova Hercules which appeared last December gives one some idea of what a variable star is like. It is a star that changes its brightness. Some variables change as much as a hundred thousand times in brightness. Many of them change fairly regularly and their brightness at any time can be easily predicted. Others vary in a most uncertain fashion and no predictions are possible. Astronomers do not know just why stars change like they do and at present are very interested in solving the problem. The amateur, under their direction, by making records of the brightness of these stars can do much toward helping solve their mystery.

A NOVAE PROGRAM

Nova Hercules (180445), which blazed up last Christmas time, reaching first magnitude, then alternating from third to fifth, dropping suddenly in April to ninth, and then after a short pause, sinking way down to less than thirteenth, has aroused new interest in this type of star. Especially are astronomers anxious to catch the next one earlier in its rise. All this offers a new and interesting field for amateur activity. It has occured to members of the Four-A that a lookout program for amateurs is highly desirable, and to this end they are working on a program of visual and telescopic research for the early detection of these unique stars.

Although Leon Campbell has been urging such activity for years no one has had the time to inaugurate such a program, and the AAAA feel that this work is one of their first tasks. It is suggested that an amateur program be planned that will take but little time and yet cover the field fairly well. Provision is to be made for the owner of a telescope. Each person will have a galactic field to cover, and will be provided with suitable charts by the AAAA. Provision will be made each month for some kind of column in Amateur Astronomy reviewing the work done.

Preliminary observations seem to indicate the work will be rather easy and several members have already voluntered to test the program starting July first.

It is suggested and hoped that any interested amateur, whether he be a meteor man, a variable man, or a telescope maker, write in to the secretary of the MAS, adding what suggestions he deems necessary.

RECORDING TIMERS

There are three principal types of recording timers adaptable to use in astronomy. The first and perhaps most common is the chronograph, an instrument incorporating a strip of paper or paper on a revolving cylinder moving under one or more electrically operated stylii or pencils, each tracing a straight line. One line is broken at regular intervals, usually one second, by a jog of the stylus at right angles to the line. The second and subsequent stylii, record by similar jogged lines the time of occurance of the phenomenon to be recorded. This instrument is used for checking the clocks of the Naval Observatory with each other and with the stars. When properly constructed, this instrument is accurate to within .001 second.

The second type, a photographic timer, has so many modifications that it is difficult to describe in detail. The principal of operation is the recording of a clock face on a photographic film. This type of recorder finds greatest use in sports where a photographic record of time is made on the same film which records the event. Modifications of this timer are used in the research laboratory and in astronomy. The author has constructed a similar recorder and called it an "Occultimer" for it is used in timing occultations. An electrically operated camera makes a photographic record of a brightly illuminated electric clock with a large second hand.

The third class, the printing time recorder, finds the greatest use industrially in time clocks and time stamps. The principal of operation is the manual or electrical actuation of numbered wheels or disks to imprint on a piece of paper or card the correct time. These numbered wheels are almost universally driven by synchronous clock motors, some of the older forms still using pendulum or balance wheel clocks.

The author has designed and constructed for the Milwaukee Astronomical Society, a modified printing time recorder for meteor work. Three wheels with raised electrotyped numbers are driven through appropriate link mechanisms by a small synchronous clock motor. The second and minute wheels are numbered from 0 through 59 and the hour wheel from 1 through 12, repeated five times. An electrical solenoid below the numbered wheels provides the impact for printing the time on adding machine paper. A typewriter ribbon between the wheels and paper makes the imprint legible. After each imprint or time-record, the paper automatically moves along to provide a new section. The solenoid is operated by a pear-shaped push button in the hands of the operator. The instrument as such is useful only for one operator so four relays were added to permit four stations making time records at the same time. To identify the time records according to stations, four small solenoids were added, each printing a station number in addition to the time. If several observers push their respective buttons simultaneously, the station numbers of each is recorded but only one time imprint is made. Likewise, one observer may still be pressing his button when a second observer presses his, each making a separate time record without interfering with the other.

This printing time recorder has proved invaluable in meteor work, both during showers and for daily observation on the Oliver-Hoffmeister program.