ASTRONOMY

Celestial Fireworks

Best Chance in Years to See August Meteors As Skies Will be Dark on Crucial Nights, 11th and 12th of Month

By JAMES STOKLEY

PERHAPS the most frequent subject for speculation in the field of astronomy is the possibility of communication with other planets. A few years ago, when the planet Mars came closer to the earth than it had for a long time in the past, a number of wild schemes were proposed for signalling the hypothetical Martians. Now that rocket propulsion seems to be dawning, there has been considerable discussion of the possibility of actually traveling to some other planet, or at least to the moon.

Most of this discussion is based on a very slight scientific background, but occasionally a competent authority ventures an opinion. Probably the most optimistic of these is Prof. John Q. Stewart, of Princeton University, who has expressed the view that man will be able to travel to the moon by the year 2050. Indeed, a few months ago, Dr. Stewart took part in a radio broadcast that he prepared, describing such an imaginary flight.

No Hope of Leaving Earth

However, an equally competent authority is Dr. F. R. Moulton, of Chicago. In a recent book, *Astronomy*, published by the Macmillan Company, he declares that there is no hope that the wish of man to leave the earth will ever be realized. He says: "The difficulty of escaping the earth's gravity is insuperable; the problem of directing a journey through the celestial spaces and that of descending gently to rest on the surface of another gravitating body are equally formidable. Only those who are unfamiliar with the physical factors involved believe that such adventures will ever pass beyond the realms of fancy."

It seems, therefore, to be a case where the doctors disagree and the layman can take his choice. One can hardly help but recall, however, that not so many years ago, just before the Wright Brothers made their first airplane flight, a distinguished physicist "proved conclusively" that it was absolutely impossible for a heavier-than-air machine to leave the ground!

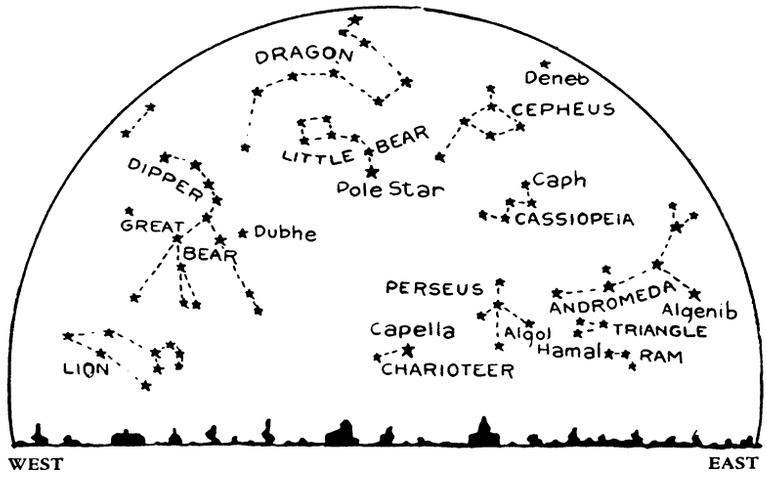
But whether or not we can ever go to other planets, or even send messages to them, it is a fact that we are constantly receiving messages from elsewhere in the universe. They have been coming for ages, and this month an unusually good chance is afforded to see them. These messages are the shooting stars, or meteors, that constantly bombard the earth from outer space, and occasionally land on the surface as meteorites. On any clear night they can be seen, at the rate of three or four an hour, but at certain times of year they come in "showers," when their numbers are greatly increased. The most dependable of these showers occurs in August. On the nights of August 11 and 12 they appear in greatest profusion. While many may be as bright as the most brilliant stars, most of them are fainter, and so the darker the sky, the more can be seen. Last year the moon was just past the full phase at the time, and its glare blotted out all but the brightest of the August meteors. This month, however, the moon is new on the thirteenth; so the crucial nights will be dark from dusk to dawn.

The reason for this meteor shower, or any such shower, is simply that the meteors are traveling around the sun in a more or less continuous swarm. This stream crosses the path of the earth in the place that it occupies in August. Then, the earth intercepts a large number of the meteors, and as they fall towards the ground they are heated to incandescence by the friction of the atmosphere. Most of them are quite small, no larger than a grain of sand, or a pin head for the largest. They are completely burned, and never reach the ground. Most meteors are seen after midnight, because at that time the earth meets them head-on. In the evening only those moving fast enough to catch up with the earth are visible.

Meteor per Minute

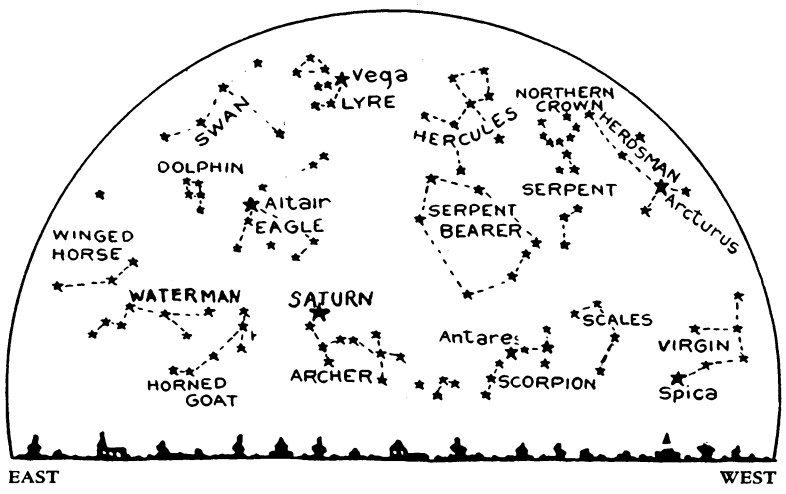
If you watch the sky after midnight on the eleventh or the twelfth, you will see them at the rate of one or two a minute. Of course, the weather has to be clear, and the sky should also be dark, if you want to see the greatest numbers. With the moon safely out of the way, one source of trouble is eliminated, but the glare of city lights may be just as troublesome. Therefore, if you want to observe the "celestial fireworks" the best thing is to get out into the country.

After you watch them for a while, you will notice a peculiar fact. They are not wandering about the sky indis-



NORTHERN SKIES DURING AUGUST

Here will be visible the constellation Perseus, from which the meteors, like a swarm of insects, seem to radiate.



FOUR STARS OF FIRST MAGNITUDE

Can be seen this month in the southern heavens: Arcturus in the west, Antares in the southweset, Vega, almost overhead, and below it to the southeast, Altaire.

criminately, like a swarm of insects, but they all seem to radiate from one part of the sky: in the constellation of Perseus. For that reason these August shooting stars are called the Perseid meteors. Actually, they do not radiate from a point. They are moving in a practically parallel direction, and their paths only seem to converge in the distance, like the parallel tracks of a railroad.

The study of meteors is one of the best means afforded the amateur astronomer to cooperate with the professionals. The latter, constantly at work with their great telescopes, can hardly afford to spare the time to chart the paths of shooting stars. But these paths should be studied, and for that reason there has been formed a very active group of amateurs, known as the American Meteor Society, with headquarters at the Flower Observatory of the University of Pennsylvania, located at Upper Darby, Pa. Dr. Charles P. Olivier, director of the Observatory, is the president and guiding spirit of this organization. New members are always welcomed, for quantity of observations, rather than a very high degree of accuracy, is wanted. Furthermore, it is a society without any dues!

Count the Shooting Stars

The simplest sort of a meteor observation is the counting of shooting stars during half-hour periods. To do this you should select a good location, away from the city, and provide yourself with a time piece, paper and pencil and a flashlight. Watch as large an area of the sky as possible, and count each meteor that you are certain you see during each half hour, for instance, from 12 to 12:30; from 12:30 to 1:00 and so on. You should also make a note of any changes that may affect the visibility, such as passing clouds. If a particularly bright meteor appears, record its time.

You should watch the same part of the sky during the whole time of observation, and note the direction. The northeast is the best part of the sky, for Perseus is in that direction in the early morning hours. By dawn, it is almost overhead. For a person who knows the constellations, a still more useful labor is to chart the meteors on a map of the heavens. The American Meteor Society issues special maps for the purpose, as well as literature giving more detailed information. These can be obtained from Dr. Olivier, to whom the observation notes should be sent.

Heavenly Commerce

At one time reputable scientists refused to believe it possible that a stone or a piece of iron could fall from the heavens to the earth. In 1790 a large number of meteorites fell to the ground in southwestern France, and were observed by hundreds of people. Over 300 signed statements were submitted to scientific bodies, as well as samples of meteorites themselves, but only to have the evidence ridiculed as an example of popular credulity. In 1803, however, some fell in another part of France, and the astronomer Biot went to investigate. He recognized their authenticity and convinced his colleagues, so since then meteors and meteorites have been respectable astronomical bodies.

But though astronomers now agree as to what meteorites are, there is a difference of opinion as to where they come from. Dr. Olivier, who is an acknowledged authority, holds to the theory that they were born of the sun at the same time as the rest of the solar system. Presumably this occurred when the gravitational effect of a passing star produced enormous tides on the sun, which finally broke off completely from the parent body, and formed the planets, and the material that formed the comets and meteors. Since some of the meteors appear to enter the earth's atmosphere with so high a speed that they must have come from outside the solar system, Dr. Olivier takes this as evidence that the process of planet building has gone on elsewhere in the universe, and that the meteors are visitors from much more distant space than has previously been supposed.

Different View

A different view is represented by Dr. Moulton, whose opinion regarding possible travel to other parts of the universe was quoted before. In his recent book he accepts the theory of Dr. T. C. Chamberlin, with whom he collaborated in developing the theory of the formation of the solar system by the action of a passing star, and which is known by their names. According to Chamberlin's theory, the sun is frequently ejecting iron, magnesium, oxygen, etc., in the form of vapor. Within a few weeks, this material reaches the distance of the earth, and by that time its heavier constituents have condensed into solid masses, which he calls chondrules. But the stuff keeps on going, though at slower speed, and the gravitational attraction the chondrules have for each other makes them form compact clusters. After long ages they may again return to the vicinity of the sun, and the heat partly melts them, and cements them into meteors. If this is true, then there is a constant supply of meteors, though one that falls tonight may have left the sun millions of years ago.

Besides the Perseid meteors, the August night skies offer some other attractions. The planet Mercury, which never travels far from the sun and is seldom seen, will be visible low in the west at twilight on the eighth and for a day or two before and after. Mars is now in the constellation of Virgo, and will be seen a little higher in the west after sunset. Saturn will be seen low in the south and the southwest all during the month. (*Turn to page* 92)

I am informed by Mr. Paget that persons belonging to the same family often have a few hairs in their eyebrows much longer than the others; so that this slight peculiarity seems to be inherited. These hairs apparently represent the vibrissae, which are used as organs of touch by many of the lower animals. In a young chimpanzee I observed that a few upright, rather long, hairs, projected above the eyes, where the true eyebrows, if present, would have stood.

The fine wool-like hair, or so-called lanugo, with which the human foetus during the sixth month is thickly covered, offers a more curious case. It is first developed, during the fifth month, on the eyebrows and face, and especially round the mouth, where it is much longer than on the head. A moustache of this kind was observed by Eschricht on a female foetus; but this is not so surprising a circumstance as it may at first appear, for the two sexes generally resemble each other in all external characters during an early period of growth. The direction and arrangement of the hairs on all parts of the foetal body are the same as in the adult, but are subject to much variability. The whole surface, including even the forehead and ears, is thus thickly clothed; but it is a significant fact that the palms of the hands and the soles of the feet are quite naked, like the interior surfaces of all four extremities in most of the lower animals. As this can hardly be an accidental coincidence, we must consider the woolly covering of the foetus to be the rudimental representative of the first permanent coat of hair in those mammals which are born hairy. This representation is much more complete, in accordance with the usual law of embryological development, than that afforded by the straggling hairs on the body of the adult.

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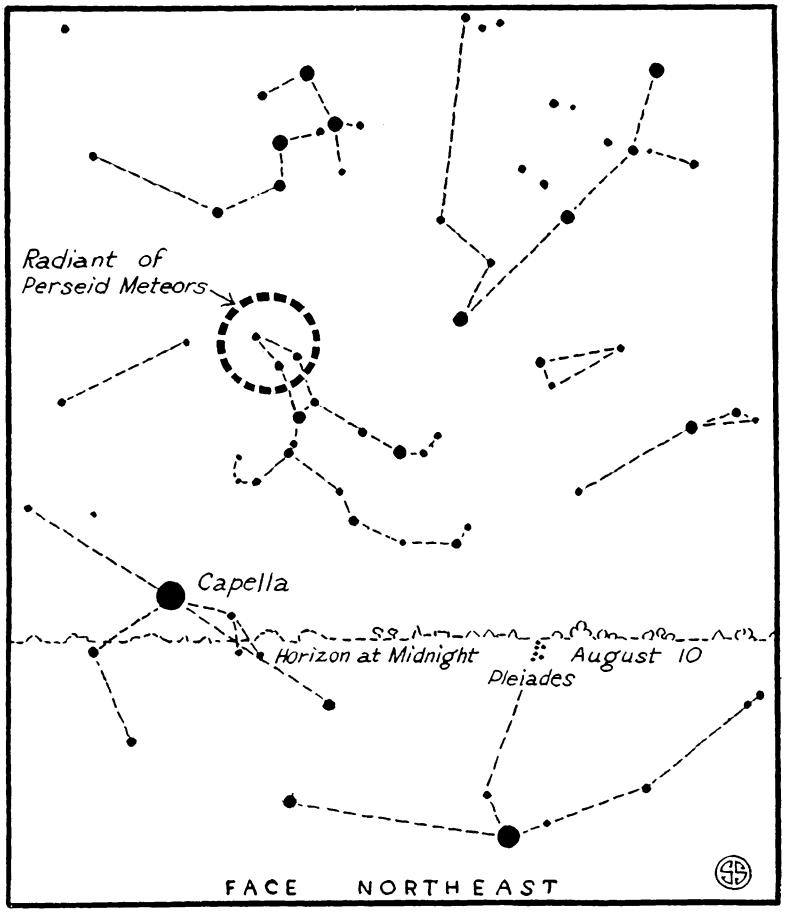

USE THIS MAP TO GO METEOR HUNTING

If you do so on the dark nights of August 11 and 12 you will achieve best results by getting out in the country away from city lights. First find the constellation Perseus, the apparent center of meteor radiation. You can do so by spotting the star, Capella, one of the brightest in the northeastern heavens. The larger the dots representing stars on this map, the brighter the stars.

From Page 87

Five first magnitude stars decorate the August evening sky. In the west is Arcturus, in Bootes, the bear driver. Antares, in Scorpius, the scorpion, shines with its red light in the southwest. Almost overhead is Vega, in Lyra, the lyre. Below it, to the southeast, is Altair, in Aquila, the eagle; and, to the east, Deneb, at the top of the northern cross, or Cygnus, the swan. The moon, as was mentioned before, is new on the thirteenth. Last quarter is on the sixth, and first quarter on the twentieth. Full moon occurs on the twenty-seventh. There will be moonlight evenings, therefore, during the fortnight beginning about the fifteenth.

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ENGINEERING

Novel Apparatus Enables Trade-Marking of Coal

HOUSEWIVES will be able to choose their favorite brand of kitchen coal just as they do articles at the delicatessen if the trade-marking precedent reported in the *Coal Age* is followed. In order to standardize its product and protect the consumer, a Virginia coal company is giving each lump of coal a distinctive marking.

With the new trade-marking apparatus, the coal from the mine is passed along a trough conveyor and comes in contact with metal arms placed perpendicularly across the width of the conveyor. At the end of each arm is a curved metal piece or shoe which rides over the lump of coal. As long as the shoe is in contact with the coal lump the valve to an attached pressure gun is open and the lump receives a neat band of bright paint.

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