

ASTRONOMY

The Swan Swims a River of Light

The Milky Way, With Giant Scattered Suns Crowded Into Haze by Distance, Is the Great Bird's Background

By JAMES STOKLEY

CYGNUS, the swan, sometimes called the "northern cross," dominates the evening sky of September. It is close to the zenith, with the vertical part of the cross extending from southwest to northeast. The bright star to the northeast, Deneb, marks the head of the cross and also the tail of the swan. The row of stars off to the southwest represents the bird's long neck, outstretched in flight. His wings are formed by the stars that outline the arms of the cross.

Directly west of the cross is a star that is brighter even than Deneb—the brightest star, in fact, to be seen at present in the evening sky. This is Vega, in Lyra, the lyre. To the south of Cygnus is a third bright star, flanked above and below by two fainter ones, Altair, a part of Aquila, the eagle. Deneb, Vega and Altair form a huge right triangle which is a convenient guide from which to find other stars.

Another brilliant star of the evening skies of late summer can be seen low in the northwest at the bottom of a constellation shaped something like a kite. The constellation is Bootes, the bear-driver, and the star is Arcturus. Between Lyra and Bootes is Hercules, a large constellation, but one which contains no first magnitude stars.

"Milk Dipper" in South

To the right of Bootes is the great dipper, and to the left is the group of Ophiuchus, and the serpent which he is holding. These two likewise contain no very brilliant stars. Almost directly south, just under Aquila, is Sagittarius, the archer, containing a well known little group, the "milk dipper." The bowl of the dipper is turned downwards, and the handle extends to the right into the Milky Way.

To the left of Sagittarius is Capricornus, the sea goat. Here we now find Saturn, with its brilliant, steady gleam, quite different from that of the stars. Saturn, of course, is a planet, a member of the family of bodies which circle around the sun, the solar system

of which the earth is part, while the stars are other suns, at vast distances.

Low in the southeast is a bright star which is one of the most southern objects which can be seen from most of the United States. This is Fomalhaut, in Piscis Austrinus, the southern fish. Just above it is Aquarius, the water carrier, supposed by the ancients to represent an old man carrying a water jar, whence the water is flowing into the fish's mouth. High in the east is a square of four stars, of similar brightness, standing on one corner. This is the "great square of Pegasus." Only the three southernmost stars, however, are in Pegasus, the winged horse, the fourth being part of Andromeda, the chained lady. Below the square is a group of stars forming some more fishes, the constellation of Pisces.

Familiar "W" in North

Quite low in the northeast is the brilliant star Capella, in Auriga, the charioteer; but most of him is below the horizon until late in the evening. Next towards the east is Perseus, the mighty champion, who stands now entirely above the horizon, and above him, and shaped like a W on end, is the group of Cassiopeia, the queen, mother of Andromeda. All these constellations,

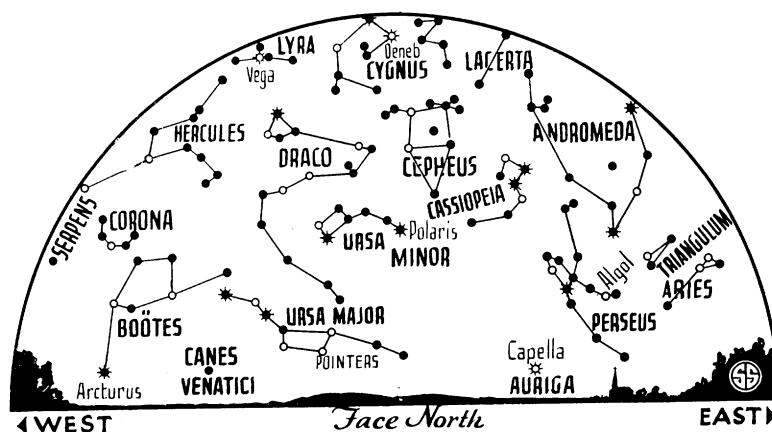
and others, are indicated on the accompanying maps, which show the stars as they appear about 10 o'clock standard time, at the beginning of the month, or about 8 o'clock at the end.

This is a good month of the year in which to see that broad band of light that extends across the sky, which we call the Milky Way. It passes through the constellations of Sagittarius, Aquila, Cygnus, Cepheus, Cassiopeia and Perseus, so that this month it goes from the northeastern horizon directly overhead and down to the southwest. Unfortunately, however, the Milky Way is a stranger to many people today. It can easily be seen in the dark sky of the country, but with the competition of city lights and their attendant glare in the sky, it fades from sight. Fortunate are those who can occasionally get away from the proximity of the city and can then appreciate it.

Even a pair of opera glasses will suffice to show the nature of the Milky Way. They reveal that it consists of countless millions of stars, each one so distant and so faint that it can not be seen by the unaided eye, but together their light combines into this luminous pathway.

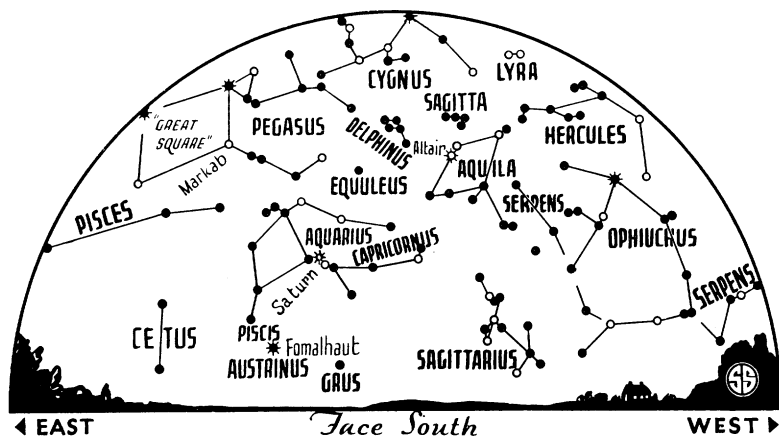
The Greek philosopher, Democritus, in the fifth century B.C. suggested that it was so composed, but it remained until 1610, when the Italian astronomer Galileo turned his first little telescope upon it, that the stars of which it consists were actually seen.

* * * • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS



CYGNUS AT THE ZENITH

Known also as the Northern Cross, the constellation of the Swan is a splendidly conspicuous sky-mark on the Milky Way.



SATURN RIDES THE GOAT

Conspicuous among the scintillating bright stars by its steadier, unwinking light, the ringed planet rules the September evening skies.

It is a far cry from Galileo's observations to the modern photographic telescopes at our great observatories which record, on a single plate, thousands upon thousands of stars crowded together in vast clouds. And every one of these stars is a sun, similar to our own, and perhaps some of them, at least, have planets revolving around them. But they are at such distances that even with the most powerful telescope, the stars all appear as mere points of light.

The question of planetary companions, and especially the possibility of their being inhabited, lies entirely within the realm of speculation. No instruments now in existence or even contemplated are capable of revealing the answer.

Not all parts of the Milky Way are bright. Even with the naked eye, certain dark patches can be seen, such as those in Cygnus and in Sagittarius. Another is in the southern hemisphere of the sky, in the heart of the southern cross, which can not be seen from these northern latitudes. They are often termed "coal sacks" and at one time were thought to be actual "holes in the sky," regions devoid of stars.

Dark Veils Against Light

If they were holes, however, they would have to be tubes through the starry swarm, and directed exactly towards us. This is most unlikely, and so now it is universally believed that they are clouds of dark material, silhouetted against the background of stars. It has been suggested that the ice ages on the earth occurred when the solar system passed through such a cloud, and the radiation received from the sun was thus diminished.

Probably there are large masses of such dark matter scattered around the

universe, but it can be seen only when it happens to be in front of a bright background. Perhaps the stuff of which these clouds consist is what remains of stars that have once glowed but have long since cooled, or, on the other hand, it may be the elemental building material from which the stars are formed. Having no light, it can not be observed by that very powerful tool of the astronomer, the spectroscope.

Heavenly "Grindstone"

The Milky Way is a most significant feature of the sky, for it represents the vast majority of the stars in our system. The sun and all the other stars that we can see in the night sky with the naked eye, or even with all but the most powerful telescopes, form a system called the galaxy. This is shaped like a grindstone, and is so vast that a beam of light, even though it travels fast enough to encircle the earth seven times in a second, would take several hundreds of thousands of years to traverse its diameter. The solar system is not far from the center of the galaxy.

When we look out towards the edges of the grindstone, we see a much greater concentration of the stars than when we look to the sides. This concentration of stars around the edge forms the

Milky Way and, though the stars there appear to be very close together, this is only on account of their distance. The distance of the sun from alpha Centauri, its nearest neighbor, approximately 25,000,000,000,000 miles, is typical of the distances between the stars.

Formerly it was supposed that our galaxy included all the objects that could be observed with any telescope, but during the last decade it has been shown that there are thousands and thousands of other galaxies, outside the limits of our own, consisting, like it, of vast swarms of myriads of stars. The discovery of still more of these, at greater and greater distances, and the more detailed study of the close ones, are among the most important problems to be put to the great 200-inch telescope that is now under construction for the California Institute of Technology.

On September 23, at 12:46 p. m., eastern standard time (11:46 a. m., central standard; 10:46 a. m., Mountain standard; 9:46 a. m., Pacific standard) the sun, which has been moving southwards in the sky since June, reaches its halfway mark, and crosses the heavenly equator. This is taken as the time of the beginning of autumn, it is the autumnal equinox. On that date, the sun will rise directly east, set directly west, and will be in the sky for twelve hours, just as long as it will be below the horizon. Hence the name "equinox," meaning "equal night."

Science News Letter, September 1, 1934

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Meteor Spectra Captured In Novel Red Light Photos

TWO UNUSUAL meteor photographs were captured at the University of Toronto's Dunlap Observatory by Dr. P. M. Millman during observations of the Perseid meteor shower. They are spectra taken with special red-sensitive plates. It is expected that they will give new information about the composition of the meteors.

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Phases of the Moon

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New	September 8	7:20.1 p. m.
First Quarter	September 16	7:25.9 a. m.
Full	September 22	11:18.9 p. m.
Last Quarter	September 30	7:29.2 a. m.