Heavenly Swan Now in Evening Sky

Astronomy

By James Stokley

With September comes the beginning of autumn. The birds that migrated to the north during the summer months have now begun to think about their long southward trip. Toward the end of the month, in parts of the country, they will be seen flying over head. Among the other birds that will be seen are the swans, with long necks stretching out ahead in a southerly direction, so it is quite appropriate that the heavenly swan should be visible in the sky at this time of the year. Look overhead tonight, and you will see a cross-shaped group of stars. This is Cygnus, the swan. Unlike many of the constellations, it is a group that does bear some faint resemblance to the object which it represents.

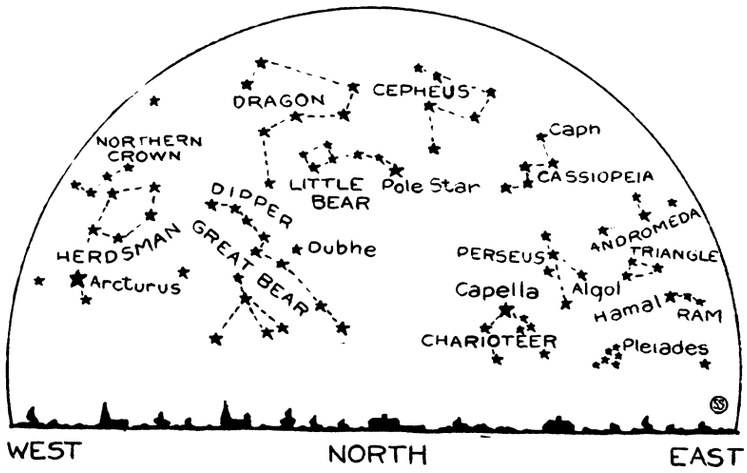
On the old star maps, such as the one by Bayer, published in 1603, the swan was depicted as flying toward the south. The lower part of the cross, the longer part, represents its neck. The cross pieces are the wings and the short upper part is the tail. There are five bright stars in Cygnus, forming the outlines of the cross. The brightest of these, the northernmost one and marking the swan's tail, is Deneb. In Cygnus there are many faint stars, the more so because it is right in the heart of the Milky Way. In it also is one of the stars which once had ideas of grandeur, and became a "nova" or new star.

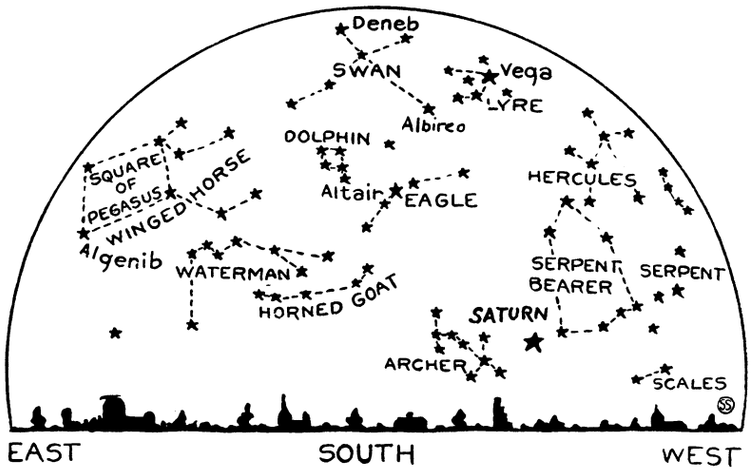
Before 1920 there was a star in Cygnus of the fifteenth magnitude, much too faint to be seen except with the very largest telescopes. Nobody had paid any particular attention to it, there seemed to be nothing about it to distinguish it from the ordinary run of stars. But one day in 1920, an English amateur astronomer, by the name of Denning, happened to look up at Cygnus and was surprised to find a star there that he had never seen before. It was of about the second magnitude. He looked at his map in surprise, to make sure that he had not suddenly forgotten some well known star. Then he realized that he had become the fortunate discoverer of a nova. The astronomical world was immediately notified, and telescopes were trained on it. Within a few days its magnitude increased to about 1.8, nearly as bright as Deneb itself. Then it began to diminish and now it is so faint that a large telescope is required to see it.

This was not the first nova to appear in Cygnus. Back in 1600 one appeared there, while another came along in the year of the American Centennial, 1876. Nor are these the only novae that have appeared. Since 1900 there have been five that have become conspicuous to the naked eye. In 1901 a very brilliant one appeared in Perseus, another flashed out in the Twins in 1912, one appeared in the Eagle, which is seen to the southwest of Deneb, in 1918. The nova in Cygnus appeared in 1920, and in 1925 a remarkable one appeared in Pictor, a constellation that is not visible from northern latitudes.

There is no particular reason to think that the first quarter of our century has been especially favored with these astronomical fireworks. Probably a great many more have appeared, but so far away that, even at maximum brilliance, they have been too faint to be detected from the earth. In fact, in the huge collection of photographic plates, made at the Harvard College Observatory, many such new stars have been found that were never noticed at the time they flashed out. The photograph tells the story.

A plate made one year may show a swarm of small black dots, each of which represents a star. Another plate made a few years later shows the same swarm of stars, but one of the black dots is a little larger than it was in the first. Still later plates might show it small again. The astronomer, examining these, sees that the star brightened up only once, and so knows that it is probably not a variable star, of the kind that regularly wax and wane. Thus he knows that he has found a nova even though it may be twenty or thirty years after the photograph was taken. (*Turn to next page*)





HOLD THESE MAPS in front of you and face North or South. The upper or lower one will then show the stars of the September evening sky

Heavenly Swan Now in Evening Sky—*Continued*

Incidentally, many of these discoveries have been made with one of the most ingenious instruments that has even been invented to aid scientific workers. Imagine a photographic plate with several thousand tiny dots upon it, and another with a similar number in the same place and of the same size except for one. How is the astronomer to find out which one has changed? It would be far too tedious to compare each particular dot separately on each plate, yet how else is the change to be measured and discovered?

To the aid of the astronomer comes an instrument with the somewhat awkward name of "blink-mikroskop". Familiar to everybody is the old-fashioned stereoscope, in which a pair of photographs is used, one for each eye. In the blink-mikroskop, the two photographic plates are placed side by side. Light passes through them to a system of lenses and the astronomer looks at them through an eye-piece similar to that of any ordinary microscope. But prisms bend the path of light so that in the same eye piece the astronomer can see either one of the plates. A small lever operates a shutter that changes from one to the other.

Thus, if you have two plates of stars, and want to find out which one has changed, all you have to do is to put them in a blink-mikroskop. Then you adjust them until the stars in each are in the same relative place. This assumes, of course, that both photographs were made with the same camera, so that the stars on the plate are the same distance apart. Then you operate the lever, or "blink" the plates, as the astronomer would say. The stars that have not changed look the same in one as in the other, so if both are entirely identical, the motion of the lever will not produce any noticeable effect. But if one of the stars has changed, that is, if in one plate it is small and in the other it is large, then the shift of the blink lever will cause this one to apparently swell and contract in a most peculiar fashion. This causes it to stand out at once from the background, and so a change may be very quickly detected.

What causes a star, ordinarily well behaved, to suddenly have delusions of grandeur and become thousands of times as bright as it used to be?

This is one of the outstanding astronomical questions, and has never been entirely satisfactorily answered. One idea that was popular in the past is that a nova is due to a collision between two stars. All the stars are moving at tremendous speed, and if two should happen to hit, something would happen. Such a collision might well produce a nova, but the fact is that the stars are so scattered in space that on the average a collision could not occur more often than once in a million years. This is the fatal objection to this theory, when we think of the five bright novae since 1900.

Probably it is caused by a sudden release of energy already within the star. According to modern ideas, the energy of the stars comes from an actual breaking up of their matter into light and heat. This process is continually taking place and if something should happen to increase it temporarily, it might produce a nova. But what that "something" is that might happen is not known. One suggestion, and a plausible one, is that a small body, a small meteor, for instance, might serve as a trigger to set off the explosion.

Perhaps a meteor might come in from outer space so accurately aimed, and travelling so fast, that it would hit the sun. It might be carried far into the star's interior before it met layers of strength enough to impede its progress. Then the energy that it had by virtue of its motion would be changed into heat and a lump of highly heated material would result. Perhaps it would be millions of degrees in temperature. At this high temperature, all sorts of things are likely to happen that do not occur at the temperature to which we are used. Some of the atoms themselves might be broken down very rapidly and a literal explosion would result. It would throw off some of the lighter layers of the star, but after it was over, the star might go on pretty much as before.

Of course, if this should happen to the sun, all of the planets would be quickly burned up. We earth dwellers would hardly have time to realize what had happened before we were burnt to cinders. Fortunately, there is no need to suppose that there is any immediate danger of this thing happening. However, there are perhaps a billion stars within reach of a large telescope. If there are ten times as many capable of becoming new stars, and as there are, on the average, ten nova a year, including the fainter ones, any star would be a nova on the average of once in a billion years. Long though this period may seem, it is short in the life of a star, and so most of the stars may have been novae several times in their history. We cannot tell whether or not the sun has ever been a nova, but the probabilities are that it will be many, many millions of years before it becomes one again, if ever.

This month brings six first magnitude stars to the evening skies. One of these is Deneb, which has already been mentioned. Directly west of Deneb, in the constellation of Lyra, the Lyre, is Vega. To the southwest of Cygnus is Aquila, the Eagle, with first magnitude Altair. Low in the northwest is Bootes, with the bright Arcturus, which will soon disappear from the evening sky completely until next year. In the south near the horizon is Fomalhaut, in Piscis Austrinus, the southern fish. Low in the northeast is Auriga, the charioteer, with the bright Capella. In a few months this star will be high over head in the evening skies.

Only one planet has been left in the evening sky, and that is Saturn. It is on the meridian, directly south at sunset, and sets about four and a half hours after the sun. Mars and Mercury are also in the evening skies this month, but so near the sun that they can hardly be seen. Venus and Jupiter are both brilliant morning stars, and can be seen before sunrise in the eastern sky.

Science News-Letter, September 7, 1929

Pennies in the Pool

Geology

A bushel and a half of hairpins, nails, badges and other miscellaneous articles too numerous to mention have been retrieved from Handkerchief Pool in Yellowstone National Park during a recent housecleaning.

According to Dr. E. T. Bodenburg, ranger naturalist, visitors at the Park must have the idea that the famous pool operates on the principle of a slot machine, for coins to the value of $1.98 were included in the haul.

The investigation of the spring's "plumbing" was undertaken to facilitate the current movements for which the spring is noted. The currents are due to the cool water sinking on the sides of the pool while the warm water rises in the center.

Science News-Letter, September 7, 1929