

ASTRONOMY

Spring is Coming

Astronomically, at Least, Seasons Change on Wednesday, March 21, When the Sun is Directly Over the Equator

By JAMES STOKLEY

ONLY ONE planet is to be seen in the evening sky this month. That is Jupiter, now brightest object in the heavens at night, appearing low in the east just above the bright star Spica in the constellation of Virgo, the virgin. A little higher in the sky and farther to the north is Arcturus, in Boötes, a star of which we heard much last summer, when its light after traveling 40 years was used to start the illumination of the Chicago Century of Progress Exposition.

High in the eastern sky is the "sickle," a group of stars resembling that implement with the star Regulus at the end of the handle, which points southwards. This is part of Leo, the lion, the blade of the sickle forming the animal's head. To the northeast is the "great dipper," with its handle hanging down.

Orion, the giant warrior, is over to the southwest. Above the three stars that form his belt is the brilliant Betelgeuse and below them is Rigel. Farther to the south is Sirius, in Canis Major, the greater of the two dogs that accompany Orion. Sirius is often called the "dog star." It is the brightest star in the sky, though it is not quite as brilliant as the planet Jupiter. Above is the lesser dog, Canis Minor, with the star Procyon.

The Twins Overhead

The twins, Gemini, are almost overhead. Castor and Pollux are their names, the latter, to the south, being the brighter.

Directly west is a red star, Aldebaran, in Taurus, the bull. This forms the eye of the beast and is part of a V-shaped group, called the Hyades, which represent its face. The Pleiades, the famous "seven sisters" are a little to the north. In the northwest shines Capella, part of Auriga, the charioteer. Cassiopeia, shaped like a W on its side, is low in the sky and almost to the north.

The maps represent the March skies as they appear about 10 p. m. on the first of the month, 9 p. m. on the 15th, and 8 p. m. on the 30th.

Perhaps the most welcome astronomical event brought by the month of March is the beginning of spring. Last December the sun was well south in the skies, but since that date it has been moving northwards. This month it is in the constellation of Pisces, the fishes, a group which could be seen in the evening skies but a few months ago.

If it were not for the earth's atmosphere, which gives the sky its blue color, we could now see these stars close to the sun, but the great glare of that body as diffused in the layer of air that surrounds our planet, hides all the stars from view in the daytime sky though they are there just as much as they are in the sky at night. If we lived on a planet like Mercury, or on the moon, bodies which have no atmosphere, we might be able to see the stars in the daytime sky.

Once Beginning of Year

On March 21, at 2:28 a. m., eastern standard time, the sun reaches the half-way point in its northward journey. At that time it will be directly over the equator. This is the position called the vernal equinox, and has long been taken as the beginning of spring. In fact, in bygone days, people began the new year at the vernal equinox instead of on the first of January.

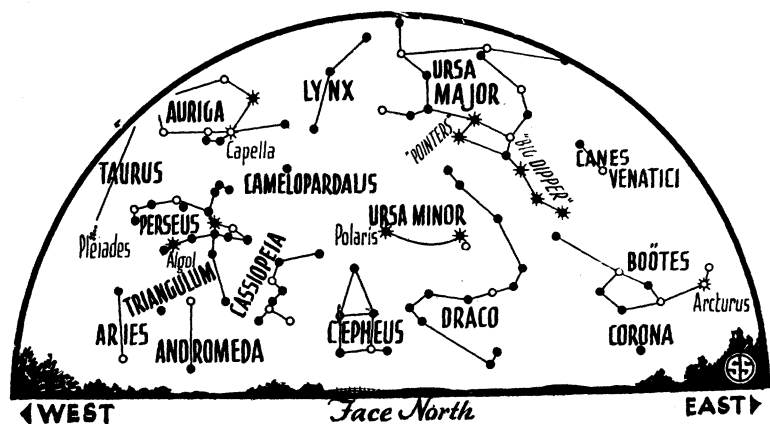
Another way that astronomers sometimes describe the event that marks the beginning of spring, is to say that at that time the sun enters the sign of Aries. Like Pisces, Aries is another of

the constellations that mark the Zodiac, the path of the sun, the moon and the planets. It thus seems a bit confusing when one finds that at the time the sun enters the sign of Aries it is actually in Pisces. Not until the end of next month will it actually be in Aries, the ram. However, the confusion is cleared when one learns something of the history of the matter.

25,800-Year Wobble

Several thousand years ago the sun actually entered the constellation of Aries at the time of the equinox, and the path of the sun, the ecliptic, was divided into twelve parts corresponding to the twelve constellations along it. After Aries came Taurus, the Bull; Gemini, the twins; Cancer, the crab; Leo, the lion; Virgo, the virgin; Libra, the scales; Scorpius, the scorpion; Sagittarius, the archer; Capricornus, the sea-goat; Aquarius, the water carrier; and Pisces.

Among the many motions that the earth is undergoing, there is a wobbling of its axis which the astronomer calls "precession." One complete "wobble" takes 25,800 years, but during this time the celestial pole, the point in the sky directly over the earth's pole, describes a large circle. At the same time the constellations of the zodiac make a complete circuit around the ecliptic. Thus, in the time since the sign of Aries was established, that group of stars has itself moved into the next sign of Taurus, while Pisces, which was then way around at the end of the line, has moved into first place. But the signs have not changed even though the constellations have, and so we say that the beginning



of spring occurs when the sun enters the sign of Aries.

Jupiter is the only planet that can be seen this month in the evening. It is a little south of the east point, and low in the sky about 9:00 p. m. It is brighter than any star. Spica, which marks Virgo, is just below. In the early morning hours just before sunrise Venus comes into view, also in the east, and during this month it is about as brilliant as it was in the western evening sky in the early winter, even exceeding Jupiter in magnitude. In fact, it is so bright that it can easily be seen in the daytime sky, if you know just where to look.

Saturn and Mercury are between Venus and the sun, but, being much fainter, they are very difficult to see. Mars passes directly in line with the sun this month and cannot be seen at all. During the coming months, however, he will come more and more into the night sky.

"By Jiminy"

Almost overhead can be seen the very interesting constellation of Gemini, the twins. Castor and Pollux are their names, with the latter, which is the brighter, to the south. They represented favorite deities of the Romans, especially the soldiers, who thought that these twins led them on to victory. They used to swear by them, and this oath still survives, in the slightly modified form, "by jiminy." This constellation also has the distinction of having had two new major planets discovered within its borders. In March of 1781, William Herschel, then organist of the Octagon Chapel at Bath, England, and an amateur astronomer, turned his little homemade telescope towards Gemini and discovered the body which later came to be called Uranus, one of the family of planets which revolves around the sun and includes our earth. Then in January, 1930, astronomers at the

Lowell Observatory, Arizona, took a photograph of this part of the sky and on one of their plates found Pluto, the most newly discovered planet.

Castor is a beautiful sight through a moderately large telescope. Instead of the single star, which it appears to the naked eye, it is then shown to be a binary, that is, a star consisting of two separate orbs which revolve around each other. Such couples are not rare, for recent studies indicate that one star in every four is so constituted. The two bodies forming Castor take about 300 years to make a complete revolution and they are so close to the earth that their light takes only 43 years to reach us. Thus they are fairly close neighbors.

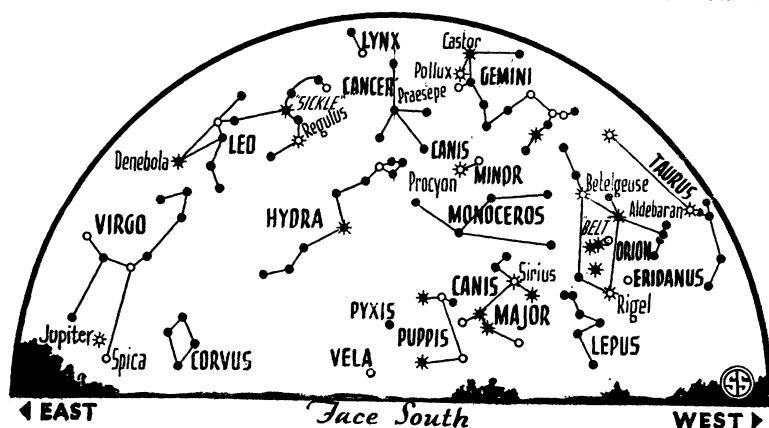
Castor has another claim to interest. It was in 1750 that the English astronomer, Bradley, discovered that Castor was a double star. Modern observations have revealed a third member of the group, a very faint star which goes around much more slowly, perhaps taking as long as 10,000 years. Even this is not the whole story, because the spectroscopist, with which so many great astronomical discoveries have been made, shows that each of these three stars consists of a pair of stars, so close together that no telescope is powerful enough to show them as two distinct bodies. Thus the star which appears single to the naked eye really consists of at least six separate orbs.

Phases of Moon

During March the moon is full on the first, at last quarter on the 8th, new on the 15th and at first quarter on the 22d. Thus, there will be moonlit evenings during the first few days of the month, and from about the 20th to the end of the month. On the fourth the moon passes near to Jupiter, with the planet to the north.

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PHYSICS

Shortest Radio Waves Measure Molecules

TWO University of Michigan scientists are using the shortest radio waves ever produced by radio tubes. These radio waves are less than a half inch long, as compared to the previous low of well over an inch and to the commonly used radio waves of about 1500 feet.

The waves are produced by electrical oscillations inside a tiny vacuum tube. The anodes or positive plates of the tube are made from graphite cylinders only three-tenths of an inch in diameter. The wave-length of the radio waves produced by the tube depends upon the time it takes the electrons to travel from the filament located in the center of the inner walls of the cylinder.

The whole vacuum tube is placed in a strong magnetic field, which also influences the wave-length of the waves produced. The stronger the magnetic field, the shorter the waves.

The Michigan physicists, Drs. C. E. Cleeton and N. H. Williams, measured the wave-lengths of these ultra-short radio waves by reflecting them from two brass mirrors three feet in diameter to concentrate the energy and spreading them out in a spectrum by means of a grating or set of finely ruled lines on a polished surface. The waves, after being focussed by the second mirror, fell on a crystal detector that amplified their electrical energy.

Perhaps the most striking thing about this experiment is the partial closing of the gap between the far infrared rays and the shortest radio waves. This gap has so far been the most difficult for the experimenter to close and this advance has decreased the radio waves by at least two octaves.

The production of these ultra-short waves, a feat in itself, was but a part of the accomplishment of the two physicists. The waves were passed through a rubberized cloth bag full of ammonia gas which absorbed a certain wavelength of the band of waves to an abnormal degree. From their measurements on this absorbed wave-length the scientists were able to show that the ammonia molecule has an apparent diameter of about 3 1/2 hundred-millionths of an inch (0.00000035 inches). That is, 100,000,000 ammonia molecules in a chain would be only 3 1/2 inches long.

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