brightness. Some, like Algol, a famous variable in the constellation of Perseus, consist of two bodies, a bright and a dark one, which revolve around each other. At regular intervals the dark star eclipses the bright one. But delta Cephei is a variable of another kind. It brightens rapidly, then diminishes more slowly. It takes 5 days, 8 hours, 47 minutes and 39 seconds for it to make a complete change and return to its starting point. Furthermore, the spectroscope, which shows how a star is moving, reveals that when it is increasing in brightness, the star is approaching us, when diminishing, it seems to be receding.

The most plausible explanation of this peculiar behavior is that the star is pulsating, a theory that was originally proposed by Dr. Harlow Shapley, director of the Harvard College Observatory, and which was later developed mathematically by the famous English astronomer, Sir Arthur Eddington. Thus the star does not really oscillate back and forth, towards and away from us, but the light that reaches us comes from the side towards the earth, which does so oscillate. The opposite side, which has the reverse motion, is invisible, and hence the apparent relation between motion and change in brightness.

But, interesting as this is, the most important thing about the Cepheid variable stars is a fact that was discovered by another Harvard astronomer, the late Miss Henrietta S. Leavitt. She found that the Cepheids vary greatly in the length of their period, ranging from fifteen hours to a hundred days, but that those of the same period have the same average brightness. Furthermore, she found that the longer the period, the greater is the average brightness.

### Tell-Tale Brightness

The studies of Dr. Shapley showed that this relation holds good for all Cepheids, and he applied it to a measurement of their distances. Because of the characteristic way in which these stars change in light, a Cepheid can always be identified. Then the time it takes to go from maximum brightness through its cycle and back again can be measured, and the astronomer can tell how much greater or less its candlepower is than another with a different period. Perhaps it comes out a hundred times fainter than another one, but both appear the same brightness when seen through the telescope. Then it is obvious that the one with the longer period, and hence the greater intrinsic brightness, is much farther away than the other, for if they were of the same distance one would appear a hundred times as bright as the other. From these data can be calculated the relative distances of any two Cepheids. Now, if the distance of one particular Cepheid can be found independently, we have a means of telling the distance of any one of them.

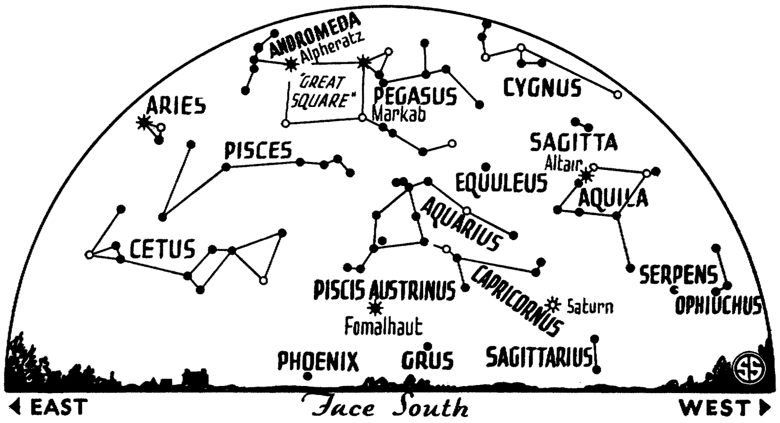
This very thing has been done, for some of the Cepheids are close enough to permit a direct determination of their distance. In some of the most distant objects studied by astronomers, the spiral nebulae, stars have been found which show all the characteristics of Cepheids, and their brightness and distance have been measured. In this way the distances of two of these objects, which are galaxies of stars outside the limits of the one to which the sun and all the naked eye stars belong, have been found to be about a million light years—a million times the six trillion miles that a beam of light travels in a year. As newer and more powerful telescopes are completed, still more distant objects can be measured in the same way.

The planets are not as numerous in the evening sky this month as they have been recently, for only one is visible. This is Saturn, famous for its system of rings, which can be seen in the constellation of Capricornus, low in the southwest. On the twenty-second of the month it is in quadrature with the sun, which means that it is directly south as the sun is setting. The planet sets, therefore, at midnight. Three other planets, Venus, Mars and Jupiter, may be seen in the morning sky, before sunrise.

During October, first quarter of the moon occurs on the sixth, full on the 14th, last quarter on the 22nd, and new on the 29th. Thus from about the fourth to the 16th, the evenings will be moonlit.

*Science News Letter, October 8, 1932*

SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS




**SATURN ALONE IN EVENING SKY**

***The ringed planet is the only one that can be seen in the evening sky. Mars, Jupiter and Venus, however, are visible in the morning before sunrise,***

BACTERIOLOGY

## Bacteria Lived in Tube More Than 22 Years

GERMS that lived for twenty-two and a half years in a sealed tube have just been studied by Wilbur E. Deacon of the University of Nebraska. This is a long life for a group of germs growing on a nutrient medium in a tube. Ordinarily such groups of germs, called cultures, are discarded after a few weeks, or at most a few months, in favor of cultures of their descendants which bacteriologists believe to be more virile.

The germs which Mr. Deacon investigated were of the species called *Serratia marcescens,* formerly known as *Bacillus prodigiosus*. They do not cause disease, and grow on certain kinds of foods. Years ago when bread was baked at home in large batches and kept for weeks in damp storerooms, red spots appeared to trouble the housewife. The spots were caused by these bacteria.

In his report to *Science* Mr. Deacon described tests he had made and to which the germs responded in characteristic style, evidently none the worse for their many years of life in a test tube. The cultures had been made and sealed between 1903 and 1911 by the late Prof. H. H. Waite of the University of Nebraska.

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