

## How Big Can a Star Be?

By EDWIN E. SLOSSON

The first star to be measured five years ago, Betelgeuse, proved to be so large that it quite cast our own sun in the shade, speaking metaphorically. For its volume is some fifty million times that of the sun. But if we compare mass instead of measure we need not feel so much ashamed of the bright particular star to which we are attached. For if the two stars could be put into balance pans, Betelgeuse would be only some fifty times heavier than our sun. If now we divide the weight, 50,000,000, by the volume, 50, we find that the average density, or specific gravity, of Betelgeuse is about a million times less than that of the sun. This red giant star is therefore a mere gasbag—minus the bag. In fact its atmosphere is so thin that it resembles the attenuated gas that we call the "vacuum" of our electric light bulbs or radio tubes.

Stars differ vastly in volume but not so much in mass. The astronomer can not find any that is very many times heavier than Betelgeuse. And he wonders why. Might there not exist a star that would be fifty million times as heavy as well as fifty million times as big as the sun?

"No," says Einstein. For if there were, it would upset his law of gravitation. Professor Eddington, of Cambridge, in his new book, "The Internal Constitution of the Stars" gives three reasons why the relativity theory sets a limit to the conceivable size of visible stars. First, because light acts as though attracted by large masses of matter, and the force of gravitation of such a massive sphere would be so great that the rays of light could not get away from its surface. They would fall back to the star like a stone to the earth. Second, it has been found that the spectral lines of light from a heavy shining body, like a star, are shifted toward the red end of the spectrum, and, in the case of a giant star as dense as the sun, all the lines would be shifted so far that the spectrum would go out of existence. Third, according to Einstein, a heavy body somehow crumples up space in its vicinity, and so immense a mass of matter as we are imagining would be sufficient to close up the space around the star and leave us shut outside of the universe; that is to say, nowhere.

This reminds me of a big bed-

fellow I used to bunk with who would wrap the blankets close about him and leave me out in the cold. Also it reminds me of a rat I was told about when I was a boy, which could never be caught, for when he ran into a hole he pulled the hole in after him.

Professor Eddington evidently anticipates that his argument may arouse surprise or skepticism for he says that lest it be "regarded as ultra-modern by more conservative readers," he hastens to add, that Laplace, founder of modern astronomy, arrived, over a century ago, at a similar conclusion, that a star of such mass would be too big to be seen and "it is therefore possible that the largest luminous bodies in the universe may, through this cause, be invisible."

Anyhow it's nice to know that no star can grow so large, through the merger of other stellar systems, that it will monopolize the universe and crowd the rest of us out of space and time.

Science News-Letter, May 28, 1927

### ARCHAEOLOGY

## Tomb of Imhotep Found?

An Egyptian tomb 4,800 years old, recently discovered at Sakkara, may be the resting place of the famous Egyptian father of medicine, Imhotep. The discovery was made by Cecil Firth, who has been excavating under the auspices of the Egyptian antiquities department.

The tomb joins the wall surrounding the oldest of all the pyramids, the Step Pyramid, so-called because it is made in six great steps. Imhotep was architect to Pharaoh Zeser, for whom this first pyramid was built about 2980 B. C. The newly found tomb is cleverly designed and the work ranks with the best of Imhotep's time. Several rooms are decorated in blue tiles similar to decorations in the Pharaoh's tomb nearby, and paintings of Zeser adorn the interior.

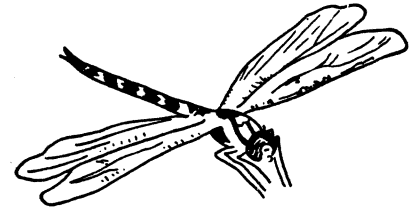
Imhotep is best known for his medical learning. More than 2,000 years after his death he was deified and became the Egyptian god of healing. Statues of Imhotep show him seated and holding a scroll. Further investigations are expected to reveal more definitely the owner of the tomb.

Science News-Letter, May 28, 1927

People of primitive races rarely have headaches, a doctor reports.

## NATURE RAMBLINGS

By FRANK THONE



55

### Dragon-Flies

As the air and earth and the waters warm up with the advance of spring, more and more insects get into the picture; and of the whole shiny-winged tribe none are more picturesque or fascinating than the dragon flies. Their bold and beautiful color schemes, their swiftness and agility in the air, the lightness and grace of their alighting on flower or leaf, have long fascinated artists. Probably no insect, certainly no insect of the watersides, has been more be painted than the dragon fly. That nation of artists, the Japanese, have almost deified the insect, and the largest of their islands is named for it.

The dragon-fly's name is well justified by its activities among the little folk of the insect world, for it is a veritable winged dragon to many and many a helpless bug and gnat and mosquito. The dragon flies are all carnivorous, and being very active, and big creatures as insects go, they require great quantities of meat. So they are constantly on the hunt. There is no close check-up on their feeding available, but it is probably safe to say that not even a swallow or a cuckoo, voracious devourers of insects though they are, can account for as many insects in a day as a handful of dragon flies that would half equal them in weight. So unceasing is the appetite of a dragon fly that if you catch one (which is not an easy thing to do), and hold it gently by the wings until it has had time to get over its alarm, it will readily eat a fly out of your fingers.

For its business as an insect eagle, the dragon fly needs to see much better than most of its kindred. Hence its relatively enormous compound eyes, with their thousands of separate lenses, which cover by far the greater part of its head. They can see forward, aft, up, down and sideways. Nothing escapes their vision, and no luckless insect escapes the swooping, arrow-like flight which they guide.

Science News-Letter, May 28, 1927