SCIENCE NEWS

THE DENSEST STAR

Science Service

THE densest star in the known universe has been discovered by Professor F. C. Jordan, of the Allegheny Observatory. It is as solid as the surface rocks of the earth and as compact as the planet, Mars, or the moon. Yet it shines so brightly that Professor Jordan was able to determine that it is what astronomers call an eclipsing variable, made up of two elliptical or egg-shaped dwarf stars which whirl round and round, one of them blotting out the light of the other at regular intervals.

The newly discovered variable star, as yet designated simply as "New Variable," is not visible to the naked eye since its magnitude is about eleven, but it is in the constellation of Coma Berenices, which is located a little south of the Big Dipper.

How a star can shine so brightly and yet have a density of the most enduring earthly granite is a mystery to astronomers. "New Variable" is from 3.1 to 4.8 times as solid as water and from 2.2 to 3.4 times as dense as our sun, which is a very compactly built star itself. The average density of all the stars is only one tenth that of water. If an ordinary star were cool enough, a person might enter one, if transported there à la Jules Verne, and not realize it.

But Professor Jordan's star is nearly as solid as the earth which, taken as a whole, is 5.5 times as dense as water. It may be more compact than the moon, which is 3.3 times water's density or Mars, which rates 3.6. It exceeds in solidity Jupiter with density of 1.6 and red Saturn which is only six tenths as compact as water.

The life of the densest star of the known universe is nearly over, astronomically speaking. It is a dwarf that is nearing extinction. Stars that are in the class of eclipsing variables are as a rule more dense than either the red giants such as Antares and Betelgeuse. The variable stars average in density one eighth that of the sun, the great red giants are about one thousandth the density of air at the surface of the earth. Most of the stars are mere vapor, even our very dense sun is only 1.4 times as solid as water, and it is understandable that their material could give off light that can be seen from the earth. But the luminescence of such a solid body as "New Variable" is puzzling to account for, astronomers declare.

The distance of the densest star from the earth has not yet been determined. The density of "New Variable" was determined by computation based on the data for its period and the total duration of its eclipse. The previously known star closest in character to the new star is W Ursae Majoris in the same part of the heavens, which is 2.5 times as dense as water.

"New Variable" is also the star with the shortest period yet known, amounting to about six hours. W Ursae Majoris ranks third in short periods while SW Lacertae is second.

BORNEO ARROW POISON AS AN INSECTICIDE

Science Service

TUBA ROOT, which was used by the "Wild Men of Borneo" as an arrow poison, and is still used in the Malay States as a fish poison, is a most effective insecticide, according to experiments made at the Rothamsted Experimental Station. Experts hope that its more extended use may relieve the shortage of nicotine, which is perhaps the most perfect insecticide known. Tuba root falls short of the ideal in that it is extremely poisonous to animals, including man; hence great care has to be exercised in its use.

Nicotine is one of a very large number of poisons obtained from plants; and the head of the Ministry of Agriculture's Pathological Laboratory suggests that these may include a number of other substances suitable for use as insecticides. Nicotine is not produced in sufficient quantity to meet the demand for it and it is too expensive to be used in general agriculture except by growers of very high priced produce, such as hops.

Hence an investigation has been carried out by Messrs. Tattersfield and Roach, of the Rothamsted Experimental Station, in collaboration with Messrs. Fryer and Stenton, of the Ministry of Agriculture. Thousands of caterpillars, reared in the Ministry's Pathological Laboratory, have been tested to determine the effect on them of the various products isolated from the plants. Great care had to be exercised in rearing the caterpillars to keep them free from parasites and in good health. This is very important, otherwise it could not be decided whether a particular caterpillar died as a result of the action of the substance tested or whether it would have died from other causes had it not been treated at all.

By far the most hopeful of the plants so far investigated is Tuba Root. It contains comparatively large percentages of a series of closely related poisons which are as toxic to caterpillars as nicotine when equal weights of the two are compared.

Tuba Root seems to have been used for an insecticide first by Chinese market gardeners, who macerated the root with water and sprayed their plants with the resulting milky fluid, thereby following the lead of the natives who painted this same fluid on their arrows to poison them. The arrow poison is now used in proprietary insecticides and the demand for it on the English market is steadily increasing.

EXPLORATION OF THE COLORADO RAPIDS

Science Service

COLONEL C. H. BIRDSEYE, chief topographical engineer of the U. S. Geological Survey, will leave Washington in a few days on one of the most adventurous explorations ever undertaken by the government in peace time—a survey of the deep, narrow gorges of the Marble and Grand

canons of the Colorado river, the most dangerous and treacherous in the world.

He will be in charge of a party of ten mapmakers, geologists and boatmen, who will go down the most dangerous section of the river in specially constructed boats. These will be fitted with air chambers. The men are strapped in a little cockpit in the center of these craft, wearing life preservers at all times and provided with long life ropes. The distance to be explored covers about 300 miles through northern Arizona.

The mapping of the Colorado has been in progress since 1909 but the dangerous part has been left for the last. When the party returns this autumn they will have completed records of the slope and topography of the entire stretch of river—an aggregate of about 1,200 miles on the Colorado and Green rivers and several hundred miles of the principal tributaries.

Four of the specially constructed boats will be used, manned by the most skillful boatmen to be obtained in that section, all experienced in shooting rapids. The rapids in this section of the river form some of the wildest water in the United States and each member of the party has been selected for his fearlessness in the face of danger as well as for his ability as a scientist.

Part of the work will consist of locating available dam sites in view of the proposed commercialization of the Colorado.

THE PROTECTION OF ENGINE CREWS IN TUNNELS

THE engine crews who drive the modern monster types of locomotive through the longer tunnels of American railways are frequently exposed to the presence of deadly carbon monoxide gas and to withering temperatures ranging up to 136° F., states the Department of the Interior, as the result of an investigation conducted by the Bureau of Mines in railroad tunnels in Utah and Wyoming. Hot exhaust gases are the source of danger from exposure to tunnel atmospheres. Many serious accidents have occurred in these tunnels due to asphyxiation or exhaustion of the locomotive crews, caused by exposure to atmospheres containing carbon monoxide, or to atmospheres of a high temperature and saturated with moisture. These hazards are accentuated by a group of less importance consisting of sulphur dioxide, hydrogen sulphide, soot and steam, accompanied by the decreased oxygen content of the air.

The Interior Department recommends the use of smoke deflectors on locomotives operating in tunnel districts as a means of reducing the hazard due to high temperatures, and the use of the train air-brake line as a source of air for breathing purposes for members of engine crews.

The object of the Interior Department's investigation, conducted by the Bureau of Mines in cooperation with the Union Pacific Railroad, was to determine the cause of gassing accidents by examining into composition of the air in locomotive cabs while passing through railroad tunnels; to learn the effect of these conditions on the engine crew; and to provide a means of protection for the men so exposed.

Gas samples and temperature readings taken in the cabs of locomotives were used in studying the atmospheric conditions to which the locomotive crews were exposed. The symptoms and the physiological effects produced in men exposed to the atmospheres encountered were studied. The pulse rates and body temperatures were taken, and determinations of the carbon monoxide content of the blood were made. Various methods for the prevention of gassing and for the protection of men therefrom were considered and tested, among which were the use of mechanical devices for deflecting the smoke away from the engine cab, and the use of various types of gas masks and breathing apparatus.

Of forty trips conducted in cabs of locomotives while the trains were passing through tunnels, carbon monoxide was found to be present on thirty-four trips. The operation of twenty-four trains of approximately 2,000 tons each, in a normal running time of six minutes through the Aspen tunnel in Wyoming, showed cab temperatures of 114° F. (dry bulb), 111° (wet bulb), and a relative humidity of 90 per cent. The maximum dry-bulb temperature recorded on any of the forty tests conducted was 136°, while the maximum wet-bulb temperature was 124°. The time consumed in the passage of the trains varied from 4½ to 25 minutes.

Results of physiological tests over periods of 10 minutes showed that the conditions in the cabs might be severe enough to cause asphyxiation or exhaustion in periods of 20 minutes, especially in cases where the engine is stalled.

ITEMS

Science Service

A NEW process in metallurgy said to hold promise of improved methods in the treatment of oxidized and semi-oxidized or "carbonate" ores of copper, lead and silver has been developed through the joint work of the Bureau of Mines and the University of Utah. It is known as the "chloride volatilization process of ore treatment." It depends upon the volatilization of compounds of the metals with chlorine, effected by adding salt or calcium chloride to the prepared ore. The exact chemical reactions are not known and the work is still in the experimental stage although promising great savings in the cases indicated where technical difficulties have heretofore caused much loss.

CHILDREN may suffer from the dietary sins of their parents, Professor A. H. Byfield, of the University of Iowa School of Medicine, told members of the American Medical Association at San Francisco. He described a series of animal experiments in which it was possible to produce rickets, which is due to faulty nutrition, only in the second generation of the animals experimented on. Studies of social conditions lead to the belief that causes extending over more than one generation are necessary for the production of this disease, and indicate a definite method of prevention, he said.

THE windmills that once dotted the Belgian landscape and furnished motive power for innumerable operations on Flanders farms are slowly being replaced by more efficient power machinery.