GENERAL SCIENCE

Industry Must Disperse

➤ THE DISPERSION OF INDUSTRY is necessary for and vital to national defense. This is a basic conclusion of the National Security Resources Board. A new urban redevelopment for industrial and population dispersion is also essential.

World War II developed weapons of swift and widespread destruction capable of attacks of unprecedented effectiveness against industrial centers, the NSRB report states. Our previous isolation and security against weapons of destruction are gone. In time, no spot in the Nation will be any less vulnerable than another. There is no military defense against the atomic bomb except space.

While there will continue to be defense against any carrier which a potential enemy might use to deliver such a bomb, this defense alone is not sufficient. The task ahead is to distribute vital facilities over greater land area to reduce attractiveness of targets and increase security of plants and workers.

The National Security Resources Board was created in 1947 to advise the President concerning the coordination of military, industrial and civilian mobilization. Industry's security is bound up in national security. An important phase of the duty of the board is "the strategic relocation of industry."

The report points out that underground installations, although probably providing maximum protection, are not thought practical for application on a large scale. This is also true for special construction of above-ground facilities, employing fire, blast, or radiation-resistant materials. Either of these may be essential and justified in connection with some highly strategic facilities. Dispersion, however, is considered the most practical solution to the problem of strategic location.

Extreme difficulties would have to be overcome in the distribution of industrial plants. Among various factors are sources of supply, fuel and transportation facilities, the distributive pattern of the industry and the location of markets, and the availability of labor. Then the communities set up must have adequate highways, streets, homes, public utilities, schools, hospitals, police and fire protection, water and sewer systems.

Cities of not over 50,000 population are suggested, with communities separated from others by country areas. Communities of this size are also proposed in Britain. It is thought that they would be too small for attack by atomic bomb because of tremendous cost of each bomb.

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ASTRONOMY

Hundred White Dwarfs

➤ DISCOVERY of nine new white dwarf stars, announced by Dr. Willem J. Luyten of the University of Minnesota and Dr. David MacLeish of the Cordoba Observatory in Argentina, have brought the total number of these stars now known to 100.

Probably the strangest, and most interesting objects in the universe, these stars are so dense that a cubic inch of them, if brought down to earth, might weigh anywhere from one to 1,000 tons.

The first of these stars ever discovered had its existence as a star predicted from little erratic shifts in the motion of Sirius, the brightest star in the sky, even before the faint star had itself been seen. It was discovered with the eyes of the law of gravitation before it was first seen with the telescope in 1862. At first it was thought to be just an ordinary dwarf star, 400 times less luminous than the sun.

But in 1915 Dr. Walter S. Adams at Mt. Wilson Observatory discovered that it was white, and therefore intensely hot on its surface, and so small that it was only a little larger than the earth and 35 times smaller than the sun in diameter. This makes it 40,000 times smaller than the sun in bulk (volume), yet within that small space there is packed just as much matter as there is in the sun itself. This makes the star so dense that one cubic inch would weigh about 2,500 times as much as gold, or nearly one ton. The mystery deepened for all we could see of the star was gas, and hydrogen gas at that, the lightest of all gases.

It was not until a few years later that the late Arthur S. Eddington in England found the solution. We are here dealing with matter-in-the-raw where, under the conditions of extremely high temperatures, perhaps billions of degrees, all the atoms are "stripped" of their protective covering of electrons. This makes the atom so much smaller that it becomes possible to "pack" them much closer, and from pure theory it was now possible to predict that there should exist stars in which one cubic inch might "weigh" over 10,000 tons.

The name "white dwarf" was coined for these stars. They are extremely small, down to perhaps the size of the moon. They are extremely feeble in light, averaging perhaps one ten-thousandth of the light of the sun. Thus they are genuine "dwarfs" in every respect. In addition, they are very hot on their surfaces, shining with a light much whiter than that of the sun, and often even blue in color.

The discovery and explanation of these stars caused a minor revolution in astronomical and physical thinking. It also forged another, and very important, link in the chain of events that led eventually to the atomic bomb.

During the first two decades after the discovery of the first white dwarf progress was slow since in the beginning astronomers did not even know where to look to find more of them. White dwarfs are so extremely faint that they are hard to find.

Of the first hundred, 61 of the white dwarf stars have been found through the work done on the motions of stars at the University of Minnesota, with the active participation of the Steward Observatory of the University of Arizona, under the direction of Dr. E. F. Carpenter and Dr. P. D. Jose, and of the Cordoba Observatory, at Cordoba, Argentina.

Observations made at Cordoba were of especial importance since this observatory is situated in the southern hemisphere. From it can be observed a number of stars which are invisible from the United States. When the problem of where to find opportunities for the observation of these stars arose, the international spirit of cooperation always present in science asserted itself, and Dr. Enrique Gaviola, director of the Cordoba Observatory, offered the use of the facilities of this observatory and took an active part in planning the observations. The same cooperative spirit prevailed under his successor, Dr. Ricardo Platzeck. Observations for the discovery of further white dwarfs are still being carried out continuously with the 60-inch reflector of the Cordoba Observatory.

Originally Martin Dartayet was in charge of the telescope, and made most of the observations. Two years ago he was succeded by Dr. David MacLeish and the present discovery of nine new white dwarfs comes as the result of these observations.

Of the 61 white dwarfs announced at the University of Minnesota, 35 were found on plates taken at Tucson, Ariz., and 26 on plates taken at Cordoba. Among the stars discovered there is one which appears 25,000 times too faint to be seen with the naked eye. From observations with large telescopes it can be proved that the star is between the earth and the moon in size, and so dense that one cubic inch would weigh about 250 tons.

Perhaps the most important among the 100 white dwarfs now known are those which form part of a double star. Only when two stars are so close together that their mutual gravitation makes them revolve around each other can it be determined how much they weigh. Nineteen such double stars have now been discovered, including one where both the stars are white dwarfs—the only system of its kind now known.

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Ceylon is a *black-tea* country; it exported over 287,000,000 pounds in 1947.