SCIENCE NEWS

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MICROTREMORS

STUDYING earthquakes in California, as with a microscope, to learn their whims and so to help prevent such damage as that in San Francisco in 1906 and in Santa Barbara in 1925, is the program inaugurated in the region of Los Angeles by the Carnegie Institution of Washington and now being introduced by local business interests around San Francisco, according to Dr. Bailey Willis, professor emeritus of geology at Leland Stanford University, and president of the Seismological Society of America.

"Earthquake centers are located in belts," Professor Willis told a representative of *Science Service*, "one belt surrounding the Pacific Ocean, and another extending across Southern Asia and the Mediterranean. Still another belt crosses the West Indies. The belts are related to zones of growing mountains, where there are marked differences in elevation, sometimes between mountainous regions and lowlands, and sometimes between the land and the bottom of the sea. These differences in level, however, are the effect, and not the cause, of earthquakes, because the forces which produce the quakes are those engaged in pushing up live mountain ranges.

"As a result of a world-wide earthquake survey, we now have maps of earthquake regions which for accuracy and completeness may be compared with the maps of the continents in the time of Queen Elizabeth, but we need much better maps, and to get them we must have closer surveys. For that purpose we have need of a new type of instrument or seismometer.

"In designing this new type, the experts of the Carnegie Institution have resorted to a pendulum which scarcely weighs an ounce and is attached to a tungsten steel wire as fine as a spider's web. It carries a small mirror which reflects a pencil of light and the latter draws the record on a moving photographic film. In size and weight the instrument is exceedingly strong, and yet it offers no large mass by which an earthquake could destroy it, as is the case with older designs.

"It has thus been made possible to record a microscopic earthquake, and we might well call the operation the study of earthquakes with a microscope. These microscopic earthquakes are called microtremors. They occur constantly in earthquake regions and frequently in other places, as on the Atlantic Coast. Their frequency and intensity is a gauge of earthquake activity.

"When we know more about them, we shall be able to follow these minute elastic vibrations very much in the same way as the Weather Bureau now follows fluctuations of the barometer. We expect that in time we shall be able to tell from them the approach of an earthquake 'storm,' and thus may come nearer to forecasting quakes —something which is now impossible.

"With a view to making a local survey, the Carnegie Institution is establishing four stations in Southern California, at Pasadena, Riverside, La Jolla and, probably, Catalina Island. The range of each station for microtremors is about fifty miles, and of course longer for heavier shocks. The four stations will therefore cover the whole of the coastal region of Southern California, and from their records we shall obtain a good knowledge of the distribution of earthquake activity. One of the instruments at Pasadena recorded two hundred microtremors in its first twelve months of experimental operation.

"The example of the Carnegie Institution led to an active campaign for the installation of modern seismometers around San Francisco Bay, and funds have been raised by business men and corporations of the cities on the bay for that purpose. The central station will be located at Berkeley, at the University of California, which will also run a subsidiary station at the Lick Observatory on Mt. Hamilton. Stanford University will take care of a third, and the California Academy of Sciences, in Golden Gate Park, of a fourth. The cost of these instruments, including the necessary earthquake-proof shelter, full equipment of seismometers and time-recording apparatus, amounts to $22,000. Their maintenance and the study of their records is assumed by the three institutions named.

"It is anticipated that we shall thus learn what the present earthquake activity is, and that we shall be able to locate it and to follow its variation as it increases toward the next severe shock.

"The installation of similar groups of instruments, not only in other parts of California, but around Boston, New York, St. Louis, New Orleans, and other great centers of population and property, is one of the things to which business men should give serious consideration, and toward which their contributions would constitute an investment in security."

THE SPIRAL NEBULA, MESSIER 33

THE spiral nebula, Messier 33, in the constellation of the Triangle, which appears now low in the northeastern sky before sunrise, is an independent stellar system, similar to that forming the Milky Way, of which the sun is a part, but much smaller in extent. This is the conclusion of Dr. Edwin Hubble, astronomer at the Mt. Wilson Observatory in California, who will publish his results of several years of study in the forthcoming issue of *The Astrophysical Journal.*

Dr. Hubble has studied Messier 33 with the aid of the 100-inch telescope at Mt. Wilson, as well as another spiral nebula in the constellation of Andromeda. Both of these nebulae can be seen faintly with the unaided eye on a dark clear night, but seen with a telescope they appear merely as hazy patches of light. Photographs, however, made with a large telescope, such as one of those at Mt. Wilson, reveal brighter spots against the hazy background, which Professor G. W. Ritchey, formerly at Mt. Wilson, called "nebulous stars."

In his photographs made with the highest powers of the big reflecting telescope, Dr. Hubble finds that these

"nebulous stars" are just the same as any other kind of stars, and that they may be studied with the same means. Some of these stars vary in light, and thirty-five of them are "Cepheid" variables, stars from which the distance may be determined when the period of their variation is known. This distance is found to be about 900,000 light years, that is, the distance that a ray of light, traveling fast enough to encircle the earth seven times in a second, could traverse in 900,000 years. This places the nebula outside the system of stars to which the Milky Way and our sun belong.

However, Dr. Hubble states that in actual brightness and size, which can be determined when its distance is known, Messier 33 is inferior to the Galaxy, and more nearly resembles the Magellanic Clouds, two clouds of stars which are visible from countries south of the equator, and which are within our system. The diameter of the nebula is about 15,000 light years, while that of the Milky Way system is thought by some astronomers to be as much as 300,000 light years.

RACE CROSSES

ONE of the worst features of race crossing is the fact that it disturbs social inheritance, says Dr. W. E. Castle, of the Bussey Institution of Harvard University.

Biologically speaking, there is no race problem in the United States, he declares in a forthcoming issue of *The Journal of Physical Anthropology*; for when traits blend in human crosses deterioration does not necessarily follow. Instead there is an intermediate degree of the various characteristics involved. The desirability of a particular race cross from a biological point of view depends wholly on whether a greater or less degree of the qualities under consideration are wanted in the resulting offspring, according to Dr. Castle.

"If social considerations were not much more powerful than biological ones," he says, "the future population of the United States would certainly be highly variable in skin color and intelligence, passing by scarcely perceptible gradations from a pure black type of the present 'black belt' to a pure white type such as would result from a mixing of European races. But the social considerations are of much more importance than biological ones in this connection, and the racial future of the United States can not be predicted from the latter alone.

"The prospect is that, if things go on as they now are, the mulattoes will not amalgamate either with the whites or with the blacks but will form a separate but diminishing proportion of the total population. The blacks are holding their own in certain rural sections of the South, but elsewhere are going back numerically. No complete amalgamation of blacks with whites is to be anticipated, simply because of social impediments, though no biological barrier whatever is discoverable."

The crosses between whites and North American Indians are numerically unimportant, Dr. Castle continues, but instructive as a biological and social experiment. The half-breed population that grew up along the frontiers has shown little evidence of physical or intellectual degeneracy, except as influenced by the introduced vices of the whites. There is no strong racial prejudice against the red man as there is against the negro, recently a slave, and in consequence the full-blooded Indian is rapidly vanishing from the population. These different results following the crossing with the black and the red races in the United States are not referable to any biological cause, Dr. Castle maintains, but are due solely to the social attitudes of the whites, which is hostile in one case and indifferent in the other.

He says in conclusion, "A further illustration of the surpassing importance of social over biological considerations in race-crossing is seen in the attitude of the Pacific Coast States towards Chinese and Japanese intermixture. No one questions the virility of these races or their biological fitness. Their cultural attainments are very high and antedate our own. Hybrids between these races and white races, so far as our information goes, are of high quality physically and intellectually. Yet public opinion is unalterably opposed to Oriental immigration or race mixture, not on biological grounds, but purely on social, economic or political grounds."

THE BACTERIOPHAGE

"THE bacteriophage is alive." So maintains Dr. F. d'Herelle, its discoverer, fronting the skeptical criticism of many other men of science, in his new book on the subject. The bacteriophage is alive, and no mere chemical phenomenon; and it maintains itself, he says, as a parasite of parasites, a deadly submicroscopic germ that kills other germs. No culture of bacteria can be "pure," as far as the bacteriophage is concerned; it is harder to find a germ without its bacteriophage accompaniment than it is to find a woolly dog without fleas in summer.

But the bacteriophage is not a mere annoyance to the germs it infests, according to Dr. d'Herelle. It kills them, just as some germs kill men and animals and plants, and then it dissolves their corpses. And just as there are special germs that attack men and not horses, and others that attack horses and not sheep, so there are special breeds of bacteriophage, each of which has a favorite germ which it attacks. But just as some germs, for example anthrax, will attack men, horses and sheep indiscriminately, so there are some varieties of bacteriophage whose appetites are equally indiscriminate, permitting them to devour several different species of bacteria. Dr. d'Herelle claims that he has succeeded in isolating single bacteriophage "corpuscles," and in breeding up pure cultures of these different strains.

According to the author, these "super-germs" are almost unimaginably small, having diameters of 20 thousandths of a thousandth of a millimeter. They pass readily through the pores of a very fine porcelain filter, that will stop ordinary germs. But one of these tiny organisms, he says, will penetrate into the body of a bacterium, and there will divide and divide again, just as a germ does in the body of a man; until the bacteriophage "family" becomes so numerous as to burst the unfortunate bacterium asunder and so cause its death.

Man and all other animal organisms habitually infested with bacteria carry about with them all the time one or

more strains of bacteriophage that make war on their commonest germ enemies. When the germs get the upper hand of the bacteriophage, we are sick; when we are convalescent, Dr. d'Herelle says, our private bacteriophage strains are in a state of especial virulence against their special germ victims.

Dr. d'Herelle made his discovery of the bacteriophage while he was at the Pasteur Institute in Paris. He is now at Alexandria, Egypt, working on problems of the control of tropical diseases. The use of the bacteriophage for combating tropical plagues was forecast in literature before it was actually attempted in practice, for the hero in Sinclair Lewis's novel, "Arrowsmith," is sent on an expedition to a Caribbean country to put down an epidemic.

THE PRICKLY PEAR CACTUS IN AUSTRALIA

THE prickly pear cactus is advancing in Australia at the rate of a million acres a year. Leith F. Hitchcock, of the Australian Commonwealth Prickly Pear Board, estimates that already 60,000,000 acres of East Australia alone are infested with this spiny pest.

Mr. Hitchcock has just arrived at the field station of the U. S. Bureau of Entomology, Uvalde, Texas, to take charge of the North American phase of Australia's war on the prickly plant. So kindly has the cactus taken to the climate of the isolated continent that it occupies more than twice as much land as all the other crops put together, and so desperate have the inhabitants become that every sort of enemy that the cactus ever had in any part of the world is being drafted into service in the wild hope that it will help check its spread.

For that purpose the Australian Prickly Pear Board has sent out men to the arid regions of the southwest to collect specimens of the various types of insects that prey on the prickly pear. Thus far, according to Mr. Hitchcock, different species of the mealy bugs or cochineal insects have been found most successful. The insects are grown in cages at the entomological station and the most vicious attackers of the cactus are shipped to Australia. There the authorities, taking warning from the rapid increase of the artificially introduced rabbit and the cactus itself, grow the insects in quarantine through at least one generation before they turn them loose to do their worst.

ITEMS

TEMPERATURE conditions of the Pacific Ocean between Los Angeles and Honolulu will be studied by means of a thermograph installed on one of the passenger ships plying that route by Director T. Wayland Vaughan, of the Scripps Institution of Oceanography at La Jolla, Calif. The thermograph will bring important information to science and shipping men, according to Dr. Vaughan, in that it will give continuous information concerning temperature, which will aid in making weather reports for the Pacific Coast.

THE weighing of overloaded trucks right on the road is the latest method of attack on this problem of the highways, according to discussion by experts at the National Conference on Weights and Measures held recently in Washington. The damage to streets and highways caused by overloaded trucks has led to the fixing of maximum loads in many regions, and to the development of special devices for the expeditious weighing of trucks caught in the act of exceeding the load limit. These portable scales enable the highway department inspectors to ascertain the weight of suspected trucks without undue holding up of traffic, while accuracy tests at the Bureau of Standards show that when properly handled they should not show errors of more than five per cent. either way. As many as eight hundred trucks, it is said, have been weighed by this new device in ten hours.

A GLAND-GRAFTING story of dramatic character is reported in Paris from the town of Lille. A nine-year-old girl had been an idiot all her life, due to certain glandular deficiencies. There was in the prison at Lille a convict who had been sentenced to the guillotine. Local surgeons decided to attempt a transplantation of the thyroid gland from the criminal's throat, under the skin of the child, and immediately after the execution this was done.

The surgeons then kept the child under close observation for several months, before they undertook to report the case. Their statement is that at the end of three months an improvement in the child's mental state began to be apparent, and that at the end of nine months, when the report was made, she had the understanding, behavior and vocabulary of a normal child of her years.

A NEW insect enemy of the already sadly plagued American chestnut has been caught trying to sneak past the guards at the gates of the United States. It is a native of Europe, and is known as the nut fruit tortrix, or more scientifically as *Laspeyresia splendana*. It is related to the codling moth, a foreign pest that long ago got into this country to work ruin in American fruit orchards, and its work on the chestnut is said to be similar to that of the codling moth on fruits. It has been detected in shipments of chestnuts from Italy, which have been growing larger year by year as the supply of native nuts has been diminishing due to the ravages of the chestnut blight disease. The Federal Horticultural Board is now considering the possibility of enforcing restrictive measures against the importation of European chestnuts.

THE cause of a certain kind of skin infection, known to physicians as "creeping eruption" is due to a tiny threadworm, scientists have just found. *Agamonemtodum migrans* is the name bestowed on the parasite by its discoverers, Drs. J. L. Kirby-Smith, W. E. Dove and G. F. White. In a report to the *Archives of Dermatology and Syphilology* they say that this species of cutaneous worm is fairly common in the southeastern and southern coastal states. Susceptibility to the infection varies, children being the most frequent victims. Whites are infected more readily than Negroes, it was found. The evidence at hand points to rats as the hosts of the adult form of the worm, though any one of the smaller domestic animals may be incriminated as the guilty harborer of the pest. Several modes of treatment have been proposed, but successful prevention of the infection will probably not take place until there is more knowledge of the life history of the adult parasite.