SCIENCE NEWS

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THE GEOLOGY OF THE BOTTOM OF THE OCEAN

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DR. MAURICE EWING, of Lehigh University, at the Washington meeting of the American Geophysical Union, described his experiments in the deep waters around Bermuda, by the seismographic method. Charges of explosive were set off to send small earthquake waves down to underlying rocks. These waves are reflected by the rocks, and the reflected waves picked up and recorded by portable seismographs put down at suitable distances. Time of travel and shape of waves can be interpreted in terms of the geological nature of the underlying strata.

This is relatively easy on dry land, but at depths of hundreds or thousands of feet in the ocean it became more difficult. The first method was to attach charges of TNT and recording instruments in a long string to a cable, which was then trailed on the bottom by a towing ship. This was a possibility in shallow water, but began to be prohibitively cumbersome when it came to real depths. The charges and instruments could be sunk unattached, of course; but how could the instruments be got back again? Dr. Ewing arranged to sink his charges and his instruments with heavy weights, but with floats attached to bring the instruments back to the surface when the work was finished. The weights of course had to be heavy enough to carry both the instrument and the float to the bottom. For floats he used tanks of gasoline. Hollow, air-filled floats would come up faster, of course; but in very deep water these would be crushed by the tremendous pressure and fail to come up at all. Gasoline would keep the tanks from collapsing, but was enough lighter than water to come back to the top all right.

The TNT charges were not cased in metal bombs, but only in ordinary five-cent rubber balloons. These were adequate to keep explosive and detonating fuse dry. At the end of a length of electric cable was a clockwork timing device with an electric trigger, to set off the charge at exactly the right second. When the charge exploded, that released the timing device attached to the gasoline-filled float, which then carried it to the surface, where a little flag would guide the experimenters to pick it up. A second release, consisting of a block of rock salt, was also attached. In case the charge missed fire, the dissolving of the salt would set free the float and its valuable timing device. Similar floats and the double arrangement of a clockwork and a rock-salt release were attached to the seismographs, which were dropped overboard at suitable distances from the TNT charges. Experimental runs have been made at depths as great as 2,400 fathoms, or 14,400 feet.

Since the studies were often conducted far at sea, out of sight of any land on which bearings might be taken, the problem had to be met of the research boat drifting away from the station and thereby losing all the apparatus as it floated back to the surface; for several hours are necessary for a run. Dr. Ewing finally solved this problem very simply. He dropped to the bottom, along with his TNT and seismographs, a number of gasoline-filled floats bearing only the little red flags, with timing devices set to release them at half-hour intervals. So whenever one of these popped to the surface, the boat could steam back from the point to which it had drifted, pick it up, and wait for the next one. It would never drift so far in the half-hour that it was in any danger of losing sight of the area beneath which the experiments were proceeding on the bottom.—FRANK THONE.

HUMAN SPEECH

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AT the New York meeting of the Acoustical Society of America, investigators from the Bell Laboratory showed that a buzz and a hiss combine to give every inflection in the whole gamut of human speech. The buzz-hiss sounds mix and mingle in the throat and mouth and turn into intelligible speech.

Homer Dudley demonstrated a new device—yet unnamed—which takes a spoken sentence apart and then puts it together in any fashion desired. A young man's husky tones turn to those of a quavering old man, or to the pleadings of a lovelorn girl, at the twist of a dial. Basically the new speech analysis instrument is like the Voder—now being shown at the World's Fair—but it is controlled by the speaker's voice rather than by keys.

Mr. Dudley pointed out that the raw materials of speech are two streams of sound. By proper variations of these two streams, intelligible speech is created. The first sound, called the "buzz," has three properties. It has a pitch determined by the fundamental frequency of vibration; an intensity determined by the total sound power issuing from the speaker's mouth; and it has a quality determined by the relative amounts of sound power carried in various frequency bands. The second sound, the hiss, has no pitch whatever and is only a noise.

With his new device Mr. Dudley showed the buzz to have a rich full tone something like a muted automobile horn. By electrical filters ten different ranges of overtones covering the gamut of the human voice could be picked out of the buzz tone. The same filters then broke down the hiss sound into ten corresponding ranges. Thus the machine splits the human voice into 20 parts and then uses the results to control the proper amount of each issuing from a loudspeaker. Only a slight shift is needed to change one vowel sound into another and to turn a word like rat into rot or rut. Using the buzz sound alone, with constant pitch, Mr. Dudley showed that a test sentence came out as a chanting monotone. By releasing the pitch, the device followed the speaker's voice with more naturalness. Normal speech was converted into a whisper when the buzz was changed to the hiss sound. While this hiss is relatively faint, it is essential in human speech in discriminating between such words as "church" and "shirt."

Expression in speech is due to the constant swinging

up and down of the pitch as one talks, Mr. Dudley showed. When the swings in pitch are cut in half the voice seems flat and dragging; when the swings are twice normal the voice is more brilliant; when the swings are four times normal the voice sounds febrile, unnatural.

SUPER-HEAVY STARS

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Two remarkable stars made of strange stuff a hundred thousand times heavier than water are the first major discoveries of the new McDonald Observatory 82-inch telescope. Even before this new giant instrument was formally handed over by its makers, Warner and Swasey Company, to the Universities of Texas and Chicago for their joint use, Professor G. P. Kuiper was gathering with the great mirror upon extremely sensitive photographic film light from stars suspected of being relatively close to earth.

He was searching for heavy-weight "suns" that tax the human imagination, stars so dense that a handful of their substance weighs hundreds of tons, stars made of degenerate gaseous matter or atoms stripped to their hearts. Two such mysterious "white dwarfs" new to astronomy were found. One of these is perhaps the most remarkable star ever discovered. It is the faintest such star ever found and it is so close to having no stellar atmosphere that there are absolutely no lines in its spectrum. This star, No. W489, is relatively cool and only such powerful telescope and fast photographic film as used would have detected it.

In six intensive weeks of observing with the 82-inch telescope, Professor Kuiper obtained 600 spectral photographs of 300 stars of large proper motions which showed them to be near us in the Milky Way. Including the two new ones, only 18 white dwarfs are known to science. Professor Kuiper discovered half of these and he has reobserved all of them with the McDonald telescope since March 15.

Most famous of heavy-weight stars is the companion of Sirius, but the heaviest, discovered some years ago at Lick Observatory, is believed to have a density ten million times that of earthly water. This is less than half as dense as the absolute limit for solidness theoretically possible. When the atoms are knocked to pieces completely, without electrons and with only bare nuclei, this degenerate matter, still a gas, strange as it may seem, would be a hundred thousand times a hundred thousand times a hundred thousand times (ten to the fifteenth power) the density of water.

Besides his strange white dwarfs, Professor Kuiper has discovered another family of faint or under-luminous stars. These are about a third of the size of our sun, instead of being about the earth's size, like the true white dwarfs. The subdwarfs are made of ordinary star gas instead of the degenerate superheavy matter.—WATSON DAVIS.

OLD VIOLINS

OLD violins of the masters—the Stradivarius and Guarnerius instruments—have been found to "speak" more easily than do modern instruments, it was reported to the closing meeting of the Acoustical Society of America in New York by Dr. Frederick A. Saunders, of Harvard University.

Working with the noted violinist, Jascha Heifetz, Dr. Saunders has been making exact physical studies of new and old violins seeking to find the reasons—if any—why people will pay $20,000 and more for a single instrument.

Studies at Purdue University, reported Dr. Saunders, show that a good and old violin will vibrate when held in the outstretched hand, if one speaks to it from an appreciable distance. An excellent old instrument picks up enough energy from the sound waves to vibrate.

"This means," said Dr. Saunders, "that the player, when doing a very rapid passage, may just succeed in making an old violin speak properly through the whole of it, while the slight balkiness of a new violin might prevent him from getting through it successfully. No wonder such violins command high prices."

A very keen listener may be able to detect that an old violin speaks more quickly at the turn of a bow than does a new one. Seeking a physical reason why this might be so, Dr. Saunders is now making tests to check the hypothesis that old violins are lighter than new ones. "There is some evidence indicating that they really are," he added. "Some of the constituents of the wood may have evaporated with time. Another cause of ease of response might be that from years of vibration (in use) some of the cell walls in the top plate of the violin may have been broken so that the wood has become more flexible than it was when new. There may be changes in the glue also. When the real changes are determined it ought not to be hard to age wood artificially, so as to get the best effects in a new instrument."

DEATHS FROM TYPHOID IN AMERICAN CITIES

NEW low records for deaths from typhoid fever in the large cities of the United States are reported by the American Medical Association for the year 1938.

The *Journal* of the American Medical Association publishes this week its honor roll of cities with no typhoid deaths.

First place on the list goes to Bridgeport, Conn., with no fatality from typhoid fever in five years. Fort Wayne, Ind., is runner-up, with no typhoid deaths for four years. South Bend, Ind., and Utica, N. Y., have had none in three years. Canton, Ohio; Fall River and Lynn, Mass.; Milwaukee, Wis.; New Bedford, Conn.; Reading, Pa.; Seattle and Tacoma, Wash., and Wichita, Kan., have had no deaths from the disease in two years.

Other honor roll cities with no typhoid deaths in 1938 are: Buffalo, N. Y.; Cambridge and Lowell, Mass.; Elizabeth, N. J.; Erie and Scranton, Pa.; Grand Rapids, Mich.; Kansas City, Kan.; Minneapolis, Minn.; Omaha, Neb.; Peoria, Ill.; Portland, Ore.; Providence, R. I.; Salt Lake City, Utah; San Diego, Calif., and Youngstown, Ohio.

Seven other cities are placed in first rank rather than on the honor roll because they have been charged with deaths among non-residents. These are: Toledo, Ohio; Hartford, Conn.; Syracuse, N. Y.; Worcester, Mass.; Springfield, Mass.; Evansville, Ind., and Camden, N. J.

No outbreak of epidemic proportions was recorded during 1938. Routine vaccination of the population is not practiced except under flood conditions. However, in

progressive communities vaccinations are urged for contacts to cases and for persons who travel widely in insanitary countries.

In this annual survey, the Americal Medical Association notes a trend in some places, particularly in the southern states, to encourage the inoculation of food handlers.

SOME PAPERS READ AT THE MEETING OF THE AMERICAN SOCIETY FOR THE STUDY OF ALLERGY

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A NEW method of treating asthma by reducing the amount of salt in the diet was announced by Drs. A. V. Stoesser and M. M. Cook, of Minneapolis, at the meeting in St. Louis of the American Society for the Study of Allergy. Patients whose asthma was not relieved by the best allergic management stopped wheezing when the amount of salt in their diet was reduced to an extremely small amount. When salt was added to the diet, the asthma promptly reappeared and continued to grow worse even after the added salt was stopped. Six patients with severe asthma which was not relieved by the low salt diet alone improved markedly when in addition to the reduction of salt they were given a pituitary gland extract which causes storage of water in the body.

LACK of the scurvy-preventing vitamin C from citrus and other fruits and fresh vegetables may be one cause of food allergy, according to a report by Drs. J. Bronfenbrenner, D. M. Hetler, Frances Love and Jack M. Burnett, of St. Louis. People with food allergy are the "one man's meat is another man's poison" folks. Eating tiny amounts of certain foods, most often eggs, milk or wheat, gives these patients severe attacks of asthma, hives, migraine headaches or other allergic ailments. Treatment with ascorbic acid, as vitamin C is now called, may enable these people to eat the foods to which they are sensitive. Guinea pigs furnish the evidence for this theory. Pigs made sensitive to egg white could eat this food when they were given the vitamin. When the vitamin was removed from their diet, practically a one hundred per cent. of the animals developed allergic symptoms when fed egg white. If enough vitamin was given to these animals over a period of weeks, they could eat the egg white, still sensitive to the substance.

JANE STAFFORD

ITEMS

REPORTS from the field to the U. S. Weather Bureau indicate that a week of warm weather in the eastern half of the country has done much to cancel out the effects of the long, chilly, wet spell in April. Winter wheat is looking up, and corn planting is getting well under way at last. By the same token, however, the lack of rain is again beginning to cause serious concern in the West. From the grain-fields and rangelands of Montana on the north to the cotton-fields of Texas on the south the threat of a new drought is causing much anxious scanning of the skies. Water for stock is low, and sheep are already being moved to summer range in the Northwest and in portions of the Rocky Mountain region.

DURING the first ten days of this month there have been five major earthquakes that registered themselves on the seismological instruments. The fifth one, relayed to the U. S. Coast and Geodetic Survey through Science Service, happened at 2:44 A.M., E.S.T., on May 10, about 100 miles southwest of Atka Island in the Aleutians, off the coast of Alaska. Epicenter location was given as latitude 51 degrees north, longitude 176 degrees east. The four preceding earthquakes this month were: May 1, Japanese coast; May 2, near coast of Lower California, in Gulf of California; May 6, under Pacific, southwest of Panama City; May 7, near Azores islands, on Atlantic Ridge. Stations reporting the latest earthquake were: Fordham University, Georgetown University, St. Louis University and the Dominion Meteorological Observatory, Victoria, B. C.

THAT young people are more easily trained as good drivers and know more about traffic regulations and road laws than older people has been demonstrated by experiments made by Professor Alvhh R. Lauer, of Iowa State College. Those with more knowledge at any age were found to learn actual driving much more easily. Those most easily trained not only showed superior knowledge, but were more deliberate in their movements and less susceptible to distraction as measured by laboratory tests. "The results seem to emphasize the need for early training in safety to establish proper habits of thinking and action regarding traffic hazards and driving."

DENTAL caries or decayed teeth are more prevalent than any other ailment except the common cold, the U. S. Public Health Service has announced, following a survey of a typical town not far from Washington, D. C. At the age of 15 years, 19 out of every 20 persons have or have had decayed teeth. The figure may be even higher among adults, but the survey was limited to school children. There is as yet no scientific answer, according to the Federal Health Service, to the questions, Why do teeth decay? and How can one prevent their decay? "For the present at least," the services advise, "the best that can be done is to feed the expectant mother, the infant and the child tooth-building foods and to visit the dentist early and often for the control of the extension of dental decay."

SULFAPYRIDINE, the new drug so successfully used in certain cases of pneumonia, has the distinction of being the first drug on which a preliminary survey of its possibilities for good or harm preceded its exploitation. The *Journal* of the American Medical Association states editorially that under the new food and drug act the medical profession has the opportunity of being informed and its representatives consulted about a drug before any preparation is placed on the market. Sulfapyridine was licensed for sale in interstate commerce on March 10. This was done with the full approval of the council on pharmacy and chemistry of the American Medical Association, which sent inquiries to a hundred investigators during the experimental period before the drug was placed on the market. Replies showed the exceedingly great value of the drug in certain cases of pneumonia and also the need for careful supervision of its use. An article on the kidney complications following its use appears in the same issue of the medical journal.