SCIENCE NEWS

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IMMUNIZATION AGAINST DIPHTHERIA

THE latest methods of preventing diphtheria, the effect of drought on the country's health and what health authorities can do about the current depression were the chief topics discussed before the meeting of the American Public Health Association in Montreal.

"A death from diphtheria must be considered as a result of ignorance or neglect," Dr. W. T. Harrison, of the National Institute of Health, declared at the symposium on toxoid immunization, the latest method of diphtheria prevention. He explained that there are two methods of preventing deaths from this disease—one is early treatment with antitoxin and the other is prevention by immunization with toxoid, the successor to toxin-antitoxin.

"The prevention of diphtheria by active immunization is the greatest thing in public health since Jenner's development of vaccination against smallpox," Dr. Harrison said. He predicted that diphtheria, once the dreaded scourge of childhood, will disappear in a few more years.

Credit for the development of immunization against diphtheria goes to Dr. William H. Park, director of laboratories of the Department of Health of New York City, although toxoid was first introduced by Professor G. Ramon, of the Pasteur Institute in Paris. "Dr. Park has done more than any living man to wipe out diphtheria," according to Dr. Harrison. "He developed toxin-antitoxin and it is his influence on health departments, parents and physicians that has enormously reduced the diphtheria death rates in many American cities."

The diphtheria bacillus produces a poison or toxin which, in massive amounts, causes illness and death. Antitoxin is an antidote to the diphtheria poison and is used to treat cases of the disease. Toxin-antitoxin, on the other hand, is toxin largely neutralized by antitoxin. When it is introduced into the body, the antitoxin gradually splits off, leaving more and more of the toxin. These very small doses of toxin have the effect of raising the body's resistance to the disease or giving it immunity.

When toxin-antitoxin has been frozen for a time it may become inert, or, on the other hand, may become toxic. This uncertainty is entirely absent in toxoid. Toxoid is toxin to which a small amount of the common disinfectant formalin has been added and which is then kept at a temperature of 100 to 102 degrees Fahrenheit for from three to six weeks. During this time it loses all its toxicity but retains its immunizing properties.

Toxoid is entirely non-poisonous and absolutely harmless, Dr. Harrison emphasized. No case of injury has been known to follow its use. Neither is there any danger of serum sickness, as it contains no horse or other serum. It is given in courses of two or three treatments. After the first course, nine tenths of the children become completely immune. Experiments have shown that toxoid is 20 to 30 per cent. more efficient, even when only two doses are given, than is toxin-antitoxin.

Toxoid plus alum gives the best results, Dr. Park and his associate, Dr. May C. Schroeder, reported. Toxoid should be used for preschool children. In a small percentage of older children and adults, toxoid causes a marked local reaction.

EARTH TREMORS BY DYNAMITE

YOSEMITE NATIONAL PARK was the scene recently of several earthquakes, the first artificial tremors of their kind produced for purely scientific purposes. They were engendered not by the slipping of rock layers along a fault line, as in real earthquakes, but by the explosion of charges of dynamite.

The experiment was launched jointly by the Carnegie Institution of Washington, D. C., and the California Institute of Technology, Pasadena, California, under the direction of Dr. John P. Buwalda, chairman of the geology and paleontology division, Dr. Beno Gutenberg, professor of geophysics and seismology at the institute, and Henry Salvatori and assistants, of Dallas, Texas.

Two methods of producing tremors were used. A tunnel, more than 2,300 feet long, was dug by the National Park Service into the cliff east of Bridal Veil Falls. In this tunnel, several hundred feet underground, several hundred pounds of dynamite were exploded twice daily. Vibrations set up by the explosions were registered on instruments many miles distant from the source of the disturbance. Smaller charges were exploded on the surface and the vibrations set up in the solid granite recorded with instruments placed some thousands of feet away.

Dr. Buwalda reported that the "Yosemite Valley is a deep, narrow and vertical-walled chasm, and when vibrations were caused on one side, the surface waves which usually confuse the readings of seismograms were eliminated because they were reflected back when they struck the vertical cliffs on the side of the valley from which they radiated. A network of telephone lines made it possible to send precise time signals from the point of explosion to the recording point."

Three problems were studied. The first was to determine the velocities of earthquake waves in the several different kinds of granite. This was done by determining the exact thousandths of a second required for the vibrations to travel a measured distance through the granite. The second problem was to determine the effect of a vertical-walled canyon or valley on earthquake waves when they travel approximately at right angles or across the valley. Each explosion, Dr. Buwalda said, set up three kinds of tremors, and it was important to know which reached the other side of the canyon and which was eliminated by being reflected back by the canyon wall.

BABIES AND MILK DRINKING

THE new-born infant can tell the psychologist about what he is able to taste and feel, according to the report of Dr. Kai Jensen, of the Connecticut Agricultural College, to the meeting of the American Psychological Association. The language used by the infants studied by Dr. Jensen was the pressure of their sucks on a nursing bottle as recorded on a complicated apparatus which he designed especially for this purpose. When milk of the correct temperature is in the bottle, the infant will suck and then swallow rhythmically and with equal pressure. But let the temperature be raised or lowered enough and he will suck much less vigorously, with increasing irregularity, until he stops altogether. The temperature acceptable varies greatly with different infants. Some will take it as cold as ten degrees Fahrenheit above freezing point. Some will drink milk as hot as 150 degrees, although the usual temperature for feeding is about 105 degrees. Differences in temperature of less than four degrees are detected by the infants.

To test the sense of taste, salt solutions were given. The weakest solution tasted by the babies was only 225 thousandths of one per cent., and differences as minute as 25 thousandths of a per cent. were noticed. The infants studied were all under twelve days old.

Putting a human baby through a test designed for testing a monkey, giving no directions, but using food for "bait," was one of the steps of a series of experiments described at the meeting by Dr. Louis W. Gellermann, of Yale University. The whole series conducted by Dr. Gellermann and Dr. Walter S. Hunter involved tests of many types of animals, from rats to human adults. They demonstrate a clear difference between the typically human ability of the symbolic type and ability of the ordinary habit-formation type.

The apparatus used in the baby-monkey test consisted of two boxes in which food was placed as rapidly as it was taken out by the infant or animal. Each box had a lock which could be operated by the person giving the test. This he did in such a way that the boxes could be opened only in a particular order, first the right one, second right again, third left, fourth left; continuing thus—twice right, twice left.

Dr. Gellermann found that two separate abilities are involved in the task of learning this pattern without any direction or encouragement other than the urge of hunger. The simple trick of learning to look in the right box first for food is one which the lower animals learn more readily than does the human infant, but the tendency to turn first to the right and then to the left and the ability to discover the pattern of two right and two left are highest in human beings and less in evidence going down the evolutionary scale. Roughly the order for the animals tested seemed to be highest for human adults, next children, then, at about an equal level, human infants and adult chimpanzees, then rhesus monkeys, raccoons and last rats.

MOVING A BUSINESS BUILDING

BUSINESS as usual! Such was the state of affairs in an eight-story telephone switchboard building in Indianapolis, despite the fact that it was moved 52 feet backward and turned a quarter of the way around. While the moving went on, not one of the many telephone wires was idle nor was connection lost with any of the gas, sewer or water mains. By means of a movable bridge, an entrance to the building from the sidewalk was even made possible.

Moving the building was necessary to make room for a new structure. The building's position was changed from one corner of the lot to an adjacent one. Demolition was first considered, only to be abandoned when the loss from such a move was figured at about $1,800,000. The unusual engineering feat was not accomplished without careful preparation. The *Engineering News-Record* describes how tests were carried out with different devices before the plan of moving was decided upon. Parallel steel rollers were finally used as the medium for sliding the building along. A concrete bed six inches thick was laid down as a mat upon which to conduct operations. Timbers and T-rails covered the mat and the moving force was supplied by screw jacks and a donkey engine with cables attached.

When the building was securely braced with steel beams and girders, men went to work with the jacks, and rollers were substituted for the cast-iron pedestals upon which the building rested. The jacks, eighteen of them, succeeded in pushing the building across the block. There it had to be lifted to allow for readjustment of the rollers before the circular move began. With the donkey engine lending a hand, the structure was turned through an angle of 90 degrees so that it finally faced and bordered on streets different from those of its original position. The old pedestals of the building were then replaced.

During the moving no appreciable cracks or breaks appeared in the building and the occupants were said to be unconscious of any motion. The telephone wires were spliced during the operations, while flexible hose connections permitted the steam, water and gas services to continue. Elevators in the building operated everywhere, except in the basement.

MATHEMATICS IN BUSINESS

MORE thorough mathematics, more honest mathematics, is one of the outstanding needs of business at the present time. Without better mathematics than now goes toward the making of statistical economic forecasts, there can be no hope of making such forecasts really mean anything. Thus, in brief, declared Professor Harry C. Carver, of the University of Michigan, in an address before the American Mathematical Association meeting in Minneapolis recently. Professor Carver said, in part:

"It is greatly to be regretted that that phase of business statistics dealing with the analysis and projection of time series rests on an exceedingly unstable foundation. There is absolutely no excuse for this state of affairs. For the most part this work is being done by economists and 'professional forecasters,' who are far more interested in making predictions than they are in estimating the probability that the actual occurrences

will differ from their forecasts by more than a specified per cent.

"Most of you are acquainted with various organizations which very properly described past events by actual numerical data, but somehow insist on predicting the future trend of the same phenomena in statements that are so vague and contain so many 'ifs' that the forecasters scarcely commit themselves. I insist that with very few exceptions the estimates of the future terms in time series should be expressed numerically and in precisely the same terms that will subsequently be employed in recording the corresponding facts for historical purposes. Just as soon as this is done, we can at least obtain empirical approximations for the probable errors of these estimates, and we may then expect that competition among forecasters will result both in an increase in the reliability of forecasts and in a corresponding decrease in the number of forecasters. . . .

"But do not infer by these remarks that the mathematical statisticians are at the present time capable of solving all the problems that might reasonably be submitted to them. Nothing could be further from the truth. For instance, the entire theory of sampling will probably require fundamental alterations in order that it may be applied properly to time series, since each sample contains ordered variates with respect to time."

THE HAGERSTOWN METEORITE

THE meteorite fragment that crashed through a garage roof in Hagerstown, Maryland, on the night of September 7 is the world's newest example of a very old class of objects, regarded in antiquity with religious awe and even made the centers of idolatrous worship. The "sacred black stone from heaven" preserved in the Kaaba, or central shrine of the Moslem world at Mecca, is an iron meteorite. Before Mohammed prohibited idolatry among his people, it was the object of actual worship in the primitive, pre-Mohammedan religion of Arabia.

Iron meteorites like the Hagerstown specimen are not as common as stone ones, in the total fall from the skies, but there are more of them in museums, due to the greater likelihood of a stone meteorite's being overlooked as it lies in the open. Nobody knows why some meteorites should consist of pure, or nearly pure, iron, though one theory that is fairly widely accepted holds that they are fragments of the dense inner core of a long-since-destroyed minor planet, drifting through space for ages until they come within the earth's gravitational field. Their light is engendered by friction against the atmosphere as they plunge to the ground.

Meteorites may have been the source of the first iron used in tools by mankind. The little iron used by American Indians in pre-Columbian times was all meteoric. Furthermore, the earliest Mesopotamian references to iron have been translated as meaning "stone from heaven," which may be a hint of meteoric origin of at least the first iron known to the inhabitants of Babylonia and Sumeria.

ITEMS

THE general healthfulness of frozen foods was attested to by Professor Carl R. Fellers, of Massachusetts State College, at the meeting of the American Public Health Association which opened in Montreal on September 14. Professor Fellers reported that he found little or no deterioration in quality, appearance or nutritive value of the foods preserved by freezing and cold storage, if the freezing is prompt and rapid and the storage kept at low, constant temperatures. Fruits and vegetables are now frozen, as well as fish, meats, poultry, eggs and oysters. The latter products, however, keep their fresh appearance, flavor and character better than the fruits and vegetables do. The changes in frozen foods are more physical than chemical, Professor Fellers reported. Freezing greatly reduces the number of microorganisms, which may include disease germs present in the foods, and prevents their multiplication. He emphasized that frozen foods should be used promptly and should be eaten while still frozen or within a very few hours after defrosting. More research is needed on the subject, he added.

CHARGES of electricity in 10,000-volt groups are carried up a moving endless silk belt until they have accumulated a potential of 1,500,000 volts on two-foot copper spheres, in a new type of apparatus for exploring the heart of matter which was described before the meeting of the American Physical Society at Schenectady, New York, by Robert J. Van De Graaff, National Research Fellow at Princeton University. While potentials of more than a million volts have been built up in the past by different kinds of generators, the construction of this apparatus is unique. "The generator has the basic advantage of supplying a direct, steady potential," Dr. Van De Graaff said, "thus eliminating certain difficulties inherent in the application of non-steady high potentials. It is simple, inexpensive and portable. An ordinary lamp socket furnishes the only power needed." Two hollow copper spheres, each 24 inches in diameter, mounted on a seven-foot glass rod, accumulate the high tension charges of electricity in each of two identical units, one unit accumulating positive electricity and the other negative. In each unit an endless silk belt runs between a pulley near the ground end of the glass rod and a wheel in the sphere.

TWO mathematicians, independently, and at the same time, announced a new way to solve certain algebra equations, according to their reports to the American Mathematical Association. Professor W. E. Roth, of the University of Wisconsin, and Professor C. C. MacDuffee, of the University of Michigan, explained their methods of solving "matrices" and "matrix" equations. These are important in Einstein's theory of relativity and in the new quantum theory of physics. Professor Roth showed what possible solutions exist under a number of hypotheses, and Professor MacDuffee proved that an earlier theorem of 1860 was not general enough.