SCIENCE NEWS

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A NEW TOOTH ANESTHETIC

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DRUG stores were doing a rushing business in New York in thymol, sulphuric ether and ethyl alcohol as dentists began making the new Hartman formula which takes the pain out of tooth drilling.

Announced by Professor Leroy L. Hartman, professor of dentistry in the Columbia University School of Dental and Oral Surgery, the new pain-killer is applied to the dentin of a tooth, lying just below the enamel, and makes possible drilling of a cavity without feeling on the part of the patient.

Here is the formula which Professor Hartman gave out before 3,000 of his fellow dentists at a joint meeting of the First and Second District Dental Societies of the State of New York. Formula by weight: Thymol, 1¼ parts; ethyl alcohol, 1 part; sulphuric ether, 2 parts.

The solution is kept in a brown bottle and applied directly to the dentin by a moistened pellet of cotton. The pain-killing effect lasts one hour if the cavity is kept dry by the use of a rubber dental dam. If saliva dilutes the solution the effect may last only twenty minutes. But because the local anesthetic is designed to kill pain only during drilling, the time is ample. A seventy-five cent bottle of the Hartman formula is sufficient for 200 applications.

Sufferers from toothache are doomed to disappointment if they rush to the nearest drug store, have the solution prepared and apply it directly to an aching tooth. It must be placed in contact with the dentin inside the tooth and not on the outer enamel for its pain-killing effect.

As a matter of fact, the discoverer of the formula and officers of the dental society warned: "In the interest of public welfare we warn the public against attempting to use this preparation for the self-treatment of toothache. It is effective when used by a dentist under the proper conditions."

The only possible condition where the solution might aid a home sufferer temporarily would appear to be in the case of a large cavity in a tooth where the dentin is exposed and the outer enamel broken away.

With a sure means of preventing pain during drilling, however, many persons who dread the dentist's chair should feel more like visiting their dentist regularly. A drug manufacturer has already begun the preparation of the tooth desensitizer for distribution to dentists of the nation.

Out of 500 volunteer cases which Professor Hartman has treated the only times the solution failed to do its work was when it came in contact with phenol, or carbolic acid, which is commonly used in dentistry to sterilize a cavity. The phenol must be removed from the cavity or else several applications of the Hartman solution must be applied to dissolve the phenol.

THE TREATMENT OF DIABETES

THE "most valuable discovery in the treatment of diabetes since the original discovery of insulin" is announced in the *Journal* of the American Medical Association.

A new preparation—protamine insulinate—is the answer found by Danish investigators to the problem of the many persons with a severe diabetes which can not be controlled satisfactorily with insulin alone.

Protamine insulinate does not supplant ordinary insulin in the treatment of diabetes but serves as an adjunct to it. The two must usually be used in the same patient at different times each day.

For example, a person with diabetes can employ the quickly acting old insulin in the morning with a heavy breakfast and the slowly acting compound at night before a light dinner.

That is what has been done at the Steno Memorial Hospital, Copenhagen, where Dr. H. C. Hagedorn and his associates have developed the new preparation. A similar procedure is being followed by Dr. Howard F. Root and associates at the New England Deaconess Hospital, Boston, where the new preparation is also being tested.

"It would appear as if a new revolution in the treatment of diabetes must follow and the possibility created for the diabetic patient to resemble more closely a normal individual," writes Dr. Root and his co-workers, Drs. Priscilla White, Alexander Marble and Elmer H. Stotz.

"While the majority of persons with diabetes are able to adjust their carbohydrate metabolism satisfactorily by the injection of insulin several times a day, many have so delicately balanced an equilibrium that it is readily disorganized by slight overdosage or underdosage of insulin," the Medical Journal explains. "Wide fluctuations in blood sugar occur in these patients." The Danish investigators have combined insulin with protamines, which are elementary compounds of amino acids containing one or more of the substances lysine, arginine and histidine. The resulting compound is relatively insoluble and tends to be absorbed slowly and over a longer time than ordinary insulin. The blood sugar lowering effect lasts about twice as long.

In presenting the work of both the Danish scientists and of Dr. Root and his associates in Boston, the *Journal* emphasizes several facts: Protamine insulinate is still a laboratory preparation and is not yet commercially available; the compound is somewhat inconvenient in that it must be prepared shortly before use, as it is stable at most for only a few weeks; it does not supplant insulin but serves as an adjunct to it; it is of no special value to persons who are now adequately treated with insulin.

Fifteen cases treated in Boston in general confirm the excellent results reported in the eighty-five cases reported from the Danish hospital.

USE OF ATOMIC "BULLETS" IN BIOLOGICAL RESEARCH

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BIOLOGICAL research, including the study of cancer, as well as physical science should benefit in the experimental program to be undertaken with the newest of all atom accelerators, just put in operation at Cornell University by Dr. M. Stanley Livingston, instructor in physics. Parti-

cles with 2,000,000 electron volts energy can be generated. Eastern leadership in the field of the conquest of matter is assumed by Cornell, according to a statement given out by the university, with the new device which is patterned after the famous 85-ton cyclotron equipment of Professor E. O. Lawrence, of the University of California.

Dr. Livingston was a co-worker of Professor Lawrence in the design and construction of the West Coast apparatus, which has done so much for increasing knowledge of artificial radioactivity, the production of penetrating neutrons and studies on the transmutation of the chemical elements.

Besides investigations into the structure of the nuclei of atoms, it is planned to use the apparatus to test the effects of neutrons which it will generate on mouse cancers, in cooperation with the New York State Institute of Malignant Diseases at Buffalo, N. Y.

In cooperation with other departments of the university, research is planned also on the effects of neutrons on plants, particularly on fern spores, and on the eggs of some of the lower forms of animal life. A comparison will then be possible between the neutron's effects and those of x-rays and the gamma rays from radium. Biologists too would like to see if the high-velocity neutrons from the apparatus can cause visible changes in the chromosomes which carry the pattern of animal make-up within them. Also scheduled for investigation are the possibilities of mutations or gene changes caused by the piercing neutrons.

The biological applications of the research hold promise because of all the elements bombarded by other investigators with neutrons, hydrogen appears to have nearly the greatest stopping power. And the animal body contains large amounts of hydrogen, both in the form of water and other more complicated chemical compounds. Neutrons therefore are expected to have striking and appreciable effects on such tissues.

Weighing 6,500 pounds, the apparatus takes charged cores of hydrogen atoms and accelerates them within a pancake-shaped vacuum chamber lying flat between the pole pieces of a powerful electromagnet. Issuing near the center of the pole pieces, the particles travel in an ever-widening spiral parallel to the faces of the magnet's pole pieces. Twice during each trip around the particles receive a boost of electrical voltage which drives them faster and faster. The cumulative effect finally ends when the particles reach the periphery of the apparatus and they have been given energies of 2,000,000 electron volts by the series of electrical kicks.

When at their greatest velocity and energy they are picked off and directed against targets, which undergo a variety of effects, including transmutation and artificial radioactivity. In the process of impact, particles torn from the nuclei of the targets' atoms come off, and among them are the neutrons.

Describing the action of the apparatus, Dr. Livingston says: "The action may be compared with that of a swing which, starting from a period of rest, increases its arc with each to-and-fro movement. In both instances—whether swing or vibrating "bullet"—perfect rhythm is at once established. Regardless of the arc which the swing describes, the time interval required for it to pass through its starting point is the same. So it is with the semi-circles described by the atomic "bullet." In each excursion, regardless of an ever-increasing radius, the oscillating "bullet" reaches the gap separating the two disks in a period of time which is constant. It is this physical principle which gives to the apparatus its resonance feature."

NORTH AMERICA BEING PULLED INTO THE PACIFIC OCEAN

NORTH AMERICA is being pulled into the Pacific Ocean by the attraction of the dense layers of the earth's crust which are below the bottom of the Pacific. This in substance is the conclusion of an investigation reported by Dr. Ross Gunn, of the U. S. Naval Research Laboratory.

The movement results in a great thickening of light material on the forward edge of the moving continent, which well accounts for the growth of mountain ranges like the Sierra Nevada in the Pacific coast states, adds Dr. Gunn in his report to *The Physical Review*.

Measurements on the velocity of sound waves indicate that layers under the Pacific Ocean have a density greater than similar layers underlying the continents. This dense mass of material produces a component of gravitational force at an angle to the normal vertical pull of gravity.

It is this sidewise, or tangential, pull of gravity which is tugging North America gradually westward, according to Dr. Gunn's findings.

The geophysical evidence, Dr. Gunn maintains, substantiates his earlier papers concerning the origin of the solar system. Dr. Gunn has shown that a star can acquire sufficient angular velocity to split into two parts. As the parts separate, while revolving around one another, enormous tidal forces are set up which cause both parts of the original star to lose pieces of themselves that eventually become planets. These planets, as they fly off, are hotter on one side than on the other.

It is this difference of temperature, Dr. Gunn has maintained, which ultimately accounts for the uneven distribution of the continental and oceanic hemispheres of the earth, the lopsidedness of the earth's magnetic field and the uneven distribution of the density in the various layers of the now-cooled earth's crust.

It is the last point, the much greater density of the earth's crust beneath the Pacific Ocean, that accounts for the tangential gravitational force that moves North America westward.

Tangential forces in regions of sedimentation and crustal weakness, explains Dr. Gunn, cause overthrusting of the outer layers. The overthrusting ultimately results in the observed mountain changes.

DRY-ICE REFRIGERATION

WIDE use of domestic refrigerators served with dry-ice is forecast by H. S. Cornish, refrigeration engineer of Los Angeles. This comparatively recent development, formerly thought to be prohibitively expensive, is now attracting attention since the price of dry-ice, or solid carbon dioxide, has fallen much below five cents per pound even in small quantities.

In the present market it is still conceded, however, that household refrigeration with dry-ice is substantially higher in cost than common icebox service under city conditions, at least for customers whose requirements are met by ordinary ice. Out in the California deserts, however, there are many locations where both ice factories and electric power are missing. The dry-ice box then scores an economic advantage.

In new models described by Mr. Cornish the dry-ice is placed in a special insulated compartment, an icebox within an icebox. In view of the extremely low temperature of dry-ice at common atmospheric pressure, 109 degrees below zero Fahrenheit, a high-grade non-conductor of heat is required in the compartment walls. Otherwise the contents of the main refrigerator would be frozen with astonishing rapidity. It happens that carbon dioxide has remarkably high vapor pressures in the solid state, causing rapid escape of vapor and great power of withdrawal of heat. A great contrast between dry-ice and common ice is noted, the former having a vapor pressure of about 75 pounds per square inch at its melting point, whereas common ice rates at little over one ounce per square inch.

At one point on the bottom of the inner compartment an aluminum plate with projecting fins or knobs is inserted in place of a small section of insulating wall. The inward transfer of heat through this plate is neatly adjusted so that the main chamber is cooled to temperatures in the range of 35 to 45 degrees Fahrenheit. Should the temperature run under 35 or over 45, the velocity of evaporation of the dry-ice will be automatically increased or decreased.

ITEMS

A WHITE elephant with pink eyes—a true albino animal—was killed not long ago by a game warden on the plains of Laikipia, in Kenya Colony, Africa. Like all "white" elephants, the animal was in reality only a dirty gray in color, but every hair on its body was white. The Kenya game warden's report relates terrible effects on wildlife of three years of drought. There are records of elephants falling into wells and perishing because they were too weak to get out again. A number of rhinoceroses and many buffalo have also died in their frantic efforts to get water. In northern Kenya, herds of wild elephants hid behind cattle while natives dug for water, and when it was found stampeded forward to get the first drink.

EVIDENCE tending to show that man existed in North America before the Ice Age is announced by Professor Paul MacClintock, of the department of geology of Princeton University. The evidence is reported to be human implements found in the White River region of South Dakota and Nebraska and deposited there before the time of the great glacier. Assisted by Justus S. Templeton, a Princeton senior, Professor MacClintock discovered last summer varved sediments in the bed of an extinct lake formed when the valley of the White River was dammed by the last advance of the ice sheet. Knowing that these sediments must be contemporaneous with the ice sheet, they figured that man-made artifacts found in or below the lake sediments would prove that man was there before the ice. Accordingly, aided by geologists from the Nebraska State Museum, they dug below the sediments and found not only many artifacts, but scores of hearthpits containing charcoal, burned stones, and burned bones of extinct animals. The pits, which are two or three feet wide and one or two feet deep, seem to have been used to preserve the fire from day to day. While no skeletons of the ancient people have yet been found, hopes are held for excavations in coming seasons.

ASTRONOMY and cooking marched hand in hand during the three years' research which led to the development of the ultra-low expansion type of glass that was used by the Corning Glass Works in the great 200-inch diameter disk of glass for the new telescope of the California Institute of Technology. Astronomy obtained the disk for the telescope mirror out of investigations in which 1,500 different kinds of glass was studied. Housewives will benefit from the same, work, for one of the new glasses is now being used for a new type top-of-the-stove glass cooking utensil. What makes ordinary glass crack when heated suddenly or unevenly, indicates Dr. J. C. Hostetter, who had charge of making the great telescope disk, is the large coefficient of expansion which sets up unequal stresses that finally pull the glass apart.

CONSTRUCTION of the world's first "cotton runway" will be undertaken next spring at the Newark, N. J., Airport, it is announced by the Cotton-Textile Institute. Cotton sheeting is already in use in the South in rural and secondary road construction where traffic is light. It is found to minimize erosion, cracking and wrinkling. The cotton sheets act as a binding layer between the highway base and the top dressing. It takes from six to eight bales of cotton to construct each mile of an 18-foot road by the method. The Newark airport installation will amount to about one mile and a half of such road.

DECAY of the teeth with attendant toothaches may be prevented if a method developed by Dr. E. P. Brady, of the Washington University Dental School, is put into successful practise. A dental examination can determine by a chemical test which of the teeth in one's mouth are liable to decay. Silver nitrate, a common drug used generally for germ killing purposes, betrays the presence on the tooth enamel of certain faults of formation. It is in these faulty areas that decay is likely to start, because there the acids in the mouth and acid-producing bacteria can penetrate through the enamel to the sensitive dentine beneath. The decay can be prevented by the use of silver nitrate. After it has started, its progress can be stopped by use of another chemical called trichloracetic acid, Dr. Brady said. This substance acts to coagulate the organic material in the tooth and block any further penetration by the acids of decay into the interior of the tooth. Nature has her own way of doing just this, under favorable conditions. When decay starts, a defense may be made in the form of a barrier of calcium deposit across the path of the penetrating acids.