SCIENCE NEWS

Science Service, Washington, D. C.

CRYSTALLINE INSULIN

INSULIN has been reduced to a purity so great that it comes down out of solution in the form of minute crystals that shine like bits of uncut diamond when viewed through the microscope. Yet this result has not satisfied Dr. John J. Abel and his corps of coworkers at the school of medicine of the Johns Hopkins University. They expect to spend the coming two or three years, at least, investigating the properties of those crystals.

The insulin used in medicine is effective clinically, Dr. Abel told a representative of *Science Service*, but it has been recognized from the first that chemically it is far from being a pure product. Most chemical compounds indicate the attainment of a state of real purity by forming regular crystals, and nobody had been able to get crystals of insulin. The trouble was, Dr. Abel explained, that the insulin was all mixed up with a lot of other unknown substances that would precipitate at very nearly the same electro-chemical state of the solution.

Beginning with the ordinary insulin used in medicine, Dr. Abel and his associates passed it through an elaborate series of precipitations with various chemicals and repeated solutions in weak acetic acid. The crystals that come down at the last stage are very small. After settling out at the bottom of the flask they were picked up with a fine-pointed, rubber-tipped medicine dropper. The process of manufacture is so slow and difficult that months of work have resulted in the preparation of only a few hundred milligrams of the precious stuff.

This pure crystalline insulin is extremely potent, Dr. Abel states. One milligram of it, or a bit as large as a rather small grain of sand, has as much power to reduce blood sugar as is possessed by 100 clinical units of the solution used in medical practice. One fiftieth of a milligram will throw a 4½-pound rabbit into convulsions, which are quickly cured, however, by injecting a little sugar solution into the rabbit's veins.

Whenever a chemist succeeds in refining a natural compound to a purity that will result in crystal formation, the next step is usually expected to be the analysis of the crystals, with a view to the possible manufacture of the compound by artificial means, so that a perfectly uniform product may be obtained at a lower price. But Dr. Abel states that a year or more of work must intervene before the analysis can be completed. The synthesis of the compound will undoubtedly be a matter of the greatest difficulty and may be impossible in the present state of our knowledge.

Dr. Abel is no novice in the field of purification of gland secretions. Three of the four extracts of the various ductless glands so far crystallized or brought to a very high concentration are checked up to his credit. In addition to the recent crystallization of insulin, he isolated epinephrin as a mono-benzoyl derivative from the extract of a ductless gland situated near the kidneys, and he has also prepared a highly purified and very potent tartrate, not yet crystalliized, from extracts of the pituitary body. The fourth internal gland secretion to be purified is thyroxin, the extract of the thyroid gland of the throat region, which was crystallized by Dr. Edward Kendall, of the Mayo Clinic.

A MEASLES SERUM

ANOTHER weapon that may help to ward off the measles epidemics that sweep over the country in irresistible waves nearly every year is described by Dr. Rowland G. Freeman in a report to the American Public Health Association and the American Child Health Association.

Since the incidence of measles is greater than that of any other infectious disease, and 96 to 98 per cent. of those who have not had the disease contract it after exposure, any agent that promises to hold it in check comes immediately into the limelight.

The mode of attack set forth by Dr. Freeman consists of injection with a serum made from the blood of adult measles convalescents. This serum acts as a preventive. This method was first used in Germany in 1916 where the percentage of immunity conferred was found to be as high as 85 per cent. When the New York Board of Health began work on the problem in 1923 it found that the first difficulty was to find a sufficient source of convalescent blood to make the serum. A suitable reward was offered to adults suffering from measles in the contagious wards of all the hospitals in New York. Eventually enough was collected to treat in all about 3,500 children.

The most reliable data collected from these cases show that over 50 per cent. were completely immune, about 40 per cent. had only mild cases and in relatively few did measles develop in the usual unmitigated form. None of the children who had been injected with the serum suffered any of the after complications of pneumonia or ear trouble that make measles really dangerous, particularly in very young children.

In the light of the difficulty of obtaining material and the fact that the passive immunity conferred by the serum lasts only from three to six weeks, its use is limited quite largely to infants and children who are too delicate to stand any illness. It has a great field of potential use in checking measles epidemics in institutions, but for the present the supply of serum is inadequate to meet the demand. "We have in convalescent measles serum a therapeutic agent which has great usefulness in a limited sphere," Dr. Freeman said; "it is not the solution of the measles problem but it is a real step toward cutting down the mortality from this disease."

STERILIZATION BY OXYGEN

OXYGEN, under ordinary conditions the very essence of the breath of life, is to be used as a means of killing germs and similar organisms and thus bring about the sterilization and preservation of fruit juices without injuring their delicate flavors, by a process which has been perfected recently by Dr. L. R. Cleveland, of the Harvard University Medical School.

Dr. Cleveland states that by the use under pressure of the ordinary commercial oxygen gas, sold in cylinders for welding and other industrial purposes, he can kill all germs and other micro-organisms in periods of from twelve hours to four or five days, depending on the nature and quantity of juice under treatment and the amount of pressure used. In bulk, the juices can be enclosed in strong steel drums or barrels, the oxygen run into them up to the proper pressure, and the whole stored away indefinitely. In smaller quantities, as in bottles or cans, the containers can be placed in a pressure tank, and then sealed or capped under sterile conditions in an atmosphere of pure oxygen.

While the process is fatal to all microbes if continued long enough, Dr. Cleveland has found that the pathogenes, or disease-causing germs, are the easiest to destroy. High pressures or long exposure periods kill the germs completely, while less drastic treatment will leave them alive but unable to multiply; that is, it will preserve the material without absolutely sterilizing it.

Dr. Cleveland did not discover this process suddenly; it came as the result of a long series of experiments. The first inkling of the principle underlying this new method of preserving fruit juices was discovered while he was studying the minute, one-celled animals or protozoa that live in the digestive tracts of termites or white ants. He wanted to get the insects free of their tiny guests, and tried various methods, including heat treatment, with success. He found finally that if he increased the oxygen present in the atmosphere of the jars in which they were kept, the insects would live while the protozoa inside them died. The difference in the effect of oxygen on the microorganisms in white ants and on the white ants themselves was very great; the ants survived more than forty times the amount of oxygen required to kill their intestinal guests.

Following this, Dr. Cleveland very soon discovered that many other animals, including even the cold-blooded vertebrates among the higher animals, lost their protozoa when confined in oxygen. Applications of this principle may be made in combating the diseases of economic insects such as silkworms and bees, in freeing young fish of disease-causing parasites, and in testing out the ability of insects to transmit protozoa and spirochaetes to man, animals and plants.

Turning from the study of the killing effect of oxygen on parasitic microorganisms, Dr. Cleveland found that it was possible to kill such organisms as bacteria, molds and yeasts living free in nature by confining them in oxygen under pressure. This suggested the query "Is is possible, without rendering food unwholesome, to kill the microorganisms which cause it to spoil?" The work on fruit juices is an answer to this question.

THE DISRUPTION OF MATTER

THE universe is running down. Presented as a purely scientific conclusion, such is the statement of Dr. Richard C. Tolman, noted physical chemist of the California Institute of Technology, in an address to the Sigma Xi scientific society at Pasadena, California. Dr. Tolman admits this conclusion is probably untenable for a philosopher, who would want to know "who wound the universe up"; or if nobody wound it up, how could it have been running down for an infinite period of past time and still operate?

Taking the position of a court of law rather than that of a speculator in thoughts, the physical chemist of today finds no direct evidence whatsoever to deny the apparent fact that matter is being dissipated into a chaos of worthless scattered energy. To be sure, only a few species of matter are being actively destroyed in this manner on earth, but the tremendous radiations of the sun and stars are explainable on no other basis.

Dr. Tolman points out that future research may prove the atoms of terrestrial matter to be amenable to some setting-off process roughly analogous to the touching of a match to gunpowder. Possibly some of the so-called "novae" or new stars, which burst suddenly into view with a brilliance born of terrific temperatures and enormous radiation, may have been set off by a cosmic fuse of some sort. Obviously the control of such forces on earth by man would involve fearful responsibilities.

It is not necessary, in the degradation of matter into scattered energy, that large atoms should always break down into small ones. It is known that hydrogen atoms —the smallest atoms known—of their own free will combine in quartets to form helium atoms, but release in the process nearly one per cent. of their substance. The off-shoot is transformed into an enormous quantity of energy. Recent calculations show that that new cosmic rays, investigated last summer by Dr. Millikan, may well have come from the hydrogen-helium transformation in some distant nebula or star. At least it is known that they do not come from the earth or necessarily from the sun.

The transmutation of hydrogen into helium is very slow in most parts of the universe, so that the accumulated supply of the valuable product is small. The control of the reaction would plainly serve as a tremendous impetus to the airship industry, but the key to the puzzle is not in sight.

PRE-MAYA EXPLORATIONS IN GUATEMALA

THE forerunners of the wonderful Maya civilization in Central America have been discovered. Earthquakes which long ago shook Guatemala may enable archeologists to shove American pre-history back many thousands of years, and thus a new era ripe for archeological research will be revealed.

Such are the probable results of a three months' reconnaissance survey of unknown Guatemala just completed by Dr. Manuel Gamio, leading Mexican archeologist, working under the auspices of the Archeological Society of Washington. Dr. Gamio is now on his way to Washington, where he will study the material he has collected and will prepare a scientific report of his exploration trip.

The survey was for the purpose of determining whether Guatemala is a promising field for pre-Maya explorations. The first reports confirm the conjecture that the Guatemala highlands would yield evidence of ancient human

occupancy, dating back to long before the time of Christ.

What happened in the central region of America before the rise of the Maya, the Toltecs and the Aztecs is literally "pre-history." From time to time clay and stone fragments of great antiquity have been found in Central America, but archeologists have vaguely termed them as "Archaic" which means only that they belong to an age and a people that distinctly preceded the Maya.

In a report to the Washington Society, Dr. Gamio states that he has made several trial excavations, digging through seven strata of deposited soil, each layer being about twenty inches thick. In these deposits he found numerous fragments of pottery and clay sculptures. Many of these are of the Archaic type. There are a few Maya finds. Also, some of the pottery shows signs of a gradual transition to the ceramic style of the Maya, indicating that the two types may have blended or that one developed into the other.

Geography and earthquakes in particular are helping in this tracing of early Mayan history. Exploring this unsettled region, Dr. Gamio has found evidence that "the Maya, able constructors of lofty and complicated edifices, did not, if one may judge from appearances, build anything in the high zones affected by earthquakes. They confined themselves to the lower and above all to the coastal regions, where shocks were not experienced."

Buildings of the Maya remain standing in Guatemala to-day. Dr. Gamio suggests that probably these careful builders profited by the earthquake experiences of the earlier and more primitive people, because the makers of the Archaic pottery had established their settlements with careless disregard of earthquake zones.

It is not yet determined, however, whether these early inhabitants built such simple homes that they did not fear the rocking of houses and the falling of walls, or whether there were fewer earthquakes in that part of the world then.

The part played by earthquakes in the wanderings of these prehistoric American tribes is being closely studied by Dr. Gamio, who says that earthquakes have had a marked influence on the development of human life.

ITEMS

PHOTOGRAPHS of ripples mechanically produced in a tank were used by A. H. Davis, of the British National Physical Laboratory, to find out how to dissipate the noises made by airplane motors at the aerodrome warming-up in preparation to flight. Constructing a model tank comprising the principles of construction of the surrounding buildings, including a hangar, wave-lengths in water to the same scale as the sound waves were produced by ripples. By photographing these ripples it was possible to detect the effect of the various obstacles. In this way shielding effects were worked out by which it was possible to place accurately on the flying field parallel "plates" or sound screens, thus doing away with much of the noise disturbance.

A "SILENT" railway motor car without engine vibrations has been achieved, and during its recent trial run over the Swedish State Railways from Malmoe to Stockholm the passengers heard no other noise than that of the wheels clicking against the rail joints. It is the design of a Swedish engineer, Magnus Tacklind, of Stockholm, but has been manufactured in Germany. Except for certain motor parts it will later be built in Sweden. The absence of the noise and vibration is due to the fact that the motor is not placed on the same frame as the passenger car itself, but is entirely isolated from it, being slung underneath. The power is transferred to the driving axle from the motor through five different sets of gears, which are kept going all the time, so as to make the driving smoother. The speed attained reached over 50 miles per hour while the consumption of fuel, a mixture of benzine and benzol, averaged about eight miles to the gallon, or about twice that of an ordinary taxicab.

THE gaseous products set afloat by the family furnace are likely to have a corrosive action on the book bindings in the family library. According to experiments conducted at the Bureau of Chemistry, the products of combustion which pollute the air in large cities have a very deteriorating effect on the leather of bindings. This may be counteracted by applying various dressings, either while the leather is being made or when the book is bound.

OIL of wintergreen, commonly used in salves and liniments, is extremely poisonous when taken internally even in moderate doses. Drs. N. C. Wetzel and J. D. Nourse report that quantities of less than two fluidounces have resulted in death. The toxic effects of this familiar drug, in frequent use in medical practice to allay pain and reduce fever, seem not to have been generally recognized. They are ascribed to the fact that oil of wintergreen, after being taken into the body, undergoes very little chemical destruction, or breaking up into less dangerous components. Editorial comment in the *Journal of the American Medical Association* says that from the standpoint of public welfare, "Access to oil of wintergreen should be made impossible for children and for persons ignorant of its poisonous properties."

OCCUPANTS of the White House hold the record for longevity, according to statistics on notable men compiled by Pitirim Sorokin, a Russian economist. Their average life-span is almost exactly the Biblical three score and ten. Close on their heels as long-lived mortals are the Popes of the Roman Catholic Church, who average 69.6 years. A third group includes American millionaires, with 69.2 years. Scholars and scientists average 67.3 years, and writing men 64.4. The poorest showing was made by the hereditary monarchs of Europe. Though this group included some very long-lived families, the average longevity was only 53.6 years. In explanation of the poor showing of kings, it has been pointed out that the other groups represent the results of selection. The presidency and the papacy, for example, are both elective offices, and are filled invariably by men of mature years and usually good health, who have made their own records, while monarchs are notabilities simply by accident of birth, and by the same accident of birth may come of stocks decidedly inferior so far as health and vigor are concerned.