SCIENCE NEWS

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TRANSMUTATION OF THE ELEMENTS

ELEMENTS can actually be transmuted and one metal can be converted into another. This seems to be demonstrated by experiments reported to the British scientific journal, *Nature*, by Dr. Arthur Smits and Dr. A. Karssen, of the University of Amsterdam. Base lead has, under the influence of electric current in a quartz lamp, been changed into mercury and perhaps into thallium, according to the claims of these two scientists.

The Dutch experiments tend to support the claims of Professor A. Miethe, of the University of Berlin, and Professor Hantaro Nagaoka, of the Tokyo Imperial University, that they have changed lead into gold. When their claims were first made, many scientists doubted that such a change could be effected without the use of vast amounts of energy, far more than any of these modern alchemists have used.

One of the first to claim that he had solved this ancient puzzle was Professor Miethe, who, in 1924, announced the result of experiments with a mercury vapor lamp, similar to that giving the violet light often used in photographic and movie studios, and in which an electric arc operates in a vapor of mercury. He was assisted in this work by Dr. H. Stammreich, and in one series of experiments the lamp was operated for 197 hours with an electrical force of about 160 volts at 12.6 amperes, a current of about the same order as that used in lighting our homes. Though the mercury was shown free from gold at the beginning, slight traces of yellow metal, less than three ten millionths of an ounce, were found at the end. Minute as such an amount is, delicate chemical tests can detect it, and the tests in this case were made by Dr. Fritz Haber, considered one of the greatest of German chemists. In later experiments, Dr. Miethe claimed that he had obtained the gold in much larger quantities, enough to test by the ordinary laboratory methods, but not enough to make the method commercially practicable.

According to modern conceptions, the atoms of which all matter is made consist of a nucleus made up of what are called protons, around which revolve a number of electrons, much as the planets revolve around the sun. The outer electrons, in fact, are referred to as "planetary electrons." The difference between elements, according to this theory, is due only to the electrical charge of the nucleus and the number and arrangement of the planets. In the case of elements like radium, the atoms break apart spontaneously with the liberation of helium, whose atom is the simplest known next to hydrogen.

Theoretically, then, it seems easy to change the atom by merely knocking out some of the planets, but this does not affect the nucleus. Dr. R. A. Millikan, of the California Institute of Technology, has thus obtained what he calls "stripped atoms" of some elements, in which the outer ring of planets has been removed, but this does not radically alter the elements.

To break into the nucleus, the central "sun" of the atomic solar system, would require, in the opinion of many scientists, vast amounts of energy. Since mercury is next to gold in the procession of the elements, the removal of a single charge, corresponding to the complete nucleus of hydrogen, which is the simplest of the elements, would convert mercury to gold. But the nuclei of other elements have been bombarded with an energy corresponding to five million volts, with no sign of disintegration.

Now it seems, however, that comparatively small amounts of energy are able to get in where larger amounts have failed, and the work at Amsterdam is taken as confirming the atomic theories. The method of the Dutch scientists, however, was slightly different from that used by Miethe and Nagaoka, for instead of mercury they used lead, its close relative. The lead was melted and the tube filled with its vapor. Though the lead was free from mercury, as demonstrated by the fact that spectral photographs of the light from the tube showed only the lead spectrum, after a current of 60 to 100 amperes had been passed through it in the form of successive sparks for a time, the lead spectrum gradually began to disappear. Instead of the lines indicating this element, those of mercury gradually appeared on the plate, together with those of thallium, a rather rare metal which lies between lead and mercury in the list of the elements.

Though the lead spectrum almost completely disappeared, "this does not prove the transmutation to be strong," Professor Smits reports, "as it is known that a small quantity of mercury can cause the spectrum of another element to disappear. But at all events, our spectra show in a very convincing way the transmutation of lead into mercury."

The presence of this synthetic mercury was confirmed by a chemical test, for when iodine vapor was passed through the tube containing the product of twelve hours of sparking, the familiar red color of mercury iodide appeared.

PARTIAL IMMUNITY TO MEASLES

THE blood serum of adults who had measles in childhood may be used to modify the disease in children so that it will take only a mild form devoid of serious after effects and yet will give immunity for life just as the normal form of the disease does.

This is the conclusion of Professor R. Debre and Dr. Joannon, of the University of Paris Medical School, reported to the Health Committee of the League of Nations. More than a thousand injections of the serum have been without any bad effects. The efforts of Dr. Leon Bernard, of the University of Paris, resulted in the establishment of two prophylactic stations in Paris for the treatment of the disease.

"Up to the present time," Dr. Bernard said, "prophylactic methods have been used to some extent in the United States and Germany to secure temporary immunity. A serum from convalescent cases was used and injected in patients during the first six days after infection.

"But a durable immunity may be developed if the serum is not injected until the germs have had more time to incubate, as in the modified procedure of Professor Debre, where the injections are made only between the sixth and the tenth day after infection. A serum shortage problem was solved by the discovery that the serum of adults who have long since recovered from measles was as efficient as that taken from convalescent children."

It is often forgotten, Dr. Bernard said, that measles is a serious disease, and there is no other disease to which man is so universally susceptible. Every year there are thousands of deaths in France alone, and statistics from the most important countries show that the death rate from measles is falling more slowly than that of diphtheria, smallpox, scarlet fever and whooping cough.

Measles caused about a million deatns in Europe between 1900 and 1910, and in the death registration area of the United States from 1901 to 1920 there were more than 100,000 deatns. Measles is more dangerous in cities than in the country, and in Europe, at any rate, the danger is directly proportioned to the density of the population, Dr. Bernard said.

Although as old as medical history, and so common that in cities over 90 per cent. of the population have had the disease by the age of eighteen, measles is still one of the mystery diseases which it has been extremely difficult to combat. It is believed to be caused by an extremely small organism which can not be seen with the ordinary microscope, and which passes through a filter which stops ordinary germs.

With the possible exception of smallpox it is the most contagious disease known to man, and, according to the U. S. Public Health Service, it is difficult to control because the symptoms of the disease are not obvious until about four days after infection.

"The importance of measles is frequently underestimated," said Dr. Victor C. Vaughan, chairman of the division of medical sciences of the National Research Council, and one of America's leading epidemiologists, "and it has been commonly believed that the disease acts as a weeding-out process to eliminate the unfit at a very early age and does no harm to the strong. On the contrary, a study of measles in the U. S. army camps during the World War revealed that a person who has recently had measles is ten times more likely to die from pneumonia than one who has not.

"It is not over-sanguine to claim," Dr. Vaughan continued, "that if this disease, together with whooping cough, diphtheria and scarlet fever, could be entirely suppressed, the average length of life would be increased by at least ten years.

"There is great probability that the work of Drs. Bernard, Debre and Joannon will lead to an eventual control of the disease."

THE DANGERS OF TETRAETHYL LEAD

TETRAETHYL lead "knockless" gasoline is safe to handle and use as fuel, though the anti-knock compound itself is still recognized as dangerous in its concentrated form. This is the gist of the findings of the special committee of the U. S. Public Health Service that has been investigating the problem brought up by the alleged "lead-gas" poisonings some months ago.

The committee examined 252 men, most of them car owners and users, employees in garages, power plants and public service corporations in Dayton and Cincinnati, Ohio. Part of them handled and used gasoline treated with tetraethyl lead, and the others only untreated gasoline. One group of 60 was exposed to lead as a direct industrial hazard. Thorough physical examinations were made of all of them by doctors who were not permitted to know which of their subjects were exposed to the ethyl-gas and which were not. The general tenor of the results of these examinations is to the effect that no health differences can be found among these men that can be traced to their exposure to the treated gasoline.

It was found that practically all the men eliminated lead from their bodies, whether they were exposed to the suspected fuel or not. This indicated that they were absorbing lead from other sources. The committee found appreciable quantities of lead in the dust in garages, presumably from tires, battery plates, etc. The suggestion is also offered that lead may be taken in with drinking water, from plumbing consisting in part of lead pipes.

In addition to the lead in garages, the committee found that the air in the Dayton Municipal Garage contained from two to seven parts per ten thousand of the poisonous carbon monoxide gas when cars were operating.

Representatives of the American Federation of Labor, of the U. S. Public Health Service and of the manufacturers of ethyl gasoline are now drawing up a system of regulations to apply to the manufacture, blending and distribution of ethyl gasoline. These recommendations are expected to form a basis for any future state and municipal regulations on the subject. The sale of anti-knock gasoline, which has been voluntarily suspended during the investigation, will probably be resumed in a few days, except where prohibited by local authorities.

On the basis of this investigation, the committee feels that the following general conclusions are justified:

(1) Drivers of cars using ethyl gasoline as a fuel and in which the concentration of tetraethyl lead was not greater than one part in 1,500 parts by volume of gasoline, showed no definite signs of lead absorption after exposures approximating two years.

(2) Employees of garages engaged in the handling and repairing of automobiles and employees of automobile service stations may show evidence of lead absorption and storage, as indicated by the lead content of the feces and the appearance of stippled cells in the blood. In garages and stations in which ethyl gasoline was used, the amount of apparent absorption and storage was somewhat increased, but the effect was slight in comparison with that shown by workers in other industries when there was a severe lead hazard and for the periods of exposures studied was not sufficient to produce detectible symptoms of lead poisoning.

(3) In the regions in which ethyl gasoline has been used to the greatest extent as a motor fuel for a period of be-

tween two and three years, no definite cases have been discovered of recognizable lead poisoning or other disease resulting from the use of ethyl gasoline.

HOME-GROWN RUBBER

ALL the schemes to take a belated stitch in the American rubber dilemma which resulted when Great Britain pulled in her supply are beset by difficulties. One of the least known of these schemes, although not necessarily the most unpromising, is that for growing rubber at home under the semi-tropical sun of Florida and California.

The U. S. Department of Agriculture has been trying out seeds and plants of various rubber-producing species in experimental gardens, but as it takes a long time for the plants to mature and produce latex, officials have as yet no information to give out, and they are advising enthusiastic investors not to put any money as yet into Florida or California rubber.

Botanists name a long list of plants which will produce the milky sap containing rubber. The most important of these is the Para rubber tree, *Hevea guianensis*. It grew originally in the Amazon Valley, but was bootlegged out more than half a century ago by British planters who tried it out in Kew Gardens, London, and in Ceylon, to see if it would grow outside of Brazil. Then it was used to start the vast plantations in the East Indies that are now supplying the world with most of its rubber.

"Healthy seedlings of the Para rubber tree have been grown at the U. S. plant introduction gardens near Miami, and are being transplanted to different conditions of soil and exposure," Dr. W. A. Taylor, chief of the Bureau of Plant Industry, stated in his annual report to congress. "The collection of rubber plants now growing at Miami includes altogether about twenty different types.

"Rubber plants that are natives of dry regions are being tested in California, in the coast regions as well as in the interior valleys," he continued. "Several dry-country rubber plants are known in Mexico, while others are reported in South America, Africa and Madagascar. The production of rubber from the Mexican guayule plant has been investigated by a private corporation and the stage of agricultural practicability is believed to have been reached in California.

"Desert types of rubber plants are being grown in the lower valley of the Colorado River, and the possibilities of one of the common milkweeds are being studied because it grows well on waste lands and produces a large quantity of rubber-bearing material readily and cheaply. Cultivation might extend over large areas if ways of utilizing the substance were perfected.

"This plant is widely scattered in southern Arizona and the desert regions of Sonora and southern California, and it also grows in small ravines and gullies of barren hillsides a few miles from the coast of Lower California. Some of the plants grow so large that they form dense masses more than six feet high and ten feet across."

If any of the rubber-bearing species does show a willingness to produce rubber in the United States in worthwhile quantities, many economic problems would still have to be solved before rubber-growing could be done on a commercial scale.

Para rubber, if that should be chosen, would not have the even rainfall it has in the East Indies because Florida has distinct wet and dry seasons. With even rainfall, rubber trees may be tapped the year around, but with an uneven one, tapping would have to be seasonal. This would involve labor complications, because at certain times a great number of laborers would be needed, and at others only a few.

Even if that problem could be satisfactorily solved by secondary crops, there would still be a labor problem. East Indian rubber planters can get cheaper labor than Florida or California planters can ever hope to get. Therefore, some other means would have to be found to reduce the cost of producing the rubber in order to compete with England's East Indian product in price.

The research chemist would have to work out new means of getting the rubber out of the latex, certainly a cheaper and better way. In case one or more of the lesser known plants were to be used, for which no method of extraction is now known, a brand new method would have to be developed. On top of it all, the chemists might come along any day with a cheap synthetic rubber that would stretch as far as the best of nature's product.

ITEMS

IMMORTALITY of the human body is forecast in experiments of Dr. Leo Loeb, at Washington University. Having successfully transplanted tumors and kept them alive indefinitely, Dr. Loeb has turned his attention to healthy tissues with some success. Cartilage, popularly termed gristle, has been grafted from one rat to another, and the transplant has not only continued to live, but it has proliferated itself also. The transplants must be made to a host of the same species, said Dr. Loeb in detailing his experiments to date. Usually grafted tissue can not be cultivated in this way, but cartilage is different, and it responds to the process. Cartilage cells, implanted in another individual, continue to divide for two and a half to three years. By serial growth—transplanting again to a third rat—the age of the cartilaginous tissue can be increased to five years. This is much greater than the age which rats usually attain. Cartilage, at least, is potentially immortal.

How America can use the great outdoors to promote health and happiness was discussed when representatives of 133 national organizations met in Washington for the second annual conference on outdoor recreation on January 20 and 21. The session opened with an address by Secretary of War Davis, chairman of President Coolidge's committee on outdoor recreation. Secretary of Commerce Hoover spoke at the dinner. The chief topics considered at the meeting were the projects which the national recreation conference have been conducting during the past two years, including surveys of state forests and parks, municipal forests and parks, and federal lands which might be used in various ways for outdoor amusement. Other subjects of importance brought before the conference were fish and game control, migratory bird laws and the development of state highway systems in connection with recreation projects.