SCIENCE NEWS

THE REPORTED TRANSMUTATION OF MERCURY

Science Service

THE transmutation of mercury into gold, which was recently reported to have been accomplished by Professor A. Miethe, of Berlin University, and generally questioned by other chemists, is now announced to have been confirmed by his collaborator, Dr. H. Stammreich. He claims to have repeated Meithe's experiment, using mercury, which careful analysis had shown to be "absolutely free from any trace of gold," but which at the end of the process was found to contain appreciable amounts of the precious metal.

Approximately one and one half kilograms of mercury were used in a mercury arc lamp. The lamp was operated for 197 hours with from 160 to 175 volts at 12.6 ampères. The gold produced is said to have amounted to eighty-two millionths of one gram, or a little less than three ten millionths of an ounce.

The conversion of mercury into gold is admitted by American and English scientists to be possible, but the sufficiency of the energy used and the reliability of the tests applied by the Germans for the detection of the gold have been questioned.

Dr. R. A. Millikan, winner of the Nobel prize for physics last year, in response to an inquiry by *Science Service,* declared that no experiments on the production of gold from mercury have been made or planned in the Norman Bridge Laboratory, Pasadena, California, of which he is director. He points out that "reliable results are very difficult to obtain because traces of gold are practically always found in mercury anyway."

Professor W. D. Harkins, of the University of Chicago, well known for his work on atomic structure, declares that in the mercury vapor lamp, with which Professor Miethe claims to have produced gold, the energy brought to bear upon the atoms of mercury is exceedingly small in comparison with the amounts of energy in all actual artificial disintegrations thus far accomplished.

"According to accepted theories it also seems probable," he says, "that such small amounts of energy would not be able to penetrate the outside of the atom to get at the nucleus at all. Professor Haber found gold in Miethe's mercury, and this is undoubtedly accurate, but Haber disclaims all knowledge of how the mercury got in. Experts in this field will not trust any reports of atomic disintegration by large or small currents, unless voltages of millions of volts have been used, until they are supported by experimental work carried out with the most extreme precautions in such a way as to give definite evidence that the results claimed have been obtained. It is possible that Miethe has such evidence. I have not repeated his experiments.

"Mercury would be converted into gold if a hydrogen nucleus were lost from or an electron added to mercury's nucleus. I have bombarded argon nuclei by helium nuclei with an energy corresponding to five million volts without their disintegration. The voltage used in a mercury vapor lamp is small."

The products of Professor Miethe's first experiment were analyzed in the laboratory of Dr. Fritz Haber, famous for his work on nitrogen fixation. Professor Haber, when in this country recently, informed a *Science Service* representative that silver as well as gold was found in the samples submitted. This is taken to indicate that both silver and gold were present as original impurities of the mercury, since they are usually associated together in mercury ore.

Dr. Frederick Soddy, the English chemist at Oxford, stated in a British scientific publication that even in advance of the German announcements, it appeared to him that not only was such a transmutation possible but that it was inevitable unless our present views of atomic structure are radically at fault. He believes that the chemical detection of the gold produced, not the transmutation, would probably be the more formidable experimental difficulty.

THE "ROTOR" SHIP

Science Service

A SEVENTY-YEAR-OLD scientific principle, easily understood by any one who knows about baseball, is the trick that underlies the new "rotor" ship invented by Anton Flettner, according to German engineers and scientists who have examined the sensation-causing craft. The smooth surfaces of the great cylindrical "rotors," spinning in the wind, increase pressure on one side and decrease it on the other, just as the surface of the rapidly rotating baseball piles up a difference of pressure on its two sides and causes it to drift into a curve.

The two tall, cylindrical objects that look like immense smokestacks are the only propellers the ship needs. They are spun on their axes by small electric motors—20 horse power is all the present ship employs. As they spin, they tend to carry a layer of air around with them. In calm weather, this air would simply keep rotating about with the rotors, and nothing would happen. But when a wind is blowing, which would split and flow equally on both sides of the rotors if they were stationary, more of the air is turned with the direction of rotation than against it. That is, the wind is split unequally. The part that travels along with the surface of the rotor blows faster, momentarily, than the part that travels against the direction of motion of the other side. The wind that has its motion slowed down naturally tends to pile up pressure at the point where the slowing occurs, while the wind that is helped to flow faster tends to lower pressure at the point where the "boost" is given. When the wind is blowing across the ship, the rotors are revolved in such a direction that the pressure will be built up behind them and lowered in front, so that the craft moves forward.

This effect is known variously as the "Magnus" and the "Bernouli" principle, from the scientists who first made critical examinations of the phenomenon, in the middle of the nineteenth century. It has been noted in the drift down the wind of rapidly rotating rifle bullets and artillery projectiles, and all army range tables allow for it. But Herr Flettner is the first, so far as known, to attempt a commercial application.

One incidental advantage is claimed for the rotor ship that sets it ahead of either steam or sailing vessels. It can be turned on its own center by rotating the towers in opposite directions. It is claimed also that the ship can be stopped very quickly by reversing the direction of rotation of the towers. This is somewhat analogous to the stopping of a steamer by reversing the screw, and is a feature absent from sailing ships. There has been considerable question as to the stability of a rotor ship in a storm, but the inventor claims that the surface exposed to the tempest by the rotors is not so great as that exposed by the bare rigging of a close-reefed sailing ship.

Since rotor ships must have wind in order to move, they would be competitors only of sailing ships. Since the pressure difference must always be built up by a wind blowing across the ship in order to move it forward, the rotor ship is like the sailing vessel in that it can not sail directly into a head wind, but must tack across it. The sailing vessel has the advantage when the wind is directly astern, for then it can sail directly before it, whereas a stern wind is almost as useless to the rotor as is a head wind.

But Herr Flettner claims that this slight advantage is offset by the greater speed of his vessel, by its greater cheapness of construction, and above all by the very small crew required as compared with the men on a sailing ship. He states that operating costs for a rotor ship should be eighty per cent. lower than those for a sailing ship of the same tonnage.

A MECHANICAL LARYNX

Science Service

THREE mutes, deprived of their voices as an unavoidable result of operations for cancer of the throat, spoke distinctly and clearly before a Baltimore audience of medical men, using an artificial larynx, invented by Dr. John E. Mackenty.

Sufferers from cancer of the throat have heretofore been able to save their lives only at the expense of their voices, for the radical operation necessary in such cases necessitates the destruction of the vocal apparatus, and after recovery the patients must breathe through an opening in the neck. The new device is strapped over this opening, and receives air which it sets into vibrations similar to those caused by the natural vocal cords. This vibrating column of air is carried to the mouth by a small tube, and there modified into human speech by the lips and tongue. The result differs from ordinary speech mainly in that it is a monotone.

The new device, according to Dr. Mackenty, represents practically a philanthropic contribution to mankind. There are so few persons who require it, and the possible sales are so far between, that his efforts to interest manufacturers to develop the idea met with no response. Finally, executives of the laboratories maintained by the American Telephone and Telegraph Company and the Western Electric Company decided to undertake the work, even though no certain return of their expense was in sight. Using the knowledge of human speech acquired in their telephonic studies scientists of these laboratories have now produced a device which will enable many unfortunate people to talk again.

Not only will the artificial larynx add to its users happiness and earning power, but it will remove one barrier to the proper treatment of cancer of the throat. In the early stages of the disease, when a radical operation offers a practical certainty of cure, sufferers have often hesitated because they dreaded the loss of their voices. Delay, even while trying other treatments, has usually allowed the disease to progress to a point where cure is impossible. With the fear of future silence removed, Dr. Mackenty believes that sufferers no longer will risk their lives, but will have the cancerous tissues removed and do their talking with an artificial larynx.

INVISIBLE FORMS OF LIFE

Science Service

LIFE when it first appeared on this planet was in a form similar to the invisible "filterable viruses" now recognized as the causes of such diseases as hog cholera and leaf mosaic in plants, according to the claim of a Canadian scientist, F. d'Herelle, director of the laboratory of the International Sanitary Council at Alexandria, Egypt, and formerly at the Pasteur Institute, Paris.

These earliest beings had a diameter of twenty millimicrons, or approximately eighteen ten-millionths of an inch—less than half the shortest wave-length of any visible light ray, and just one tenth of the diameter of the smallest of known visible bacteria.

Dr. d'Herelle has made his life work the study of the invisible forms of life that lie beyond the reach of the most powerful microscope. Since they can not be seen by any means now known, he has had to study what they do rather than what they look like. He has found that these "viruses" will pass through the walls of the finest filter, and even through an apparently solid sheet of collodion. It was by the latter means that he learned the diameters of the living particles that compose the viruses, for the apparently solid collodion is known to have pores of almost infinite minuteness.

He contends that his tiny creatures, though invisible, are still alive; for they have the properties of all living beings. They feed, they reproduce, they adapt themselves to their environment, by suitable means they can be crippled or killed. They can be divided, according to the effects they produce, into definite species. One form causes a certain fatal disease in poultry and other birds, another causes temperate-zone sleeping sickness, and the several varieties of a third give rise to several varieties of diseases in man and other animals.

One, which is d'Herelle's special pet and private discovery, causes epidemics in the bacterial world, wiping

out disease germs as disease germs wipe out people. This form, known as the bacteriophage, or "bacterium-devourer," caused a profound sensation when its discovery was announced, and is still the subject of much scientific controversy. Dr. d'Herelle claims, on the basis of this discovery, that health is really as contagious as disease, once the bacteriophage begins its crusade.

All this ultramicroscopic, ultrafiltrable world beyond the reach of sight Dr. d'Herelle has grouped together into a genus which he calls "protobios," or "primitive life," for he claims that nothing possessing life can be simpler than these creatures. He conceives a "protobe" to consist of a single "micella," or complex group of protein and other molecules.

A further interesting concept of Dr. d'Herelle's is that higher forms of life may be given rise to by the aggregation of micellae, and that at the borderline between protobes and ordinary microbes there are organisms that pass through both forms during their life cycle. He cites two instances to support his case. In one, the culture medium containing one of the lower bacteria was filtered to exclude all its cells. Yet the filtered liquid, with suitable food elements added, again gave rise to bacteria. In the second, the bacteria of a plant tumor disease were raised from bits of tumorous tissue in which no bacteria could be found by microscopic examination. It is as though a camel coming to the eye of a needle, could disintegrate into little bits and thus pass through; and the bits again reassemble into a camel on the other side.

Thus at least does Dr. d'Herelle argue. Micellae endowed with life are protobes; protobes may aggregate into microbes; microbes may differentiate and develop, becoming organized cellular structures like the simpler fungi and the protozoa; unicellular organisms may evolve into multicellular, "higher" plants and animals. The theory is too radical to have been fully accepted as yet; but it is certainly a bold picture and one to wonder over.

EFFECT OF ULTRA-VIOLET LIGHT ON LOWER ORGANISMS

Science Service

THE invisible ultra-violet light beyond the upper end of the spectrum, which has come into general use in hospitals for the treatment of a number of human ills, kills many of the lower forms of life like a stroke of lightning, according to the results of researches just made public by Drs. C. E. Barr and W. T. Bovie, of Harvard University.

The efficacy of ultra-violet light has long been known to depend on its destructive effect on protoplasm, which is the living substance that forms the basis of all animals and plants, but the present experiments have shown for the first time with what rapidity this destruction takes place.

Drs. Barr and Bovie used living protoplasm in its simplest available form; the animals used in their experiments were amoeba, which are naked and unprotected bits of protoplasm of microscopic size that crawl about in stagnant water. Exposed to ultra-violet light for one fourth of a second, an amoeba apparently suffered paralysis. It stopped moving and seemed dead, but after a time recovered. But if the exposure lasted three seconds, the animal was killed and its substance broken down at once. One second of exposure killed the animal, but the disintegration of its body was sometimes delayed for a short time. Successive exposures of a fraction of a second each, with intervals of one half second between flashes, produced a cumulative effect, and the amoeba was killed when the sum of the successive brief exposures was approximately equal to one continued exposure long enough to be fatal.

ITEMS

THE United States Department of Agriculture has supplied the government of Colombia, Brazil, Venezuela, Ecuador and Cuba with large numbers of plants yielding chaulmoogra oil, found useful in treating leprosy. Hawaii, Porto Rico and the Canal Zone have also received shipments of the much desired plants and chaulmoogra trees will soon be fruiting widely in tropical America. Seeds for these plants were obtained in the wilds of Siam and Burma during a series of explorations begun in 1920 by the department's plant hunter, J. F. Rock. Chaulmoogra oil is now obtained from India where it is pressed cold and imported at great expense, but experts hope that within ten years tropical America will be supplying its own oil for the cure of leprosy. During the period of fourteen months ended March 15, 1924, 50 per cent. of the leprosy patients at the Kalihi Leprosy Hospital in Hawaii have recovered and been paroled as a result of chaulmoogra oil treatment, and during the past five years 260 patients have been discharged as cured.

STATISTICAL observations on birds over the north Atlantic ocean indicate that their number increases steadily toward the north, reaching a maximum in the seas between Norway and Iceland. The minimum is found in mid-ocean at about the latitude of North Carolina and the Straits of Gibralter. The data for this census of sea birds was obtained by Danish scientists during the past four years, with one earlier set of observations some ten years ago. In making their counts they dealt only with birds that spend most of their time at sea, like terns and albatrosses, and excluded shore birds and land birds in passage. One very prominent factor in determining the distribution of bird life seems to be the Gulf Stream. Where this current crosses the Atlantic, between Newfoundland and Britain, there is a considerable abundance of birds. Southward the number falls off abruptly. Between 30 and 40 degrees north latitude less than a tenth as many birds were observed as between 40 and 50 degrees. The number of oceanic birds increased near the land, on both sides of the Atlantic.

WHAT is described as the most important visitor from the skies ever to fall to earth has been discovered in the North African desert. It is an enormous mass of meteoric stone, with a volume in the neighborhood of 160,000 cubic meters. M. LaCroix, French geologist who studied the meteorite, says it contains some rare metals.