SCIENCE NEWS

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THE REPRODUCTION OF MUSIC BY NEW METHODS

THREE loud-speakers on an empty stage, three telephone lines running to three microphones in a sound-proof room containing the Philadelphia Symphony Orchestra, Leopold Stokowski turning electrical control knobs instead of wielding a baton, telephone engineers operating the electrical circuits, was the most advanced development of musical reproduction that will be introduced to the public in a Philadelphia-Washington concert for the National Academy of Sciences on April 27.

In a private preview for scientists and music critics held at the Academy of Music in Philadelphia, the American Telephone and Telegraph Company engineers demonstrated the results of two years of scientific research conducted with the collaboration of Director Stokowski. Wagnerian music was played with whispering pianissimos and thunderous crescendos hitherto unheard by human ears. Stokowski by the turn of a control knob could subdue his orchestra, isolated in another part of the theater, to a mere trickle of sound or he could build up their music to the sound of two thousand musicians at a peak of output. Brünhilde, sung by Miss Agnes Davis, became an electrical supervocalist, rising above the orchestral accompaniment of Götterdämmerung. Wagner's music was rendered as probably he never dared to dream it might be played.

This merging of music and telephone science has introduced jointly three factors in the electrical reproduction of orchestral music: (1) auditory perspective; (2) tone and overtone control; (3) volume control. Three loud-speakers at left, right and center of the empty stage, each connected with a similarly placed microphone on the remote stage of the actual performers, give perspective to the music and sounds. Musicians could tell, just where the violins or horns were placed. In one demonstration, stage hands moved across the distant stage and the audience of the empty stage "followed" them about the empty stage by using their ears. Engineers had previously felt that this illusion of auditory perspective might be obtained only with many loud-speakers on the empty stage, but three were found to give perfect results when the electrical transmission had high quality.

A wide range of nine musical octaves, from three below middle C to nearly six above, was utilized for the first time in electrical transmission of music. This corresponds to all frequencies from about 35 cycles per second to about 16,000 cycles per second. Radio by federal regulation is limited to a band of 5,000 cycles per second. When experimentally the high and low frequencies are chopped off by electrical filters the damage to the tone and overtone qualities was readily apparent. Each of the three telephone wires carried the full range of frequencies, and the frequency channels utilized therefore were roughly nine times those of the most perfect radio transmission. In loudness range, the orchestra or other sound being transmitted can be varied from an output equivalent to a millionth of a watt to a sustained hundred watts and even a kilowatt at momentary peaks without distortion. The sound in the demonstration was raised from the rustle of leaves to beyond that of a roaring airplane engine.

Practical applications are foreseen by the telephone engineers and Director Stokowski. A symphony orchestra in one place may render its concerts with perfect tonal quality and with improved volume in a hundred or a thousand different halls in distant cities. Music may be spread from high towers so that 100,000 may enjoy it in large parks. The musician and composer can add electrical amplification and control to his material out of which beautiful sound compositions are wrought.

PAPERS AT THE CINCINNATI MEETING OF THE FEDERATION OF AMERICAN SOCIETIES FOR EXPERIMENTAL BIOLOGY

PROGRESS toward isolation and laboratory preparation of the life-saving hormone of the adrenal gland cortex and a tentative chemical name for it were reported from two research centers. This hormone has proved valuable because its use prolongs lives of patients suffering from the hitherto incurable Addison's disease. From the gland itself, Drs. Arthur Grollman and W. M. Firor, of the Johns Hopkins University, have extracted a crystalline substance that is so very powerful that it is probably the pure hormone. However, Dr. Grollman stated that several more years of investigation will be needed to make sure of this point. The chemical composition of this substance has been investigated at the Mayo Clinic by Dr. E. C. Kendall, H. L. Mason, B. F. McKenzie and C. S. Myers. Dr. Frank Hartman, of the University of Buffalo, a pioneer investigator of this hormone, had suggested the name cortin, spelled without the final e, and Dr. Kendall's research into its chemical nature shows this to be a suitable name with the addition of the final e, which indicates the presence of nitrogen. Dr. Kendall and associates are trying now to produce the hormone from the chemicals in their laboratories, and while they have not yet synthesized the entire compound, they have succeeded in obtaining a preliminary compound.

A NEW hormone of the pituitary gland that exercises control over the thyroid and seems to "double" for the secretion of that gland causing exophthalmic goiter was a leading topic of discussion among medical investigators. As one doctor expressed it: "The pituitary gland is in the driver's seat." It is small but important, located at the base of the brain. It produces many powerful hormones or chemical regulators of the body's activities. Some of these hormones have an important stimulating effect on the sex glands. Another hormone promotes growth. The latest discovery is a new hormone

that influences the secretion of the thyroid gland. Exophthalmic goiter, characterized by extreme nervousness and protruding eyes, results from over-secretion of the thyroid gland. Now scientists have found the newly discovered pituitary hormone can produce the same effect. For the first time scientists have been able to produce this type of goiter in animals, which will greatly aid further research on this serious and wide-spread disease for which the only relief at present is surgical operation.

THE "chemical dissection" of a gland has been accomplished by Drs. J. B. Collip, D. L. Thomson, H. Selye and E. M. Anderson, of McGill University. The gland is the pituitary, located at the base of the brain, and apparently possessed of far greater powers than hitherto supposed. This gland secretes a number of hormones, powerful chemical regulators of body activity. One investigator estimated that twenty-two pituitary hormones had been reported by various investigators. Dr. Collip and his associates are working to get clean hormone extracts from this gland, each separate from the other, and to determine the exact effect of each on the human body. In his pocket, Dr. Collip carried a tiny bottle containing a clear, colorless fluid. One cubic centimeter, or about four drops, of this particular pituitary hormone is sufficiently powerful to produce exophthalmic goiter in two hundred guinea-pigs.

THE parathyroid glands, located next to the thyroid gland in the neck, probably play an important rôle in the mechanism which sets free the rickets-preventing vitamin D from the skin and the tissues just under the skin, according to Dr. F. L. Kozelka, of the University of Wisconsin. Investigators have believed for some time that the ultra-violet rays of sunshine change a fatty substance, ergosterol, found in the skin and subskin tissues, into the vitamin. The parathyroid glands apparently make the next move by liberating the vitamin from the tissues so that it in turn can play its part in the body chemistry.

CAUTION against too large doses of viosterol, artificial vitamin D which is widely used as a preventive of rickets in babies, was urged by Dr. Agnes Fay Morgan, of the University of California. Dr. Morgan and associates reported a new method of studying bones to find out how they were affected by vitamin D. Dr. Morgan's studies with rats have convinced her that the largest safe dose of viosterol is very much less than previously supposed. Overdoses of this substance seem to produce kidney injury, which Dr. Morgan believes is the cause of death of animals receiving too much viosterol. She emphasized that it is unwise and unsafe for mothers to buy this potent substance and give it to their children without a physician's directions as to the amount of the dose.

THE dye, methylene blue, which has been widely heralded as an antidote for deadly cyanides and carbon monoxide gas, may kill people instead of saving their lives when used to treat victims of carbon monoxide, Professor Yandell Henderson, of Yale University, reported. In his laboratories at Yale, Professor Henderson said, Dr. Howard W. Haggard has been using the dye to treat dogs that were near death from the effects of the invisible carbon monoxide gas which is found, among other places, in the exhaust gas of automobiles. The dogs would have recovered with the usual treatment for carbon monoxide poisoning. They had been exposed to the gas in amounts just short of that which causes death. When given methylene blue treatment, instead of recovering, they died. This investigation has brought out plainly that what the dye really does, Professor Henderson commented, is to convert the oxygen-carrying hemoglobin of the blood to methemoglobin. This compound is powerless to supply oxygen to the tissues and the victim then dies of asphyxia. Carbon monoxide kills in the same way, the gas forming a strong chemical union with the hemoglobin and thus preventing it from carrying oxygen to the tissues.

A FUNDAMENTAL difference between the sexes in the way the body takes care of the sugars and starches of the diet was reported by Dr. H. J. Deuel, Jr., of the University of Southern California. Fasting adult male rats had more sugar stored in their livers than did the females, Dr. Deuel and associates found, while the females had more fat stored in the liver than the males. There was no difference in immature rats. Dr. Deuel was trying to find why women develop a condition of much greater acidosis during fasting than men do. Apparently it is because of their smaller store of sugar and larger store of fat. The problem is important in connection with diabetes in which this kind of acidosis develops when the patient is on a sugar-free diet. It indicates that diabetic women might need a slightly different diet from diabetic men. When the ovaries were removed, female rats had as much sugar stored in their livers as did normal males, Dr. Deuel found. When these rats were given doses of theelin, a female sex hormone, the sugar stored in their livers was the same amount as that of normal females.

SCIENTISTS whose knowledge of nutrition taught us how to feed our fighting men during the World War are now turning their knowledge to the problem of feeding the soldiers of the depression. The fight to-day is against the "undisclosed signs of deterioration" in health resulting from malnutrition, Professor Lafayette B. Mendel, of Yale University, pointed out at the meeting. Disease due to lack of proper foods grows slowly. Scientists are trying now to recognize these diseases in their very earliest stages, just as bankers are trying to find ways of detecting unsoundness in banks early enough to prevent disaster. Early signs of the beginning of these diseases could be seen last year in the bread lines, Professor Mendel said, and on the hands of patients admitted to the wards of Bellevue Hospital in New York, doctors saw the faintest marks on the skin which meant the beginning of pellagra. In this fight we need the help of the family physician who knows his patients well enought to see the development of what Professor Mendel called "subvisible disorders."

LOOKING through a window in a rabbit's ear, University of Pennsylvania physiologists have gained a better understanding of how the body disposes of débris cast out of the blood vessels. This has been one of the important problems still unsolved by physiologists. Drs. E. R. Clark and E. L. Clark reported their observations at Cincinnati. Lymphatic tissue, which has been credited with doing this scavenging job, appears to be much less important in this relation than previouly thought, the Clarks' study showed. Enzymes which digest protein substances may play a rôle in the scavenging process, it was suggested. The window in the rabbit's ear was devised several years ago at the University of Pennsylvania laboratories. It is a sort of double window composed of two thin sheets of transparent substance, with the space between thin enough so that light can pass through the tissues that grow into it. A microscope was used to look through this window and watch what goes on in blood-vessels, the blood itself, the connective tissue and other kinds of living material.

EVIDENCE that stomach ulcers may result from diets lacking in vitamin A was presented by Dr. Ira A. Manville, of the University of Oregon Medical School. Dr. Manville reported that white rats fed a diet deficient in vitamin A developed stomach ulcers and erosions. Nearly two thirds of all the animals fed on diets that were deficient to various degrees in the vitamin showed these sores. As the vitamin deficiency became more severe, the number of animals affected became greater until nearly 100 per cent. were found to have ulcers. Vitamin A, found in liver, butter, egg yolk, cheese, cod-liver oil, spinach and the leaves of plants, is necessary to promote normal growth. In its absence growth is stunted and a severe eye disease develops. This vitamin is also considered necessary for normal functioning of the mucous membrane of nose, throat and breathing apparatus, and urinary and gastro-intestinal tracts. In this connection it has been claimed that vitamin A will prevent colds.

THE warfare and strategy that goes on in the human body when the blue dye, methylene blue, is called in to fight poisonous cyanides was revealed in a report by Dr. William B. Wendel, of Washington University School of Medicine. Dr. Wendel's study showed that methylene blue can only win the fight for life against the poison when the dose of cyanide is not great. Successful use of the dye as antidote in a case of cyanide poisoning was reported last fall by Dr. J. C. Geiger, San Francisco director of public health. The antagonistic action of the dye for cyanides has been observed by a number of scientists. Mrs. Matilda M. Brooks, of the University of California, claims to have first suggested its use as an antidote in poisoning and suicide cases. Cyanides cause death by suffocation, since they interfere with the supply of oxygen to the tissues. Methylene blue fights cyanides by converting some of the oxygen-carrying hemoglobin of the blood into a new chemical compound, methemoglobin. This new compound is able to force the cyanide out of combat by uniting with it to form the chemical union, cyan-methemoglobin, which is harmless itself, and which keeps the cyanide from interfering with the vital, oxygen-carrying activity of the rest of the blood hemoglobin.

PROGRESS in the search for a new, safe morphine was reported by Dr. Nathan B. Eddy, of the University of Michigan. Dr. Eddy is engaged in research sponsored by the drug addiction committee of the National Research Council. The object of the research is to produce, if possible, a substitute for morphine which will have that drug's valuable pain-relieving and sleep-inducing qualities, but none of its dangerous habit-forming propensity. The morphine molecule consists of a number of chemical units arranged to form a series of rings. Among these two units, known as hydroxyl groups because they are made up of hydrogen and oxygen, are appended to the rings. At present, Dr. Eddy is trying to find which of the units is responsible for relieving pain, which for quieting nerves and inducing sleep, and which for the sense of well-being that leads to habit-formation. He reported that the two hydroxyl groups have opposite effects in the action of morphine in the body. One of them increases the pain-relieving and other useful properties of morphine, while the other hydroxyl group decreases the same properties.

ITEMS

FINAL proof that the yellow fever mosquito, *Aedes aegypti,* can transmit a serious epidemic disease of horses and mules, popularly known as Kansas-Nebraska horse plague, has been obtained by Major R. A. Kelser, of the Veterinary Laboratory Division of the Army Medical School. The proof was obtained when a horse, on which infected mosquitoes had been feeding, developed symptoms of the disease and became seriously ill. A short time ago Major Kelser reported that the yellow fever mosquitoes had spread the disease among guinea-pigs, which implicated them as possible carriers of the disease among larger animals. At that time, however, the horse on which he had fed the infected mosquitoes had not yet developed the disease. Major Kelser's investigations also showed that the mosquito is not a mechanical carrier of the disease, but that the virus of the disease undergoes a change in the mosquito's body.

FEWER children are being killed by automobiles now than any time in the last ten years, according to statistics published by the Metropolitan Life Insurance Company. The decrease in the number of child automobile deaths began in 1930. "The year 1932 was the third successive year in which there had been a considerable drop in the death-rate of children from this cause." This gratifying reduction in automobile accident deaths of children is attributed to the safety campaigns that have been waged by schools, police departments, insurance companies and women's organizations. Along with the marked reduction in the number of child victims, there has been a decline in the total number of automobile deaths during 1932.