

## SCIENCE NEWS

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## ATOMIC ENERGY

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THE long-sought "chain" reaction in uranium fission, in which one uranium atom splitting sets off the fission of another, and so on with each releasing atomic energy in large amounts, is reported by four French scientific men.

If science is ever to create a source of atomic power by the liberation of atomic energy in uranium splitting with low-energy neutral particles (neutrons), then chain reactions will be needed to make the fission self-perpetuating.

Ever since the first reports of uranium's splitting, a little over a year ago, investigators have searched in vain for the crucial chain reaction. It has remained for Dr. H. von Halban, Jr., Professor F. Joliot, Dr. L. Kowarski and Professor E. Perrin, of Paris, to find the chain effect. They report that the chain effect is convergent, gradually weakening and coming to an end. This result, at first sight discouraging for those who have envisioned atomic power, is only for the particular geometry of the experiment they have performed. Whether it would also be true for other experimental arrangements is not known. Perhaps it could be improved.

During the year of feverish research on uranium splitting which has now elapsed, the number of neutrons liberated by each uranium fission (without chain reactions) has been measured in both Europe and America. It comes out that between 2 and 3.5 neutrons, on the average, are liberated per fission. The test of a chain reaction is to compare this number of neutrons (without chain reactions) with the number of neutrons produced by fissions plus chain reactions.

This the French scientists have done, and they find that eight neutrons are liberated per primary uranium fission, whereas previously they had reported only 3.5 neutrons per fission. The difference, they conclude, is the evidence for the long-sought chain reaction and due to secondary and tertiary effects in the chain.

As a basic source of neutrons a mixture of 160 grams of beryllium mixed with one gram of radium was used. They allowed neutrons created by this source to bombard 300 kilograms (661 pounds) of uranium oxide contained in a copper sphere 50 centimeters in diameter. The copper sphere itself was immersed in a tank of water.

To detect the neutrons present they used detectors of dysprosium placed inside the copper sphere and in the surrounding water. The radioactivity produced on these detectors gave them a measure of the number of neutrons present in various parts of the system.

The goal of uranium fission experiments, from the practical standpoint, has been to produce a chain effect, which would liberate atomic energy (175,000,000 electron volts per fission) and yet remain under control. The fact that the new French experiments are convergent, gradually dying out, may mean one of two things. Either the energy liberation by the chain reaction is difficult to achieve and keep going, or that the scientists intentionally used an

experiment which would give a convergent and thus be safe to carry out.

The new results are reported in the French scientific publication, *Journal de Physique et le Radium*.—ROBERT D. POTTER.

## NEUTRINO

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DISCOVERY that the neutrino, the most elusive atomic particle, in all probability has no weight whatever when at rest has resulted from the first important experiments made by Dr. E. U. Condon and his associates at Pittsburgh with the Westinghouse 4,000,000-volt atom smasher.

The very existence of the neutrino has been considered doubtful. The new experiments show its reality, and they make probable that it actually weighs nothing, yet does carry away energy when moving rapidly. Paradoxical as it may sound, a very high velocity of a massless particle will give it energy.

The measurements show that any mass that the neutrino may have is certainly less than 7 per cent. of the mass of the electron, the fundamental particle of negative electricity. The neutrino, like its big brother the neutron, has no electrical charge. The determination of the neutrino's lack of mass was made by finding the least energy with which carbon atoms have to be struck by protons in order to knock out neutrons. The result of such a transmutation is to give radioactive nitrogen. By combining the new data with other energies already measured for nitrogen, it is possible to tell that the neutrino has extremely little or no mass.

Associated with Dr. Condon in the experiments were Dr. W. H. Wells, who designed the large generator, and Drs. W. E. Shoupp, R. O. Haxby and W. E. Stephens, who carried out many of the experiments.—WATSON DAVIS.

## SUPER-RABBITS

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THE same powerful chemical that has been used in the creation of new and larger fruits and flowers has been tried on rabbit egg cells.

Colechicine, which doubles the number of heredity-bearing chromosomes in plant cells, allowed the production experimentally in glass vessels of rabbit egg cells with double the normal body number of chromosomes. The research conducted by Drs. Gregory Pincus and C. H. Waddington, of the University of Cambridge, is reported in *The Journal of Heredity*.

Cell division in the experiments did not go beyond the very earliest stages of development. For the present at least, therefore, dreams of colechicine-induced races of giant super-rabbits (and, by inference, of giant supermen) must remain only dreams.

Artificial increase in mammalian chromosome numbers has never been accomplished before, and natural occurrence of higher numbers of these heredity-bearing units in the cell's nucleus has been reported only once or twice,

and then not in egg cells but in structures associated with the developing embryo.

Drs. Pincus and Waddington accomplished their results by treating fertilized rabbit egg cells with colchicine, already well known for its chromosome-multiplying effects in plants. They also used alcohol, ether and abnormally high temperatures; but colchicine was most effective.

The doubling of chromosome numbers resulted from the slowing down of the cell division process. The first stages of division, in which the chromosomes split and thereby double their number, went through as usual, but the cells then failed to finish the process, leaving the two sets of chromosomes in the undivided cells. Subsequently a few of these cells did divide, but only at a rate less than normal. In no case did such divisions go beyond the very earliest stages.

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### VITAMIN E

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VITAMIN E, known as the fertility vitamin from wheat germ, is being hailed in medical circles in London as a probable cure for hitherto hopeless diseases of muscle weakness and nerve degeneration. It is also seen as a possible means of protecting children against infantile paralysis and adults against one horrible result of syphilitic infection, locomotor ataxia.

Striking results in treating more than a score of human patients suffering from incurable and even fatal muscle weakness and nerve degenerative diseases with vitamin E are reported by Dr. Franklin Bicknell, honorary physician to the Farringdon Dispensary, London, in *The Lancet*.

The vitamin should also be used to protect children against infantile paralysis, at least during epidemics, according to Dr. Bicknell, though his report does not include such use of the treatment. He believes that in children who have a diet rich in this vitamin the nerve and brain cells attacked by infantile paralysis virus will be more resistant.

Lack of vitamin E in the diet, apparently necessary for nerve and muscle health as well as for normal reproduction, may explain why some patients with syphilis later develop locomotor ataxia while others do not. Dr. Bicknell believes that arrest of this painful, disabling condition may be possible with the vitamin treatment. He tried it, without success, in two cases, but the condition was too far advanced in these patients for the negative results to show what the vitamin treatment can do. Locomotor ataxia, he believes, may be the result not of syphilitic infection alone, but also of a deficiency of vitamin E causing a degeneration of nerve tracts already weakened by syphilis.

Muscular dystrophy, amyotrophic lateral sclerosis, peroneal muscular atrophy and amyotonia congenita are the muscle and nerve disorders for which Dr. Bicknell used the wheat germ or vitamin E treatment. Results of treatment in the muscle weakness condition were remarkable, every patient except one, even bed-ridden patients, showing improvement.

These patients, fifteen of them children, are apparently

the first to receive the new vitamin treatment, although the discoverer of the vitamin, Dr. Herbert M. Evans, of the University of California, reported success in vitamin E treatment of similar muscular weakness and wasting in animals.

Vitamin E has been called the fertility vitamin because it is necessary for normal reproduction, but Dr. Bicknell suggests that the substance in wheat germ which produced striking improvement in his patients may be something other than the fertility vitamin. For this reason, suggested by animal studies, he used fresh dried whole wheat germ, one-half ounce twice daily, to treat patients, rather than the chemical, alpha tocopherol, which has been identified as the pure form of the anti-sterility vitamin.

"Our diet may in some cases be on the edge of a vitamin E deficiency," according to Dr. Bicknell. He points out that the most important food source of this vitamin, wheat germ, "is to all intents and purposes never eaten" because it is removed from the wheat flour in ordinary milling processes. Other foods containing small amounts of the vitamin may lose it in the course of storage and preparation.

### THE PRODUCTION OF AGAR

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JAPAN has a world monopoly of one commodity that the average person never sees and seldom hears about, yet which indirectly is of considerable importance to his health and well-being. It is the stuff called agar, a gelatin-like material made from seaweeds.

Agar is indispensable as a culture medium in all bacteriological laboratories, and hence to all hospitals, medical schools and research institutions occupied with problems in foods, dairy products, soils and all other phases of pure and applied microbiology. Indigestible itself, it is the best substance known to hold in readily available form such favorite germ foods as glucose, beef extract, boiled potato and blood. Agar, in tubes, plates and flasks, is the germs' laboratory dining-table.

Agar comes in dried form, as a grayish, light, stringy solid. It will take up many times its volume of water to form a slightly amber, translucent mass that looks exactly like ordinary gelatin dessert. As a matter of fact, sweetened and flavored agar has been used to some extent as a dessert material, but the bulk of the importation has continued to go to the laboratories. Department of Commerce figures show that the United States buys between 600,000 and 700,000 pounds of the dried product every year. The price has been as low as 25 cents a pound, but in recent years it hit the dollar-a-pound mark, and at the present moment the price is \$1.50 a pound, and little or no agar offered. The Japanese say that severe storms around their islands during 1939 have interfered seriously with the seaweed harvest.

If American and world laboratories were completely deprived of Japanese agar they would not be permanently crippled, although admittedly there would be a period of embarrassment and confusion similar to that experienced on a larger scale when the German sources of dyestuffs and drugs were cut off in 1914. The several species of red seaweed from which agar is made grow in many parts

of the world, including the warmer coasts of the United States; and the manufacturing process is well known and not complicated.

The principal reason why the Japanese have been permitted to enjoy a monopoly in agar is that its making, and especially the harvesting of the seaweed, involves a large amount of hand labor, and such labor is cheapest in Japan.—FRANK THONE.

#### FURTHER PAPERS READ AT COLUMBUS

DR. ERNEST L. SPENCER, of the Rockefeller Institute at Princeton, N. J., reported that "Plants receiving from 20 to 40 parts per million of sulfanilamide produced new roots from one to three days earlier than similar plants deprived of the chemical." Uncut seedlings, however, were not stimulated, and concentrations of sulfanilamide which stimulated root formation in cut plants poisoned plants with normal root systems. If sulfanilamide is to be used for fighting plant diseases it must be used in very much smaller doses than can be safely used in treating human patients.

THE first results of scientific efforts to learn how the tiny pituitary gland in the head determines what becomes of the fats, sugars and starches, and proteins such as meat eaten by man and other animals were reported by Drs. Oscar Riddle and Tellef Senum, of the Cold Spring Harbor Laboratory of the Carnegie Institution of Washington. Female sex hormones increase the fat in the blood of fowl, both hens and roosters, and of doves and pigeons of all ages and sexes. Male sex hormones do not increase the blood fat in birds of any age or sex, even when given in thirty times the effective quantity of female sex hormone. One of the many pituitary gland hormones, the one which stimulates sex glands, has now been found to cause large increases of blood protein in doves and pigeons. These increases in blood fat accompany egg production. Fat regulation in rabbits and rats was investigated. A pituitary hormone which increases the blood fat of rabbits, however, it wholly inactive in rats, these species apparently being as different in this respect from each other as each is from the pigeon.

SUCCESSFUL results from anti-cold vaccination in more than 3,000 persons were reported by Dr. Leonard J. Piccoli, of the Fordham University College of Pharmacy, New York. Another 3,000, who did not get the vaccine, had about four times as many colds during any experimental year as those who had taken the vaccine. Large-scale trials of the vaccine on hundreds of thousands of employees in industry have been going on for the past three years in addition to Dr. Piccoli's investigations. The vaccine is made to be taken by mouth, thus avoiding the necessity of frequent visits to a physician. It is taken every day, either before breakfast or before retiring at night. It is made, not from the virus which has been identified as the cause of the common cold, but from other germs found in cold patients.

A CHEMICAL weapon against tooth decay that may prove as effective as sulfanilamide is against streptococcus infections was announced by Drs. Benjamin F.

Miller, Sigmund Bradel and John A. Muntz, of the Zoller Memorial Dental Clinic of the University of Chicago. The new anti-caries chemical, called Zephiran, was made by Professor Gerhard Domagk, of the I. G. Farbenindustrie in Germany, who gave sulfanilamide to the world and who was awarded the 1939 Nobel Prize for this achievement. Long-term studies of Zephiran with patients suffering from dental caries are now under way, following the promising results of the laboratory experiments. Zephiran was tried after it was found that two other chemicals, sodium fluoride and iodoacetate, markedly reduced the amount of experimental caries or tooth decay in rats. Search for a better and less poisonous substance than sodium fluoride or iodoacetate to use on human patients led to the trials of Zephiran. This substance is, in chemical terms, alkyl dimethyl benzyl ammonium chloride. It is a powerful germ-killer. In addition, it acts as a cleansing agent, is relatively harmless to mucous membranes such as line the inside of the mouth, and it lowers the surface tension of water.

#### ITEMS

RECENT German figures on cotton production, given out through the weekly journal, *Die Umschau*, are far too low, U. S. Department of Agriculture data indicate. The German figures showed a world production figure of 3,250,000 bales, in which the USSR participated to the extent of 600,000 bales. The Department of Agriculture figures show a world production, for the year 1938-39, of 27,407,000 bales, with Russian production at 3,800,000 bales. Preliminary estimates for 1939-40 indicate a world production increased to 27,450,000 bales, with Russian production remaining at last year's figure.

A SURVEY of the needs of electrical engineering in the field of transportation was described at the meeting in New York City of the American Institute of Electrical Engineers. J. A. Noertker, of the Cincinnati Street Railway Company, predicted a revolution in urban transportation on the day when an electrical device is invented which will record and collect passengers' fares in proportion to the length of the individual ride. "At present," he said, "the major part of short haul rides are lost because the cost of these rides is, as a rule, out of all proportion to the value to the individual patron."

THE first inch of insulation on a home is as effective as the next 20 inches, according to P. D. Close, of the Insulation Board Institute, Chicago, who spoke at the Cleveland meeting of the American Society of Heating and Ventilating Engineers. "The first 1 inch of insulation," he said, "which will reduce the heat loss through a wall or roof 47.5 per cent., is more effective than the next 3 inches of insulation which reduce the rate of heat loss an additional 33.0 per cent. This next 3 inches of insulation are only 69.5 per cent. as effective as the first 1 inch of insulation in this case. Because of the rapidly diminishing effect of each inch of insulation it would actually require nearly 20 inches of insulation in this case to double the effect of the first inch of insulation, or the first inch of insulation is equal in insulating effect to the next 20 inches."