SCIENCE NEWS

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RELEASE OF ATOMIC ENERGY FROM URANIUM

URANIUM has been split with great release of energy. And the atom-splitting agency is the neutron, the electrically neutral particle discovered only seven years ago, itself a part of the hearts of atoms.

Bombard uranium with neutrons, even those with only a fraction of an electron-volt of energy, and its nucleus will split and give off millions upon millions of electron-volts of energy, up to 100,000,000 volts in actual experiments and some 200,000,000 volts theoretically.

Of course, it is not nearly so simple as this sounds, for there is the matter of producing the neutrons and arranging it so that they hit frequently enough to make the process efficient, which it is not as yet. But the energy release is astoundingly high, nevertheless, since the greatest release of atomic energy hitherto achieved consisted of 20,000,000 electron-volt gamma rays, obtained when deuterons, hearts of heavy hydrogen atoms, are smashed into lithium, a light metal. Incidentally, neutrons are given off at the same time and it is these neutrons that can be used to split uranium.

Neutrons slide into the nuclei of elements easily, and for that reason the energy-releasing bombardment to be efficient would probably need to be performed upon very pure substances, such as seldom exist now. This is probably the reason why the effect was not discovered accidentally, perhaps through a laboratory explosion.

This latest chapter of physics began in its immediate phases with researches in Berlin by Professor Otto Hahn. He observed the strange action of uranuim under neutron bombardment, but could not quite account for it. Dr. Liese Meitner, long associated with Professor Hahn, and Dr. R. Frisch, of Copenhagen, suggested the idea of uranium splitting into other elements, which although unheard of previously proved to be the case. Ironically, Dr. Meitner is now an intellectual refugee from Germany, temporarily working in Stockholm.

This work, just reported in *Die Naturwissenschaften*, became known first by private communication from Professor Hahn and later through publication. The Hahn-Meitner-Strassmann paper was the sensation of the theoretical physics conference in Washington last week under auspices of the Carnegie Institution of Washington and George Washington University.

Atom smashers were rushed into service to confirm or deny the German work. Long distance telephone and cables provided prompt communication. At least four independent confirmations have been obtained.

It was learned subsequent to the Washington conference that the experiment was confirmed in Copenhagen at Professor Niels Bohr's laboratory two weeks ago (about January 15). Professor Bohr is himself in America visiting Princeton University.

Columbia University, whose research team consists of Professor John Dunning, Dr. E. T. Booth, Dr. G. N. Glasoe, H. L. Anderson, Professor S. G. Slack, Dr. George B. Pegram and Professor Enrico Fermi, confirmed uranium's energetic splitting on Wednesday, January 25. The Carnegie Institution of Washington's Department of Terrestrial Magnetism, directed by Dr. John A. Fleming, got into action with their new atom smasher as soon as they heard of the Berlin experiment and in a historic midnight experimental conference on Saturday, January 28, demonstrated to Professor Bohr and Professor Enrico Fermi, Italian Nobelist now at Columbia University, pioneer in neutron bombardment of uranium, the reality of the energy's release. The Carnegie research crew consisted of Drs. Richard B. Roberts, R. C. Meyer, N. P. Heydenburg, L. R. Hafstad and M. A. Tuve, assisted by a Carnegie associate, Dr. Gregory Breit, of the University of Wisconsin.

On Saturday morning, January 28, the Johns Hopkins University, in experiments conducted by Dr. R. D. Fowler, confirmed the discovery also.—WATSON DAVIS.

Scientists have smashed another chemical element and made its atoms give off the tremendous quantities of energy which have long been locked within them. The element is heavy thorium.

Experiments just made with the 1,000,000-volt atom smasher at the Carnegie Institution of Washington show that high-speed neutrons (neutral atomic particles) will split thorium into two parts and yield energies so enormous that they have not yet been accurately measured.

This new experiment follows closely on the heels of the splitting of uranium, which also gives up its atomic energy in the splitting. Similar experiments on thorium have been done independently at the Johns Hopkins University. Both American researches confirm results known to have been secured a few days ago at the Institute for Theoretical Physics in Copenhagen by Dr. R. Frisch. A report of the Frisch experiments is soon to appear in *Nature*.

The release of thorium's atomic energy differs from that of uranium in that only very energetic neutrons from lithium, with energies of millions of electron-volts, seem to be able to split the element and release its energy. For uranium, both high and low energy neutrons appear able to touch off the "trigger" mechanism inside the atom that makes it split into two parts and release energies estimated at 200,000,000 electron-volts.

Investigators of the Carnegie Institution have also made a quick survey of other heavy elements—bismuth, lead, thallium, mercury, gold and tungsten—for similar results. But no conclusive evidence of splitting has been obtained for these non-radioactive elements.

While the research scientists at Carnegie are working night and day on both of their huge atom smashers, theoretical scientists are puzzling over the meaning of the astounding experiments. Most plausible suggestion now is that the action of neutrons on uranium and thorium is a kind of resonance phenomenon inside the nucleus of the atom. Neutrons smashing into the atom with some special energy can shake it and make it split apart. The enor-

mous binding energy which holds it together is released in this process.

Experiments now in progress seek to find if there is some particular neutron energy which is most efficient in releasing the atomic energy. In the case of thorium, the most efficient energy lies somewhere between 400,000 and 2,000,000 electron-volts. The Carnegie scientists systematically are narrowing these limits.—ROBERT D. POTTER.

THE NEW SUPER-NOVA

A TREMENDOUS stellar explosion—a super-nova star which probably has a brightness hundreds of millions of times that of the sun—has been reported by Professor Fritz Zwicky at the Mount Palomar Observatory of the California Institute of Technology.

The super-nova is only the eighteenth reported in astronomical history. It was first discovered by Professor Zwicky in the eastern sky with his small but powerful Schmidt type telescope-camera. On January 17 its magnitude was approximately 14. Three days later, on January 20, the brightness had increased to 12 magnitudes. It is so distant that it can not be seen with the unaided eye despite its brilliance. Its general location is almost directly east. It rises above the horizon about midnight and reaches the meridian position at 5 A.M. in the morning.

As the super-nova comes into view it is near the constellation of Leo and approximately on a line between the beta star of this constellation and the bright star Spica in the constellation of Virgo. Its position, as given in a telegram from Harvard Observatory, is right ascension 12 hours 40 minutes and declination north three degrees one minute.

The super-nova star is located near the nucleus of the nebula known as NGC 4636, listed in the nebula catalogue of Sir John Herschel, the nineteenth century British astronomer, as being a bright, large and irregularly shaped nebula. The nebula is resolvable into individual stars. It is one of these stars which apparently has flared up into super-brilliance.

THEORY OF IMMUNITY TO INFANTILE PARALYSIS

THE commonly held theory of why most of the population is immune to infantile paralysis is getting its first direct experimental test in the laboratories of the Johns Hopkins Medical School.

The theory is that man becomes immune to this disease by repeated slight attacks in which the virus or germ invades the nervous system without causing paralysis and without the knowledge of the person thus acquiring his immunity. It is hoped results of the test, now only in the beginning stages, might help in finding a way to make the rest of the population immune to the malady.

To learn whether the theory is true, or at least to learn something more about immunity to the disease, is the object of one part of the research Dr. Howard A. Howe is conducting at Hopkins. This research was begun under a grant from the President's Birthday Ball Commission for Infantile Paralysis Research. The study is being made with monkeys, in the hope that the findings may also apply to man.

Monkeys become permanently immune to this disease only by surviving an actual paralyzing attack of it. Dr. Howe has found a way to give them the disease without causing paralysis. He isolates the nerve connections between the central nervous system, including the spinal cord, and that part of the monkey's brain which receives sensations of smell. This isolated bit of nerve tissue still sends nerves down into the nose but is no longer connected with the rest of the brain.

When these animals get a dose of infantile paralysis virus in their noses, they develop fever at the same time as normal monkeys infected in the same way. The normal animals, however, become paralyzed and die, while the others remain healthy and active. The conclusion is that the treated animals have suffered a non-paralyzing attack of infantile paralysis in the isolated bit of olfactory brain. Whether or not the monkeys have acquired immunity to the disease is not yet known. Dr. Howe plans to investigate that point next.

VIRUS DISEASE OF ELMS

A NEW-FOUND, deadly disease, caused by a filterable virus instead of a fungus, has killed many hundreds of American elms in Ohio. Plant pathologists of the U. S. Department of Agriculture fear that it will prove even more destructive than the so-called Dutch elm disease that they have been fighting for several years in the neighborhood of New York, unless its cause can be discovered and means for combating it developed.

The disease was first called to the attention of government scientists in Ironton and Dayton, Ohio. During three years it killed more than 1,000 out of about 1,800 elms in Chillicothe. It is now rampant in Columbus. It was at first thought to be a "city" disease, but it has since been found in forest trees in West Virginia, northern Kentucky and southern Indiana and Illinois.

The symptoms are: first, a slight shriveling and brittleness in the leaves; then a rotting of the roots and the inner bark of the trunk. Within a few months the tree may be dead.

The new disease is not related to the Dutch elm disease of the Northeast. That is caused by a fungus which is carried about by a beetle. The Ohio Valley elm disease has been proved to be due to a filterable virus—a mysterious, self-multiplying something that is too small to be seen through a microscope. How it gets from one tree to another is still unknown. The present outbreak is the first known instance of a virus disease causing a fatal epidemic among trees.

Since the disease may have gained a foothold outside the Ohio Valley, government authorities wish to be informed regarding trees showing symptoms of its presence. Notices should be sent to the Division of Forest Pathology, U. S. Department of Agriculture, Washington, D. C. Because the disease is caused by a virus that can not be isolated and identified, there is no point in sending diseased samples.

THE NOVACHORD, A NEW ELECTRIC MUSICAL INSTRUMENT

A SINGLE versatile new electric musical instrument, looking for all the world like an old-fashioned spinet, is the Novachord, which uses vacuum tubes instead of piano or violin strings or the pipes of a wind instrument. It was

invented by Laurens Hammond, inventor of the Hammond electric organ, which likewise uses electric currents to produce its music instead of the familiar banks of pipes.

Requiring only to be plugged into a household light outlet, the Novachord is smaller than a grand piano. It contains no pipes, reeds, strings, hammers or vibrating parts. It has a keyboard of seventy-two notes which are, however, played exactly like a piano and has the regulation piano sustaining pedal and a pedal for controlling volume. Punching the keyboard and using the other controls determines the type of electric wave generated in the vacuum tubes. This electric wave is then converted into sound in much the same method as a radio.

Its imitating abilities it owes to the fact that the person playing it can change at will the two chief varying characteristics which give each musical instrument its identity. A group of controls mounted on the front panel above the keyboard makes this possible. One group on the left controls the actual tone color, while the other varies the "envelope." The player can thus pick the tone color and "envelope" he desires.

Mr. Hammond does not consider the Novachord, however, strictly an imitative instrument. It does, however, bring up distinct new possibilities for varied orchestral effects and for greater diversification of home entertainment.

SOME PAPERS PRESENTED AT THE RICHMOND MEETING

BACTERIA are scarce in the ocean and large fresh-water lakes primarily because these big bodies of water do not give them access to solid surfaces to which they apparently like to cling, according to Dr. Claude E. ZoBell, of the Scripps Institution of Oceanography. Various other factors which have been offered in explanation, such as the lethal effect of sunlight, and the presence of one-celled animals that eat the bacteria, he considers to be of less importance. In various experiments with Pacific Ocean water and with fresh water from Wisconsin lakes, Dr. ZoBell found that there was a definite correlation between the numbers of bacteria present and the ratio between the volume of the water and the area of solid surface presented. Bacteria numbers increased enormously when he artificially increased the solid surface by introducing glass wool, asbestos fibers, or other finely divided solids or colloids.

A STEP toward the more adequate understanding of the minute parasites that damage the health of animals and human beings has been taken through the successful "in vitro" cultivation in the laboratory of the twisted wire worm of sheep and other cud-chewing animals. Drs. R. W. Glaser and Norman R. Stoll, of the Rockefeller Institute for Medical Research laboratories at Princeton, N. J., reported that they had raised this worm, scientifically known as *Haemonchus contortus*, through the four larval stages. A germ-free diet, consisting of liver extract, agar, rabbit kidney and killed yeast, was made available in test-tubes to the worm eggs carefully made germ-free by sterilizing agents. In this way the worms were taken through their two free-living stages. These test-tube worms, when fed to a three-months-old, bottle-raised lamb which was worm-free, produced a normal infection of the worm parasites. Using a slightly different food medium, they were carried through the two further larval stages, which are parasitic.

A NEW chemical victory over disease appeared in the report of Drs. Willard H. Wright and Frederick J. Brady, of the U. S. Public Health Service. The victorious chemical remedy is gentian violet, familiar to bacteriologists as a stain for showing up microbes under the microscope. The disease for which it was used is oxyuriasis, more familiary known as pinworm infestation. Public health officials reported that, given in tablet form, this dye cured over 90 per cent. of the patients treated. Control of this condition, it was emphasized, depends on treatment of all members of a family or household.

THE first known change in the chemical nature of chlorophyll, the green coloring matter in leaves that enables plants to make food, was reported by Dr. O. L. Inman, of Antioch College, and Dr. A. F. Blakeslee, of the Carnegie Institution of Washington. Seeds of the common jimson-weed were treated with x-rays in Dr. Blakeslee's laboratory. Something must have happened to the chromosomes that carry the chlorophyll-determining genes or hereditary factors, for when the plants grew their leaves contained chlorophyll unlike any hitherto known. Examined under the spectroscope, it was proved to absorb light in a pattern different from that shown by other chlorophyll. However, it was still able to perform its natural food-making function. Since chlorophyll is remarkably stable chemically, and appears to be the same substance in all known species of green plants, this production of a new kind, with different chemical make-up, has created something of a stir in botanical and chemical circles.

WHY some plants can form fruits from flowers that are never pollenated was explained by Professor F. G. Gustafson, of the University of Michigan. Some time ago, Professor Gustafson created something of a stir when he produced fruits from unpollenated flowers by means of spraying them with growth-promoting chemicals. Now he has examined the ovaries of flowers that naturally produce fruits without being pollenated, and has found them to contain relatively large amounts of the natural growth-promoting substances, or auxins. He suggested that this high auxin content may account rather generally for the production of unpollenated, seedless fruits.

SPROUTING of seed potato pieces can be prevented and started again at will, reported Dr. John D. Guthrie, of the Boyce Thompson Institute for Plant Research. Pieces that would normally grow with no hesitation at all can have their sprouting held up by treatment with a chemical known as potassium naphthaleneacetate. The spell of this chemical can be broken with another, ethylene chlorhydrin, which caused them to sprout most vigorously. Dr. Guthrie suggested two possible practical applications: The treatment may be used (1) to retard the sprouting of potatoes and other plants during storage, and (2) to delay the blossoming of fruit buds that have a tendency to come out while there is still danger of frost.