SCIENCE NEWS

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THE CREATION OF SUPER-HEAVY ELEMENTS

THAT the giant atom-smashing cyclotron has confirmed the discovery of super-heavy elements, Nos. 93 and 94, was announced at the meeting on December 17 of the American Physical Society at Stanford University.

About a billion atoms of these man-made chemical elements, lying beyond uranium in the periodic table of the elements, have been created, according to Dr. Philip Abelson, of the University of California. He said: "The evidence is quite conclusive for elements Nos. 93 and 94. There is some evidence for elements 95 and 96, but it is not entirely convincing."

Uranium, heaviest of all naturally-occurring elements, was bombarded with neutrons created by the giant cyclotron. By this bombardment were created new elements which have chemical properties entirely different from other heavy radioactive elements. Moreover, it was found that the super-heavy elements were radioactive and liberated electrons.

Mr. Abelson said that "Since when an electron is emitted from the atom, in general the atomic number increases by one, it can be inferred that when element 93 decays, element 94 is formed." The super-heavy elements created are no fleeting, transitory things. Their life is more than 1,000 years. This is a new finding made possible by experiments seeking to discover evidence of the liberation of alpha particles, or helium nuclei, in the disintegration.

With the billion atoms available for study, such alpha particle liberation occurring could be detected if the half life of the super-heavy elements was a 1,000 years or less. "Because of the null result of this test it is deduced," concluded Mr. Abelson, "that above uranium in the periodic table there can be produced an element or elements that are relatively stable."

POSSIBLE ORIGIN OF THE X-RAY PARTICLE

SCIENCE may be on the threshold of discovering a whole host of particles intermediate in mass between the electron and the proton nucleus of the hydrogen atom. This is the implication in the report of Professor G. E. M. Jauncey, of Washington University, St. Louis, published in *The Physical Review*.

Under the title "Possible Origin of the X Particle" Professor Jauncey describes a new theory which accounts for the new-found particle first discovered at the California Institute of Technology by Drs. Carl Anderson and Seth Neddermeyer and confirmed by Drs. J. C. Street and E. C. Stevenson, of Harvard University.

Drs. Street and Stevenson found that the mass of the X particle was about 130 times that of the electron. But, says Professor Jauncey, there is no special reason why the particle should have this particular mass. Other investigators, in fact, have determined that the particle may have a mass of 700 times that of an electron.

Professor Jauncey's theory indicates that the X particle may well be formed in the intricate process of collision occurring when cosmic rays strike the earth's atmosphere and scatter atomic "débris" in the form of electrons and photons through the air.

When a photon of radiation strikes an electron in the atmosphere, according to the new theory, the photon loses an enormous amount of energy. To create X particles like those observed by Drs. Street and Stevenson the photon responsible would have to lose energy amounting to 4,306,000,000 volts.

Professor Jauncey suggests that this vast amount of energy is split two ways. Of this, 4,240,500,000 volts go into kinetic energy of the moving X particle and 66,000,000 volts energy goes into increased mass of the X particle. It has previously been found that energy and mass are different forms of the same thing and interchangeable. The mass energy of an electron at rest is 500,000 volts which is about one-130th of the mass of the X particle created or, said another way, the X particle has a mass 130 times that of the initial electron. The point is, by this theory, that the X particle created can not be expected to have any fixed, exact mass. Its mass depends on the energy in the initial photon of energy which created it. The higher the photon energy the greater the observed mass of the X particle and there should be, in fact, a whole range of masses for this new particle.

CANCER-CAUSING CHEMICALS

A CLEARER definition of the essential structural features of cancer-producing chemicals, one more step in the fight to conquer the disease, has been made in the Converse Memorial Laboratory at Harvard University by Professor Louis F. Fieser and his associates.

While the important problem of determining the exact manner in which these chemicals initiate malignant growth is still unsolved, it is felt that this progress may clarify understanding of the chemicals and help to point the way to an eventual solution.

Three years ago Professor Fieser accomplished the synthetic production of methylcholanthrene, a complex and very powerful cancer-producing hydrocarbon. This compound can also be obtained chemically from the bile acids of the human body. Since that time Professor Fieser and his research associates have synthesized 68 new chemical compounds, all of them similar to methylcholanthrene but each with small structural differences. These have been injected into mice in an attempt to learn why methylcholanthrene is so powerful and how it acts on living cells.

Experiments now completed show that 22 of these new compounds are definitely carcinogenic and that 19 definitely are not. Of the active compounds certain ones of far simpler molecular structure than methylcholanthrene, known chemically as 1: 2-benzanthracene derivatives, are very nearly as powerful as the complex hydrocarbon.

The fact that methylcholanthrene can be chemically obtained from the bile acids, Dr. Fieser points out, gives

strong support to the possibility that cancer might result from abnormal metabolism that leads to the formation of some hydrocarbon of the methylcholanthrene type within the body. This idea is also supported by what Dr. Fieser terms "the striking circumstance that this particular hydrocarbon—which carries as a mark of its possible origin the five-membered ring characteristic of sterols and sex hormones—is very potent."

Since any investigation of the biological formation of methylcholanthrene by direct experimentation is not yet possible, these circumstantial lines of evidence are very important.

THE SCIENTIFIC STATION IN THE ARCTIC OCEAN OF THE U.S.S.R.

SIX months ago, the Soviet expedition consisting of four airplanes landed on an ice floe near the North Pole and established there a scientific station. The four people who remained at the station after return of the airplanes drifted, together with ice field, in the Arctic Ocean, making most interesting scientific observations daily in an area hitherto unexplored.

Scientists of all countries followed the results of the measurements of depth, direction and speed currents. In six months the station drifted about a thousand kilometers (620 miles). Having started from the North Pole, it is now approaching the eighty-second degree of latitude between Greenland and Spitzbergen. The ice field upon which the station is located forms part of a tremendous flow of ice fields from entire central polar basin to Atlantic Ocean. The ice field has stood the drift splendidly, and the daring four so far have not been forced to suspend scientific work in order to change location or take other urgent measures.

How long will drift yet continue and when will this group of explorers be taken away from ice? The research station had a program of work lasting until spring of 1938. It is true that it has already passed the altogether unexplored northernmost localities, but the area which the station now enters, that between 82 and 78 degrees latitude, is also almost unexplored and is of greatest interest.

The four explorers wish to continue their work. This aspiration is comprehensible. Life and work in the Arctic, of course, are not easy. However, they have so far withstood the dangers and there is no ground to expect that the situation will be substantially more unfavorable.

The ice floe, on which the station is established, is three meters (10 feet) thick and two kilometers (1.2 miles) in diameter. It is quite probable that it might some time develop fissures. However, there is nothing in that which could frighten experienced Arctic explorers. It will be possible to continue to live and work on an ice floe of smaller size. For emergencies, Leader Papanin was supplied food in considerably greater quantity than his group can consume, and this supply is distributed in several stores located at intervals on the floe. The warm living tent is so designed that four people could lift it and carry it to a new place without dismantling.

I have happened to hear and read some expressions of anxiety in regard to the fate of the personnel of the station. The view has been expressed that with its approach to Greenland, the ice floe would be crushed into small pieces and smashed. These fears, however, contradict our entire Arctic experience. The ice floe with station by no means can be pressed to the very shore—there is much local Greenland ice in the way. Though ice jamming occurs, it never smashes such strong ice fields. This situation is understood by the scientists at station "North Pole" and it is being watched constantly. There are airplanes on Franz Josef Land which in case of need would fly to drifting station. They can do this without even awaiting good weather as the location of the station is determined daily and is well known. The pilots can follow the course, listening to radio signals from the station, while personnel of the station would light fires for landing. This is the reason why we do not intend to take the station off its ice floe before the time scheduled. In the spring, when the work is completed, the icebreaker *Yermak* will sail to meet the ice floe. Should the station still be far from the border of the ice, airplanes will be sent to take off the people and the scientific materials.

The method of using the drifting station on ice, applied for the first time by us, has proved remarkably effective. We expect further successes from the work of the four scientists—Papanin, Krenkel, Shirshov, Fedorov—who have the respect of the entire world, the ardent love of the Soviet people and the constant care of the Soviet Government.—*Statement to TASS by Otto Schmidt, chief of the Northern Sea Route Administration, U.S.S.R.*

THE NEED OF FEDERAL FUNDS FOR AVIATION

IN stating that the present type of aircraft engine has very nearly reached the limit of its efficiency, John H. Geisse, chief of the power plant section of the Bureau of Air Commerce, urged the necessity of federal appropriations for experimental work on planes and equipment for a mightier aviation industry of to-morrow.

Aircraft engines of the next few years will be considerably different from present-day models, he told the Washington section of the Society of Automotive Engineers, but because of the unwillingness of many large-scale manufacturers to attempt to build engines of novel design, the Bureau of Air Commerce must have funds with which to help the inventor bring his ideas from the drawing board to practical operation.

To-day's sky-liners, Mr. Geisse told his audience of engineers, are not more than three per cent. efficient. For 100 per cent. efficiency in converting the gasoline that powers a modern sky-liner into movement of the plane, only thirteen and a half pounds of gasoline an hour would be required. Actually, the plane he described uses 465 pounds. "The operation of the airplane to-day is on a par with the best efforts of Rube Goldberg," he asserted before going into a description of valve and other engine improvements which, if carried out, will result in enormous savings. "I do not hesitate to predict that the present four stroke, poppet valve, air-cooled radial engine refined to the *n*th degree will give way to types now considered radical."

In England engineers are experimenting with a "sleeve type valve" engine which differs from American engines in a number of respects, including the fact that it is considerably more efficient than the type used here. A still more radical type is also being tried in Britain.

Diesel airplane engines, because they have less of a fire hazard and are more reliable, will come into wider use, he predicted. The Diesel's greater reliability lies in the fact that each cylinder is more independent of the others than is the case with a gasoline engine. In the latter, a carburetor defect or trouble in the ignition system knocks out the entire engine. With the Diesel, each cylinder has its own gasoline pump and the ignition system is dispensed with entirely.

The remarkable possibilities of new types of engines, he explained, should serve to "warn us against rejecting proposed designs for the sole reason that the inventor claims an engine weight of one quarter of a pound per horsepower and is therefore necessarily a nut. He could be right."

SCIENCE IN 1937

(Concluded)

Psychology and Psychiatry

MOST hopeful was the first experimental use in the United States of shock by insulin, metrazol or other drugs for the treatment of the widespread mental disease dementia praecox. This treatment has demonstrated that the brain is not deteriorated in these afflicted persons but only functionally deranged.

Wider and more intense interest in practical social problems—war, unemployment, strikes, political attitudes—involving an understanding of human behavior was a significant growth in the field of psychological research.

Other outstanding developments in psychology and psychiatry were:

Diagnosis of epilepsy was accomplished through brain waves, detecting hitherto unsuspected cases.

Calcium was successfully used to calm excited mental patients and banish their hallucinations.

Use of sleeping medicines was found to be partly responsible for an increase in mental disease.

Chimpanzees can become addicted to morphine, displaying craving as well as physiological symptoms, and are thus suitable for testing effects of narcotic drugs, it was discovered.

Brain wave study led to revision in conceptions of the function of the brain, no longer considered only a connecting mechanism between senses and muscles but now known to originate activity.

Discovery that a guinea pig's brain originates impulses identical with the brain waves of man threw doubt on the idea that such rhythms are associated with higher mental activity.

Brain wave research showed that different parts of the brain apparently go to sleep separately and to different degrees, and that the rhythms in early sleep resemble those of some cases of mental illness.

Practicing psychologists formed a new professional society, the American Association of Applied and Professional Psychology, with strict entrance requirements.

Stuttering in children was blamed on over-anxious parents when a study revealed that most very young stuttering children do not differ from others.

Loud noise is not a universal cause of fear in infants but it does make all of them wiggle their toes, very slow motion pictures revealed.

Announcement that the Dionne quintuplets are identical in origin, yet differ in personality and mental ability, raised problems for psychological explanation.

A new psychological measure—PQ, personality quotient—was reported to be more important for human relationships than is IQ.

Intelligence test scores of 300 children in foster homes were found to be only slightly related to the IQ's of the true mothers.

Engineering and Technology

TRANSCENDING the mere building of bigger bridges and the breaking of records, is the growing appreciation on the part of the public of the effect of technology upon the social structure of nations and the world.

The National Resources Committee listed the following inventions as likely to be widely used with social effects: Mechanical cotton picker, air conditioning, plastics, photoelectric cell, artificial fibers from cellulose, synthetic rubber, prefabricated houses, television, facsimile transmission, trailers, gasoline from coal, steep-flight aircraft, tray agriculture.

Among the engineering and technological advances of 1937 were:

Golden Gate Bridge and the San Francisco-Oakland Bay Bridge were completed and a man-made mile-square island created between them.

A coaxial cable carrying 240 simultaneous telephone conversations or one television message was put in operation between New York and Philadelphia.

Television of 441 lines was demonstrated.

Television tubes were made available commercially.

A new method of switching telephone calls, in which connections are made by closing relay-like contacts is being put into use.

The first rural telephone central office to be served exclusively by wires plowed underground was placed in service.

Automatic radio receivers were authorized on U. S. ships.

High-pressure mercury vapor lights were introduced commercially.

A method of sterilizing wool fabrics without injury was perfected.

A panchromatic photographic film three times the speed of fastest previously used was introduced.

Fatigue failure of machinery parts was traced to minute surface cracks which can be eliminated by initial polishing.

Heat treated cast irons were used for gears and other parts formerly made of steel.

Research in physical nature of lubrication led to treatment of lubricants to permit much higher bearing pressures.

High octane anti-knock gasolines at lower cost promised increased fuel efficiency for airplanes.

A new type of handset telephone with bell and coil in base was introduced commercially.

Carbon dioxide filled incandescent lamps, providing artificial daylight, were commercially perfected.

The world's first "free-flight" wind tunnel for aeronautic research was completed.

A new blind landing radio beam with antenna in an underground pit at the field's center was developed.

Improved tricycle type landing gear was made available to private owners on several commercial aircraft.

The effects of roughness on wing surfaces was determined in new high-speed wind tunnel.

A new nose-slot N. A. C. A. cowling for radial air-cooled engines was developed to give better cooling and less drag.

Pressure water-cooling systems were applied to aircraft engines using pressure of 30 pounds per square inch.

Silver bearings were adopted in high power aviation engines.

An improved rotating-wing aircraft was developed using feathering blade control.

Survey flights for transatlantic air travel were made successfully.

Scheduled transpacific air travel was established.

MEDICAL SCIENCES

OF far-reaching promise was the report that the viruses of at least two animal diseases, in addition to those of certain plant diseases, are non-living protein molecules. New and more successful methods of treating and preventing the largely unconquered group of virus-caused ailments, to which belong infantile paralysis and encephalitis, may result from the new knowledge of the nature of the causes of these diseases. It has even been suggested that this discovery may give a clue to the secret of life itself, since it gives scientists a chance to study the phenomenon by which non-living matter appears to become endowed with characteristics of living matter.

Other outstanding medical events of the year follow:

Discovery that jaundice temporarily checks the progress of chronic deforming arthritis suggests that some degree of control of this crippling, disabling disease may be accomplished.

Congress appropriated $750,000 for a National Cancer Institute building and $400,000 for cancer research and control during the fiscal year.

Cures by sulfanilamide of Type III pneumonia, gonorrhea, kidney and urinary tract infections, meningococcus meningitis and gas gangrene were announced.

A so-called elixir of sulfanilamide caused over 80 deaths by poisoning from diethylene glycol used as a solvent in the remedy.

Cholera became epidemic in China and Japan, infantile paralysis in the United States and Canada, and influenza in Europe and America during the year.

Malnutrition was pronounced a world-wide problem by a League of Nations commission.

A National Foundation for Infantile Paralysis to strengthen and mobilize medicine's attack on this disease was formed under the leadership of President Franklin D. Roosevelt.

The question of state and federal aid in providing medical care was widely discussed.

Discovery that ether-extracted wheat germ oil may cause sarcoma in rats gave first evidence that a product of vegetable origin could cause malignant tumors.

A sugary substance from a common disease germ, the colon bacillus, was found to kill one kind of cancer in rats in 24 hours without destroying healthy body tissue.

Use of a new direction-finder makes possible repair of fracture of the head of the thighbone in 20 minutes through a 1½ inch incision without cutting muscles and with the patient up in a chair 48 hours later.

Brain wave studies suggested that sugar injections or inhalations of carbon dioxide may prove useful in the treatment of epilepsy.

First results in treatment of pneumonia with hydroxyethylapocupreine, a new drug derived from quinine, hold out hope that this remedy may reduce pneumonia deaths.

Treatment of gonorrhea by artificial fever and also by a new antitoxin was announced.

Large doses of vitamin D—300,000 units daily—were found effective in treating psoriasis, a skin disease.

Silicosis prevention was suggested by mixing protective dusts or chemicals, including aluminum dust, with mine dust causing this disease.

A craving for vitamin B_1, which may be the strongest of all animal cravings, was discovered in rats.

Ovulation can now be detected electrically and the process has been induced in rabbits by electrical stimulation and the brain center for the process located.

Some of the damage done in prostate gland disease may be remedied by doses of one of the male sex hormones.

A new male sex hormone, epiallopregnanolone, minute amounts of which aid the development of male sex characteristics in birds, man and other animals, has been isolated and made synthetically.

Two new adrenal gland hormones were discovered, one of which brings maturity to sexually undeveloped boys and the other increases virility in male rats but causes atrophy of sex glands in female rats.

For the first time a man-made radioactive substance, radiosodium, was used to treat human disease.

Neutrons, newly discovered atomic particles without electric charge, were found to be more effective than X-rays in destroying breast cancer of mice.

X-rays kill cells by suffocation, it was found in studies which also showed that cancer cells are more susceptible than normal cells to x-ray because they have a "greater speed of life."

Discovery of the possible transformation of a micro-organism, Aerobacter aerogenes, into colon bacillus in the human intestinal tract suggested need of new tests for safety of drinking water.

A new vitamin, P, closely related to vitamin C and found in lemons and paprika, was discovered.

A new digestive hormone, enterocrinin, was discovered and extracted from the large intestines of man and other animals.

It has been shown that patients with chronic heart disease may be materially improved by the administration of large doses of vitamin B complex.