SCIENCE NEWS

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ATOMIC POWER

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Is atomic power at hand? Here is the way *not* to write the story of this possibility, but the flood of reports which have swept the country telling of the isolation of a rare isotope of uranium with mass 235 and the possible implications of this discovery for releasing atomic power, make it highly desirable that some one sit down, take off the gloves, separate fact from fancy and give a fair picture of what is happening. Here are the facts. Fantasy may come later.

1. Over a year ago, when it was first discovered that uranium atoms could be split by bombardment with neutrons, neutral atomic particles, and made to release a large measure of the atomic energy, Professor Niels Bohr, of Denmark, Nobel Laureate, and Dr. John A. Wheeler, of Princeton University, forecast that atoms of uranium 235 would probably be split by very weakly energetic, "slow" neutrons. Only high energy neutrons, they predicted, would be successful in splitting the common form of uranium with mass 238.

2. Occasion for the recent spectacular retelling of the story of uranium fission, which has been reported again and again since late in January, 1939, was the confirmation of the Bohr prediction on uranium 235 by Dr. A. O. Nier, of the University of Minnesota, and Drs. E. T. Booth, J. R. Dunning and A. V. Grosse, of Columbia University.

3. Dr. Nier made possible this confirmation by isolating, in an instrument known as a mass spectrometer, the tiny sample of uranium 235, which was only a few millionths of a gram of material. Others, including Drs. K. H. Kingdon and H. C. Pollock, of the laboratories of the General Electric Company, have been effecting similar concentrations of uranium 235 and uranium 238, its heavy common isotope. Professor J. W. Beams, using a gold-plated centrifuge at the University of Virginia, has been working on the problem, but is having the material he has isolated checked in a mass spectrometer to determine its atomic weight. He has just told Science Service that he has no specific report to make until this mass spectrometer test is concluded.

4. The isolation of the uranium 235 isotope is extremely slow, tedious and costly in time and effort. Figures discussed by Drs. Kingdon and Pollock show that even for the much more abundant uranium isotope of mass 238 it takes three hours of operation to produce one and eight tenths of a microgram, where a microgram is a millionth of a gram and a gram is less than one four hundredth of a pound.

Simple computation shows that at this rate it will take some 70,000 days (over 191 years) to make a single gram of concentrated uranium 238 and over 400 times as long—over 75,000 years—to make a pound of this material. The rare isotope of uranium of mass 235, occurring in only one part in 139 in comparison with uranium 238, would take still longer for its production.

5. It has been definitely shown that a chain reaction occurs in uranium fission with neutrons. The only new thing in this is that it has now been confirmed in an American laboratory. Some months ago this same fact was announced from Paris by Professor F. Joliot and his colleague, Dr. H. von Halban. The new American work probably confirms this fact more thoroughly than before, since the scientists supposedly were working with the pure, concentrated uranium of mass 235.

So much for the facts about uranium's fission which, unembellished, are seemingly prosaic. Much better reading—and the cause of the wide-spread use of the recent story—is the speculation about the future of the possible release of atomic energy from uranium.

Taking off from fact into fancy one can cite the following:

1. The separation methods of isolating uranium 235 are bound to improve so that while it may take over 75,000 years to concentrate a pound of uranium 235 to-day it may be done far quicker in the future. Perhaps the wish for a five-pound chunk of the stuff can be realized within our times.

2. It may not be necessary to have pure uranium 235 (U-235) to find practical uses. True, the U-235 works best with the weak neutrons, but uranium 238, much more common, splits with fast, high-energy neutron bombardment. It can be recalled that the discovery of uranium fission was obtained with uranium oxide—a commonplace chemical compound widely spread throughout the earth.

3. The energy liberated from uranium by fission is enormous and weight for weight it is at least 5,000,000 times as effective as coal.

4. If the chain reaction of having one uranium atom split and liberate the neutrons which will split another one near by and so on, can be controlled, then a compact power source for military purposes could be achieved despite whatever the cost might be. Things which are uneconomical in a peacetime sense become practical for military services if they can perform tasks not possible, or carried out as easily, in any other way. No price can be put on such developments that might save the life of a nation which owned the discovery, any more than one can put a price on a surgical operation which saves a man's life.

5. Is Germany pressing the utilization of the discovery of uranium fission? The answer is probably yes, for it has been pointed out since the first announcement of the sensational find that Germany was the home of the original discovery, and that Germans have had a six months and more start on their research.

This drive is going on in all nations and does not require the special large cyclotron atom-smashers which dominate the American scientific scene.

The whole virtue of uranium fission from any possible practical applications, is that it does not require huge heavy cyclotrons to set off the fissions and release the energy. A little bit of radium mixed in a flask with beryllium and embedded in a block of paraffin is the

entire "source" that is required. This radium-beryllium mixture is a source of neutrons and with these to bombard uranium the uranium splitting and its own chain reaction do the rest.

Those five points are the fancy which may or may not come true within our times. There are others, like the uranium bomb, which go beyond fancy into the fantastic. One would be a fool to say that these possibilities will not happen when it is less than two years ago that talk of atomic power was relegated to talk of perpetual motion, ancient medieval alchemy and the search for the philosopher's stone.

Probably the sanest forecast of the future is that uranium atomic power will be so valuable when and if it comes that it will be used only for the most special purposes for which it is characteristically adapted and which it can do better than anything else.

Still nearer to reality as a forecast is that the discovery of uranium fission will have its greatest benefits as a ready-at-hand, compact source of neutrons which are highly sought-after in medicine and biological experiments and in nuclear physics. At present huge and costly atom-smashers are necessary to create these neutrons for experiments. If the chain reaction can be started and controlled in uranium, every university laboratory could have its own neutron source. The benefits to research on understanding the structure of atoms—and hence all matter—would be immeasurably enhanced by this advice.—ROBERT D. POTTER.

CONCENTRATION OF URANIUM

A WAY to speed 11,000-fold the concentration of the element, uranium 235, from which it is hoped to obtain practical atomic power, is reported from Stockholm. But the spread of the European war has stopped, at least temporarily, the research that holds such promise.

With tubes about 30 feet high, Professor Wilhelm Krasny-Ergen, of the Wenner-Grens Institute of the University of Stockholm, was on the verge of concentrating, at a rate more than 10,000 times faster than ever before, the rare material which is a potential source of atomic power. Work had to be suspended when Germany marched into Norway.

The 24-hour yield of rare uranium 235 would be 1.3 milligrams per day, whereas the best yield reported up to now for the much more common uranium 238 is only 14.4 micrograms a day. This means that with a single tube in his thermal diffusion apparatus, Professor Krasny-Ergen would require about three years to get a gram of uranium 235. At the present rate of production with mass spectrometers in America it would require over 33,000 years to get a gram of uranium 235.

The thermal diffusion tubes, described in a report to *Nature*, are easy and cheap to make. A whole series of such tubes could be constructed and run in tandem, or separately, and greatly increase the yields of uranium 235.

Uranium of mass 235 is, weight for weight, about 5,000,000 times as potent in energy as is coal. Each time an atom of uranium is struck by a low-energy neutron (neutral atomic particle), it splits in two and yields 175,000,000 electron volts of energy. The aim has been to concentrate enough uranium 235 in one lump to test its ability to keep on liberating its energy by a "chain reaction" in which each fission of a uranium atom would yield more neutrons which could split other adjacent atoms, and so on.

PAPERS READ BEFORE THE NEW YORK MEETING OF THE AMERICAN ASSOCIATION OF PHYSICAL ANTHROPOLOGISTS

BOYS and girls now growing up show a tendency to become less tall than their older brothers and sisters of a few years ago, and also not to become mature men and women at so early an age. Data in support of this contention were submitted to the meeting of the American Association of Physical Anthropologists, meeting in New York on May 3, by Professor Clarence A. Mills, of the University of Cincinnati. Professor Mills was inclined to attribute this reversal in the human growth tide to a change in climates toward the warmer, rather than to any differences in the American diet. The tendency for young people of the recent generation to grow tall and mature early, which he said is now reversing itself, has been laid to improved diet. Yet the present generation of college students (on whom the studies have been based) is just as well fed as their taller immediate forebears. Need for more information, especially from foreign lands, was stressed by the speaker in his concluding remarks: "It seems likely that a profound racial change is taking place in humanity, physically as well as socially. It would be highly desirable to know whether a similar physical reversal is taking place in those foreign lands where the upward surge of the last half century has been most marked."

IDENTICAL twins are "more identical" physically than they are mentally, at least by any criteria at present available, it was pointed out in the address of Dr. C. B. Davenport, of the Carnegie Institution of Washington, with headquarters at Cold Spring Harbor, N. Y. After pointing out the extremely close resemblances of identical twins, even in such details as the dimensions and structure of their noses, Dr. Davenport went on: "However, in the mental reactions there is by no means identity and in certain details, like those of the papillary patterns, there is only a general resemblance." The speaker suggested that, in general, twins are most alike in characters that have the least complex genetic make-up. The more factors that are involved, the most likely there are to be changes, even though all the original factors were alike at the outset. Another cause for differences, as development proceeds, is to be sought in changing relations between the heredity-controlling genes and the cytoplasm, or general cell protoplasm, which is the instrument for the expression of hereditary trends.

RE-STUDY of the fossil ape skulls and teeth found in South Africa by Dr. Robert Broom, of the Transvaal Museum, in 1936, was reported in an illustrated lecture

recently by Drs. William K. Gregory and Milo Hellman, of the American Museum of Natural History. Their findings confirm those of Dr. Broom that the canine teeth of these apes are almost human, while the large molars combine human and ape features. According to Dr. Gregory, "Our reconstruction of the upper dental arch comes out in almost human form. The lower teeth also combine ape and human characters. These creatures probably represent persistent primitive forms that lived on in South Africa after man himself had arisen, possibly in another part of the world."

THE Indians who built the famous Hopewell mounds of the Ohio Valley and whose cultural remains have been found as far west as Iowa and Missouri, were brought a little closer to personal portraiture by a paper presented by Dr. T. D. Stewart, of the U. S. National Museum. Trouble with the Hopewellians is that they practised cremation, so that bones found in their elaborate funeral mounds have always been burned beyond any possibility of reconstruction. Therefore while investigators have been able to collect great amounts of data on their really beautiful workmanship in copper, shell, mica, obsidian, horn, bone and river pearls, they could never get an idea of what the people themselves looked like. However, some skulls from a Hopewell site near Kansas City, Mo., excavated by Dr. W. R. Wedel, of the National Museum, at last give a clue to the Hopewellians' personal appearance. Search in the great collection of Indian skulls has also brought to light specimens from the Illinois-Wisconsin-Iowa region, which had hitherto been overlooked. The typical Hopewellian skull appears to have been long and narrow—in Europe it might have been classified as either Nordic or Mediterranean. Similar skulls were common among more recent Indian tribes in eastern North America. There is also a pronounced narrowing of the forehead, which Dr. Stewart believes may have been artificially produced by binding of the heads of the young children. Head binding is common practise in many Indian tribes, though it is usually done in such a way as to cause a flattening instead of a narrowing of the skull.

EVIDENCE that Indians who once lived near Washington, D. C., practised the skull-piercing surgery that was common in ancient Inca-land was offered in another paper presented by Dr. Stewart. A skull dug up by Mrs. Alice L. D. Ferguson on her property on the Maryland side of the Potomac, opposite Mount Vernon, has a triangular hole in it, the sharp edges bevelled inward. The bone had healed perfectly. The find is a very puzzling one, because primitive trepanning has not hitherto been known for this part of the continent. Yet the job was so skilfully done that "it would seem unreasonable to expect such a successful end result on a first attempt at cranial surgery."

ITEMS

THE Great Plains region, except for its southwestern end, has enough rain for the first time in years, according to the U. S. Weather Bureau. April rainfall in Montana was double the normal amount, and the excess precipitation in North Dakota amounted to 50 per cent. Grain crops and pastures are thriving accordingly. Moisture is short in the Southwest and on much of the Pacific slope, but east of the Plains region excessive moisture and low temperatures are holding things back. Effects are felt alike in the cotton, corn and wheat belts.

DANGER of any serious epidemic disease breaking out in Poland and spreading with coming of spring is now believed past, according to James T. Nicholson, of the American Red Cross, who has returned from six months' relief work in German-occupied Polish territory. Food is so scanty, however, that famine threatens this area in the interval before autumn harvest. All winter, Mr. Nicholson states, immunization against typhoid and paratyphoid has been pushed in the area. To prevent typhus outbreaks, de-lousing and other sanitary precautions have been carried on. Disease incidence has been less than normal.

HOW the United States is attaining national self-sufficiency by its chemical research is shown in the exhibit of the E. I. du Pont de Nemours & Company, which has been redesigned for the World's Fair in New York. Made-in-America materials are displayed which can replace former imports that in times of war may be difficult to obtain. Included in the display were: nitrates, dyes, medicinals, potash, synthetic rubber, optical glass and camphor. A feature of the exhibit this year will be the actual knitting of hosiery made of Nylon fiber.

THAT gas of still unknown chemical composition, given off by moldy lemons, greatly speeds up the production of yellow color on the rinds of sound lemons kept in the same room or container, is reported by Dr. J. B. Biale, of the University of California at Los Angeles. When dark green lemons are exposed to the vapors produced by the mold fungus they color up several weeks earlier than similar unexposed fruits and their respiratory activity is greatly accelerated. There is also a tendency to shed the stem bases or "buttons," and in some cases pitting of the rind has resulted.

A NEW frothy, foaming soap-like germicide that is odorless, non-staining, inexpensive and non-toxic was reported to the meeting of the American Chemical Society, at Cincinnati, by Dr. Robert S. Sheldon, T. J. Becker, M. R. Warren and D. G. Marsh, of the W. S. Merrell Company. The new germ-killing chemical is cetyl pyridinium chloride. Effective against bacteria, it is reported to be relatively non-poisonous to body tissues. Carbolic acid, the well-known germicide, has the handicap of harming tissues in cencentrations sufficiently strong to kill bacteria. Moreover, like iodine and mercurial compounds, it is irritating to open wounds. The new germicide can be applied in one per cent. concentrations to the skin without irritation. A 1: 5000 concentration can be used safely in the eyes. Another outstanding advantage claimed is that this new compound does not interfere with healing or skin granulation. Clinical uses include treatment of infected wounds and infections of the ear, nose and throat, as a lavage or wash for lungs, nose and throat, and, in surgery, for pre-operative and post-operative sterilization of the skin.