

## SCIENCE NEWS

*Science Service, Washington, D. C.*

## THE WEIGHT OF THE NEUTRON

New hope of obtaining energy from the atom and convincing proof that the neutron is lighter than its generally accepted mass figure, have resulted from the latest experiments of Professor E. O. Lawrence and his associates working with the unique magnetic "merry-go-round" atom gun at the University of California.

The University of California investigators, having faith in their own previous experiments, have continued to devise new and conclusive proofs that the mass of the neutron is 1.0003. Heretofore the whole scientific world was rather thoroughly convinced that this most important constant had the value 1.006. This higher value was proposed by the discoverer of the neutron, Professor J. Chadwick, of Cambridge, and subsequent work seemed to verify it.

Less than a year ago Professor Lawrence and Drs. Stanley Livingston and M. Henderson working with deutons (nuclei of heavy mass two hydrogen) made by Professor G. N. Lewis found that the deutons apparently split up when bumped hard and gave out more energy than was put in. This could be true only if the neutron were lighter than 1.006.

Such a result was so startling that it was not generally accepted. Physicists offered all possible explanations of how it might be wrong. A further experiment described in *The Physical Review*, however, confirms the earlier result.

Two targets were bombarded with exactly similar protons of about 3,000,000 volts energy accelerated in their atom gun. One target had ordinary hydrogen in it and nothing happened. The other target was just the same, except that heavy mass two isotope (deutons) replaced the ordinary hydrogen. From this target great showers of protons and neutrons were emitted. These often had more energy than the impinging protons. Analysis showed that these results could be explained only if the neutron's mass is less than 1.0003.

The method is so convincing that the conclusions will be accepted everywhere in spite of the jolt they give to preconceived notions about the structures of the nucleus. First, they mean that the beryllium nucleus, the deuteron, or heavy isotope of hydrogen nucleus, and the proton are all unstable in the sense that they could break up into parts with explosive violence. They do not and scientists have no notion why.

Some day physicists hope to understand the process and then there will be a chance of obtaining energy from the nucleus. For example, the small difference between 1.006 and 1.0003 means that a pound of heavy hydrogen could give off more heat than the burning of five thousand tons of coal.

Science is still far from such a goal but the nearest approach is in these recent experiments of Professor Lawrence and his coworkers. They have boosted the efficiency of such processes many thousands of times during the past two years. They report that one proton in four thousand is able to disintegrate a deuteron into a proton

and a neutron and five million volts. The scientific significance of this high yield is much more important than its possible practical application.

## EARTHQUAKES IN NORTHERN INDIA

"GROWING PAINS" in the most tremendous mountain system in the world, which is still getting bigger, are probably responsible for the disastrous earthquake in northern India. The whole south slope of the great Asian mountain mass is a very active seismic region, and shakedowns of major intensity, such as always accompany the upfolding of mountain ranges, can be expected there at any time.

It is just short of an even generation since the last major earthquake in that neighborhood. In 1905 occurred the great Kangra quake, which was strongly felt in Simla, summer capital of British India.

Major earthquakes in northern India might have been more frequent in recent decades, but for the relief to internal strains in the earth's crust that must have been afforded by the exceedingly severe Assam quake of 1897, is the opinion of Captain N. H. Heck, of the U. S. Coast and Geodetic Survey. This was the most terrific earthquake recorded in the history of the world. It was felt over two and a quarter million square miles, and caused total destruction of all buildings in an area of 12,500 square miles. The tremors it sent through the earth were visible on lake surfaces in Europe.

Other and more recent earthquakes traceable to growth movements of the Himalaya system have caused widespread death and destruction in Burma. Earthquakes are always most frequent and most severe in regions where the earth's crust is being wrinkled and folded to form mountains. The younger the mountains the greater the seismic activity. Thus, earthquakes have been few and far between in the eastern United States, where the mountain systems are old. The Rockies, which might be classified as mountains in early middle age, are the scene of occasional quakes, while the Pacific coast, with its young and actively growing Coast Range infants, have earthquakes with considerable frequency. The great mountain arc that starts in Alaska and swings down the western shore of the Pacific through Kamchatka, Japan and the Philippines, is one of the most actively growing mountain regions of the world, and also one of the most lively of the earth's earthquake zones.

## GYPSUM AS A DRYING AGENT

CALCIUM sulfate, specially prepared by a simple process, joins the ranks of thirsty substances known to chemists as "drying agents." The new preparation is called "soluble anhydrite." It is thus contrasted with common or insoluble anhydrite, a mineral of apparently the same chemical composition, but different behavior.

Professor W. A. Hammond, of Antioch College, Yellow Springs, Ohio, and Professor J. R. Withrow, of Ohio State University, report that calcium, or lime, sulfate, cheaply available and known for hundreds of years, has

surprising powers of taking water away from other material. Common distillery alcohol, normally containing several per cent. of water, at once becomes absolute, or practically 100 per cent., by merely being shaken with the new soluble anhydrite. Numerous other liquids which must be thoroughly dried, or freed from water, before use in chemical processes, may now be desiccated by this treatment.

Most drying agents are either expensive, corrosive or not thorough in action. Soluble anhydrite escapes these three evils, but does have one drawback—it will absorb only six per cent. of its own weight in water. It does not do much, but does that little well. Other agents, such as calcium chloride, absorb greater quantities under favorable circumstances, but will not strip a liquid so thoroughly of water actually held in solution.

Apparently the virtues of anhydrite were overlooked for generations, after plaster-of-Paris chemists had reported that neither the mineral anhydrite nor its artificial imitation made in a furnace would absorb water. Professors Hammond and Withrow now find that the cautious heating of ordinary gypsum, a compound of calcium sulfate with water, for three hours in an oven at 460 degrees Fahrenheit yields a reactive form of the sulfate which drinks in water with great avidity.

Technical measurements reported by the discoverers to the American Chemical Society indicate a possible wide use of the anhydrite particularly by organic chemists, who have frequent need for thoroughly dried alcohols, ethers, esters and similar liquids.

### PROPANE AND THE EXTRACTION OF LUBRICANTS

PRACTICALLY all automobile lubricating oils contain a substantial fraction of so-called Pennsylvania oil, according to Dr. Ulric B. Bray, petroleum chemist, in a report to the American Chemical Society meeting at Los Angeles. The difference between good and poor oil lies in the relative amount of the much-prized Pennsylvania-type ingredients. Many supposedly inferior western oils now prove to contain fifty per cent. or more of the good material, and the question naturally has arisen how to get it out.

Unfortunately distillation, the stock-in-trade process of the oil refiner, does not separate good oil from bad, although it does separate light from heavy. Recent researches show that propane, a normal constituent of liquefied natural gas, can be made to turn the trick. This remarkable substance, cheaply available, looks like gasoline, but has a boiling-point of 48 degrees below zero Fahrenheit. It has the ability to dissolve out, or extract, the Pennsylvania type of ingredient, but not the asphalt, paraffin wax and other undesirable components which mar the cheaper lubricants.

Lubricants extracted with propane have the pleasing habit of constancy in viscosity during the process of warming up of a motor. They are thin enough to permit the starter to turn over a cold motor—and at the same time remain sufficiently viscous in a hot motor for proper lubrication.

The new refining method opens wide new resources for

manufacture of really good motor oil, since Texas, Oklahoma and California oils, previously thought unsuitable, are available as raw materials. Entirely new and peculiar refining apparatus must be devised, however, to take care of the propane in view of its extremely low boiling point. The whole process will have to be conducted under pressure.

### THE FOOD VALUE OF INVERTEBRATES

Food and vitamins from starfish and red sponges, among the most abundant, most useless and most unappetizing of all sea life along the Atlantic coast, are possibilities hinted at by researches in the Sterling Chemistry Laboratory of Yale University, under the direction of Professor Treat B. Johnson.

One of the interesting things discovered about starfish is the presence in its tissues of considerable quantities of free amino acids, which are the chemical building-blocks of proteins. In other animals these acids are for the most part bound up in proteins, and before another animal can make use of them it must break the proteins apart by digestion. Just what the scientific significance of uncombined amino acids in starfishes may be, and what practical advantage can be taken of the phenomenon, are points awaiting further investigation.

Red sponges have been found to contain the vegetable pigment carotene, which is the raw material used by animals in making vitamin A. Only red sponges contain this pigment. Getting it out constitutes a terrific laboratory job: it takes a ton of wet sponges to yield a hundredth of a pound of carotene.

One of the things hoped for from the researches is further light on the relationship that may exist between vitamin A, which prevents an eye disease, and vitamin D, preventive of rickets. They are close chemical associates, but it is not yet known whether one is derived from the other, or both from a common source.

Oysters, a more conventional marine food animal, are also being subjected to analytic treatment, especially by Dr. Warner Bergmann, working in a special laboratory at Milford, Connecticut. He states that they contain two hundred times as much iodine, weight for weight, as milk, eggs or beefsteak.

### THE TREATMENT OF ARTHRITIS WITH GOLD SALTS

RHEUMATOID arthritis, if treated within two years of its onset, may be cured in 50 per cent. of the cases by injecting small doses of a gold compound into the muscles, a French physician, Dr. Jacques Forestier, of Aix-les-Bains, told members of the Hunterian Society at a special meeting held in London.

Dr. Forestier's report was based on five years' experience with five hundred cases of this type of arthritis. Half of these patients were completely cured and the other half greatly improved, he said. Of patients who had suffered from the disease for more than two years before starting his treatment, one fifth were cured, and nearly two thirds showed great improvement. Dr. Forestier described the case of one woman, thirty-five years old, who had been confined to her room with com-

pletely stiffened joints for thirteen years. After treatment with the gold compound, she was able to resume her profession.

The gold compound which he has found most successful in treating this wide-spread malady is known by the chemical name of aurothiopropionol sulfonate of sodium. It is injected into the muscles of the patients. In severe cases repeated courses of injections of small amounts of the gold salts must be made over a period of eighteen to twenty-four months in order to effect a cure.

The method has been gradually accepted by French physicians and is being gradually adopted by German physicians also. It is often successful in cases of infectious arthritis, but not in another type of the disease, osteoarthritis.

During treatment it is essential to make routine blood tests to determine the progress of the disease and treatment must be continued even after the disappearance of symptoms until one of these tests, the sedimentation test, becomes normal. This latter is a relatively new test which shows the rate at which red blood cells fall in a column of blood in a test-tube.

The poisonous effect of the gold compound is slight provided the patient is free from diabetes, nephritis and liver disorders, and provided smaller doses are given than for the treatment of tuberculosis. The patient to be treated must be free from a tendency to hemorrhage.

### ARCHEOLOGICAL DISCOVERIES IN CZECHOSLOVAKIA

WHAT is believed to be the oldest musical instrument in the world has been discovered on the slopes of the Pollau Mountains in Czechoslovakia.

It is a musical pipe made of a lion's tooth. It sounds a signal in the notes of D and G which can still be played perfectly after some 30,000 years.

Professor Karel Absolon, of the Brno University, discoverer of the pipe, claims that the very origin of musical instruments, and painting and sculpture as well, is traced to these mountains.

His excavations, continued through a number of years, have brought to light many objects made by the mammoth hunters of Central Europe. The lion-tooth pipe is his latest find.

The artistic work of this Aurignacian culture is shown by such pieces as the head of a wild horse, admirably modeled. The stone horse's head is identified as copied from the little horse, *Equus ferus*, which was thickly covered with hair and roamed in Europe during the Ice Age. The species was rediscovered only in the eighteen eighties, by a Russian explorer in the Central Asiatic steppe lands. A reindeer head is another art work by the mammoth hunters.

Most striking of the art exhibits is the statue of a mammoth complete. The prehistoric sculptor captured the characteristic form of the shaggy giant, the back drawn upward, its plump and heavy legs, all familiar to science from reconstruction of real mammoth remains.

The ancient hunters made "combination tools," Professor Absolon's collection shows. One three-fold implement is a blunt stiletto at one end, a notched trowel at

the other, while from beneath it is a chisel. A saw with serrated teeth is another tool of this Old Stone Age.

### ITEMS

THE only known case of an Alaskan glacier advancing was called to the attention of the Geological Society of America at its Chicago meeting, by Dr. Chester K. Wentworth and Louis L. Ray, of Washington University, St. Louis, Missouri. During the past fifteen or twenty years, Dr. Wentworth said, Alaskan glaciers generally have been melting back faster than they have been flowing forward. The net loss had been as much as 170 feet in some glaciers, as little as 20 feet in others. But the Taku glacier alone has been in rapid forward movement. It has advanced 7,600 feet since 1909. The cause of this anomalous advance is a mystery. Dr. Wentworth suggested the possibly of an earthquake's having caused the dumping of a huge quantity of snow on the glacier, perhaps in 1899 or at some time since. But, he added, no wholly satisfactory explanation has been formulated.

A BIRD no bigger than a good-sized bee, found in the Haitian highlands, is described in a new publication just issued by Dr. Alexander Wetmore, assistant secretary of the Smithsonian Institution. It is known as the Hispaniolan vervian hummingbird. In spite of its tininess it is quite pugnacious, as indeed most hummingbirds are, and does not hesitate to dart to the attack of birds as big as a mockingbird if it objects to their presence. Among the other remarkable birds found in Haiti, Dr. Wetmore and his companion, Frederick C. Lincoln, of the U. S. Biological Survey, found a species of woodpecker that lives in community "apartment houses" instead of in solitary dwellings, after the fashion of the woodpeckers familiar in the North. They favor trees with hard trunks, and a whole group of them—a dozen pairs or more—will dig their nests out close together. Dr. Wetmore believes that subsequent wetting and rotting of the trunk at this point may result in so weakening it that it will break off readily in a storm.

A ROOSTER without wings is the strange freak of nature recently received by the Smithsonian Institution. It has been given quarters at the National Zoological Park, where it is being studied by Dr. Herbert Friedmann, curator of birds at the U. S. National Museum. Fowls without wings are hatched occasionally, but all hitherto reported have died while still young chicks. The present specimen, a Plymouth Rock, grew to healthy adulthood in the flock of Mrs. Olia Deering, of Rose Hill, Kentucky, who sent it to the Smithsonian Institution. Its parents were normal birds.

If the meteors that have fallen upon the earth during the past hundred million years were to be evenly spread upon its surface they would form a layer hardly more than one hundredth of an inch in thickness. This is the calculation made by Dr. Harold Jeffreys, F.R.S., of St. John's College, Cambridge, and communicated by him to *Nature*. Dr. Jeffreys states that on the average, in ordinary circumstances, about three meteors are visible per hour at a given place, and that represents meteors that have fallen within a radius of at least 100 kilometers (about sixty miles).