SCIENCE NEWS

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THE NEUTRINO

NEW experimental research, strongly indicating the existence of the long-sought atomic particle, the neutrino, is announced by Drs. H. R. Crane and J. Halpern, at the University of Michigan. Reporting in the *Physical Review*, they described new methods of studying impact relations in atomic collisions.

"This is the first experiment," according to the authors, "which has given any information at all regarding the momentum relations in the individual disintegration event. Although the results are of limited accuracy they strongly indicate that momentum is not conserved between the electron and the nucleus alone. Hence the laws of momentum, as well as those of energy, indicate that a third particle participates in the disintegration. This third particle, while undetected of itself, is probably the long-sought neutrino."

A gaseous compound of radioactive salt was placed in a Wilson cloud chamber, a device which renders visible the tracks of ionizing particles liberated in radioactive disintegrations. Several times previously the disintegration of a substance in the form of a gas has been suggested as a key experiment for measuring the momentum or energy of recoil in atomic studies. The difficulty has been that the length of track made by the recoiling nucleus is far too short for observation, even in a cloud chamber operated at the lowest obtainable pressures.

Drs. Crane and Halpern, however, circumvented this experimental difficulty by allowing the ions formed to diffuse, for a little while, until the clusters created attained a diameter of several millimeters. The individual droplets in these clusters could then be counted and the energies of the motion of the recoiling nucleus could be estimated. By applying magnetic fields and bending the tracks of the particles the momentum of the nucleus could be compared with that of the electron.

The result of the research shows that the basic laws of the conservation of energy and of momentum (fundamental building stones of physical theory) do not appear to be obeyed for the collisions created. Rather than abandon these basic laws, which are so well substantiated everywhere else through the field of physics, Drs. Crane and Halpern believe a third particle, the neutrino, took part in the collision so that it was a three-body, instead of a two-body, impact. Such a condition could easily explain the experimental results obtained.

THE MOTIONS OF DOUBLE STARS

DR. LEOPOLD INFELD, of the Institute for Advanced Study at Princeton, has cleared up an astronomical puzzle on the motions of double stars. Dr. Infeld's study, entitled "Electromagnetic and Gravitational Radiation," appears in the current issue of the *Physical Review*.

Gravitational radiation may be a new term and concept to many laymen and scientific men alike, but astronomers have been wondering for some time if the effects of energy dissipation through gravity might cause a shift in the orbits of double stars. Theoretically it was suggested that, perhaps, double stars might gradually come closer together due to gravitational radiation. In Einstein's theory of relativity the equations expressing the gravitational field have the form of a wave equation. Disturbances in the gravitational field energy are pictured as being propagated by waves through space. Such disturbances have come to be known as gravitational radiation. Dr. Infeld, who collaborated with Professor Einstein recently in writing the book entitled "Evolution of Physics," has shown mathematically that for the cases of double stars the energy losses in the system, due to gravitational radiation, turn out to be negligible. He points out that the result shows the astonishingly small rôle played by the gravitational radiation in the motion of double stars.

PETROLEUM PRODUCTION

THE chemical process of cracking heavy crude oil, to get greater yields of gasoline, saved the world 2,000,000,000 barrels of crude petroleum in 1937, according to a report made by Dr. Gustav Egloff, of the Universal Oil Products Company, Chicago, to the joint meeting of the International Congress of Chemistry and the International Union of Chemistry held recently in Rome.

World production of crude petroleum was about two billion barrels last year, but it would have required 4,000,000,000 barrels of oil to produce the world's needs of gasoline, if cracking processes had not been available. Thus, at an investment of $600,000,000 in cracking plants, modern chemistry saved an amount of crude petroleum equal to the entire world production. By the cracking process, too, a vast store of by-products resulted which are capable of blending with ordinary gasoline to produce the high-efficiency 100 octane fuels for aviation. Typical are the ethers so obtained. One of them alone, known as isopropyl ether, is now available in amounts of 420,000,000 gallons a year. By blending isopropyl ether with 40 per cent. of 75 octane gasoline, and adding 3 cubic centimeters of tetraethyl lead per gallon of blend, there results a superior 100 octane aviation fuel. A billion gallons of such fuel can now be produced yearly. Potentially some 2,500,000,000 gallons of 100 octane aviation fuel can be obtained from the various ethers available through the cracking of crude petroleum.

From crude petroleum, too, is obtained valuable isooctane, which is another useful blending agent to produce the high-powered, anti-knock aviation gasolines. When all plants now under construction are producing, Dr. Egloff estimated that 3,700,000 barrels of isooctane can be made yearly. By blending this with 60 per cent. of 74 octane gasoline there would result nearly 10,000,000 barrels of 95 to 100 octane aviation fuel. In commercial aviation these super gasolines are used at take-off, when great power is needed. When they become avail-

able in quantities, and at a price, for regular use, the pay-loads of airplanes will increase markedly. Dr. Egloff estimates that if the engines of the China Clippers and other trans-oceanic flying boats were now equipped to use such fuels there would result a saving of $2,000 for each flight across the pacific.

PLATINUM IN THE LA PLATA MOUNTAINS

THE discovery of "promising" amounts of platinum in the La Plata Mountains of southwestern Colorado on unclaimed public land open for location is announced by the U. S. Geological Survey. It is the first promising platinum find in continental United States. Found by a chemical analysis of ores collected by Edwin B. Eckel, who has been doing field work in the La Plata region for several years, the platinum metals content of some samples is as high as .54 ounces of platinum and palladium per ton. Platinum currently sells at $33 an ounce. Experts of the Geological Survey declined to advise on possible production and methods of working this deposit. From other sources it was learned, however, that if the ore body found is large enough, the platinum can best be mined on a by-product basis—the ore body worked for copper and the platinum metals recovered during the electrolytic refining processes. This method of recovery has already proved successful in Canada.

A possible rush of prospectors to the district, not far from the silver mines of Durango, is foreseen. According to the Geological Survey, the new finds warrant at least "thorough examination." Occurring two miles above sea-level on Copper Hill, between Bedrock and Boren Creeks, near the old town of La Plata and 21 miles northwest of Durango, the platinum-bearing veins have already produced 4,500 ounces of silver and 225,000 pounds of copper. Most of this production occurred between 1911 and 1917, when a great "glory hole" and a 600-foot tunnel were excavated. Buried by soil and the débris from an ancient glacier, much of the ore body is hidden, and only a fraction of it, known to be 150 feet in diameter and 50 feet deep, is exposed. Further exploration by diamond drilling will show the extent of the platinum-bearing rock.

A NEW TYPE OF LANTERN SLIDE

A NEW type of lantern slide has been perfected and put in use at Princeton University.

Consisting of a small-sized 35 mm microfilm held between two ordinary microscope slides, the new lantern slide costs less than a cent and a half to make and is considerably easier to transport and pack than the present type. Single frame movie 35 mm film may also be used. Dr. Hubert N. Alyea, assistant professor of chemistry at Princeton, who devised the slide for his illustrated introductory chemistry course, said "our art department alone would save more than $20,000, if they had put 25,000 of these slides on file instead of the regulation big size." Dr. Alyea has also invented a new mechanism whereby the speaker can by remote control change slides and lights in the projector in the back of the room. This has not yet been applied to the small-sized projecting unit.

The lantern slides now in use measure 3¼ inches by 4 inches and require an expensive process to expose and develop the special emulsion on their face. Thus the price of a finished slide ranges from seventy-five cents to three dollars, according to whether black-and-white, or colored pictures are desired.

Dr. Alyea's diminutive slides measure 1 by 3 inches, and their developing is that of a simple camera film. The biology microscope slides may be procured at two for a cent, and the finished black-and-white film costs less than half a cent a frame, a saving of more than 73 cents per slide. Finished Kodachrome frames cost less than 14 cents, a saving of more than $2.85 per colored slide. Considerable economy can also be effected in the camera and projecting equipment.

"When unversities wake up to the possibilities of these miniature lantern slides, they will be universally adopted, and the old-fashioned plates will be relegated to the past along with the horse and buggy. A national clearing-house for chemical slides could keep thousands of strips of negatives on hand. For five cents apiece (which would include the cost of mailing) it could print positives, clip them off, put them in slides and still make a profit."

Other advantages of Dr. Alyea's slides are that they may be stored in a regular biology micro-slide file, which holds eight times as many as the usual slide file and takes up about one sixth the space, and that a traveling lecturer can put three hours' supply of slides in his pocket and carry the projector in his hand.

Microfilm reproductions are now furnished by some of the nation's leading libraries. From Bibliofilm Service in Washington copies suitable for use in Dr. Alyea's slides may be procured for about a cent a picture. Five-and-ten-cent stores retail yard-strips of educational movie (35 mm) film for ten cents. Thus illimitable educational resources are open to the public for a song.

Depreciation is slight, since the label is glued between the slides and can not be lost, there is no tape around the edges to fray, and if the slide is dropped and broken one need merely pick out the film (which was not in contact with the glue itself) and put it between another pair of slides—cost one cent.

HOMEOSTATIC MECHANISMS

THE reason why it takes a young man to win the 100-yard dash and an older man to win a marathon or set a record for the 10-mile race is the same as the reason why old people seek a place by the fire and wear heavier clothing than young people. The explanation for this was given in a lecture by Professor Walter B. Cannon, of the Harvard Medical School, at the Mount Sinai Hospital in New York City.

Nurmi set the 10-mile record when he was 31 years old and old men and women hug the stove because of the aging of "homeostatic mechanisms." This term refers to the mechanisms which keep the blood and other body fluids stable and which also, as shown by recent research, maintain uniformity over other conditions in the body. As examples of some of these other conditions, Dr. Cannon gave the flushing of active muscles with abundant blood when they are vigorously at work, thus providing them

with oxygen and washing away their waste; the special provisions for an adequate blood supply to essential and highly sensitive organs such as the brain and heart when severe hemorrhage occurs, the blood supply to other parts of the body being temporarily diminished at such times in order that there may be an adequate flow to these structures which are of supreme importance to the organism; and the plenteous blood supply to glands of internal secretion such as the thyroid and adrenal, which put forth locally from their surfaces powerful secretions.

Describing what happens when the mechanisms for maintaining these conditions begin to age with the rest of the body, Dr. Cannon said: "As men grow older the body temperature is maintained at the usual fairly uniform level, but the agents maintaining it become gradually more and more defective. The rate of heat production in the body gradually falls until it is about 25 per cent. less in late senescence than it is in early manhood. For this reason old people seek a place by the stove or open fire or other source of heat, or wear heavier clothing than the young.

"There is also a gradual lessening of the ability to accommodate to high temperature because sweating and dilation of the surface vessels, by means of which heat is lost from the body, become deficient as the skin undergoes atrophy and the blood vessels stiffen in later years of life. For this reason there is a sharp rise in the death rate from heat strokes in the decades after the seventieth year.

"Limitations of similar character are seen when vigorous muscular activity is undertaken. The bounds are set in part by restriction of the so-called 'vital capacity'—the maximal to-and-fro movement of the air in breathing. From early manhood until the sixtieth year the reduction may be 20 per cent. and by the ninth decade it may be reduced more than one third. This is largely due to increased stiffening of the chest wall.

"Furthermore, the blood pressure is likely to raise in the late years because the arteries become less elastic and therefore do not adapt themselves to the needs of the active muscles in physical exertion.

"The heart likewise shows a lessened ability to adjust itself to bodily needs; in experimental tests the maximal heart rate in youth during maximal work averaged 196 beats per minute, whereas in the 60's the maximal rate was 163 beats per minute, a reduction of about 16 per cent. As a result of these limitations insufficient oxygen is delivered to the active muscles to burn the lactic acid which is produced by vigorous muscular exercise, and consequently performance is much reduced.

"In harmony with these observations there is the fact that records in competitive sports are held by young persons when quick actions are required, and by older persons when slower actions are allowed. The record in the 100-yard dash was made by a young man of 21 years. The running records from 1 to 5 miles are held by men from 23 to 27 years of age. The record for 10 miles was made by Nurmi when 31 years old. DeMar, who ran marathons between his twenty-second and his fiftieth years, was at his best between 36 and 42. Baseball players are rarely first-rate after about the middle of the fourth decade. Indeed, there are few stars in sports after forty. These limitations are due to the gradually reduced ability of homeostatic mechanisms to maintain stable states in the body fluids as one grows older."

ITEMS

ROBOT recorders of the slow and complicated motion of glaciers, recently used at Spitzbergen by Dr. Hanns Tollner, of the Vienna Meteorologic Observatory, their inventor, have disclosed a new ice motion. Long ago, the forward creep of glacial ice was known. Now, Dr. Tollner's instruments show an intermittent motion, likened to jolting, in addition to the forward creep. Jumping forward at times, the ice may move as much as four inches in a few minutes, in addition to its steady motion. Sideward ice motions, and vertical movements, up at the edges of the ice and downward at the center, were also indicated by the Tollner instruments. Changes in air temperature, according to Dr. Tollner's observations, may cause shifting of the position of the ice front of as much as 20 per cent. of the ice length. From observations in the Alps, he found that high air temperatures cause rapid ice motion, while lower temperatures reduce the speed.

WATER is an important component of molten rocks, even though at high temperatures it is a gas, according to a report of Dr. George W. Morey, geophysicist of the Carnegie Institution of Washington, who described his researches into rock chemistry before the New York Section of the American Chemical Society. "Liquids dissolve gases, but when dissolved the gas is no longer a gas but one component of the liquid." He likens the dissolved water (a gas at rock temperatures deep in the earth) to the carbon dioxide dissolved in the water in a bottle of soda-pop. Until the pressure is released, the dissolved gas is a part of the liquid. Deep in the earth, molten rocks, during the various cooling processes which lead to the formation of ore bodies, drop out one component after another, causing the proportion of water in the melt to increase, and to become more important in the later stages of the cooling process. During those closing stages of volcanic activity, when water is chemically very important, hot springs are the means of escape of the excess heated water.

EVEN from Stone Age days, Sweden's inhabitants have been Nordics, according to Dr. Hanna Rydh, archeologist of the University of Upsala, now lecturing in this country. The oldest human skull found in Sweden dates from somewhere between 6000 and 8000 B. C., and is of the long and narrow shape characteristic of the Nordic. A few broad-headed people of the physical type characteristic of central European countries did migrate into Stone Age Sweden, but the land remained predominantly Nordic in population. Dr. Rydh, who recently excavated the tomb of a Swedish king of the Viking age, states that the Vikings made their famous long-distance voyages, not so often for belligerent raids, as for the prosaic business of trading for a living. They were driven to become international traders because the oldest son of a household inherited the farm, and the younger sons had to find careers for themselves.