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ARTIFICIAL PRODUCTION OF NEUTRONS

ARTIFICIAL production of neutrons in larger quantities than the world has hitherto known has been achieved by Drs. Charles C. Lauritsen, Richard Crane and Andrew Soltan at the California Institute of Technology.

This is considered the greatest step in atomic physics since British experimenters, Drs. J. D. Cockcroft and E. T. S. Walton, of Cambridge, disintegrated lithium last year and released atomic energy. It shows that possibilities lying within the nucleus of the atom are practically unlimited, in the opinion of those who have analyzed the work.

In the experiments just performed the metal beryllium was disintegrated with artificial alpha rays or hearts of helium atoms. These were given a push of half million volts. Slow neutrons, which probably have under a million volts of energy but which nevertheless penetrate two inches of lead, were produced.

The neutrons were measured with a small electroscope about the size of a fountain pen which was devised by Dr. Lauritsen. Paraffin was used as a detector, the neutrons, or electrically neutral particles, plunging into this substance and giving rise to radiation that affected the roentgenometer or small electroscope.

This experiment was the first time that neutrons had been produced without use of radioactivity. This means that the quantities and intensities of neutrons to be produced in the future will undoubtedly be much greater as the bombarding radiation can be supplied by extremely high voltage apparatus that is now being built in not one, but several, laboratories. The alpha particles used were accelerated by one of the institute's giant high voltage tubes.

The ranges of neutrons and protons so produced will soon be measured accurately and this will mark the beginning of the spectroscopy of the nucleus of the atom. Far-reaching developments are expected from this new field comparable with the advances brought about by the exploration of the outside portion of the atom in the past decade.

PROFESSOR EINSTEIN AND ABBE LEMAITRE

"CAN you explain, Professor Lemaitre, in simple terms without too many mathematical symbols, the important features of your theory?" That is exactly the question asked by Professor Einstein at a symposium on relativity at the California Institute of Technology. It was a gathering of scientific men interested in relativity, and a small crowded room contained an imposing set of personalities: Professor Einstein, Abbé Georges Lemaitre, Professor P. S. Epstein, Dr. H. Bateman, Dr. E. T. Bell, Dr. R. C. Tolman and Dr. T. von Kármán.

First Professor Epstein presented an interpretation of the so-called cosmical constant. This was promptly attacked by the others but successfully defended by Professor Epstein. Finally he himself dealt a death blow to his suggestion.

Then the Abbé Lemaitre took the floor, and Professor Einstein asked his question. It was not entirely facetious, for Professor Einstein thinks about the fundamental ideas before he worries about questions of technique which he can later develop with ease.

The essence of the discussion was the use of the cosmical constant. Professor Einstein had introduced it into relativity, but when Dr. Edwin Hubble, of Mount Wilson Observatory, found that light coming from distant nebulae was considerably reddened, he no longer found it necessary. His present position is that if one can get along without this constant it might be better to do so. However, Abbé Lemaitre contended that while he could not prove the constant was an absolute necessity for a consistent theory, it was certainly legitimate and would moreover lead to useful results. Thus with its help he could explain the formation of the nebulae. This was exactly what Professor Epstein had just concluded was impossible on any classical non-relativistic basis. He had tried to do this twenty years before, but the present discussion brought out the deficiencies of the method.

Professor Einstein pointed out that it might nevertheless be possible to explain the formation of nebulae with a relativity theory, but without a cosmical constant. He also mentioned that this constant played a part like matter of negative density. It moreover expressed the instability of a uniform or even distribution, so that if a hole was formed it would push matter away from itself and thus enlarge; it is like a negative gravitational force or a repulsion.

Abbé Lemaitre countered that he felt it would be impossible to construct such a theory, but he said he could not rigorously substantiate his feeling. However, he added a very important argument in his own favor. He showed that without the cosmical constant, designated by the small Greek letter lambda, it would be extremely difficult to explain the rapid development of the universe. This on classical grounds would require a thousand million million years (10^{15}) while only about ten billion (10^{10}) are available. On the other hand, it might be mentioned that lambda is responsible for the recent short estimates of the age of the universe.

Next Professor Tolman warned against possible neglect of complications which occurred in nature. It is very hard to tell which are unimportant and which are significant.

The discussion took place in three languages. Professor Einstein usually began to speak in adequate English. He would generally feel hampered and soon go on in German. Abbé Lemaitre showed slight difficulty with that and then Professor Einstein burst out in French, which came much more easily than his English.—R. M. LANGER.

CLOUDS IN THE STRATOSPHERE

THE existence of clouds at heights from 15 to 19 miles above the earth, a region of the atmosphere where clouds have never before been believed to exist, has been established recently by observations made in Norway by Professor C. Störmer with the photographic equipment he has successfully used in measuring the height of aurora.

These high clouds have been called "Mother of Pearl Clouds" on account of the pureness of the spectral colors with which they glow and the concentric arrangement of their coloration in band after band similar to the color scheme inside a clam shell. Shades of pink, lilac, purple and blue occur, but generally reddish hues predominate. These colors shine about as bright as in an average rainbow and may be seen only near sunset, increasing rapidly in brightness immediately after the sun sets.

Mother of Pearl clouds have been reported most frequently after the passage of a center of low pressure, but have not been observed generally, on account of the thick low cloud obscuring their view. On the lee-side of mountains, however, the föhn winds dissolve these rain and storm clouds, permitting a view of the extremely high cloud. Mother of Pearl clouds have been found to remain stationary for hours and on other occasions to move with velocities up to 100 miles per hour. On January 13, 1929, they were observed to fall steadily a distance of one mile in an hour and a quarter.

The origin and constitution of these clouds has not so far been explained. The highest cirrus clouds formed from floating ice crystals are only eight miles high in these latitudes and until these Mother of Pearl clouds were discovered, the stratosphere was considered cloud-free except for the noctilucent clouds about fifty miles high and supposed to be associated with volcanic ejecta.

Observers in states and provinces just east of the Rockies would appear to be favorably situated to observe these extraordinary brilliant clouds especially during chinooks. The observer should note the time, arrangement and brilliance of colors as well as the direction and velocity of the cloud.—ANDREW THOMSON.

FOUCAULT EXPERIMENT

DELEGATES to the annual meeting of the Royal Astronomical Society of Canada, held in Toronto, saw a new version of a celebrated experiment which demonstrates the rotation of the earth, using only an iron ball and a long wire as the apparatus. It was shown by the President, Dr. R. K. Young, who is associate professor of astrophysics in the University of Toronto.

Known as Foucault's pendulum, from the name of the French physicist who devised it, the experiment created a sensation when it was first shown in the Pantheon in Paris in 1851. Foucault suspended a heavy cannon ball at the end of a 200-foot wire, fastened in the ceiling. Attached below the bob was a pointer, sweeping out a track in a layer of sand. The scientist gave the ball a push, starting it swinging. It drew a line in the sand each time the motion reversed. As the hours passed, the line slowly rotated, an effect attributed to the earth's rotation. The pendulum continues to swing in the same plane in space in which it is started, while the earth turns beneath it.

The demonstration here removed anomalies from the original experiment. It has been found that the pointer on the iron ball usually traces a narrow ellipse in the sand, instead of reversing in a straight track, a behavior not previously explained. Dr. Young suggested a reason for the looping. He hung the suspension wire through a small, rigid ring, which took out the side-play through friction. He said: "The tendency for the ball to travel in an ellipse may be due to the flattening of the earth at the poles.

"When the pendulum is not moving, it hangs perpendicular to the earth's surface. If the earth were a perfect sphere, the pendulum line would pass through its center. But the world is not exactly round. A perpendicular to its surface at intermediate latitudes does not go through the middle.

"This fact introduces an additional small force, which encourages the Foucault pendulum to move in an ellipse."

At Toronto the pendulum path turns through a complete circle in about 35 hours. A pendulum hung over the equator does not deviate from its original path. At the North or South Pole the track would turn once every 24 hours. The rotation of the tracks of other pendulums, many of which are in constant operation in the museums of the world, can be calculated from the latitude in which the ball is swinging.

AN EXPLANATION OF STUFFY ROOMS

SIR LEONARD HILL, the well-known English physiologist and writer on public health subjects, finds that certain heat rays (infra-red rays) given off by dark or dull-red sources of heat cause the nostrils to contract and thus interfere with breathing. He believes that this is the chief reason for the stuffiness that we experience in an overheated room.

In a lecture given in London at the recent Public Health Congress he showed that this effect is not due to a direct action of the heat upon the nostrils, but that it is a reflex effect from the sensory nerves of the skin. He described the particular heat rays that give this effect as "nose-shutters."

Their action is especially marked in persons whose breathing is already partially obstructed, those with a deflected septum of the nose, for example, or a person suffering from catarrh, asthma or hay fever.

The effect can be neutralized by fanning the skin of the face with an electric fan, or by the action of certain other rays, which he speaks of as nose-openers, that are given off especially by luminous sources of heat. They may also be absorbed by water vapor and he suggests that this is the explanation of the efficacy of a bowl of water placed in front of a heater in relieving the stuffiness of a room.

He finds also that these nose-shutting rays cause a diminution in the secretion of the mucous membrane of

the nose, and since these secretions may be supposed to protect us from infecting organisms in the air, it is possible that the nose-shutters increase the risks of respiratory infections.

From experiments made at Bedford College, London, he found that 60 per cent. of the persons examined experience difficulty in breathing when exposed to heaters that give off these nose-shutting rays and that in over 25 per cent. of the cases the obstruction to breathing was so marked that it could be demonstrated in records of the respiration made upon a suitable apparatus.

CHOLESTEROL AS SOIL FOR THE GROWTH OF CANCER

CHOLESTEROL, an important chemical compound found in animal tissue, "prepares the soil" for the growth of cancer. This new theory of a cause of cancer is suggested in a report by Dr. A. H. Roffo, of Buenos Aires, in the current issue of the *American Journal of Cancer*.

Cholesterol is found in all animal fats and oils and in many organs of the body. It is related chemically to ergosterol, from which vitamin D is formed by the action of sunlight.

In the case of skin cancers, Dr. Roffo believes that cholesterol is accumulated in the skin by the effects of exposure to light and in turn acts as a condition for the production of cancer. It prepares the soil, as he expresses it, probably because under the influence of light it itself becomes photoactive, emitting emanations which affect the surrounding tissue.

As evidence for these views he presents such facts as these: Cancerous tissues show an increased cholesterol content compared with normal tissues, especially as regards the skin; tumor cells show a tendency to absorb and fixate cholesterol from the blood, or, in the case of cell cultures, from the surrounding medium.

In the skin a fixation of cholesterol in the tissues is favored by exposure to light. His analyses show that in the face and other parts of the skin exposed to light more cholesterol is present than in those parts protected from the light by clothing. He finds in this relationship an explanation of the fact that skin cancers are frequent on the face and rare where the skin is covered by clothing.

So far as skin cancers are concerned he sums up his views in the statement that "cholesterol prepares the soil for subsequent malignant growth by acting as an accumulator of light."

ITEMS

THE anti-neuritic vitamin B has been produced by the action of ultra-violet rays on adenine sulphate, B. C. Guha and P. N. Chakravorty, of the Bengal Chemical and Pharmaceutical Works, Calcutta, have reported by cable to *Nature*. Thus it appears that two vitamins are produced by activation of a chemical with ultra-violet light. Scientists found several years ago that rickets-preventing vitamin D is formed by the action of ultra-violet light on ergosterol. Vitamin B is found naturally in the bran layers of cereals, in vegetables, milk, eggs, liver and pancreas. Professor Adolf Windaus, of the University of Göttingen, isolated the vitamin in pure form a year ago and gave it the chemical formula, $C_{12}H_{17}N_3OS$. The Indian report indicates that the vitamin is the type of compound known as a purin.

FURTHER exploration of the cave at Choukoutien, China, where the Peking skull was found, has disclosed a small wrist bone not appreciably different from that of modern man and also a piece of collar-bone about the average of the length of the collar-bone of an adult male in North China to-day. Describing these discoveries, Professor Elliot Smith said that the feet of Peking Man showed that he must have walked like an ape, with in-turned toes, but there is no evidence that he shared the apes' ability to grip with his feet. The shape of his hands leaves no room for doubt that this member of the human family had already gained the skill and intelligence which stamp him as genuinely human.

THE mystery that for forty years has surrounded the highly fatal Peruvian disease known as Oroya fever is finally being penetrated, it appears from a report in the current issue of the *Journal* of the American Medical Association. Dr. Ramón E. Ribeyro, professor at the National University of San Marcos of Lima, Peru, has finally shown that the outlook in this disease is good unless it is complicated by infection with an organism known as paratyphoid B bacillus. It is this complication which is responsible for the deaths that occur in cases of Oroya fever.

THE positions of all the large thunderstorms which occur over Europe and the North Atlantic can now be determined by radio apparatus in the British Isles, independently of weather reports. This is announced by R. A. Watson Watt, superintendent of the Radio Research Station of the British Department of Scientific and Industrial Research. Atmospherics produced by the thunderstorms are so exactly analyzed by cathode ray oscillographs that with two radio stations working in cooperation it is possible to calculate trigonometrically the positions of the storms to within about a hundred miles. The two stations used are the Radio Research Station, near London, and the Leuchars Aerodrome Station, in Fifeshire, Scotland. These stations are about four hundred miles apart, and they enable thunderstorms to be located within a radius of 3,000 miles.

EFFORTS to raise antelope in captivity have at last succeeded in Alberta, with the growth of a herd of 42 to nearly 500 animals. The raising of this most timid of wild animals without its being conscious of captivity was accomplished by Canadian Government big game specialists, when they decided to save the antelope from the extinction which threatened it not long ago with the advance of settlements. A small herd of 42 animals was found grazing near Medicine Hat. The area on which it was living was fenced in, unknown to the antelopes, and now the shy animals will come to be fed. The preserve is one of two established in southern Alberta to save this once numerous animal.