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THE STRUCTURE OF EARTH'S INTERIOR

How earthquakes and other natural events help geologists and geophysicists to form ideas of the inaccessible interior of the earth was related by Professor R. A. Daly, of Harvard University, in his presidential address before the meeting of the Geological Society of America in Cambridge, Massachusetts.

Ordinary rocks, like granite, sandstone and limestone, forming the forty-mile-deep crust of the earth, are aggregates of larger or smaller crystals. Below the crust and all the way to the center of the globe the temperature is too high to permit crystals to form. Down to the depth of about 1,800 miles the material is vitreous, or glass-like. On account of the dead-weight pressure, increasing from 15 tons to 7,000 tons on the square inch, this glassy "rock" is on the average more rigid than steel. Hence it can transmit earthquake waves of the "shear" or "shake" kind.

This thick shell of rigid glass overlies a core, which, in spite of a minimum pressure of 7,000 tons on the square inch and maximum pressure of 22,000 tons on the square inch, seems to a number of expert seismologists to act like a true liquid; if so, the core can not transmit the shear waves. It is generally regarded as essentially a huge ball of metallic iron, chemically like the meteoritic iron of our museums of natural history. If the core is liquid, it must be at a temperature much higher than that of the electric arc.

The thin, crystallized crust itself is layered, lighter rock resting on heavier rock. Similarly the thick, vitreous shell is layered, with a downward step-wise increase of density. At the depth of 1,800 miles the material is more than twice as dense as granite, but at that deep level the density rises abruptly so as to be nearly four times that of granite or ten times that of water.

The great heat of the interior was explained as largely primitive, inherited from the earth's beginning. A fraction of the heat is of radioactive origin and has been generated by the violent explosions of atoms in the rocks, particularly within the thin crust itself.

Because more than 97 per cent. of the earth is too hot to crystallize, its body is extremely weak. True strength is almost, if not entirely, confined to the crust, which, being so thin, must bend if over wide areas it becomes newly loaded with glacial ice, ocean water or deposits of sand and mud. It must bend in the opposite direction if widely extended loads of such material be removed.

Professor Daly's theory of the earth thus accounts for some of the major reshapings of the planet during its long history. The theory seems best to account for the continued existence of dry land; for the origin of chains of high mountains; for the rise of molten rock, or lava, into the crust or all the way to the earth's surface, as volcanoes, and for the great chemical variety of of the world's lavas.

Yet Professor Daly was careful to point out that, in spite of support from modern conclusions about the earth's origin, from earthquake studies, from the record of temperatures found in deep mines and bore-holes, from the nature of volcanic action, and from the myriad facts now known about "igneous" rocks, the general theory he described is best regarded as a working hypothesis, a useful guide to research during the decades to come.

ABBE LEMAITRE ON COSMIC RAYS

PROFESSOR ALBERT EINSTEIN has given his scientific blessing to the ingenious theory proposed by Abbé Georges Lemaitre that cosmic rays are birth cries of the universe and the radiations from the super-radioactive primeval matter that existed when the universe was young.

Abbé Lemaitre, the young Belgian priest-cosmologist, first proposed this idea of cosmic ray origin in 1931. He has now expounded it to investigators at Pasadena with Professor Einstein in his audience.

The father of relativity commented upon the Lemaitre "birth cries of the universe" theory by saying that "if matter is short-lived Lemaitre's theory is inevitable" and that besides no other theory agrees so well with all observations.

Abbé Lemaitre stated that cosmic radiation contains a thousandth of the total existing energy. He views the commonest elements as analogous to alpha rays that are emitted by radium.

The difference of interpretation of the nature of cosmic rays existing between Dr. Robert A. Millikan and Dr. A. H. Compton was touched upon by Abbé Lemaitre. He explained that beta particles or electrons must show latitude effect which moreover seems to exist. This upholds the Compton idea. But Abbé Lemaitre added that experiment shows that a preponderance of cosmic rays consists of photons or radiations like light rays. This upholds the Millikan idea.

The original energies of the "universe's birth cries" radiation have been greatly degraded by the red-shift effect, Abbé Lemaitre explained. This is the effect that when observed in the spectra of the far-distant nebulae indicates that the universe is expanding at a tremendous rate. Abbé Lemaitre was the first to enunciate the expanding universe theory later sponsored by De Sitter, Einstein and other "universe makers."

METHYLENE BLUE AS AN ANTIDOTE

SEVERAL thousand persons are killed each year by carbon monoxide gas and by cyanides. If half this number could be saved by the newly-discovered antidote, methylene blue, Dr. Matilda M. Brooks and Dr. J. C. Geiger, of San Francisco, would have made an epochal contribution to medicine and the welfare of mankind.

For Dr. Brooks, working in the department of zoology,

University of California, hit upon the idea of using the common bacteriological stain as an antidote for these two poisons, and Dr. Geiger, director of public health, promptly put the idea into use and two lives have already been saved.

Dr. Brooks was carrying on research in biology, working in pure science when she made the methylene blue discovery. She knew that earlier investigators, chief among them Professor Otto Warburg, of the Kaiser Wilhelm Institute for Biology, Berlin, found in connection with work on yeast cells and other organisms, that methylene blue counteracts the effect of cyanide and of carbon monoxide on living tissues. Dr. Brooks took the next step and tried the effect of methylene blue on animals that had been poisoned with carbon monoxide or with cyanide. She found it a successful antidote with small mammals, such as mice and guinea-pigs, and in a report of her work to the Society for Experimental Biology and Medicine in April, 1932, she suggested the use of methylene blue in human cases of cyanide or carbon monoxide poisoning.

When Dr. Geiger called on Drs. P. J. Hanzlik and C. D. Leake, professors of pharmacology at Stanford University and the University of California, respectively, for modern methods of treating poison cases, they suggested to him, among other methods, the methylene blue method for cyanide and carbon monoxide.

As a result of its successful use, methylene blue may become part of professional first aid kits, such as those carried by fire and police rescue squads. The method used at the Park Emergency Hospital at San Francisco consists of injecting into the patient's vein a one per cent. sterile aqueous solution of methylene blue, which is listed in the U. S. Pharmacopoeia as methylthionine chloride. In the first cyanide poisoning case reported, 50 cubic centimeters, or nearly two ounces, were used. The patient stated that he had taken 15 grains of potassium cyanide in about 4 ounces of water.

A NEW VARIETY OF BARLEY

A NEW type of barley that is more disease-resistant, that will yield more, and that incidentally will make a finer and more potent brew for beer, has been perfected at the University of Wisconsin by Professor Benjamin Donald Leith, and was one of the five crops that was awarded a place in the "Hall of Fame" of the International Livestock Exposition at Chicago, Illinois.

In 1918 Wisconsin annually raised 38 million bushels of barley, most of which went into the huge beer vats of the state. It was famous as a good "beer barley," but it had one serious drawback. On its stalk were hundreds of little inpointing barbs. These stalks would get into the harvesters' clothes and would creep up and up, despite frenzied efforts to get rid of them. Things got so bad that the farmers' helpers refused to harvest barley crops, and there was a general appeal to the university for help.

Professor Leith was set at work to discover a new barbless type of barley, and it was only a month or so ago that he announced the completion of his work. The new barley has been given the official name of Wisconsin Barbless Barley, Pedigree 38. It is almost entirely resistant to striped disease, the scourge of barley. An increase of from ten to twenty bushels to the acre has been made in its yield.

Gustave W. Pabst, a well-known Milwaukee brewer, has tested over 5,000 bushels of it at his own expense and has found that for brewing purposes it is a vast improvement even over the old barley.

Seed for the Pedigree 38 barley has been distributed over the entire United States by the university agricultural department and preparations are all made for a colossal comeback of the barley crop—provided Congress legalizes beer.

FACIAL EXPRESSIONS OF THE BLIND

THE pantomime of smiling for politeness' sake, and of putting on an expression of fear or concern when a friend tells of a slight mishap, is a language of which the blind know scarcely "a single word."

This is the report of M. Georges Dumas, who has studied the quiet, often apathetic faces of the blind in French institutions, to find out whether they mimic expressions at all, as seeing persons do. His studies, reported in the *Journal of the American Braille Press,* shed light on the origin of the social art of looking pleasant.

The blind laugh or look sad when genuinely stirred. But those interviewed by M. Dumas did not know how their faces changed in emotion, nor how to produce these expressions at will.

One blind man, accustomed to self-analysis, said: "I know perfectly well what you ask me, but I do not know how joy, sorrow or anger are expressed on my face."

The same man said that he did not feel that his happy, laughing face was different from his face when sad.

M. Dumas attributes the absence of mimicry in blind people to their inability to observe other people and to imitate their expressions. Before his study of the blind, he said he had thought it likely that human beings learn mimicry by a different method from imitating others. He had speculated "that we imitate voluntarily in our own spontaneous expression after becoming conscious of it through our own muscular and cutaneous sensibility."

M. Dumas concludes: "It would obviously be a great service to the blind to teach them mimicry which would make them seem more like ourselves. It would draw us nearer them and at the same time help to adapt them to community life from which their blindness isolates them."

ITEMS

REPORTS received at the U. S. Public Health Service indicate that influenza is decreasing throughout the country, both in the number of cases and in the number of deaths. For the week ending January 7, the latest for which figures are available, there were 72,241 cases reported throughout the country. This is almost twenty thousand less than the previous week's total. Deaths

for 85 cities of the country have also decreased from 14.7 per thousand to 13.6. While the epidemic is not yet over, no more great rise in the number of cases is expected. Health authorities have pointed out, however, that little waves of increased influenza prevalence always follow a large outbreak, and such small waves may continue for the rest of the winter.

BORON is the latest chemical atom to be smashed at the Cavendish Laboratory, Cambridge, by Drs. J. D. Cockcroft and E. T. S. Walton, who last year succeeded in smashing lithium in a similar manner with a release of atomic energy. Bombarding boron atoms with speedy hydrogen atomic hearts, they obtained electrically charged helium atomic hearts or alpha particles. Twenty-five times the number of helium atoms were obtained from the boron bombardment than had previously been obtained with lithium. But as yet the atom smashing is not a useful process in a practical way since roughly only one alpha particle is emitted for every two million proton hydrogen hearts flung at the boron by an electrical potential of 500,000 volts. The Cambridge physicists wrote to *Nature:* "The ionization produced by the particles suggests that they are alpha-particles and the energy of the main group would support the assumption that a proton enters the boron nucleus (of atomic mass eleven) and the resulting nucleus breaks into three alpha-particles."

THE first steps toward making a female sex hormone in the chemical laboratory seem to have been taken by two British investigators, Dr. J. W. Cook, of the Cancer Hospital, and Dr. E. C. Dodds, of the Middlesex Hospital, London. They have produced a chemical compound which, when injected into castrated rats, has an appreciable oestrogenic action similar to that of the sex hormone, oestrin. In their report to *Nature,* Drs. Cook and Dodds give the following formula for their compound: one keto, one, two, three, four tetrahydro phenanthrene. Phenanthrene is a coal-tar product used in the artificial production of dyes and drugs. The rest of the new compound's name tells the chemist the way in which additional hydrogen and oxygen are combined with the phenanthrene. At least four female sex hormones have been reported in recent years from research centers in the United States, Canada, England and Germany. They have been obtained from human placental material and from the kidney secretions of expectant mothers.

MADE visible by invisible light, dials on an aviator's instrument board will glow in darkness so that the pilot may see distant beacons without being blinded by close-up lights. This lightless, yet efficiently usable airplane "dashboard," has been described before the Illuminating Engineering Society by S. G. Hibben, of the Westinghouse Lamp Company, as a new application of ultra-violet light. The dial figures are to be covered with a special paint which fluoresces under ultra-violet light.

THE time designations of A. M. and P. M. will be obsolete and the hours run from 0 to 24 in British post offices if a proposal before the House of Lords finds approval. The movement for continuous numeration of the hours has the support of Sir F. W. Dyson, who recently retired as astronomer royal, who says that there is no valid objection against the 24-hour system which is less confusing and has been in use on the European continent for a long time. Astronomers already use the 24-hour notation, with 0 at midnight and 13 o'clock corresponding to old-fashioned 1 P. M.

THE germs that cause colds in the head are harmless at certain times even if they reach a human being in food, water or air. This is the theory advanced by Dr. E. C. Rosenow, of the Mayo Clinic, and reported to the Society of American Bacteriologists. Colds and other respiratory diseases occur when germs belonging to the ever-present streptococcus family acquire peculiar virulence and other properties. Contact with persons suffering from colds is not of prime importance in the spread of this or other respiratory ails. In these studies Dr. Rosenow used his newly-developed method of identifying peculiar properties of disease organisms by their electric charges. In this way he found streptococci of the same charges and disease-producing potency for animals in the throats of persons suffering from the usual colds and allied ailments of early autumn, from the raw milk and water supplied, and from flies.

EYES act as glands, in certain animals at least, secreting a substance that causes the contraction of color-bodies in their skins and thus controls their chameleon-like color changes. Experiments pointing to this hormone-production by eyes were reported by Professor Lloyd M. Bertholf, of the University of Western Maryland and the University of Munich, in a paper before the American Society of Zoologists. The animals furnishing the color-changing extract were crustacea. The hormone was found in the stalks on which their protruding eyes are mounted. The eye-stalk extract, when injected into the body, produced color changes not only in crustacea, but in frog tadpoles and several species of fishes—animals far removed in the zoological realm from the invertebrate crustacea.

GRASSHOPPERS will not cause major crop damage in the West during the coming summer, unless unexpected weather conditions favoring them should occur. This is predicted as a result of the annual grasshopper survey of the bureau of entomology of the U. S. Department of Agriculture, which has just been completed. The field research men of the bureau examine the soil in trouble-promising areas, counting grasshopper eggs and judging as well as they can the climatic conditions that favor or hinder their development when warm weather returns. In only one state, North Dakota, is the egg-count higher than it was in the fall of 1931, though there are local "bad spots" in a number of other states. In these places the farmers may again have to spread poison bran bait for the young 'hoppers, unless a cool, moist spring favors the development of parasites and fungus diseases and thus keeps the numbers of the insects down by natural means.