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THE CREATION OF MATTER

CREATION of matter in some outlying part of the universe, by some process of which we have no inkling, is necessary or else the universe will return to the condition described in Genesis, "without form, and void." This is the opinion of Dr. Walter S. Adams, director of the Mt. Wilson Observatory of the Carnegie Institution of Washington.

It is based on modern conceptions of the source of energy in stars, which suppose that their matter is being transformed to energy. Eventually, unless some such process exists, all the matter in the universe would be transformed.

Ordinary sources of energy are entirely inadequate for the stars, said Dr. Adams. Transmutation of elements, in which the electrons and nuclei of the atoms are redistributed into forms involving less energy, is one possible method.

"If, in this process, several atoms of the simplest of all elements, hydrogen, were to be combined to form one atom of a more complex element, about 0.008 of the mass of each atom would be lost in the change and would be released in the form of energy.

"For example, were a pound of hydrogen transformed into helium, an atom of which is made up of four hydrogen atoms, the result would be 0.992 pound of helium and 0.008 pound of energy. This last figure sounds very small, but 0.008 pound of energy is rather more than 430 billion horse-power a second.

"So if we can think of the sun as originally a mass of hydrogen gas which has gradually been transformed into the various elements that we now find within it, the energy released in the process would keep the sun shining for about 10 billion years. The time-scale provided for in this way seems to be ample even for the vast periods required by cosmological history.

"A second conceivable way by which energy is supplied in the stars is that which would take place if matter were being annihilated. If instead of concluding that a part of the atomic energy is released by the transmutation of elements, we assume that all of it may be made available by the complete annihilation of matter, our supply of energy would become very much greater.

"In this case our pound of hydrogen would give us a pound of energy instead of 0.008 pound, and our total supply would be multiplied by a factor of 125. Our sun, on this hypothesis, would be radiating away its mass at the rate of 120 thousand billion tons a year and the material now contained in it would be sufficient to maintain the present rate for about 15 thousand billion years longer. At the end of that time, however, no mass would be left.

"One final consideration of profound interest is that of the possible reversibility of the process of radiation. If matter can be annihilated to produce energy, can energy recombine, as it were, to form matter?

"Of the energy poured out by the sun less than one two hundred millionth part is intercepted by the planets, and a quite negligible amount by the stars, while the flood of radiation from the stars themselves passes out into remote space quite unchecked except for the small quantities absorbed by the nebulae.

"Is it possible that radiation is finally reflected back from the boundaries of a limited space, or do we have in the nebulae some mechanism by which the energy released from matter can be stored up once more in the form of atoms and electrons?

"Such considerations are purely speculative, for we know of no process of this kind. If it does exist, we can picture our physical universe as renewing itself and perpetually changing; if it does not exist and energy is finally dissipated, the end will be that pictured in the first chapter of Genesis: 'And the earth was without form, and void; and darkness was upon the face of the deep.'"

BIOMETRY OF BEES' TONGUES

ONE of the first large scale measurements of insects, comparable to the elaborate measurements made by anthropologists of members of the human race, has been undertaken by Dr. W. W. Alpatov, of the Zoological Museum of Moscow, now working at the Institute for Biological Research under Professor Raymond Pearl, of the Johns Hopkins University. Thousands of bees from Russia and the United States were examined during the investigation, which has shed interesting light on problems of bee-keeping, according to a report in *The Quarterly Review of Biology*.

The anatomical features to which Dr. Alpatov devoted the most attention in this huge survey with the microscope was the tongue, tool of supreme importance in the business of honey-collecting. In Russia it was found that bees' tongues increase in length as one travels south, until in the Caucasus, the southeasternmost corner of European Russia, are found the longest-tongued bees now known to entomology. In the United States no such geographical distribution held good, a condition accounted for by the fact that all honey-bees in this country are species introduced from Europe within the last two or three centuries. Furthermore, progressive bee-keeping has fostered interbreeding with bees from all parts of the country. Racial characteristics can not be as fixed as with indigenous bees bred in the same locality for hundreds of years.

Before the war the Caucasian bees were the subject of special investigation on the estates of one of the members of the royal family of Russia. The records left by the agronomist in charge show, said Dr. Alpatov, that crops of red clover, a plant that carries its nectar too deep down in the blossoms for most bees, were much heavier in fields where there were hives of Caucasian bees than where they were absent.

Another point emphasized by Dr. Alpatov was the difference in tongue length of worker bees of different types but of the same race. Those collecting pollen, for instance, had shorter tongues than those collecting nectar. Slight as the present information on the subject is, it shows a promising possibility for systematic investigation of the selection and adaptation of the worker bees of different races to different plants. The preference of certain bee races for certain plants is the cause of differences in the quality of honey collected. It happens often that the color and flavor of the honey collected in the same locality by colonies belonging to different races differ greatly. This has naturally a certain importance from the point of view of marketing honey.

Provision for further large scale measurements of the honey-bees, according to Dr. Alpatov, would bring to light facts of practical value both to bee-keepers and theoretical scientists alike.

THE LARCH CANKER

ENCOURAGED by a Congressional appropriation of $35,000, experts of the Department of Agriculture have outlined a comprehensive campaign to stamp out larch canker, a new tree disease similar to chestnut blight, which threatens timber valued at more than $3,000,000,000.

Dr. Haven Metcalf, in charge of the Office of Forest Pathology and generalissimo of scientific forces battling the disease has announced that practically all the 3,100 trees known to be infected have been destroyed. These trees were located in Massachusetts and Rhode Island and comprise, in addition to larches, specimens of the Douglas fir and yellow pine.

All officers of the U. S. Forest Service, inspection officers of the Department of Agriculture and state officials have been instructed to be on the lookout for the disease and have received photographs and descriptions to facilitate their search. These men will report immediately from places where stands of the yellow pine and Douglas fir are located, particularly east of the Mississippi.

In addition, an accurate check is being made on importations of the three species infected, since the disease came in on trees from Europe prior to enactment of the plant quarantine law in 1918. The customs records are being combed to find where the trees came from so that the department may trace the trees to the place where they were planted.

Five men are now working on laboratory studies of the disease, and later in the season this corps will be increased to twenty. Two investigators, Dr. E. P. Meinecke and Dr. Glenn G. Hahn, have been conducting studies of larch canker in Europe, and conferring with experts abroad. The laboratory studies are extremely complicated, owing to the fact that the fungus is one of a group of more than 100 species, whose characters have not been well separated and which are difficult to differentiate.

CALMETTE VACCINE IN A CATTLE TEST

UNFAVORABLE results were reported from one of the latest experiments made in this country with the Calmette vaccine against tuberculosis. This protective vaccine, developed by the French scientist, A. Calmette, of the Pasteur Institute, has been the subject of heated controversy among scientists of this country and abroad. It was concluded from this latest experiment that the Calmette vaccine does not protect cattle which have been intimately exposed to tuberculous animals, reported the investigators, Dr. W. P. Larson, of the University of Minnesota, S. J. Stanard, Commissioner of Agriculture, and W. A. Evans, at the meeting in Chicago of the American Association of Immunologists.

For the experiment sixty head of cattle, ranging in age from one day to two years, were secured from areas of the state of Illinois. These cattle were known to be relatively free from bovine tuberculosis. After careful examination they were admitted to an experimental farm which was at the disposal of the commissioner of agriculture. Twenty of these animals were vaccinated with the Calmette vaccine, twenty with a vaccine known as the Springfield vaccine and twenty were left unvaccinated and served as control animals.

At the end of six months ten head of cattle in the advanced stage of tuberculosis were placed with the herd for the purpose of exposing the animals to tuberculosis under natural conditions. At the end of one year the cattle were revaccinated according to the method advised by M. Calmette. From time to time other tuberculous animals were added to the herd for the purpose of getting complete exposure to the disease under natural conditions.

At the end of two years the animals were killed and their bodies carefully examined by experienced meat inspectors and pathologists. It was found that tuberculosis occurred as frequently among the animals vaccinated with the Calmette vaccine as among the control animals which received no vaccine. Among the animals vaccinated with the Springfield vaccine less than one half were tubercular.

THE CAUSE OF CANCER

IN spite of much research and many theories nothing is yet known of the cause of cancer, if it has a single cause, Dr. Shields Warren, of the Palmer Memorial Hospital, told his audience at a recent public lecture in the Harvard Medical School.

"While there is no one accepted cause of cancer, there are certain theories that are useful as working hypotheses," said Dr. Warren.

The reported discoveries, from time to time, of a parasite as a cause of cancer have raised hope. Among these Dr. Warren mentioned the work of Dr. Gye, in England, which unfortunately was not confirmed.

Many theories that special foods or substances cause cancer have been raised. Civilization has been blamed as a cause of this disease. But all of these theories have proved untenable.

The theory of chronic irritation covers many of the cancers that occur in human beings, but it is to a certain extent a superficial explanation, according to Dr. Warren. Prolonged chronic irritation of tissues stimulates cell growth and brings about unknown changes in the tissues which favor the development of cancer. Many

types of chronic irritation do not go on to develop cancer, but many cases of cancer may be traced to long-standing irritation.

Heredity has been considered a cause of cancer. Proof of this theory has ranged from examples of so-called cancer families or cancer villages to the painstaking work of Dr. Maude Slye. Dr. Slye proved by very careful and extensive experiments that in mice there is a hereditary predisposition to cancer, but it is questionable as to whether her findings are applicable to human beings, Dr. Warren explained. The so-called cancer villages are usually found to be inhabited largely by older people among whom the prevalence of cancer is always greater, no matter where they live.

"Certainly we are safe in saying that at the present time heredity is not considered of importance as a cause of cancer," Dr. Warren declared. While the cause of cancer is still unknown, enough facts are known about cancer to make its behavior less incomprehensible and its treatment more hopeful.

DESCENDANTS OF STONE AGE MAN

DIRECT descendants of men of the Old Stone Age, eagerly sought for all over the world by anthropologists, are to be found in a small and dwindling race of South African natives, the Korannas, according to a report made by Dr. Robert Broom, of Victoria College, Stellenbosch, S. A., in *Nature*.

The skull measurements of the present-day Korannas agree closely with those of a prehistoric skull recently found about 80 miles north of Pretoria, associated with the bones of an extinct species of buffalo, which had apparently killed the hunter and then died of its own wounds. The human skeleton was badly broken, the skull especially being crushed into small fragments. The latter, however, have been skillfully pieced together, permitting a scientific determination of the type of man it once belonged to.

The skull, which Dr. Broom has christened the "Bushveldt skull," is of modern type, with little or no suggestions of the Neanderthal about it. It is not of the well-known European Cro-Magnon type, although Bushveldt man was contemporary with early Cro-Magnon man in Europe, as shown by the type of implements he used, and by the bones of the extinct buffalo. Its comparatively modern pattern is suggested, among other things, by its small teeth, its well-developed chin, and the relative thinness of its bony walls.

The character that marks Bushveldt man as a primitive type, and at the same time ties him up with the present Koranna tribe, is the relatively low temporal, or side region of the head. In all advanced races this part of the cranium is quite definitely high.

Although the Bushveldt skeleton was the first find of actual human remains to be made in the region, Dr. Broom is of the opinion that the valley of the Vaal River was once the home of tens if not hundreds of thousands of men and women of this race. He bases this conclusion on the enormous numbers of the stone implements of their workmanship which have been discovered.

ITEMS

WHEN the eyesight of Egypt's wise men grew feeble from study they used magnifying glasses to make the stone tablets and papyrus rolls easier to read. This is indicated by pieces of round glass from Egypt, one of which, now in the Ashmolean collection, may date back to the first dynasty of Egypt, or about 3500 B. C. That magnifying glasses were known in the famous civilization of Crete, about 1200 B. C., had been shown by two crystal lenses discovered in the Cretan ruins.

THE value of a community health program was reported to the Health Conference in New York by Edgar Sydenstricker, who has been serving the U. S. Public Health Service and the Milbank Memorial Fund as statistical expert. In one community, Cattaraugus County, the death-rate from tuberculosis dropped from 68.1 per 100,000 in 1923 to 39.2 per 100,000 in 1928. This reduction can be attributed directly to the demonstration health program carried out in that community. School health also has improved because of the community health program. The number of underweight children and the number of children having physical defects, such as eye, teeth and nose and throat, has diminished very markedly.

ONE of the oldest representations of an insect in art has come to light in the archeologically famous cave of the Three Brothers in the commune of Montesquieu-Avantes. It is a grasshopper crudely carved out of a bit of ancient bison bone now in the possession of Comte Begouen, father of the three youths who first discovered the cave of prehistoric wonders, and for whom it is named. It is the first time that an insect of this type has been found in the art of the Old Stone Age, according to Comte Begouen, and presents a considerable puzzle to archeologists to explain, since such insects were rare in the cold climate that prevailed in France in the Magdalenian epoch when the carving was probably made.

ALTHOUGH it is less than two years old, yellow dwarf caused a 25 per cent. loss to onion growers of Pleasant Valley, Iowa, last season, according to Professors I. E. Melhus, C. S. Reddy, W. J. Henderson and Edgar Vestal, of the Iowa Agricultural Experiment Station at Ames, Iowa. Yellow dwarf of onions made its appearance in June, 1927, and it was not then thought to be serious. In May, 1928, however, the disease took on epidemic proportions in Pleasant Valley which resulted in losses in some fields of as much as 50 per cent. of the crop. The disease is of that type of mysterious malady for which no causal agent can be found—a virus disease. In the advanced stages of the disease the plants are severely stunted and yellowed with lopped-over leaves indicative of a wilt. The symptoms usually appear at first on the fifth leaf and then spread to the entire plant. Yellow streaks may extend through the entire length of the leaf. Marked stunting occurs on all diseased plants, which, together with the conspicuous yellowing, gives the common name to the trouble.