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ORGANIC EVOLUTION

"ORGANIC evolution is no longer an hypothesis. It is an experimental fact; new species have been built while we look on, and in some cases we know how they have been built." With this challenging dictum, Prof. Edwin G. Conklin of Princeton University concluded the Penrose Memorial Lecture before the meeting in Philadelphia of the American Philosophical Society.

Professor Conklin who spoke on "A Generation's Progress in the Study of Evolution," stated that more progress has been made in the solution of evolution's riddles during the past quarter century than in all previous centuries. The most fruitful field for the study of evolution, has been found in the very heart of the cells.

"Imagine" he said, "the amazement and incredulity of the naturalists of a former generation who thought of evolution only as the transformations of developed organisms under the influence of changing environment, if they could learn that to-day the great problems of evolution center in the structures and functions of the germ cells! And yet this is strictly and literally true. The germ cells are the only living bonds not only between generations but also between species, and they contain the physical basis not only of heredity but also of evolution.

"In the microscopic chromosomes which are found in the nuclei of all cells, and in the ultra-microscopic inheritance units, or genes, which lie in the chromosomes are found the causes of heredity, mutation and evolution." By the manipulation of mutations, or sudden large changes, it has been possible to create actual new species.

Dr. Conklin continued: "The most important advances of the past twenty years concern the causes of mutations, or inherited variations, which are the building materials of evolution. Among these causes are changes in the numbers and composition of the chromosomes of the germ cells and changes in the inheritance units or genes which lie in those chromosomes. In many plants it has been found that new mutations are caused by an increase or decrease of their chromosomes and in a few instances absolutely new species have been formed which breed true but are sterile with their parent stocks."

EFFECT OF X-RAYS ON THE DROSOPHILA GERM CELL

DR. JOHN W. GOWEN, of the Rockefeller Institute for Medical Research at Princeton, N. J., reported to the American Philosophical Society an increase in the proportion of males to females as a result of X-ray treatment of the male reproductive cells of the fruit fly, Drosophila.

"During development the body, due to its inheritance, may become a mosaic of cells, some normal, some abnormal, and the morbidity and mortality may increase directly with the proportion of defective cells in the mosaic," Dr. Gowen explained.

This is one of four general ways in which the genetic or inherited constitution of an organism may affect the development of a diseased condition. The other three are as follows:

An unbalance in the proportion of genes, or hereditary units, may cause death or greatly reduce the length of life.

Genes normal to a species may by a permanent change in character cause physiological and developmental processes so abnormal that death or lasting disability results.

The segregation of specific genes for susceptibility or resistance to diseases caused by bacteria or viruses may be responsible for immunity, disease or death within the population exposed to disease-causing bacteria.

Starting with these known facts, Dr. Gowen sought information on the total genetic constitution of a single organism. X-ray analysis seemed to him a method for such an investigation. Consequently he exposed Drosophila sperm cells to graded doses of X-ray and found four types of change.

Besides the increase in the proportion of males to females, he observed that a large number of the sperm cells die in a prescribed order; that many sex-linked fatal changes are produced and that a few changes in the character of the genes occur which cause changes in body form.

DISEASE-PRODUCING DRUGS

THE cause of a new, fatal disease has probably been found in amidopyrine, better known as pyramidon, widely used remedy for headaches and for relieving pain in such other conditions as sciatica and arthritis.

Pyramidon and a group of chemically related medicines also used to relieve pain seem to poison the bone marrow where some of the blood cells are formed, causing agranulopenia.

This disease has a number of aliases by which it is known to medical scientists: agranulocytic angina, agranulocytosis, malignant leukopenia, granulocytopenia, and malignant neutropenia. It starts suddenly with fever and sore throat. Some of the patients thought they were getting a cold. Ulcers appear on tonsils, tongue, gums and elsewhere, spreading rapidly. Most striking, however, is the drop in the number of white blood cells from a normal of 6,000 or 7,000 per cubic millimeter of blood to 2,000 or less. The number of red blood cells and the amount of hemoglobin, meanwhile, remain normal. Most of the patients die, in spite of vigorous treatment.

The disease was first observed by a group of German investigators in 1922. But the connection between the medicine and the disease has only just been discovered.

No cause for agranulopenia had been found up to last year. Then Drs. F. W. Madison and T. L. Squier, of Milwaukee, realized that the increase in number of cases of agranulopenia paralleled the increase in use of pyramidon with other drugs containing a barbiturate, such as luminal. They studied the records of thirteen consecutive cases and found that all the patients had been

taking one or more of these drugs over varying periods of time before the onset of the disease.

They tried giving doses of the medicine to rabbits and one animal developed the characteristic drop in white blood cells, while three others showed characteristic changes in bone marrow.

Previously, in 1931, Dr. R. R. Kracke, of Emory University, had pointed out a possible connection between the use of coal tar derivatives and attacks of agranulocytosis. He reported in the next year that eight out of nine patients having this disease had been taking drugs containing the chemical group known as the benzene ring.

Both pyramidon and the barbiturates contain this chemical group. Benzene itself has been responsible for poisoning cases in industry. Some persons seem more susceptible to it than others, and investigators of agranulopenia suggest that in this disease also individual susceptibility or idiosyncrasy may play a part.

Over fifty cases of agranulopenia developing in patients who had previously taken pyramidon with or without one of the barbiturates, modern sleeping and pain-relieving powders of the veronal and luminal group, have been reported by Drs. C. H. Watkins and P. S. Hench of Rochester, Minn., Samuel B. Grant of St. Louis, Johnson McGuire of Cincinnati, Clyde L. Randall of Kansas City, Mo., and Arthur M. Hoffman, E. M. Butt and N. G. Hickey of Los Angeles.

The use of pyramidon, either alone or in combination with other drugs, should be restricted to patients having white blood cell counts made several times a week, according to Drs. Hoffman, Butt and Hickey, in their report to the current issue of the Journal of the American Medical Association.

The danger as well as the usefulness of certain new reducing medicines, among them sodium dinitrophenol, were described by Dr. Edward L. Bortz of Philadelphia at the meeting in Chicago of the American College of Physicians. So dangerous are these medicines if carelessly used that an eminent jurist urged Dr. Bortz to recommend their inclusion in the list of dangerous drugs whose use is governed by the Federal Food and Drug law.

Three deaths have been reported in medical journals from the use of dinitrophenol, according to Dr. Bortz. In every one of these cases and in certain others, not fatal but in which other untoward effects occurred, the dosage was too strong or the drug was not correctly given. "One wonders how high the toll of deaths is going to mount when the beauty parlors and physical culture emporiums begin to pass it around," Dr. Bortz commented.

Sodium dinitrophenol and allied drugs were described by Dr. Bortz as accelerants of metabolism, the change whereby foodstuffs, water and air are adapted to the needs of the body for growth, maintenance and repair and the production of energy. This change is accompanied by heat production. When metabolism is speeded up, under the influence of dinitrophenol, for instance, more heat is produced, the surplus fat of the obese person's body furnishing the additional fuel. This results in the desired loss of weight.

With overdosage of the drug, heat is generated faster than needed and faster than the heat regulating center of the body is able to dissipate it through stimulation of the respiratory apparatus and sweat glands. The body temperature rises, up to 115 degrees Fahrenheit or higher, and death occurs from heat rigor. The body almost literally burns itself up. This was the fate of the unlucky victims of overdosage of dinitrophenol. To protect others from a similar fate, Dr. Bortz believes that the sale of this drug should be regulated so that it can be used only under a physician's directions.

ARCHEOLOGICAL DISCOVERIES ABROAD

DR. G. G. MACCURDY, director of the American School of Prehistoric Research, stated at the recent meeting of the American Philosophical Society that men of the Old Stone Age have been traced at no less than seventy places in Russia since 1921. Bones found in the Crimea, he said, add much to the understanding of what the hands and feet of Neandertal Men were like. The Neandertalers lived some 50,000 years ago, and are generally considered the forerunners of *Homo sapiens*, the species of man to which all living races belong.

China is contributing brilliantly to scientific knowledge of ancient man. The race of Peking Man, or Sinanthropus, discovered from bones and tools and hearth fires left in a cave in China, is believed to be older than Neandertal Man, but seems to have been his mental equal. Use of fire by the very ancient Celestials is a mark of their advancement.

Professor MacCurdy also cited the recent discovery on the Solo River, in Java, of skeletal remains of a new race of man. This ancient race, previously unknown, has been named *Homo soloensis*, and is considered to be a link between ancient Peking Man and the living primitive Australians.

In Palestine, British and American investigators have begun their seventh joint season of ancient man-hunting in caves near Mount Carmel. The institutions which have found these caves such profitable hunting places are the American School of Prehistoric Research and the British School of Archaeology in Jerusalem. In deep deposits, of refuse in the caves, the excavators have differentiated thirteen different stages of culture in man's slow climb toward civilization. The present season of digging, Professor MacCurdy stated, may shed more light on the earliest of the cave dwellers there, who lived 100,000 years ago in the warm interval between two of the chill glacial epochs of earth history.

THE ALASKAN EXPEDITION OF THE SMITHSONIAN INSTITUTION

ACCOMPANIED by volunteer students, Dr. Aleš Hrdlička of the Smithsonian Institution is to set out next month for an Alaskan island containing important remains of an ancient people. The young volunteers who will get their first taste of Far Northern anthropological digging include C. T. R. Bohannan from the University of Maryland, Harold E. Zickefoose from the University of Iowa, and Robert Heizer from the Junior College of Sacramento. There will probably be several others.

The site to be explored is one of the best preserved places of ancient habitation known in Alaska, Dr.

Hrdlička said, telling of plans for the expedition. The site is a high point on Kodiak Island, above reach of the sea. Portions of the site have already been excavated by Dr. Hrdlička, and this summer he hopes to complete the work.

These Alaskan expeditions, continued from year to year, have the aim of tracing early immigrations of Asiatics into America, the study of long abandoned sites of habitation in the Far North, and the search for ancient skeletal remains showing the types of men that came across Bering Strait to the New World.

The buried village at Kodiak Island is said to be very nearly unique. Digging through three separate layers of habitation, represented by bones, ashes, fireplaces and house remains, Dr. Hrdlička has already found enough to show that two distinct peoples have lived at the site. Their culture changed in radical ways. They gave up old fashions of burial. They gave up old ways of chipping stone and began to use polished stone. They gave up artistic work in stone, simplifying their workmanship, but they replaced that lost art with a new art in ivory.

The earlier people who lived at the site were cannibalistic, the evidence shows. Why they should have had this gruesome custom in a region that teemed with fish, bear, foxes, whales and other food animals is not yet explained. One curious custom noted by the anthropologist is that of burying a fox with a child. One child lay with a fox's head in its hand. Whether foxes were pets or had some funereal significance is another unfathomed mystery of the site.

ITEMS

DR. ANNIE JUMP CANNON, astronomer of Harvard College Observatory, explained at the recent meeting of the American Philosophical Society how stars, so far away that it takes their speeding light eighty-five thousand years to reach us, are being analyzed chemically, with as much accuracy as though they could be seized and thrust into a test tube. The stars are in the Large Magellanic Cloud, the nearest "island universe" outside the galaxy, or star-group of which our sun is a minor member. This extra-galactic star system has been searched, star by star, with telescopes armed with spectrographic attachments. These split the light of each star up into the various colors out of which it is blended. Every chemical element has its characteristic group of light "lines," its spectral signature or fingerprint, which can not be duplicated by any other element. Thus when the thousands of plates of Magellanic star and nebula spectra are examined, astronomers will know what these immensely distant celestial objects are made of.

WHEN a fish changes its color, as some fishes do, becoming darker or lighter according to background, the color change is impelled by a gland-like action of the nerve ends, secreting a substance called a "neurohumor." So Professor G. H. Parker of Harvard University told the American Philosophical Society. He has given much attention to this long-suspected but only recently demonstrated gland-like activity of nerve endings. In the case of the color-changes in fish, he found that there are two opposing neurohumors at work. One set of nerves secrets a neurohumor that causes the color bodies, or melanophores, to spread their pigment through their cell processes, and the neurohumor from a second set of nerves causes them to concentrate.

WORKING like ferments which are active in the making of wine and bread and the brewing of beer, the tiny hereditary units known as genes direct the development of our bodies, in the opinion of Dr. Charles B. Davenport, director of the Department of Genetics of the Carnegie Institution of Washington. If the genes are not themselves ferments, they are capable of producing in the cells of the body substances possessing the ferment property of bringing about chemical changes without themselves undergoing any change.

ANESTHETICS work by keeping our cell protoplasm from getting coagulated, as it normally does when stimulated. This, in brief, is the theory of anesthesia, presented before the meeting of the American Philosophical Society, by Professor L. V. Heilbrunn of the University of Pennsylvania. Stimuli of all kinds tend to produce coagulation in protoplasm—and the normal waking or conscious state subjects us to an endless train of stimuli, hence keeps our protoplasm always more or less coagulated. This coagulative state, Professor Heilbrunn explained, does not resemble the coagulation produced by heating so much as it does the kind of coagulation that marks the formation of clots in the blood. One way of studying the reaction in living cells is to tear them so that the protoplasm flows out. Under these circumstances, Professor Heilbrunn continued, the surface of the emerging protoplasm forms a film or clot, just as blood clots when it is poured from a vessel. In the presences of only a small concentration of calcium, fat-dissolving anesthetics like ether tend to prevent film formation. It is believed that within the cell these anesthetics act in a similar fashion to prevent the coagulative change produced by stimulation.

THE virus or "germ" of infantile paralysis may enter the body through the digestive tract as well as *via* the nasal route, in the opinion of Dr. John A. Toomey, of Cleveland. Dr. Toomey reported at the meeting in Chicago of the American College of Physicians that he was able to produce the disease in monkeys by injecting the causative virus into a part of the digestive tract from which it could easily reach the gray fibers of the nerves. He believes earlier failures to produce the disease by injections into the digestive tract were due to the fact that the experiments were not planned so as to give the virus a chance to reach the nerves before being swept out of the digestive tract.

HEAVY water, at a concentration of thirty per cent., is to be manufactured by Imperial Chemical Industries, Ltd., London. The planned output is five grams (about one sixth of an ounce) daily, at a maximum price of $10 a gram. Several American laboratories, both commercial and attached to universities, have already undertaken the manufacture of heavy water in quantity, although as yet there is no standardization of the concentration in which it is offered, nor any fixed price.