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THE GROWTH OF SERUM

THE possibility that an animal's blood fluid may increase and multiply outside the body of its parent animal, feeding on the blood of another animal as though it were a living thing, was the startling suggestion laid before the Western Society of Naturalists at their meeting at the University of California on June 20, by Professor W. H. Manwaring, of Stanford University.

Foreign blood serum injected into the blood stream of an animal causes certain characteristic physiological reactions. The intensity of these reactions is proportional to the amount of foreign serum introduced.

Professor Manwaring and his assistants injected horse blood serum into rabbits. A few days later they tested the rabbit blood for its reaction. The tests indicated not merely the presence of all the horse serum originally used, but an actual increase of from 200 to 400 per cent. This suggests strongly the possibility of a "non-living" substance being able to live and feed and grow by itself, if given suitable environment.

The only thing so far known that is comparable to Professor Manwaring's "serum multiplication" is the action of the bacteriophage, a serum-like substance first described some years ago by the Canadian scientist d'Herelle. Whether the bacteriophage is a living organism or simply a complex chemical has been the subject of much dispute among bacteriologists and physiologists since that time. But blood serum has always been a familiar substance, and has never been thought of as being alive in its own right. To find it apparently growing, and thus exercising one of the prerogatives of life, is the most heterodox result of all Professor Manwaring's many experiments.

THE TEMPERATURE OF SINGLE CELLS

ACCURATE measurements of temperature inside a single cell of a living organism can be made to within less than one two-thousandth of a degree, using a pair of wires less than one twenty-five thousandth of an inch in diameter. Methods of making and using these microscopic wires were described by Dr. D. M. Whitaker, of Stanford University, speaking before the meeting of the Pacific Division of the American Association for the Advancement of Science.

To make the microscopic wires an ordinary fine wire is placed in a tube of glass or quartz which melts at a temperature higher than the melting-point of the metal, but below its boiling-point. Thus for copper wire a glass would be used that melts at a temperature between 1,980 degrees Fahrenheit, at which copper melts, and 4,190 degrees, at which it boils. Then the glass tube is softened by heat, melting the metal. When the tube is pulled, it can be stretched to a capillary tube of minute dimensions, with the melted metal inside. As the glass cools, the metal "freezes" into a still finer wire.

For obtaining thermocouples, used for the delicate temperature measurements, two different metals are drawn out in the same kind of glass, and then the glass capillary tubes are fused together. A short glass needle is the result, with two metal cores. A little of the glass at the end is removed, exposing the wires. They are then joined together, either by silverplating or by melting them. The resulting thermocouple, like any similar junction of two such metals, whether large or small, gives off an electric current when heated. With the microthermocouple inserted in a cell which is to be studied, operating under a microscope, the current is measured on a sensitive galvanometer. From this current the temperature can be found with great precision.

CALIFORNIA EARTHQUAKES

WHEN a California earthquake occurs on a fault-line, or "crack," which runs northwest, it is most likely that the moon is in the western sky, or else that it has not risen and is in just the opposite direction.

This discovery was announced to members of the Seismological Society of America, meeting in conjunction with the Pacific Division of the American Association for the Advancement of Science, by Maxwell W. Allen, of Sanger, California.

Mr. Allen pointed out that previous efforts to correlate earthquakes with tides due to the passage of the moon had been unsuccessful and that the suggestion had been made that the position of the fault-line had to be considered. For instance, a fault running one direction might be affected by the moon in certain positions, while one in another direction would not.

After studying more than 1,200 quakes occurring in California since 1812, of which the exact origin can be located, Mr. Allen states that "it appears that those shocks occurring on the northwesterly trending faults of the region show a tendency to take place with the moon between the meridian and the western horizon, or between the nadir and the eastern horizon. Shocks on the less numerous east-west faults cluster in the opposite quadrants. These tendencies are more marked as the fault lies inland and is well located, as the shocks are more certainly assignable as to fault, and in the case of stronger shocks."

Where a series of quakes occur in the same place, he found that four out of five of the stronger shocks occur with the moon within thirty degrees of the same part of the sky as the main shock of the sequence. Just why this correlation should take place, Mr. Allen did not suggest, but confined his paper to the actual findings.

RESISTANCE OF INSECTS TO POISON GAS

INSECTS are better able than men to resist the fumes of hydrocyanic acid, deadliest of all known gases. This was brought out in reports by a number of scientists

before the meeting of the American Association of Economic Entomologists meeting at the University of California.

Hydrocyanic acid has frequently been proposed as a possible war gas. A very low concentration of it will kill human beings almost instantaneously, and no known gas mask could stop it. It can not be used for military purposes, however, because of its extreme volatility, which dissipates it very rapidly when it is released in the open air. It would be effective only in closed spaces, such as dugouts or the hold of a warship. It has, however, come to be very widely used for killing scale insects and other pests in orchards, being released under tents that are thrown over the trees to hold it down.

There have been claims that strains of insects are being evolved in California that can stand increasingly heavy doses of the deadly vapor. These received some substantiation from G. P. Gray and A. F. Kirkpatrick, of Azusa, Calif. They established black scale insects from so-called resistant and non-resistant districts on potted seedling orange trees and simultaneously fumigated them under the same covering. There was a much greater percentage of survivors among the scale insects from the reputedly resistant districts.

If certain species of scale insects get just a faint whiff of hydrocyanic acid it "knocks them stupid," but in this condition of stupor they can survive a gassing that would otherwise kill them very quickly. This was brought out in experiments reported by Mr. Gray and Mr. Kirkpatrick. This "protective stupor" may be achieved by insects in remote parts of the covering tent, or even by insects on neighboring trees reached by escaping whiffs of the gas. It was recommended that some sort of circulating fan be used to make the gas reach all parts of the tree in full concentration at once.

Fumigating flower bulbs to rid them of insects may have other beneficial effects, according to the observations of C. F. Doucette and F. J. Spruyt, of Sumner, Wash. They found that narcissus bulbs exposed to cyanide fumes blossomed from two to six days earlier than unfumigated control bulbs.

CANCER RESEARCH

In a report never before made public, the sub-committee on cancer research, appointed by the conference of consultants called by the Surgeon-General of the U. S. Public Health Service, suggested that the Public Health Service could carry on cancer research along four lines: statistical study, study of occupational cancer, study of the general biochemistry of the cell and study of various phases of radiation. This is the report which Senator Wesley Jones, chairman of the Senate Commerce Committee and its new cancer sub-committee, has mailed to scientists throughout the country in order to get their opinions. Later it will be discussed at the hearings of the cancer sub-committee.

"The United States was the first government to publish a statistical volume on the mortality from cancer," stated the report. "This volume gives all the facts obtainable from the census records up to 1914. It should now be complemented by another volume covering the time since 1914. The study of occupational cancer can not be carried on by private institutions so well as by the government, because the material is so widely scattered.

"For example, we know but little of the cancers of tar workers in the United States; of the occurrence of cancer in garage workers, whose hands are continually in contact with oils; of the spatterburn cancers seen in workers in the steel mills; of brass and dye workers' cancer. If the widely scattered information concerning these types of cancer could be collected and studied, facts important both to the problem of the causation of cancer and to industry would be immediately obtainable."

More fundamental researches on the general biochemistry of the cell which might be carried out in existing laboratories were summarized as follows:

"Tissue cultures offer one method of approaching this problem. We still lack information as to the difference between the cancer cell and the normal cell. If cancer cells and normal cells can be grown continuously in culture and the differences noted between the two, either in morphology or in response to radiation, or to physical or chemical agents, it might lead to the discovery of methods, chemo-therapeutic or other, which would damage the cancer cells and leave healthy cells untouched. If this happy discovery could be made we should be approaching a cure for cancer. Similarly, general biological work should be encouraged at institutes like the Marine Biological Laboratory at Woods Hole, which would lead to greater knowledge of the cause of growth and death of cells. Any investigation of this type may well be expected to throw light upon the cancer problem which is largely an understanding of the uncontrollable growth of certain groups of cells in the human body.

"There are many other problems of the greatest importance still unsolved," the report continued. "Among these are the standardization of the measurement of X-ray and radium radiation by a single standard unit. Also, the study of methods of measurement of radiation of longer wave-lengths than X-ray, from the ultra-violet to the electromagnetic groups with an investigation of their biological effects."

THE PROTECTION OF CHAMOIS AND IBEX IN THE ALPS

In spite of war and post-war disturbances, several species of European game animals have succeeded in holding their own and now are showing signs of increase. This is shown by an examination of numerous animal censuses, made by Dr. Theodor G. Ahrens, an American naturalist residing in Berlin.

The chamois, original source of chamois-skin and as much a part of Alpine life as the edelweiss, are holding their own in Switzerland, and in the Italian Alps they have a special home set aside for them. This is the "Gran Paradiso," a large game preserve formerly the personal property of the King of Italy, but since 1923 a national park. There are about 1,000 of them here. The main population in Switzerland numbers about 10,000,

and they are numerous in Bavaria as well. Hunting is strictly regulated.

The ibex, prized for its beautiful curved horns, had become extinct in Switzerland, until the recent re-introduction of new stock from Italy. At present there are a dozen of them in a preserve near St. Gall, and 72 head in the Swiss National Park. In Italy, the Gran Paradiso harbors some 2,500 of them.

In the Baltic region the moose, which Europeans call elk, is also staging a come-back. In 1848, after revolutionary turmoil in Germany, the stock in the lowlands of East Prussia was reduced to 11 head, but now there are over 800 in this district. In part of the area they receive the benefit of a permanent closed season, and in the rest hunting is rigidly limited. The only other area iu Europe where moose survive is Norway, where there are about 1,000 animals.

The animals that suffered most heavily during and after the war were the European bison, or wisent, various species of deer and the wild boar. The wisent especially is an object of anxiety among European naturalists and friends of game animals, for its once large populations in the Baltic region and in the Caucasus appear to have been completely wiped out, and the only survivors are a few carefully tended animals in various zoological and private parks.

DIAGNOSIS OF HEART DISEASE

AN important physiologic discovery which should help the doctor to tell the patient suffering from heart disease how sick he is, about how long he can live and what he must do to live that long, has been reported by Drs. A. R. Barnes and M. B. Whitten, of the Mayo Clinic and Foundation, Rochester, Minn. Drs. Barnes and Whitten have announced that it is now possible to tell, in a given case of infarction, or obstruction, in the heart, the site of infarction in the left ventricle and which of the main arteries of the heart is involved. In this work Dr. Barnes was the electrocardiographer and Dr. Whitten the anatomist.

Nearly ten years ago, Dr. J. B. Herrick, of Chicago, predicted that the time would come when diagnosis would be as complete as this. Three years were required by the present investigators to work out the problem. Although the work was difficult to do, to get a general understanding of it is not as hard as it seems.

The walls of the heart, just as any other muscular part of the body, must be nourished with blood. For this purpose, two main blood vessels, the coronary arteries, extend over the heart. If an artery is injured, a clot may form in it. Later, the clot may work loose from the arterial wall and may be swept along in the blood stream until it reaches a place where the artery is too small to let it through. Then the artery, of course, is plugged. If there are no other arteries to supply blood to the same region, the tissue beyond the plug in the artery is not nourished, and, in a sense, dies. Physicians call these dead places "regions of infarction." When infarction affects the heart muscle the condition is serious and the phenomena that take place in that heart are different from those in a healthy heart.

Among the phenomena that are disturbed by infarction in the heart are the so-called action currents. These are waves of varying electrical potential that are developed as the various portions of the heart muscle contract. Physiologists have known of these action currents for many years, and finally a way was devised of recording them.

The machine that was developed for this purpose is called the electrocardiograph. Essentially, it is an electromagnet with an almost invisible filament stretched across the magnetic field. When wires are led off from a patient to this filament, the filament is deflected as the action currents pass over the heart. These deflections are recorded photographically on a moving film, the film is developed, and then there exists a permanent record of the action currents in the patient's heart. This procedure is done every year in doctors' offices, hospitals and clinics.

Throughout the years, investigators have learned the types of heart disease that will produce certain types of records. Their importance is that when certain types of records are obtained, they enable the doctor to be pretty sure whether or not a patient has heart disease, and if he has, to determine whether or not anything can be done about it.

The refinement of diagnosis announced by Drs. Barnes and Whitten is an important physiologic discovery, but neither this discovery nor any other can take the place of measures for the prevention of heart disease that are being so widely advocated in public lectures and in the public press.

ITEMS

A FEW years ago matters pertaining to the arrangements of the chemical elements would have been supposed to be purely the affairs of chemists, but the American Physical Society, meeting with the Pacific Division of the American Association for the Advancement of Science, heard how a spiral curve can be used for convenience in studying them. Modern developments in both physics and chemistry have brought them so close together that the once sharp dividing line between them has almost completely disappeared. Dr. A. E. Caswell, of the University of Oregon, told the physicists that the elements could be put on the spiral curve, starting with hydrogen at the center and traveling outwards to uranium, the highest. Elements of the same family are along the same radial line, while the non-metals are on one side and the metals on the other.

IN about a year the cost of photographic film with cellulose acetate base, now about one fifth higher than the dangerous cellulose nitrate film that caused the Cleveland Clinic disaster, may be reduced so that it competes in price with the nitrocellulose variety. This is the prediction of chemists who foresee future price declines in the costs of the raw materials, acetic anhydride and acetic acid, that enter into the manufacture of the cellulose acetate film base. New methods of manufacture of acetic acid and its compounds from alcohol are likely to bring about a price reduction of acetic acid from about 14 cents to 8 cents a pound.