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THE LIFE CYCLE OF GERMS

THAT a metamorphosis or change in form is part of the regular life cycle of certain germs is suggested by the work of Alice C. Evans, senior bacteriologist of the U. S. Public Health Service, who has investigated germs cultivated from cases of encephalitis.

Germs belonging to the family of streptococci have been recovered from these cases. These are small round germs, well known to bacteriologists, and the cause of many diseases. They can not pass through the pores of fine filters. Investigating these germs, Miss Evans was astonished to find them change into the long narrow germs known to bacteriologists as rods. Also, she found that sometimes these germs were able to pass through fine-pored filters.

A few years ago, bacteriologists were certain they knew all about the lives and habits of the well-known germ families, like the streptococci. Some germs might be round and some straight, some reproduced by dividing or splitting and some by growing spores. But they all remained true to type all their lives.

In fact, bacteriologists were so sure of the stability of germ families that when they saw a rod-shaped germ growing in a family of round ones, they concluded that the rod was a contaminating organism that had gotten into the colony by mistake. For the most part they are right about this, but Miss Evans's studies led her to suggest that bacteriologists may for years have been seeing the rod-forms of round streptococci and mistaking them for contaminating organisms of another family.

Miss Evans thinks that the germs exist in the body either in the filterable form or in several different forms of bacteria. It is only with difficulty that the germs living in the body can adjust themselves to growing on artificial material outside the body. For the first few days after they have been transferred from the body to the artificial growth material, they waver from one form to another. But once they are established on ordinary culture material, one form or the other grows and multiplies indefinitely without variation.

The rod-shaped form of the germ that Miss Evans investigated was more virulent in animals than the familiar coccus form. However, she could not conclude that one or the other form was the cause of the disease in man.

THE FORMS OF BACTERIA

BACTERIA are made to live not merely a double life but a triple one, in the laboratory of Miss Agnes Quirk, of the U. S. Department of Agriculture. By suitable modifications of diet, she can at will make them visible or invisible, and she can make the visible forms develop two different kinds of colonies on the solid nutrient media that constitute their food.

There is a certain parallelism between Miss Quirk's work and that of Dr. Arthur I. Kendall, of the Northwestern University Medical School, Chicago. Last summer Dr. Kendall announced his ability to make bacteria visible or invisible at will, using a special protein medium which he had developed. Miss Quirk controls the life forms of her bacteria without using an unusual type of food, but by controlling the acidity and alkalinity of the ordinary beef infusion broth and agar.

The bacteria which Miss Quirk was studying had a habit of forming spots of "colonies" of two different types, when cultivated in the laboratory. One colony type was smooth-surfaced, the other rough. Bacteriologists never knew why they did that. Miss Quirk found that she could produce either type at will from the same original stock, getting 100 per cent. "smooth" colonies on a poured agar plate when she left the culture medium chemically neutral, and 100 per cent. "rough" colonies when she made it acid.

She discovered further that the germs in "smooth" colonies are virulent and active, whereas those in "rough" colonies are less able to cause disease. She can convert either form into the other at will, merely by changing the acidity and physical state of its food.

The germs in both "smooth" and "rough" colonies are visible under the microscope; but it was found that at a certain stage of the growth of the smooth-type organism, it can produce a filterable form, which can be induced to pass through the pores of a close-grained porcelain cylinder, and, after a period of time, be developed again into the microscopically visible form, retaining the characteristic virulence and behavior of the parent strain. The bacteria used were those of two plant diseases; potato black rot and plant tumor.

The method for causing bacteria to produce at will "smooth" and "rough" colony forms in pure plate culture has been applied by Miss Quirk to thirteen plant pathogens and by Major James S. Simmons, of Walter Reed Hospital, to the Rawlin's strain of typhoid with success. The "smooth" and "rough" typhoid organisms were not tested for their pathogenic or antigenic properties.

It is believed that the technique for causing bacteria to assume a dual existence is applicable to many, if not all parasitic bacteria.

Miss Quirk believes that the invisible or filterable stage of the organism is reached during the transformation period of the smooth form to the rough form and that conditions can be imposed upon the organism to produce a filterable stage or invisible state and later be returned to the visible state.

CANYONS IN OCEAN BOTTOM OFF NEW ENGLAND

DR. FRANCIS P. SHEPARD, department of geology, University of Illinois, and collaborator, U. S. Coast and Geodetic Survey, writes that a whole series of vast canyons, rivaling anything that the West has to offer, have been found in the bottom of the ocean off the New England coast by the U. S. Coast and Geodetic Survey during the season which has just closed. Corsair Gorge, which created something of a sensation a couple of years ago when it was first discovered, proves to be only one

feature in this new-found stupendous submarine landscape.

This summer it was decided to examine in much more detail some of the valleys in the Corsair Gorge neighborhood to see if they might be used as landmarks for navigators. The last survey revealed an area with such relief and irregularity that it dwarfs by comparison anything above water in eastern North America and must rival the grandest topographic features of the West. The area charted represents only the upper mile of the two-mile-high continental slope.

The preliminary contour map which has been drawn shows a series of steep-walled canyons cut thousands of feet deep into this escarpment. The least of these is deeper than the Yellowstone Canyon and the greatest must be comparable with the Grand Canyon of the Colorado.

Some geologists have attempted to show that submarine valleys are not the product of river erosion, but the valleys under discussion have every indication of a fluvial origin. They have the typical sinuous shape of river valleys, as well as the branching tributaries and the V-shaped cross sections characteristic of canyons cut by streams. Since the valley floors are traceable to depths of at least 7,000 feet, it is evident that during the valley-cutting stage New England must have been a plateau at least a mile and a half above sea-level.

The steepness of the canyon walls, probably exceeding 45 degrees in places, makes it appear very probable that they were cut in solid rock rather than in the soft sediments of the ocean floor. The finding of fragments of weakly cemented conglomerate on the wall of one canyon partially confirms their rocky nature. Unfortunately only a few samples were collected since the soundings were made by echoes using the "fathometer," and it takes a long time to get samples from deep water.

The outer portions of the valleys have hummocky topography suggestive of landslide accumulations. It seems probable that the sediments which were deposited in the inner valleys after they were submerged have been shaken loose and have slid out into the outer valleys where they lodged because of the decrease in gradient.

ROCK FORTS IN ALASKA

REPORTS of finding inaccessible rock fortresses in the sea, used by people of the Far North many centuries ago, are brought back from Kodiak Island, Alaska, by Dr. Aleš Hrdlička, of the U. S. National Museum.

Dr. Hrdlička's discovery reveals for the first time that inhabitants of the North in ancient times had to take extreme methods of protection, very much as Pueblo Indians in the Southwest entrenched themselves on mesa tops. The fortresses discovered in the North are rocky islets off Kodiak Island coast. On the flat summits of these high cliffs were found ruins of villages strategically placed by the ancient people who had some formidable enemy to fear, perhaps because they had enviable wealth in sea-otter skins.

Ascent of the cliffs to reach one of these abandoned villages was a real "mountain-goat climb." Not even spade or camera could he carry with him. Yet the old inhabitants must have packed their supplies year after year up the weary ascent.

"Kodiak Island is a unique archeological site," said Dr. Hrdlička. "This island, neglected by archeologists, can be studied for a hundred years and continue to shed light on aboriginal America.

"The chief result of this year's work is the definite ascertainment that there lived on the island in the course of time two distinct types of people, one the old and one more recent. Just who the old people were is not yet certain. While slightly Eskimoid, their main resemblance is to the Indian.

"It has been argued that only the crudest elements of culture were brought into America, and that all the rest of the Indians' art and industry were developed in America. Yet, the deeper we dug into the older remains of Kodiak Island, the higher the type of culture we met. These oldest natives made beautifully shaped knives of slate. They made lamps from rounded pieces of hard basalt and granite, and weapons some of which are of types found for the first time in American archeology. Among the carvings of fossil ivory is a portrait of a man, so cleverly carved that it must take rank among the fine art of prehistoric America. It is a true portrait, not a mere representation of a man."

Petroglyphs, or picture writings on the rocks, were found in astonishing quantity. Science knows of no way to decipher these records of the ancient people, but there is much scientific interest in studying them. Dr. Hrdlička reports that Kodiak Island contains the richest and best collection of petroglyphs of any site north of Mexico.

ITEMS

WHALES in Antarctic waters are being counted by scientific men aboard the Royal Research Ship, *Discovery II*, operating under the direction of the Falkland Islands Government. The *Discovery II* sailed recently from Melbourne, Australia. The data on whale numbers are intended for use in drawing up an international agreement to prevent the depletion of whale herds through over-killing.

USING an electrical telescope that automatically counts the cosmic rays, Drs. Thomas H. Johnson and J. C. Street, of the Bartol Research Foundation of the Franklin Institute, are observing night and day on the summit of Mount Washington, highest of the White Mountains, with an altitude of 6,288 feet. The effects of the earth's magnetic field on the directional distribution of the cosmic rays are being studied and thus far a slightly greater intensity of the cosmic rays in the magnetic meridian seems to have been found. Camden Cottage, a building left open during the winter for the shelter of hikers, is being used as an observatory at the summit through the courtesy of the Mount Washington Club. The scientific apparatus was carried to the top of the mountain by auto truck. Observations will continue until September 25.