

GENERAL SCIENCE

Germ-Killers in Soil Promise Conquest of all Bacteria

Substance Which Can Pass Through Bacterial Filter Destroys Germs of Gram Positive and Negative Groups

CONQUEST of the entire world of disease-producing germs seems possible as a result of the discovery, reported to the National Academy of Sciences, of germs in garden and field soil which destroy disease germs of the gram-negative group. The discovery was made by Drs. Selman A. Waksman and H. Boyd Woodruff, of the New Jersey Agricultural Experiment Station.

Disease germs of the gram-positive group can also be destroyed by chemicals extracted from germs found in soil, Dr. Rene Dubos, a former student of Dr. Waksman, and now at the Rockefeller Institute for Medical Research, has just reported.

Since all disease germs belong to either one or the other of these two groups, the discovery announced seems to herald the rapid approach of man's triumph over germ-caused disease, even if many years must yet be spent in searching for methods of applying these two discoveries in practical germ-fighting.

Germs of typhoid fever, dysentery and cholera, among others, belong to the group of gram-negative germs against which Drs. Waksman and Woodruff have found natural enemies in other micro-organisms from soil. Pneumonia and diphtheria germs and the staphylococci belong to the gram-positive group for which Dr. Dubos has discovered in soil germs death-dealing chemicals.

Two specific bacteria and several germs of the fungus type were isolated from the soil by the New Jersey investigators and shown to be able to antagonize—that is, check the growth and destroy—one or more of the gram-negative germs. The soil germs are quite specific in their action. The one that checks the growth of the colon bacillus, for example, is quite different from the germ that checks the growth of the undulant fever germ.

The substance in the soil germs which destroy the disease germs can pass through a bacterial filter, is absorbed by charcoal, is soluble in ether and is fairly stable when heated, Drs. Waksman and Woodruff have discovered.

Drs. Waksman and Woodruff stated that when disease-producing bacteria "are

introduced into the soil, as in the excreta of patients suffering from various diseases, as well as in the dead bodies of men and animals, they are rapidly destroyed by corresponding antagonists," meaning the soil germs they found.

"As a result of this," they stated, "the soil can hardly be considered as a source of epidemics and as a carrier of the more common infectious diseases."

Science News Letter, May 4, 1940

Feed on Non-Living Matter

A NEW step forward in the exploration of the baffling but challenging border zone that may lie between the living and the non-living was announced before the Academy meeting, when Dr. L. O. Kunkel of the Rockefeller Institute for Medical Research at Princeton, N. J., told how he had succeeded in isolating and cultivating a new group of filter-passing organisms that do not require living tissues on which to feed.

Viruses are either the simplest and smallest of living things or (probably) the largest and most complex of non-living molecules, able, among other life-like performances, to perpetuate their own kind. All species hitherto known require living tissues for their sustenance; they are parasites, causing such plant diseases as mosaic and curly-top, and animal diseases like hog cholera, hoof and mouth disease, smallpox and yellow fever.

Scientists have been intrigued by the possibility that viruses may represent the most primitive form of life on earth; but obviously so long as they required the presence of much higher types of organisms for their food, they could not be imagined as pioneering life on a lifeless planet. Discovery of a group of virus-like entities that can get along without living hosts is a step away from this dependency.

To be sure, the divorce between filter-passing organisms and hosts in the group described by Dr. Kunkel is not a very drastic one. The new organisms were discovered in tomato and tobacco plants afflicted with mosaic disease, and in a few apparently healthy plants. How-

ever, the facts remain that they can be cultivated in glass dishes and that they will feed and grow on a diet of sterile, non-living plant juice.

As described by Dr. Kunkel they produce translucent colonies that resemble spheroid crystals. They are composed typically of radiating needle-shaped or plate-shaped structures that may be dissolved in dilute alkali solutions. Films composed of such dissolved colonies, suitably stained, show large numbers of tiny spherical particles.

"The particles occur singly or in chains of twos, threes and fours," Dr. Kunkel reported. "The chains suggest that multiplication is by division and that the particles are minute cells."

Science News Letter, May 4, 1940

Radiation Varies with Spots

FLUCTUATIONS in the amounts of light and heat given off by the sun correspond closely to fluctuations in the areas of the spots that freckle the sun's face, Academicians were told by Dr. Henryk Arctowski, eminent Polish scientist now at the Smithsonian Institution.

Dr. Arctowski made a careful comparison of day-by-day records of both solar radiation and spot areas, covering a period of five years. While the ups and downs of the two curves he drafted run closely parallel they do not exactly coincide. There was a constant tendency for both maxima and minima in the solar constant curve to run a little in advance of those for the sunspot areas.

Science News Letter, May 4, 1940

Moon's Apparent Size

THE GIANT size of the full moon as it comes above the horizon is proverbial in song and story, but two Harvard scientists showed that the moon's apparent size is only an illusion based on how you look at it.

Drs. Edwin G. Boring and Alfred H. Holway told the academicians that if one lies on his back on the ground and looks at the moon when it is on the meridian (at culmination, or greatest altitude in the sky) it will have a much larger apparent diameter than when on the horizon. This is just the reverse of the moon's ordinary appearance, where it seems largest on the horizon and smallest when high in the sky.

The illusion of the moon's size, the Harvard scientists declared, seems to be linked with the movement of the eyes.

"For a supine observer," they stated, "the horizon moon is smallest and the moon in elevation (*Turn to page 285*)

ceremonials to accomplish the death of enemies, Dr. Oliver said.

Dr. Oliver obtained many examples of the highest art of the Siwai, the decoration of long spears and arrows with designs woven with fern fibers dyed yellow and red.

Siwai language, extremely complex and difficult, took the anthropologist ten months to learn, aided by young men of the tribe who had learned Pidgin English on coastal plantations.

The Siwai are a farmer tribe, and pigs are an important basis of wealth and exchange, being nurtured with specially cooked food, Dr. Oliver said.

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largest. The perceived size diminishes when the head is kept fixed and only the eyes are elevated. It does not change when the head is tilted back so that the eyes are not moved with respect to the head."

It works out, the scientists said, that, if one could see the moon below the horizon while standing in an erect position, "it would appear about as much smaller, angle for angle, when compared with the horizon moon, as the moon in elevation seems smaller. The general rule is that objects at a great distance appear largest when the eyes are looking straight ahead with respect to the head, irrespective of the position of the observer's head and body."

Science News Letter, May 4, 1940

Eyes' Electricity Changes

THE ELECTRICAL potential of the human eye—a slight but readily detectable difference between the front and back of the eyeball—is less in dim light or darkness than in brighter light, Prof. Walter R. Miles of Yale University reported. He found an appreciable decline in eye potential after a moderately bright light had been turned off and his subjects left for five minutes in nearly total

darkness, with a further drop after another five minutes. When the light was turned back on, the eye potential rapidly rose again to its former level.

This change in eyeball potential may be of great use in future studies of the retina, the light-sensitive lining of the eye, Prof. Miles suggested. Hitherto, the only way to study effects of light changes has depended on reports of the visual sensation given by the subject under examination, which naturally introduced a considerable subjective element, and therefore possible error. By the new method it is now possible to obtain results that are entirely objective, and independent of the personal equation.

Science News Letter, May 4, 1940

May Make Antibodies

THE POSSIBILITY of eventually manufacturing synthetically in the laboratory for injection into ill patients the antibodies that fight disease germs was suggested in a paper by Dr. Linus Pauling of the California Institute of Technology.

On the basis of how simpler molecules are built, Dr. Pauling has worked out a theory of the structure and process of formation of antibodies. From this theory Dr. Pauling predicts that the synthesis of antibodies might be achieved by denaturing serum globulin, from the blood, and then removing the denaturing agent in the presence of an antigen or haptene. An antigen is a substance which can incite the formation of antibody. A haptene when injected can confer specific antigenic powers on proteins with which it combines.

Science News Letter, May 4, 1940

Light on Growth Processes

LARGE and mature plant cells which have been stimulated by injury to divide again throw much light on the processes of cell division, it was indicated in experiments reported by Prof. Edmund W. Sinnott and Dr. Robert Bloch of Columbia University.

Such cells are hundreds of times as large as the cells of ordinary embryonic tissue and the processes of division in them may therefore be observed on a greatly magnified scale. An important feature of this process, and one which has not been recognized before, is that the cytoplasm of the cell is distributed very early in the exact position which will later be occupied by the new wall. This fact is important for an understanding of plant development, for it

indicates that the entire living substance of the cell, and not the nucleus alone, determines the plane of cell division and thus the direction of growth.

Science News Letter, May 4, 1940

Prone Pressure Best

SAVING lives threatened by death from drowning or gas poisoning by the prone pressure method of resuscitation, familiar to Boy Scouts and other first-aiders, is the best or as good as the best method now known or that can ever be invented, Prof. Yandell Henderson, Yale University, declared.

Even when a man is unconscious and breathless, the breathing center in his brain still controls the tone and elasticity of the muscles of his chest, Prof. Henderson presented evidence to show. This tone of the chest muscles determines how much air is drawn into the lungs between compressions. The compressions cause only expirations.

The person giving artificial respiration cannot "by pulling, pushing, or poking the victim in some particular way," get more air into the lungs than the tonic elasticity of the chest draws in. The standard Schafer, or prone pressure method, is the most effective for the compressions. No method can do more.

Normal breathing is mainly controlled

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by the carbon dioxide produced in the body, Prof. Henderson explained.

"The respiratory center in the brain regulates the breathing so that the volume of air with which the lungs are ventilated is almost exactly 20 times the volume of carbon dioxide that the blood brings from the tissues of the body to the lungs," he continued.

"A man walking slowly produces twice as much carbon dioxide as when sitting still, and he breathes twice as much air. When he does enough work to produce three times as much carbon dioxide as at rest, he breathes three times as much air." The same control operates to a large extent even when a man is unconscious and under artificial respiration.

Science News Letter, May 4, 1940

Ambiguity Principle

A STATE of balance, with a resulting ambiguity, was seen as the ruling condition in the universe by Prof. George D. Birkhoff, Harvard University mathematician, who addressed the National Academy of Sciences.

"Nothing happens without a reason," said Prof. Birkhoff. "On this basis we try to understand what goes on. Philosophers and scientists answer the deepest questions in the same way: How are life and matter related? What is the basis of moral law? Why has space three dimensions?"

"The most satisfying ultimate reasons appear to depend on symmetry and the resulting ambiguity. A scale balance with equal arms and equal weights in the two pans must balance just because of the symmetry and ambiguity of the scales. This is the Principle of Sufficient Reason.

"It may be conjectured that underlying reasons are always best expressed in terms of symmetry and ambiguity. The world then appears as natural and inevitable as the laws of geometry. The theory of such symmetry is the mathematical Theory of Groups."

Science News Letter, May 4, 1940

Swastika Evil in Plants

"THE SWASTIKA is not only the symbol of malignancy in politics, but also in the living organism."

This dramatic declaration concluded an address before the National Academy of Sciences, by Dr. D. F. Jones, geneticist at the Connecticut Agricultural Experiment Station at New Haven.

Dr. Jones found the perverted Sign of the Crooked Cross in the cells of a

corn plant that had gone wrong. The grains were partly aborted, some of them showing little swellings like malignant tumors. When he made microscopic preparations of cell tissues he found that two of the long chromosomes had become crossed at right angles. Where they crossed there had been a break or bruise and the two had grown together. Their ends had bent over, giving the whole figure a sinister semblance to a swastika.

Of course, it was only a matter of chance that he found chromosomes distorted into a swastika, Dr. Jones explained. The real mischief results from chromosome breaks and fusions, whatever shapes they may assume. There is some evil magic in chromosome chemistry that makes for diseased and misshapen parts and organs when the chromosomes themselves are injured and assume the wrong shapes.

Sometimes the ill effects become manifest at a distance from the place where the chromosome abnormality occurs; for example, when a gland thus made abnormal causes malformation in a part of the body quite remote from itself.

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Medals Awarded

AN eminent Swedish geologist, an American zoologist and a well-known public servant were honored by the National Academy of Sciences with medals and awards, at the Academy's annual dinner.

To Dr. A. H. Westergaard, of Stock-

holm, went the Charles Doolittle Walcott medal and honorarium, in recognition of his outstanding researches, through many years, on the fossil fauna of the Cambrian period, 500 million years and more ago.

Dr. Frank Rattray Lillie, emeritus professor of zoology at the University of Chicago and former president of the National Academy of Sciences, was awarded the Agassiz medal, "for his important researches and his wise leadership in marine biology, for his enduring contributions to the sciences of oceanography in the founding and endowing of the Woods Hole Oceanographic Institution, for his modest but effective leadership in causing this country to assume its share in a world-wide program of oceanographic research."

The Academy's Public Welfare medal was given to J. Edgar Hoover, head of the Federal Bureau of Investigation, as an acknowledgment of his applications of the methods of science in the detection of crime and the conviction of criminals.

Science News Letter, May 4, 1940

Boulder City, which had about 6,000 people during the peak of construction on Boulder Dam, now has a permanent population of about 3,500.

Cornell scientists are evolving breeds of *chickens* in which the sex of baby chicks is shown by color of the down—useful to poultrymen who like to discard cockerels and spend their time and money on the pullets.

Many readers of SCIENCE NEWS LETTER have from time to time inquired about the syndicate side of SCIENCE SERVICE. During the next few weeks we shall try to describe this work by exhibiting advertisements, circulars and other material addressed to editors and publishers of America's daily newspapers. The advertisement on the opposite page was published in the April 20 edition of EDITOR & PUBLISHER, the weekly magazine of the journalistic profession.

The chief function of SCIENCE SERVICE is the popularization of science. In other words, it is even more important that we carry news of science through newspapers to the man in the street than that we bring the news to the scientifically trained minds of you readers of SCIENCE NEWS LETTER.

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Watson Davis
