SCIENCE NEWS

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INVISIBLE STAGES OF GERMS

SCIENTIFIC men have often been baffled in their search for disease germs because germs have a stage or stages of development in which they are too small to be recognized by microscopic examination, filtrable through fine filters and, for a time at least, non-cultivable by ordinary methods. This is the opinion of Dr. Philip Hadley, of the Medical School of the University of Michigan. Dr. Hadley, known for his studies on the transformations which bacteria undergo in artificial cultures and in the body, told a gathering of scientists at Ann Arbor that he had been successful repeatedly in causing disease-producing bacteria, appearing under the microscope and in cultures in the conventional form, to undergo dissociative changes which rendered them invisible, and filtrable through fine-grained earthen and porcelain filter candles. After further laboratory procedures these minute bodies were made to redevelop into the "normal" form. Sometimes weeks or months were required to effect this reversion.

Should Dr. Hadley's experiments and conclusions be correct—and it was admitted that it was more than possible that they were—a number of firmly held notions in present-day bacteriology would seem to demand some revision. This refers to such matters as valid criteria for judging the sterility of normal or pathological tissues and body fluids, criteria for judging when a bacterial culture was really dead, the true significance of so-called "bacteriolysis" and the bacteriophage phenomenon; also perhaps the biological relation between the filtrable forms of bacteria and some of the so-called filtrable viruses.

Dr. Hadley emphasized the need of studying bacteria not alone with reference to the ordinary form that is well known to bacteriologists and described in the text-books, but also with reference to the other cyclostages in which the organisms may masquerade for a time, and in which form they are seldom recognized. One of the most important of these is the filtrable form which occurs in the G-type culture.

The speaker voiced the opinion that, contrary to the common belief, any bacterial species in its entirety is not so simple a thing that it can be revealed by a study of a single cell or a single culture; but that it is highly intricate in its cellular organization. This might be taken to mean that far more remains to be discovered regarding the complex biology of many "well-known" microbes than is already known by bacteriologists to-day.

MILKWEED AS A SOURCE OF OIL, FIBER AND INSULATION

MILKWEED, once considered as a possible source of rubber but long since dismissed, may yet become a useful crop plant, in the opinion of Dr. Fisk Gerhardt, of the Iowa Agricultural Experiment Station.

In a report to *Industrial and Engineering Chemistry*, Dr. Gerhardt shows that milkweed compares favorably with other plants of commercial value, such as flax and kapok. He reports a yield of 30 bushels of seed, 280 pounds of floss and one ton of air-dry stems per acre. He finds that its seeds are rich in oil, that its seed fibers are buoyant and do not absorb water readily and that its stem fibers compare favorably with hemp and flax.

Analysis shows that the dark brown seed of the milkweed is similar in composition to that of several of our crop plants. It contains 21.2 per cent. of oil, as compared with 19 per cent. in cotton seed, and 33 per cent. in flax seed. It is classified as a semi-drying oil. By bleaching it is possible to make it a clear, colorless product similar to various plant oils now in use as food.

The fibers just beneath the bark and along the outer surface of the woody stem are soft, pliable, almost white, and resemble flax very closely. This makes them potentially valuable as material for the textile industry.

The silvery white seed fibers of the milkweed plant have been called "the cotton of the north." All attempts to use them in the textile industry, however, have so far failed, as the fibers are rather brittle. Nevertheless they do have a low moisture absorption and a high degree of buoyancy. These specific qualities make them especially fitted for use in playground equipment, life savers and insulating materials. They resemble kapok in these respects.

"With the pronounced increase in our consumption of cellulose," Dr. Gerhardt says, "it becomes obvious that our future supply will of necessity originate in annual plants rather than in those plants requiring years to attain sufficient maturity, such as trees. In the development of future sources, the by-product return in the form of oils, gums, resins and protein concentrates will continue to be a factor of prime importance. The commercial demand for these latter commodities is gradually approaching in magnitude that of our cellulose industries. Among the primary problems now confronting the chemist and plant breeder are those concerned with further exploitation of our present cellulose wastes and the development of our most promising sources of fibrous materials."

BACTERIA FOR THE EXTRACTION OF PLANT OILS

TINY bacteria may replace ponderous iron presses in the work of extracting vegetable oils from many varieties of seeds and nuts. This is the suggestion of John Woods Beckman, an Oakland industrial chemist, made in a report to the American Chemical Society.

Vegetable oils are held in microscopic cells in plant tissue. The walls of these cells are composed of tough cellulose. The pressing of vegetable material for oils means crushing these cell walls. Exceptionally tough cell walls often offer so much resistance to pressure that extraction of fat is far from complete. A means of

eliminating the cell walls not only would liberate the fat more perfectly, but would leave the remaining cellulose material in far better condition for further working. The residue, a hard fibrous cake in the pressing method, is valuable as a source of by-products, chief among which is cattle food.

To dissolve the cell walls by chemicals is inadvisable, because most substances necessary would affect the quality of the oil. These same walls, eaten away by the action of bacteria, would liberate the oil completely and untouched. "There is a very prevalent hardy and vigorous bacterium that is easy to obtain from brewer's malt," says Mr. Beckman. "This bacterium has been pressed into service in a new oil recovery process.

"The temperature at which these organisms prefer to work is 60 degrees Centigrade, and this fact makes it possible to work under conditions that are self-sterilizing. If a culture of this organism made from brewer's malt is mixed with disintegrated nuts such as copra (dried coconut) together with a weighed amount of ground limestone and sufficient water to form a mush, and the resulting mixture is placed in an incubator at the desired temperature with exclusion of air, active growth takes place, and free oil begins to appear on the surface. After about six days the oil can be recovered from the residue by filtration."

Several advantages are claimed for this method over the older method of pressing. There is more complete extraction of oil, which means greater profit. The quality of the oil is better. The residue, containing as it does bacteria, amino acids made indirectly by the bacteria, and calcium lactate, is more valuable as cattle feed than the cake produced by pressing. It is virtually a predigested food which can be fed in larger quantities than press cake.

The simplicity of the method, the fact that all operations and equipment, except the incubator tanks, are standard, makes the labor required negligible compared with the old method, and the cost of operation is only a fraction of the cost of producing oil by the standard pressing method.

ENGINEERING OPPORTUNITIES IN LATIN AMERICA

Opportunities similar to those in the United States before the Civil War are open to engineers to-day in Latin America, R. W. Hebard, New York contractor, states in a report to the American Road Builders' Association. This is the reason, he says, that the Central and South American countries have fascinated the engineer and contractor as perhaps no other in this generation.

"Here in Latin America were found rich productive countries with an interesting historical background, with an educated, cultured governing class, but without railways and highways or ports; important populated cities were lacking in or utterly without adequate water supply or modern sewerage and paving; important picturesque capital cities were found lying back in the mountains, two and three weeks distant from the coast, which could only be reached by mule and small river steamers; countries and cities, in one word, in more or less the same condition as that of the Spanish Colonial period. Such a field was bound to attract the American engineer as no other, not necessarily or primarily for reasons of possible financial gain, but because the pioneer spirit, which is by no means extinct in the American race, asserted itself and drew these men to this part of the world. We have seen, in consequence, commencing one hundred years ago, the American engineer blazing the way well in advance of the banker, salesman and other business missionaries."

Mr. Hebard combats the idea popularly held in this country that all the twenty Latin American Republics are more or less the same. The contractor and his staff working in South America must adapt themselves to widely varying conditions not only of government and political situations but of topography and climate, of transportation facilities or the lack of them, of labor conditions, and of the characteristics of the people themselves.

"In this vast region of which little was known, where almost every facility was lacking, man could dream and see visions of prosperity replacing poverty, of comfort supplanting hardship. A few of these men had vision coupled with common sense and ability. They succeeded. But the majority failed, and they will continue to fail through lack of understanding the economic obstacles which have to be overcome. Propaganda is not now required to convince Latin America that modern highways and railways should be built, that cities should be paved and water and sewage systems installed. All these things are desired in those countries as much as here. The realization of these desires, however, is frequently balked by cold, unescapable, economic facts.

In order to build railways, freight, either actual or potential, must exist. Unfortunately in all tropical countries, agricultural products, which in the temperate zone are the source of the greatest single class of tonnage, are in general of high value and small bulk. This can best be illustrated by comparing wheat with coffee. One family by the use of machinery can readily grow 160 acres of wheat, producing on the average, say 100 tons of grain. One family can grow at the most 6 acres of coffee, with a production of less than 2 tons. Measured in railway tonnage, a given number of people in the temperate zone will produce twenty-five times as much as the same number of people in the tropics. This comparison holds good with coffee, cacao, rubber, etc. While these products have such a high value per pound that they can stand a high freight rate, this rate is often controlled by the competition of primitive transportation methods. It is for these reasons that there are so few railways in the tropics, and the greater part of these have been built with the aid of heavy government subvention.

HIGH BROADCAST POWER

Broadcasting with 200 kilowatts of power, four times as great as the highest powered regularly licensed sta-

tion, was successfully accomplished at Schenectady, N. Y., on March 9, by station WGY, of the General Electric Company. Using a special experimental license, with the call letters W2XAG, the highest power ever used in broadcasting was put on the air at 4:00 A. M. eastern standard time. Tests will be continued for seven days at the same hour, which has been chosen to prevent possible interference with other stations of the country.

Six of the world's highest power vacuum tubes, each rated at 100 kilowatts, make the new station possible. Each tube is five feet long with a water jacket to cool it that increases the length to seven and a half feet. Every minute 100 gallons of water circulate through the tubes to keep them cool.

The transmitter employs a 200 kilowatt linear power amplifier, incorporating in a push-pull circuit the six 100 kw. tubes. Frequency control is maintained at precisely 790 kilocycles, or 379.5 meters, by means of a quartz crystal in piezo-electric circuit. The power for the plate circuit is obtained from a rectifier capable of supplying direct current with a power of 750 kilowatts at 20,000 volts. The antenna is of the cage type supported by four steel towers, three 300 feet high and the fourth 150 feet. The entire transmitter is located on the grounds of the 54-acre radio laboratory at South Schenectady.

WGY was the first super-power station. In July, 1925, broadcasting began on the then unprecedented power of 50 kilowatts. A number of stations throughout the country are now licensed to use this power regularly. In August, 1927, the General Electric engineers began experimental broadcasting on 100 kilowatts. Early in January this year the power was increased to 150 kw., though no announcement was made of it, and listeners were not informed of the power. The Pacific Coast reported reception of these special broadcasts with unusual strength and clarity, and a listener in Hawaii said that the strength was equal to that of an ordinary Pacific Coast station.

ITEMS

LESLIE C. PELTIER, amateur astronomer of Delphos, Ohio, who discovered the year's first comet a few weeks ago, once again has to share the honors with European astronomers. But the Europeans made the discovery at one of the world's best equipped observatories, that of the University of Berlin and the Prussian Government at Neu-Babelsberg, a suburb of Berlin, while Mr. Peltier has only a small telescope in an observatory largely of his own construction. It was in November, 1925, that his first cometary discovery was made. Before the news had been generally circulated, however, it was also picked up by a Polish astronomer named Wilk, at the University of Cracow. Therefore it was called the Peltier-Wilk comet. Schwassman and Wachmann are the names of the two discoverers of the new comet, and so it will bear the name of Peltier-Schwassmann-Wachmann comet. It is now rapidly receding from the earth, and is visible only in the largest telescopes.

ONE mine rescue station has already been established and two others will be created in the chief mining districts of Ontario following legislative action, D. G. Sinclair, chief inspector of mines for Ontario, told the Canadian Institute of Mining and Metallurgy in annual session at Toronto on March 6. These stations come as the result of governmental investigation of the Hollinger mine fire in 1928, which took 39 lives. Experts now teach miners modern rescue methods in the rescue station already established at Timmins. It also contains apparatus for fighting underground fires, including self-contained oxygen-breathing apparatus, gas masks, an inhalator, oxygen and carbon monoxide detectors, etc.

IN spite of the example in the Cleveland Clinic disaster of the danger of fire and explosion from stored X-ray nitrate base films, many communities are still as liable to such a calamity as they were before, Dr. P. F. Butler, radiologist at the Boston City Hospital, has warned the Congress on Medical Education of the American Medical Association. The safe acetate base film is no more dangerous than so much office stationery, Dr. Butler said. It costs about 20 per cent. more than the nitrate film, but the added expense is good insurance.

TEN automatic weather bureaus, scattered about by airship on the Arctic ice, equipped to broadcast weather conditions three times a day for a year without human attendance, are contemplated by the International Society for Exploration of the Arctic Regions by Means of Aircraft. The plans of the society, generally known as Aeroarctic, are described by Dr. Fridtjof Nansen, its leader. Already an automatic weather observatory has been constructed which tells the temperature, air pressure and humidity by radio for use on a small balloon. In inhabited regions, balloons are often sent up with small recording instruments, and the finder is expected to return it to the proper authorities. As there is no one in the Arctic regions to perform this service, it is necessary to provide the radio transmitter. This operates for about two hours, sending its observations back to the airship base.

CONSTRUCTION material for airplane hangars built recently in inaccessible parts of Persia and New Guinea were freighted over desert and jungle by the planes they now house. A great number of small structural units made of a light alloy were used. Assembling the units is so simple that it was done largely with native labor. Framework of roofs made of these units forms a diamond-shaped checker work. This type of structure, known as the lamella roof, is made of both wood and steel and is found to a large extent in Europe.

THE U. S. Bureau of Standards has found that the quality of parchment and fine papers, which are still made from cotton and linen rags, is injured if the rags contain rayon. This may easily be the case, because the sale of cloth of cotton-rayon mixture is steadily increasing. Hence there is more rayon in rag waste used for paper making.