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(Editors: This is one of the most startling stories that we have sent you. Coming as it does from the Pasteur Institute we believe that it is the first news of a momentous forward step in medicine and biology. Please watch release date.)

> PASTEUR INSTITUTE SCIENTIST ANNOUNCES DISCOVERY OF PARASITIC ULTRAMICROBE FOE OF DISEASE-PRODUCING BACTERIA; ADDED TO DRINKING WATER WOULD PREVENT EPIDEMICS

### (By Science Service)

Release, Thursday, November 10.

Paris, November 9.- The discovery of an ultramicrobe, which is a parasite on bacteria, and which effects a cure of such diseases as dysentery, typhoid fever, hemorrhagic septicemia and bubonic plague has been announced by Dr. F. d'Herelle of the Pasteur Institute of Paris.

This powerful, minute organism will be able to play an important part in control of epidemics, according to Dr. d'Herelle. He has been able to make men, buffalos, and birds resistant to various diseases by simply introducing into them the ultramicrobe which had become accustomed to preying upon the particular bacterium that causes the disease.

All that would be necessary to stop an epidemic of some disease, typhoid for instance, would be to pour into the drinking water supply a very small amount of the proper strain of the ultranicrobe, Dr. d'Herelle declares. This would infect all of the people with the harmless bacteria-dissolving ultramicrobe which will protect them and prevent an epidemic. The ultramicrobe is tasteless and for all animals and man it is absolutely harmless, Dr. d'Herelle has found by experience.

This wonderful parasitic ultramicrobe has been named the "bacteriophage" or bacteria-eater by Dr. d'Herelle.

Brought to mind by this new discovery is Dean Swift's often-repeated quotation:

> So naturalists observe a flea Has smaller fleas that on him prey, And these have smaller still to bite 'em, And so procede ad infinitum.

Before announcing his work on the bacteriophage, Dr. d'Herelle has made exhaustive researches into the nature of this ultramicrobe which seems to hold the Possibilities of revolutionizing ideas in medicine and biology.

Dr. d'Herelle explains the action of the bacteriophage as follows: Take the case of bacillus dysentery. If a sample of the feces of the patient is taken, mixed with bouillon, and then passed through a Chamberland filter, all of the microbes visible under the microscope will be retained in the fine pores of the porcelain filter and the filtrate or the liquid that passes through Will be clear, will remain so indefinitely and is in appearance sterile. Suppose that a case of dysentery is followed during its course and that such a filtrate is prepared for each of the thirty days of the illness. If thirty tubes of bouillon cultures cloudy with dysentery bacilli were prepared, and if a drop out of each of the thirty filtrates prepared each day were added to the correspondingly numbered cultures, the following would be the result after twelve hours incubation: Tubes 1 to 6, no change, cloudy with dysentery culture; tubes 7 to 18, perfectly clear; tubest19 to 30, cloudy like the first six. A strange phenomenon has occurred in tubes 7 to 18 caused by the adding of the drop of filtrate. The bacilli have been dissolved. And at the same time that this dissolving began to take place the patient began to get well, and on the 18th day the cure was complete. The presence of the dissolving principle and the cure coincide. This has been found to be the case in other diseases, even those that are not intestinal in character.

And this principle that appears in the filtrate is thousands of times more powerful than the most energetic antiseptic known. A billionth part of a cubic centimeter of filtrate will dissolve a tubeful of dysentery bacilli. And unlike <sup>a</sup> chemical, the bacteriophages will multiply themselves over and over again. A mere trace of the liquid in the tube of dissolved bacilli will clear up another tube of culture, dand if the process is continued a trace from the 999th tube will effectively cause the solution of the 1000th culture.

But in the dissolved culture of bacilli there can be seen no microbes, even if the most powerful optical means are employed. In fact, the bacteriophages are so extremely small that Dr. d'Herelle declares that without a doubt no human eye will ever be able to see them and determine their form even with the aid of any instruments that may be devised in the future. The volume of a bacteriophage is practically equal to that of a molecule of albumen. It is only by diluting a culture of bacteriophages many, many times, then adding a very small amount to a culture of bacilli and counting the spots where dissolving takes place, that the number of the bacteriophage in a given volume could be determined and that its role in nature could be discovered. By this method it was found that there are at least 2,500,000,000 bacteriophages per cubic centimeter.

There is only one species of bacteriophage, able to acclimate itself to parasitism on a very large number of species of bacteria. A strain active against one bacteria can be trained in a test tube to become virulent toward a totally different one.

The bacteriophage is, of necessity, a parasite that is not able to develop except by penetrating into the interior of a living bacterium, sedreting a bacterial solvent, and then reproducing itself by feeding on the dissolved microbe. It then sends forth the young bacteriophages to prey upon other bacteria.

The normal habitat of the bacteriophage is the intestine and it has been found in the intestinal tracts of healthy animals, both vertebrate and invertebrate. But it can be introduced in the blood as well and act there. Whether the bacteriophages protect the animal or not depends upon whether the strain present is virulent to the particular harmful and invading bacteria. In the case of the dysentery patient it took six days for the bacteriophages to become active. In fact, the history of a case of contagious disease is the reflection of the vicissitudes of the struggle engaged in within the animal or person by the pathogenic bacteria and the ultramicroscopic bacteriophages. But some bacteria, such as those that live in a healthy animal are able to acquire an immunity to the bacteriophages, Dr. d'Herelle has found.

The bacteriophage is transmitted in the same way as the harmful bacteria and an epidemic ends because all of the people have been infected by the bacteriophage and have become bacteriophage carriers.

Dr. d'Herelle declares that his discoveries are not antagonistic to the fact that the white corpuscles of the blood provide a defense against bacterial disease, but that the bacteriophages act in the case of animals without natural immunity or that acquired by disease or vaccination.

A monograph of Pasteur Institute now in the process of printing will shortly be issued and will give a detailed scientific account of Dr. d'Herelle's researches on the bacteriophage. (Editors: This is one of the series of astronomical stories by Mrs. Lewis that you are receiving week by week. They will give your readers authentic and time-ly news of what is happening in the sky.)

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NEWS OF THE STARS Sit Up to See the Pleiades . by Isabel M. Lewis of the U. S. Naval Observatory. (Science Service)

No group of stars in the heavens has been more universally known and admired among all the nations and tribes of the earth from earliest antiquity than the Pleiades which passes the meridian at midnight on November 17.

On late fall evenings this small cluster of faint stars appears in the eastern part of the heavens not far from the V-shaped group of the Hyades in Taurus, which contains the bright red star Aldebaran, the Eye of the Bull, and which is scarcely less famous than the Pleiades in story and legend.

To the average person the Pleiades appears to consist of five or six faint stars arranged in the form of a diminutive dipper. A keen eye will make out a seventh star at the end of the handle and persons with exceptionally fine eyesight have made out as many as eleven stars in the group. Even the smallest of telescopes will show about one hundred stars in the cluster and it is known that there are nearly two hundred and fifty stars, at least, in this group that are all traveling through space together in the same general direction. The Pleiades cluster is distant about three hundred and twenty-five light years from the earth and if our sun were in this cluster it would be one of the faintest stars in the group, invisible without a telescope. In fact all the stars in the Pleiades that are visible to us without the aid of a telescope are full one hundred times more luminous than our own sun.

The Pleiades have been woven into the stories and legends of all civilized nations and savage tribes of all lands. To the Greeks they marked by their rising with the sun in the spring the season for the opening of navigation. They w were, therefore, called the sailing stars. Many primitive people began their year with November, the Pleiad Month, and it was said that on November 17 the night of the midnight culmination of the Pleiades no petitition was ever presented in vain to the ancient kings of Persia. Even to this day savage tribes in Australia dance to the "Seven Stars" as they call them.

To the Greeks the Pleiades were The Seven Sisters; to the North American Indian they were The Seven Brothers; to the savage tribes of the South Pacific Islands, The Little Eyes; and to the ancient Babylonians, The Many Little Ones.

Poets of all nations have sung the praises of the Pleiades but no description of them is more beautiful than that of Tennyson's in which he compares them to a swarm of fireflies tangled in a silver braid.

The entire group of the Pleiades is known to be enmeshed in nebulosity which is condensedaround the brighter stars. To the astronomer it is a question Whether the stars are condensing from the enveloping nebula or whether the nebula is being driven forth from the more brilliant stars. The more brilliant stars in the Pleiades are of the excessively hot helium type to which the stars in Orion belong and the Orion stars also are involved in nebulous mist.

GAS I'EN CLEAN PIPES BY MEANS OF COMPRESSED AIR. (Science Service)

Release Friday morning, November 11. Chicago, November 10.- You have often blown out the stem of your favorite pipe when it became clogged. Now gas men are using the same method of cleaning Out gas pipes that have become filled with rust or other obstructions. At the meeting of the American Gas Association here today J. T. Griffin, of the Consolidated Gas, Electric Light and Power Co. of Baltimore told how tanked compressed air under pressure of 1500 pounds per square inch is used to clear out water or rust clogged pipes either in commercial plants or homes.

USES FOR MOSS GELATINES RANGE FROM FOOD TO HAIR OINTMENT

## (By Science Service)

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Washington, November .- The gathering of moss from stones along our seashores is the first step in the preparation of a gelatin that is used in shoe stains, soap, mustache mucilage, food, water paint, medicine, packing canned fish and clarifying oil and beer.

Investigations that were completed by Prof. Irving A Field of Clark College and the U. S. Bureau of Fisheries, shortly before his recent death, reveal the f fact that neglected mosses of our Pacific coast could produce agar-agar, one of the most important of these moss gelatines which is now imported by us from Japan, China, Malaysia and Ceylon.

Agar-agar is employed in the preparation of jellies, thickening of soups, ice cream, fruits, meat, or fish, and in candy making. In this country it is used most extensively in hospitals and in bacteriological laboratories. As a base for culture media it is unexcelled by any other substitute, since it remains solid with a smooth, firm surface at the higher temperatures required for cultivating certain species of bacteria. Other jellies are useless because they melt under the requisite conditions. Recently it has been found to possess considerable therapeutic value in the cure of chronic constipation. Its action is dependent on the fact that it has the property of absorbing and holding water, becoming at the digestive enzymes. The action is not violent as with ordinary cathartics, and it leaves no harmful after effects. It has also been found a valuable dressing for certain types of wounds. Emulsions for photographic plates much superior to the ordinary gelatin emulsions are claimed to have been made.

On the New England coast of this country there are men who make their living by gathering Irish moss and manufacturing carrageenin, as its gelatinous extract is called.

LARGE HEALTH MEETING AND SEMI-CENTENNIAL IN NEW YORK

(By Science Service)

New York, November .- One of the largest health gatherings that this country has ever witnessed will be held this week and next when there will be a health institute, a health exposition, and the fiftieth annual meeting of the American Public Health Association.

This week (November 8-11) visits, demonstrations and lectures on a large variety of public health and medical matters at New York's laboratories, museums, hospitals and other health centers, will be held, and next week the half century mark of the American Public Health Association will be celebrated by a large annual meeting which will include addresses and papers on all phases of health from food and drugs to health administration and control.

Present at the meetings will be Dr. Stephen Smith, who fifty years ago founded the association. Though now 99 years old, he is still active in health work. He will be honored with a souvenir medal at the meeting.

MORE WHITE WAYS WOULD PREVENT NIGHT TRAFFIC ACCIDENTS (By Science Service)

Rochester, N. Y., November .- Over a sixth of the people killed in auto-Lighting, according to a report made by Earl A. Anderson and O. F. Haas to the lighting Engineering Society.

It is estimated that \$1,000,000,000 in money each year is lost on account of all street accidents, and that nearly half of this is due to lack of light. According to the census reports the total expenditure for street lighting in the United States is not in excess of \$50,000,000. Three to ten times as much light as is furnished on most city streets is an entirely feasible proposition and would largely reduce the present accidents, these investigators declare.

## SHALE: THE FUTURE SOURCE OF OIL By M. W/ von Bernewitz (Science Service)

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The observing public knows pretty well that an enormous quantity of oil and distillates are consumed, for what purposes, and that the demand is growing rapidly. From the stove in a house to driving a battleship is a comparative use for crude oil; moving parts in machinery must be lubricated, hence the use of refined oil; and from the airplane to a large motor-truck is another comparison for the distillate gasoline.

The world has great resources of petroleum, and every country is searching for more deposits; yet consumption is so large that it overtakes production and stocks are decreasing. Although the output is increasing, it will soon reach the limit possible. From 1857 to 1920, the world produced 7,000,000 barrels of oil, of which the United States yielded 70 per cent. Nearly an equal quantity remains, but consumption now-a-days is many times that of the earlier years of production. The United States is supplying 70 per cent of all the oil at present. The public generally does not know that the oil reserves of this country are counted by years, and that our Geological Survey estimates not much over 20 years of oil remaining. That is the position: the end in sight, and an ever-increasing demand. How is it to be met? The remedy is at hand, namely, oil-shale; and the problem is under consideration.

That Colorado, Nevada, Utah, and Wyoming contained vast deposits of oil-shale has long been known; but the necessity of their utilization has not been warranted until recent years, when the petroleum situation became acute. Besides, the shales are in more or less arid and inaccessible regions of high elevation, rendering their exploration rather difficult. In those four states it is conservatively estimated that there is a reserve of 50,000,000,000 barrels of oil.

Other States have shale, such as California, Kentucky, Montana, Pennsylvania, and West Virginia, but they are too low in oil to be worth development at present. Eastern Canada has shale, also Brazil, England, Scotland, France, New South Wales, South Africa and other countries, so the world has a great potential supply of oil.

The making -- for such it is termed -- of shale-oil from oil-shale is by no means new. The Scotch shales have been worked for 50 years, and 3,500,000 tons are mined annually, while those in New South Wales, Australia, have been mined for 15 years.

Oil-shales are sedimentary in origin. They consist of dense, dark-brown, tough, but friable clays, originally laid down as muddy deposits in shallow seas. The strata or layers are separated by sandstone. The resultant beds were subjected to upheaval, erosion, and uncovering. Rivers cut through and exposed them. The generally accepted theory--the organic--of the origin of the oil-forming elements is that of countless small plants, fish, and animals were imbedded in the muddy deposits. Another theory, highly respected, is that shales represent an old oilfield.

Unlike the sands of petroleum areas in California, Oklahoma, Pennsylvania, Texas, Wyoming, and other States, shale contains no oil as such. But it contains the hydro-carbons, or essential ingredients for making oil, in their primary condition. This matter has been termed 'kerogen' and petrogen'. When sands are drilled, oil commences to flow; but when shales are drilled, nothing happens; yet when heated, vapor comes off; which when condensed, becomes oil. Hence, the oil-shale industry will be a mining and metallurgical problem. Deposits of shale are easily sampled and estimated as to quantity. Mining in many cases will be similar to that of coal, minus the attendant danger. Eduction, that is, making the oil, will be by means of retorts, condensers, and refineries.

The yield of oil per ton of shale is estimated in Colorado to be 20 gallons, or say half a barrel. In some of the States mentioned it is more, and in the various strata of the same deposit it will vary. In Scotland the yield is over 30 Ballons. In New South Wales it is up to 100 gallons, which is  $2\frac{1}{2}$  barrels. The oil is of high grade, having a paraffin base, just as do the oils of the mid-Continent field of the United States. Many by-products are obtained during retorting, such as illuminating oils, gasoline (termed 'shalene'), lubricating oils, grease, wax, and ammonium sulphate.

The oil-shale, or 'petro-shale', deposits of the Rocky Mountain States are now receiving considerable attention, and investigation is under way by Government and private individuals. There will not be as much risk in working oil-shale as oil field, though the capital required may be greater. In Scotland they have ppaid good dividends. Shale oil production will gradually increase until in 1950, shale fields will have replaced real cilfields, and they will insure a fegular supply of oil for many generations to come. (Editors: These six groups of paragraphs can be used as an editorial page feature, or they will come in handy as fillers.)

DO YOU KNOW THAT --

A ship's cargo, consisting of a million nails, was recently recovered from the bottom of the sea. Hany of the kegs containing the nails were broken wide open and their contents was strewn far and wide in the mud. The feat of recovering the nails was easily performed by means of a big lifting magnet.

A single bill of paper money may carry as many as one hundred thousand bacteria. These are mostly of the type found in the intestines, but disease producing bacteria may also be present.

Steel ties are extensively employed on only one American road, though they are in common use in continental Europe.

The Vormont Experiment Station has recently shown that the number of thorns which a blackberry vine produces is determined by the amount of light which it receives. Plants grown under shade produced only a few weak prickles while those grown in full sunlight produced their full complement of very stiff, stout spines.

DO YOU KNOW THAT ---

At the largest copper mine in the United States, located at Bingham, Utah, the ore yields only 30 pounds of copper to the ton. A few years ago such low-grade ore was not thought worth mining, but improved methods and large-scale operation have made this mine very profitable.

An aviator, Major C. R. Carr, whochas had much experience in flying over snow-covered lands, accompanies Sir Ernest Shackleton's present expedition to the Antarctic. One of his duties will be to scout out passages between the ice floes for the ship which carries the explorers.

A zoopraxinoscope is an instrument by which pictures projected on a screen are made to exhibit the natural movements of animals. It was one of the forerunners of the cinematograph.

It has been found that salts of lead, in very small amounts will stimwhate plant growth.

DO YOU KNOW THAT --

It is estimated that 150,000,000 cubic feet of natural gas is wasted annually in this country with domestic appliances alone. If this amount of wasted natural gas were replaced by artificial gas at \$1.25 per thousand, it would cost a million dollars a day.

Nearly twenty-two billion telephone messages were sont in the United States in the year 1917.

It has been demonstrated at the University of Minnesota that there are at least 25 distinct varieties of the stem rust of cereals and grasses.

Gold was comparatively scarce in the Middle Ages. It is estimated that the total stock of this metal in Europe at the time America was discovered did not exceed a value of \$225,000,000. DO YOU KNOW THAT ---

Venice has enjoyed almost a monopoly of the manufacture of glass boads ever since the fourteenth century. About a thousand Venetian artisans devote their time to this industry.

A campaign recently waged against rats in a small town in Virginia resulted in 30,000 tails being turned in as evidence of its success.

Spider silk is used in telescopes and various other optical instruments to indicate by cross lines points in the field of vision. Many attempts have been made to substitute spiders for silkworms in the production of silk for general use, and a small industry of this description exists in Madagascar.

A recent note in SCIENCE records what is believed to be the temperate zone record for a single season's growth of a shoot of the tree type of woody plant. This phenomenal shoot grew from the stump of a beheaded Paulownia and reacheda height of 21 feet 6 inches, a circumference of 10 inches at the base, and had 24 leaves, one of which, measured in late July, was found to be 38 inches long in the largest dimension.

DO YOU KNOW THAT ---

A radish will turn its leaves toward a source of light no stronger than that of a candle twenty-five feet away, while one of the cresses is similarly sensitive to light of a strength equal to that from a candle about one hundred eighty feet away .

A species of globefish, known on the shores of New England and Long Island as the swelldoodle, puffer, eggfish and bellows-fish, when lifted from the water inflates its body by means of short, jerky inspirations of air. If dropped on the ground it will bounce about like a rubber ball.

California produces 99% of the total domestic crop of almonds and 96% of the walnuts.

Of the towns in the United States supplied with gas, about half use natural gas and half artificial: More than 2,100 communities are using natural gas, with a total of 2,500,000 consumers, but the supply is waning and these figures will probably be much reduced in a few years.

DO YOU KNOW THAT ---

When the House of Commons was first lighted by gas, the architect insisted that the gas pipes be run at least four inches away from the walls to avert fire. He believed that the illuminant passed through the pipes in the form of a red-hot vapor.

The "Ophir" of the Bible, from which King Solomon obtained gold, is now plausibly identified with Zimbabwe, in Southern Rhodesia, where the remains of ancient gold mineshave been found.

Some very sensitive tendrils will respond with a curvature to the friction, produced if a bit of thread weighing about one hundred-millionth of an ounce/being blown across it by the wind.

One of the most remarkable undertakings in the history of coal mining Was the sinking of a shaft in the bed of the Firth of Forth, half a mile from the shore, off the town of Borrowstounness (pronounced Boness). The top of the shaft was surrounded by a quay, at which vessels could load coal. After being used for many years the shaft was engulfed by an unusually high tide and the miners were all drowned.