SCIENCE NEWS

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CHEMISTRY IN THE FIELD OF MICROBIOLOGY

PLANS for a systematic campaign against the minutest and most dangerous enemies of mankind were developed in the Division of Medicinal Products of the American Chemical Society in session at Baltimore on April 10. For the first time in the history of the healing art, chemists are cooperating with bacteriologists and physicians in the effort to make compounds that will be harmless to the human body and yet will poison or paralyze the noxious plant and animal parasites that prey upon it.

New tactics are being employed in this campaign. Professor Treat B. Johnson, of Yale University, in opening the symposium on "Chemistry in the field of microbiology" advanced the novel idea that the first step was to find out what the microbes were made of in order to find a drug that would kill them. He is accordingly engaged in growing tubercle bacilli by the pound and then analyzing them, and he has already discovered in these microscopic creatures a nitrogen compound hitherto unknown to biologists.

Dr. Carl Voegtlin, of the Hygienic Laboratory of the U. S. Public Health Service, is working on organic compounds containing arsenic in order to discover one that will penetrate the human tissue in pursuit of the parasite more freely than the earlier arsenicals introduced by the late Professor Ehrlich, of Germany. He reports that it is possible to produce a peculiarly active form of arsenic that will attack the mechanism by which the microbes breathe.

Dr. John W. Churchman, of the Loomis Laboratory, New York City, finds that certain of the aniline dyes will attack and paralyze particular species of bacteria so they can be used as antiseptics, both for skin wounds and internal infection. Solutions of these dyes strong enough to check infection may be left in cavities, such as the joints, since they are too weak to damage the tissues. He thinks it not improbable that we shall soon be able to combat many cases of blood poisoning successfully.

Dr. Veader Leonard, of the Johns Hopkins University, has made a new antiseptic that promises to be of great value. It is a derivative of the familiar coal-tar compound, resorcinol, and is called "hexyl-resorcinol." This is more than 15,000 per cent. stronger as a germicide than the mother substance, resorcinol, yet is probably less poisonous. The new compound is excreted through the urinary tract so is likely to serve as a cure for infections of this region.

Professor George W. Raiziss, of the University of Pennsylvania, has prepared chemically and investigated biologically a number of new dyestuffs containing mercury and has found two which are so much less toxic than the common mercury bichloride that they may be injected directly into the blood. In tests on rabbits they were found to be as curative against blood infections as mercurochrome, which is one of the recent products of such research.

The discovery of mercurochrome, meroxyl and similar antiseptics was no lucky accident but the result of the systematic investigations that have been carried on at the Brady Urological Institute of Johns Hopkins Hospital for the last eight years. Dr. Hugh H. Young, director of the institute, reported that in the progress of these investigations 265 dyestuffs had been studied and tested for their power of destroying germs and several drugs had been found among them that are useful as remedies for local or general infection.

RADIOACTIVITY AND THE AGE OF THE EARTH

EXPLODING atoms, changing uranium into lead, are giving geologists a clew to the age of the earth. Science is beginning to learn how to read the radioactive time clock that is contained in many of the rocks of the earth's crust.

An age of at least 1,250,000,000 years has been assigned to the earth by experiments reported to Professor A. C. Lane, of Tufts College, chairman of the committee of the National Research Council on estimation of geologic age by atomic disintegration, which is carrying on extensive investigations. Dr. H. V. Ellsworth, of the same committee and of the Canadian Geological Survey, Ottawa, has made analyses of the original crust of the earth in the Canadian region, and the relative amount of the radioactive elements and the lead decomposition products indicates that those minerals date back a billion and a quarter years in that region. Professor Lane, in a report to the Canadian Mining Institute, called attention to this method as about the only way of safely matching beds and determining their order in the early days before there were any well marked fossils, in the ages which he calls "collozoic" because the animals may have been but jelly. Of course even these immense stretches of years do not go back to the time when the earth was molten, and Dr. T. C. Chamberlin, of the University of Chicago, has doubted if it ever was. But Dr. Lane has pointed out a possible way of figuring how long ago it was if it was.

The lead derived from radium, while indistinguishable in every other way from ordinary lead, is slightly lighter, the weight of its atom being 206 while that of ordinary lead is 207.18. On the other hand, thorium also yields lead which has a little greater weight, say 208. Now why should not lead from different places have more range in weight? Dr. T. W. Richards, of Harvard University, the famous chemist and Nobel prize winner, has suggested that ordinary lead dates back to a molten earth, and generally speaking that it was the mixing that then took place which makes the atomic weight so

uniform. Kirsch, the geologist, has suggested that both thorium and radium are produced from uranium but at different rates.

Dr. Lane believes that if Kirsch and Richards are right, some 240 million years earlier than the earliest known mineral cited by Kirsch the uranium must have contained the atoms changing to thorium and to uranium in such proportions that they would give ordinary lead, so that if ordinary lead was formed that way the molten condition of the world antedates the ancient granites of moss in south Norway about a quarter of a billion years.

Even these are not the earliest minerals known; yet, making some allowance for lead not so derived, it is assumed that they are 900 million years old. Thus geologists can say that there is no reason to believe the earth crusted over less than 1,100,000,000 years ago.

On a recent trip to Europe, Dr. Lane secured chemical analyses which show that the Katanga region of Africa which is now producing radium and copper at low cost is twice as old as the last time of geologic upheaval in the Appalachian region of the eastern United States and half as old as some Canadian rocks. He believes that radioactive methods of setting the ages of rocks will unravel the structure of ore depositing intrusive rocks in Canada which now lead the world in silver and nickel production and are overtaking the Rand in gold.

FOSSIL REMAINS IN THE ARCHAEAN ROCKS

PROOF that life existed on the earth when the oldest of known rocks were formed is claimed by Dr. John W. Gruner, of the department of geology of the University of Minnesota. He has shown traces of blue-green algae, very primitive microscopic plants, to be present in rocks of the age known to geologists as Archaean, which have hitherto been thought to be devoid of all fossil remains. In the past, indeed, many geologists believed that most of the Archaean rocks were formed by direct cooling of a molten earth, which would, of course, have meant a temperature too high for the existence of any life.

The rocks in which the new life traces were discovered have in the course of ages been subjected to immense pressures, partial solutions and recrystallization processes, to such an extent that the exact nature of the plant remains can not be stated with certainty; but botanists at the university have no doubt that they were some kind of algae. If they were algae of the blue-green type, there is still a possibility that they may have existed in a very warm environment, for plants of this kind still live in the nearly boiling natural waters of Yellowstone Park and other hot springs regions; though blue-green algae are also common in water of ordinary temperatures.

Because of the fact that most of the oldest fossils hitherto known, from rocks much younger than the Archaean, were of animals and plants relatively high in the evolutionary scale, biologists and geologists have long predicted on theoretical grounds that simpler remains would some day be found in older formations. Dr. Gruner's find is therefore looked upon as an interesting confirmation of this scientific prophecy. And inasmuch as blue-green algae were among the plants whose probable early existence was looked for, the fulfillment is regarded as the more accurate.

Other organic remains of almost equal age have been found in rocks of the Algonkian and Huronian periods by Dr. Charles D. Walcott, secretary of the Smithsonian Institution of Washington. In these rocks, which belong to the geological times immediately following the Archaean, Dr. Walcott has demonstrated the existence of blue-green algae and bacteria; but here, as also in the Archaean, no sure sign of animal life has yet been found. Animal fossils appear for the first time in the Cambrian, which followed these three earliest geological epochs.

THE ORIGIN OF OIL POOLS

MOST of the vast oil pools of the world were built up by swarms of microscopic plants and animals, each contributing its infinitesimal bit to the total as it died and settled to the oozy ocean floor many ages ago. Dr. Junius Henderson, of the University of Colorado, advanced this thesis before the meeting of the American Association of Petroleum Geologists in session at Wichita, Kansas.

Dr. Henderson discounted the theory advanced by some geologists that all petroleum is derived from the remains of fishes, overwhelmed in shoals by great showers of volcanic ash, as both insufficient and unnecessary to account for the presence of oil. He pointed out that while fish bones and scales are frequently found associated with oil deposits, such deposits are also frequently found with no traces of fish remains.

In defense of his claim that oil originated from minute plants and animals, he said: "While they are not usually so rich in oil as some fishes, their composition is such as to make them a quite possible source of petroleum under favorable circumstances, their size is such that they are easily buried by ordinary processes of sedimentation, their prodigious numbers compensate for their small size, and they are actually found to enter largely into the composition of certain formations rich in petroleum, in which fish remains are uncommon."

How the study of fossils aids in the location of oil was told by Dr. David White, chairman of the division of geology and geography of the National Research Council. Though the practice was started only a few years ago, many oil companies now have paleontologists on their staffs whose studies of fossils, often of microscopic size, greatly facilitate the finding of oil and saves the boring of many useless holes. The work, however, is still only in the pioneer stage, Dr. White stated. Many of the men at work in the field need further training, and almost all of them are handicapped by the lack of proper libraries of reference books and by the difficulty of getting at the large collections in museums for purposes of comparing their materials. Improvement in these respects will mean even greater economies, he stated. He announced also that the National Research Council is preparing a directory of all students and

specialists working on small fossils found in the oil fields, and hopes to facilitate the advancement of this branch of oil work by making the work of experts and the facilities of libraries more available to field workers.

Dr. W. A. J. M. van der Gracht, of Houston, discussed his geological studies in the High Plains region of western Texas. He has found in this region continuations of geological formations of the highlands of the eastern United States and Canada, which are lost in intervening regions. Parts of these regions contain gas and oil deposits of considerable promise.

INSECT WARFARE

GOVERNMENT research workers seeking for the most effective poisons to use against the cotton boll weevil of the South, the alfalfa weevil of the West and others of the horde of insect pests everywhere, have found themselves confronted with some pretty problems in electrical physics. The Bureau of Entomology and the Bureau of Standards are now cooperating in an endeavor to find cheaper and more effective methods for insect warfare by solving some of them.

The antics of the minute particles in the dry poison dusts that are used against the boll weevil and other pests furnish a very interesting electrical puzzle. Some time ago it was found that a fine dry dust of calcium arsenate or other poison would stick to leaves just about as well as a liquid spray. It was cheaper to apply the poisons in this way, and for some purposes more effective as well. But poison dusts have been found to vary considerably in the thoroughness with which they cover the leaves, and also in the length of time they will stick before being blown or washed off.

It has been suggested that static electricity is at the bottom of this behavior. As the microscopic particles of the poison dust, some of which are as small as five microns or one five thousandths of an inch, in diameter, swirl through the nozzle of the spray gun the friction apparently gives them an electrical charge. "Like charges repel; unlike attract," says the old rule. If the particles receive similar charges each one will push its neighbor away and "flock by itself." This will result in an even distribution of the poison dust over the plants, so that each weevil will have a chance to get the fatal mouthful he is entitled to. But if the particles receive mixed charges the opposites will attract each other, and little clumps of ten or a hundred of them will form, resulting in an uneven distribution. Obviously, the desirable thing is to devise apparatus that will give a uniform charge to the particles, and thus get thorough distribution of the poison at lower cost.

Another suggestion is that the natural electrical charge of the earth, which extends into the plants as into a sort of antennae, attracts and holds the particles if they happen to bear an electrical charge of opposite sign. However, investigators of the Bureau of Standards, while they admit the possibility of this phenomenon, are not inclined to make much of its importance.

The behavior of the minute droplets of liquid sprays also is controlled by electrical charges, but in a somewhat different manner. The liquid drop acquires its charge by the chemical action of the dissolved arsenic compound rather than friction, and is attracted by small electrical charges in the living parts of the plant itself.

The summer campaign of the boll weevil is being eagerly studied and anticipated by government specialists and by the cotton industry.

Agents of the Department of Agriculture have collected 6,500 pounds of Spanish moss from plantations in Louisiana, South Carolina and Georgia, and have carefully counted the weevils that survived the winter in the moss. Last summer was so hot and dry that few weevils raised the usual large families, but many of those that survived the summer spent a fairly comfortable winter in their hibernating quarters. Consequently, what the department calls a "normal" number of weevils are on hand to start the season in the southeastern states. From Alabama westward the infestation this year is expected to be fairly light.

However, these records are merely indications of what may be expected, and do not represent in any way the final damage which may be expected for the season. The weather, which is a big, unforeseeable factor, may change the outlook entirely.

Conditions last year were so favorable to the cotton growers that many farmers have concluded that weevil control measures are no longer necessary, that the pest is at last conquered. This feeling will surely result in disaster if it persists, representatives of the department believe. The cold winter and hot summer of last year and the activity of the leafworm which starved out so many weevils represent a combination of circumstances which is not likely to recur in many years. Farmers are being urged to lay in an advance supply of calcium arsenate and of necessary machines for applying it, so that the weevil hordes may be attacked when the squares of the young cotton appear.

ITEMS

WHAT may be a genuine companion to the sun has been discovered in the constellation of Taurus, the Bull, according to a study by Dr. W. J. Luyten, of the Harvard College Observatory. The star, which is known as 46 Tauri, and just barely visible to the unaided eye, has been observed at the Lick Observatory in California, and the Dominion Astrophysical Observatory at Victoria, B. C. It is approaching the sun at a speed of about half a kilometer per second, which is a very slow velocity, astronomically speaking. As its motion across the sky is also relatively slight, it is believed to be moving through space with the sun.

THE government exploration party which is traveling to the northern wilderness of Alaska in order to chart the oil resources of Naval Petroleum Reserve No. 4, has made the first 150 miles of its dog team journey, according to telegraphic advices to the U. S. Geological Survey. The party, which consists of Gerald Fitzgerald, topographer, Walter R. Smith, geologist, and two assistants, still has 500 miles to go over the mail trail before striking off into the wilderness at the top of the continent.