SCIENCE NEWS

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THE INTERNATIONAL CONGRESS OF SOIL SCIENCE

SOIL nitrates, one of the most important classes of plant nutrients, are materially increased by the addition of other fertilizers in proper amounts. This is the central idea of a paper by Professor A. B. Beaumont of Massachusetts Agricultural College, before the second International Congress of Soil Science, which opened at Leningrad on July 20. He added graded amounts of various types of fertilizer to different kinds of soils, and tested for increase or decrease in nitrates. Lime, he found, increased the nitrate concentration, in amounts up to six tons of lime to the acre. Beyond that amount lime was not beneficial; in some cases large amounts depressed nitrification. Green crops plowed under checked nitrification for three or four weeks, but after that time nitrates again accumulated rapidly. The addition of nitrate fertilizers naturally increased the amount of soil nitrates, but in some instances it was found that the natural reactions and biological activities in the soil increased the soil nitrates over the figure allowed for even in adding the nitrogen fertilizers. Only one non-nitrogenous fertilizer element, phosphorus, had a consistent tendency to decrease soil nitrification.

FLOWERPOTS that water themselves were demonstrated before a large group of Russian and foreign scientists by Professor E. P. Deatrick of West Virginia University. The device used is known as the auto-irrigator, and is the invention of Professor B. E. Livingston of the Johns Hopkins University. It consists of a cone-shaped vessel of porous porcelain, to the neck of which a glass tube can be attached, leading to a water reservoir. As the plant removes water from the soil, the soil permits water to ooze out through the walls of the cone, maintaining an even state of moisture much more satisfactorily and with much less labor than is the case with the old method of pouring water into the pots from the top. Professor Deatrick showed results from experiments conducted with a battery of 150 four-gallon pots, all equipped with auto-irrigator systems.

PROFESSOR S. KRAVKOV has developed a method for restoring fertility to apparently exhausted soils without the use of fertilizers. It consists of keeping the soil to be treated under optimum physical conditions, especially as regards temperature, moisture and aeration, while the natural microbiotic population builds itself up and captures nitrogen from the air. Professor Kravkov stated that he had increased the nitrogen content of "podsol," a poor, gray soil found in certain forest lands, approximately tenfold by his method.

To find out how little lime there is in the soil, find out how much iron there is in the plants that grow on it. This, in rough outline, is the field method of soil analysis used by Professor Oscar Eckstein, of Berlin. It is not of much practical value, Professor Eckstein said, to determine by analysis the total calcium content of a soil. Not all the calcium in it is available to plants, and it is only the available calcium that really counts. But it has been learned that there is an antagonism between calcium and iron, and when a plant gets too little calcium it is very apt to take up an excess of iron. Iron in a plant stem can be detected very easily, by means of several different chemicals that cause a change of color when it is present. So by this indirect method it is possible to determine whether or not there is sufficient calcium in a given piece of land.

IRON in the soil has a constant tendency to break up aluminum compounds it finds there and set the aluminum adrift. This is indicated by experiments reported by Dr. J. S. Joffe, of the New Jersey Agricultural Experiment Station. Analyses of river waters showed that ordinarily they contain more aluminum than iron. In an endeavor to learn how this comes about, Dr. Joffe added a soluble iron compound to samples of soil, and found that in the solutions he got out again the iron had decreased in concentration, having been captured and held by the soil, accompanied by a release of aluminum. But when soil containing a good deal of iron had a soluble aluminum compound added, it did not lose any of the iron.

SULPHUR must take its place on the list of approved fertilizer minerals, at least for certain types of land. Such is the indication of experiments performed by Professor W. L. Powers, of the Oregon Agricultural Experiment Station. Professor Powers has attacked the problem of black alkali, one of the most hopeless types of land ruin in the arid and irrigated West. He found that applications of sulphur, especially when used in combination with a nitrogen-rich organic fertilizer, will reclaim such land and make it yield good crops. Even normal land is often benefited by sulphur application, he found. Sulphur-treated fields produced higher yields of alfalfa, which had a richer, greener growth than that of the unsulphured fields.

NITROGEN-FIXING bacteria are active even in the arid soils of the desert, according to Professor P. S. Burgess, of the Arizona Agricultural Experiment Station. We usually think of these nitrogen-capturing microbes as active only in soils where higher plants leave something for them to feed on; but Professor Burgess found that in the desert soils there were enough algae, free-living one-celled plants, to supply at least part of the foodstuffs needed by the bacteria. The bacteria are able to thrive also in the presence of rather high concentrations of alkali.

BACTERIA are the chief chemists of the multiplex changes of material that are constantly going on in the

soil. We have begun to understand their work, but our understanding so far is only a beginning, and soil microbiology is on the threshold of a development that will dwarf all present accomplishments in that field. These were among the ideas presented by Professor Selman I. Waksman, of the New Jersey Agricultural Experiment Station. Professor Waksman's paper summed up the present status of soil microbiology, with special stress on recent developments. While soil microbiology is rapidly growing up into an independent branch of science, its future still depends on its continued contact with its parent sciences, Professor Waksman emphasized. General bacteriology and the study of the fungi, on the one hand, and soil chemistry on the other, will both make large contributions to its development and receive new growth themselves from the data which it will produce.

EVERY plant that sends its roots down into the soil gathers to itself a great crowd of microscopic hangers-on, like the vassals around a baron of old. It greatly promotes the growth of soil bacteria and to a less degree it encourages fungi and other soil microbes, according to Professor Robert L. Starkey, of the New Jersey Agricultural Experiment Station. Plants seem to produce a substance or substances through their roots, that bacteria find available for their needs, for the microorganisms grow thickest in immediate contact with the roots and are much scarcer a fraction of an inch away.

THE FOOD OF MALARIA MOSQUITOES

TWO Russian investigators, Drs. N. Kadletz and L. Kusmina, have devised a method for forcibly feeding malaria mosquitoes. They imprison a captured mosquito between a slip of thin glass or cellophane and a fold of soft paper, tightly enough to hold her but not so tightly as to break any legs or wings. Then they slip an exceedingly fine glass tube over her proboscis, and by this means feed her on any liquid they wish to try out. In a large percentage of cases the captive mosquito will begin pumping as soon as the liquid comes into contact with her mouthparts.

This forcible feeding method makes it possible to try out many other things besides blood, and thus to study the mosquito's food preferences, her digestive reactions and her susceptibility to various poisons.

One of the first results of the experiments was the interesting discovery that mosquitoes like syrups better than they do blood. In one "run," the insects consented to drink in 90 per cent. of all tries with sweetened water, but took blood in only 48 per cent. This indicates, in the opinion of Drs. Kadletz and Kusmina, that the preferred diet of even female mosquitoes may after all be plant nectars and saps, and that they develop ogreish appetites only on occasion.

Mosquitoes can be fooled, too. Glycerin, which has no food value, apparently tastes sweet to them just as it does to us, for they drink it as though it were a syrup. But when they do, it does not seem to have the same reaction in the digestive tract, for only the crop, or front part of the tube, becomes filled, whereas when blood or a salty bouillon is fed the whole abdomen swells.

Tests were made with hibernating mosquitoes. Some of the insects store up fat like bears in summer, and like bears they live on their fat while they doze the winter through. If such hibernating mosquitoes are roused by warming, most of them will refuse to feed, even if their beaks are left in the feeding tube for a long time. But some of them will accept syrup or blood; and this willingness of a few of the hibernators to take a meal may explain the occasional mysterious attacks of malaria that occur in winter when there are supposedly no mosquitoes around.

When offered unknown fluids, mosquitoes react differently, according to the nature of the stuff in the tube. They can be tricked into drinking poisons, such as formalin, quinine and corrosive alkalies, as if they were ordinary water.* But they will not take any kind of ethereal oil, even in the smallest quantity. Syrups which the insects had previously drunk with eagerness were flatly refused when a trace of clove oil was added.

MILK FROM SUN-BATHED COWS

SUN-BATHS for cows may have advertising value, but experimental evidence shows that milk from them does not have the power to prevent rickets. A group of scientists at the University of Wisconsin report in a recent journal the findings of a series of experiments which show rather conclusively that "daily exposure of cows to sunlight has little if any effect upon the antirachitic potency of milk."

The flavor and general quality of summer-produced butter has suggested to scientists as well as to laymen that there may also be a difference in the vitamin value of milk from cows which have been in sunlight and those which have been kept in a barn all the time.

Vitamin D prevents rickets by promoting the formation of calcium phosphate in bones. Animals, both human and otherwise, obtain vitamin D either from food or from the action of sunlight upon their bodies. The source of the vitamin D which the cow puts into her milk is of greatest importance. It is especially necessary that cows get this particular vitamin, since babies are so completely dependent upon milk for their supply of this rickets-preventing vitamin.

Early investigators in the field of vitamins were inclined to believe that milk from sun-bathed cows showed greater powers of bone growth. The burden of proof points to the fact that "well recognized superior quality of summer-produced butter and milk must have its primary origin in other factors than sunlight acting directly upon the cows." The authors state that in all of their experiments "no improvement in milk or butter fat secretion was observed."

E. M. Luce, who is also working in this field, is quoted by the authors as concluding from experiments that any antirachitic properties of milk depended not upon the amount of sunlight the cows had, but upon their diet. This knowledge is of vital importance to the owners of dairy herds, especially those whose dairies supply the milk for thousands of city children, whose chance at sunlight is pretty small. It is not sufficient that cows have sunlight. They must be fed rations which contain vita-

min D ready made, in order that their milk will keep children from having rickets.

THE IDAHO FOSSIL HORSE

FOSSIL bones of a new species of extinct horse, discovered in Idaho by J. W. Gidley, of the U. S. National Museum, have made an evolutionary prediction good, just as the recently found planet Pluto made an astronomical prediction good.

When paleontologists arranged all the fossils of the many extinct horse species in the order of their geologic age some years ago it was found that they also fell into a structural order. They showed graded series of characters that fairly shouted "evolution." Most notable were the step-like increase in size, and the decrease in the number of toes from five in the little Eohippus to one in the modern horse.

There were three gaps in the series, however, and it was predicted from the characters of the species on either side of each gap what the animal would be like that filled it when it was finally discovered. Two of the gaps have now been filled, Mr. Gidley's find constituting a new species of the genus immediately below the modern, one-toed horse.

The skeletons and skulls of the horses found by Mr. Gidley were buried in what seems to have been a boghole in a watercourse. There was a great mass of plant material along with the bones, consisting principally of leaves and twigs of trees, of species as yet unidentified. It is unusual to find fossil plant and animal remains in the same place, for the conditions required for their preservation are not always alike. In the present instance, the plant remains influenced the character of the fossils, for the bones from the lower part of the pit are darkly stained with bog-iron, leached out of the leaves.

Other animal remains found in the pit with the horse skeletons represent a species of giant peccary or wild hog, a large beaver, a mastodon, an animal that is probably a badger, an otter-like animal, turtles, frogs and fish. Outside the pit but in the same neighborhood and in the same geological deposit Mr. Gidley found a small mastodon, only seven or eight feet high, and a cat about the size of a small mountain lion. Both of these may be new species. In addition he found bones of two species of camel, one of them about the same size as the modern camel and the other much longer-legged and longer-necked. There were also bones of a small sloth, of the giant peccary, and of beavers, pocket gophers and field mice.

ITEMS

BECAUSE of a year's delay in obtaining radium for the Marie Curie Radium Institute of Warsaw, for which Madame Curie was given $50,000 in 1929 by a group of Americans, the hospital will not be able to open its doors until December. The delay has had its advantages, however, for the interest on the money will be sufficient to purchase platinum screens for the radium when it becomes available. Madame Curie said that the demand for radium was now so great that the producers are far behind in filling their orders. Only one gram is required for the Warsaw hospital, and although it was ordered last November when Madame Curie returned with the purchase money, its delivery will require another five months.

INSECTS that are worth ten dollars a million are cheap at the price, for they prey on the eggs of other insects, thereby preventing the pests from ever seeing the light. They are the almost microscopic wasps known as *Trichogramma* which are reared in captivity by Stanley E. Flanders, entomologist of the Citrus Experiment Station. Mr. Flanders has been at this work for some time now, and has improved his rearing methods to a point where the tiny parasites can be produced at a thousand for a cent. They are shipped out in great numbers to orchardists, who release them to assist in their endless warfare on fruit-spoiling insect pests.

A PIECE of petrified wood from Yellowstone National Park, so perfectly preserved that even the finest microscopic details are practically as clear under the high-power lens as those of modern wood, is described and illustrated in *The American Journal of Botany* by Professor H. S. Conard, of Grinnell College. It was found in a region where the only previously described petrified woods were those of redwood trees, but its structure is more closely akin to that of one of the species of pine found in the park. Before it could be studied and photographed under the microscope, bits of it had to be ground down thinner than tissue paper, so that the light would shine through it.

TWIN snowflakes are responsible for the optical effect known as mock suns, or sun dogs. These are luminous spots that sometimes appear in the sky near the sun, observed in snowy weather in high altitudes. At the meeting of the American Meteorological Society, held in connection with the Pacific Division of the American Association for the Advancement of Science, Dr. John Mead Adams, of the University of California at Los Angeles, announced that he had produced these crystals artificially. The microscopic crystals that are born twins develop into a T-shaped crystal that refracts the light to produce the effect.

IT has been an accepted theory among sportsmen and commercial fishermen that salmon always return to spawn in the river where they were hatched and from where they travel out to sea. Last year a six-mile commercial aqueduct was opened, emptying into Grays Harbor, Washington. At the spawning time this spring, numbers of salmon entered the great pipe at the point where it pours its fresh water into the bay and traveled the six miles to where the pipe begins in an artificial lake. The fish were seen entering the pipe and were later found in the lake. According to the water superintendent there are now thousands of baby salmon in the lake.