SCIENCE NEWS

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THE ORBIT OF "PLANET X"

DOUBTS that the new member of the solar system discovered beyond Neptune is the ninth major planet predicted by the late Professor Percival Lowell have been raised by computations of its orbit made at the Lowell Observatory, Flagstaff, Arizona, where the object was discovered, and reported in a telegram on April 13 by Dr. V. M. Slipher, the director.

While the position of the object, it was stated at the time of announcement of the discovery a month ago, seemed to conform to the expected orbit of the "ninth planet," it is now thought that it may be proved to be a unique asteroid or an extraordinary comet-like object.

Dr. Slipher reports that the "preliminary orbit of planet X" was computed by the Lowell Observatory staff with the aid of Dr. John A. Miller, director of the Sproul Observatory, using positions of the object on January 23, two days after it was first photographed, February 23 and March 23.

The computations give the eccentricity as slightly more than .9, meaning that the object sweeps through space in a greatly elongated ellipse, far flatter than the orbit of any known planet and more like that of a comet. The object's path is far more inclined to the plane of the earth's orbit than any major planet, the calculated inclination being 17 degrees 21 minutes.

Dr. Slipher reports the distance of the object from the sun as 41.3 times that of the earth. This is about the distance predicted by Professor Lowell for his "planet X."

The greatest diameter of the object's orbit exceeds by 40,000,000,000 miles that in its position closest to the sun. This is far greater than any distance hitherto measured within the solar system. The object has just begun to recede from its closest approach to the sun.

Dr. Slipher's report conforms to an announcement of an orbit computed by A. C. Bower and F. L. Whipple under the direction of Professor A. O. Leuschner, of the University of California Observatory at Berkeley. Professor Leuschner telegraphed:

"The Lowell result confirms the possible high eccentricity announced by us on April 5. Among the possibilities are a large asteroid greatly disturbed in its orbit by close approach to a major planet such as Jupiter, or it may be one of many long-period planetary objects yet to be discovered, or a bright cometary object.

"I have frequently referred to the close orbital and physical relationship of minor planets and comets. High eccentricity and small mass would seem to eliminate object as being planet X predicted by Lowell, and signify an unexpected discovery, nevertheless of highest astronomical importance and interest on account of the great distance of the object in the solar system at discovery."

Dr. Harlow Shapley, director of the Harvard Observatory, wired:

"The preliminary orbit indicates remarkable type of member of the solar system not comparable with known asteroids and comets, and perhaps of greater importance in cosmogony than would be another major planet beyond Neptune."

GRAVITY MEASUREMENTS AND ACCURATE MAPPING

EXACT determination of the force of the earth's attraction now in progress at the U. S. Bureau of Standards will make the United States independent of Germany in a few years in knowledge of how hard the earth pulls things toward it. Speaking on April 5 in a *Science Service* radio talk over the Columbia Broadcasting System, Dr. Paul R. Heyl told of the work, which is under his charge. Dr. Heyl's determination during the last few years of the "constant of gravity," from which scientists calculate the mass, or "weight," of the earth, is the most accurate that has yet been made.

The new measurement of the absolute value of gravity is being made to an accuracy of within one part in a million. It will help the surveyors of the Coast and Geodetic Survey to map the country more accurately than before.

"The surveying of large areas differs from small-scale work in that the curvature of the earth must be taken into account," Dr. Heyl explained. "It is not sufficient to assume that the surface is spherically curved, even on the Great Plains. One of the best ways of determining the change of curvature of the earth's surface is by the variation in the pull of gravity at different places. Where we are farther from the earth's center, the pull of gravity is less. But since such departures from spherical form are always very small compared to the size of the earth, we must be able to measure gravity very accurately indeed if the results are to be useful.

"Determinations of gravity are made throughout the United States on a comparative or relative basis, with reference to a base station, where the value of gravity should be known to as high an accuracy as possible. While it is a comparatively simple matter to compare different values of gravity with one another it is quite another thing to determine the absolute value of gravity at the base station.

"It happens that our Coast Survey has never had a real base station for gravity in this country. The measurements throughout the land have been compared, it is true, with the value of gravity at Washington, but the value at Washington traces its pedigree from the absolute gravity station at Potsdam in Germany. It is by no means as simple a matter as it appears to extend comparisons of gravity across the ocean, and without a base station of our own we are not quite sure of our ground. The experiments now in progress at the Bureau of Standards are for the purpose of establishing such a base station in our own country."

One very practical use of gravity measurements is in locating valuable deposits of oil and minerals.

"The pull of gravity may vary because of the nature

of the material beneath the surface at different places." It is possible that "there may be underground a large body of rather heavy rock, or again there may be a deposit of oil, very much lighter than the average crust of the earth, and consequently less attractive (from a gravitational point of view). Many an oil well has been discovered in this way; but it will be obvious that if the deposit is very deep it will require great precision in our gravity measurements to detect its presence."

The measurements are made with a very accurate pendulum. Both its length and the time it takes to swing can be measured with great accuracy. For the same length of pendulum, the greater the force of gravity, the more quickly does the pendulum oscillate.

THE PRODUCTION OF XYLOSE

XYLOSE, a sugar made from woody stuff, may come to figure as largely in American industry as its chemical cousin cellulose now does. A commercially practicable means of manufacturing it out of cottonseed hull bran, now a very low-value byproduct of the cottonseed industries, has been worked out at the U. S. Bureau of Standards and was discussed before the meeting of the American Chemical Society by one of the group of scientists who developed it, Dr. W. T. Schreiber.

Although xylose has almost the same chemical makeup as glucose, lactose and other food sugars, it is not expected to play its most important rôle as a food. It can be fermented into a variety of materials useful in industry, especially alcohol and such solvents as acetone, lactic acid and acetic acid. By other manipulations it can be turned into a basis for dyestuffs and food colors. Transformed into an allied substance, xylite, it may be treated as cellulose is treated to make guncotton, resulting in a new explosive which might be called nitroxylite.

Although the possible use for xylose as food is not large in bulk, it may be important nevertheless. It is not as sweet as common cane- or beet-sugar, but it has a definitely sweetish taste, and it may therefore turn out to be useful in the diet of diabetics, who can not tolerate ordinary forms of sugar. Xylose appears to be harmless to diabetics.

Xylose has been an expensive laboratory possibility for a long time, but its preparation from agricultural waste on a large scale makes it an important industrial novelty. The Bureau of Standards group that developed it includes S. F. Acree, who originated the present process for its manufacture, W. L. Hall, Max Bradshaw, Fred Acree, W. T. Schreiber, Klare Mackley, R. C. Geib, W. Eckhardt, Baker Wingfield, C. S. Slater and G. M. Kline.

THE REACTION OF PLANTS TO COLOR

ALTHOUGH plants have no eyes to see with, they can distinguish between different colors of light, and they paradoxically indicate their choice by bending toward the radiation that they find hardest on their growth. This preference by plant protoplasm is being explored by investigators at the Smithsonian Institution as a part of a program of research on the influence of radiation on living things sponsored by Dr. Charles G. Abbot, the secretary.

The group immediately concerned with the work is led by Dr. F. S. Brackett, physicist, and Dr. E. S. Johnston, plant physiologist. In one of the laboratory rooms they have arranged a dark chamber with an electric lamp at either end, its light passing through a color screen. A young plant is placed between the two, at a point where the energy of the opposing light-beams has been instrumentally determined as being exactly equal.

The plant thus finds itself in the position of the donkey exactly midway between two haystacks, which medieval philosophers are said to have argued about. Which will it choose? The way out of the dilemma is as though the donkey had found himself between a stack of timothy hay and one of clover: there is a qualitative choice. All kinds of visible lights seem to have a retarding effect on plant growth, but some have more than others; and the plant grows less on the side exposed to the more growth-retarding of the two beams, and therefore grows toward it, being pushed over by its more rapidly-growing side.

Red light, and the short-wave infra-red, the Smithsonian experiments have shown, have very little effect on growth. Yellow light still has little effect, though more than red. But the green sector of the spectrum has a powerful influence, and the blue-violet group of wave-lengths is stronger still in causing growing plant-tips to bend.

The work, Dr. Brackett informed *Science Service*, is still in its preliminary stages, and only broad groups of wave-lengths have so far been used. Apparatus is now being made that will enable the experimenters to split white light up into much more finely subdivided individual beams, and thereby make possible a much more exact test of the effect of each separate wave-length throughout the spectrum.

The research on the color likes and dislikes of growing plants is only a small part of the work projected by the Smithsonian Institution. Eventually the experimenters hope to get at some of the secrets of the mechanism by which the chlorophyll of green leaves uses sunlight to combine carbon dioxide and water to make sugar. But the barest beginnings of an understanding of the structure of these complex living molecules have yet to be worked out, and while the attack on this stubborn citadel of mystery is being organized, other problems, like that of the effect of light on growth, can properly be undertaken.

FUNGI AS A CAUSE OF BLUE STAIN IN TREES

BLUE stain is one of the most troublesome of timber ills in the South. A variety of it that attacks trees is found to depend for its entrance on an insect, one of the bark beetles, in somewhat the same way as malaria and yellow fever have been traced to the guilty germ-carrying activities of mosquitoes. Blue stain is due to the growth of certain fungi which discolor the wood and lower its market value; and it now appears that some of these organisms are active agents in the killing of pine trees.

The hooking up of the bark beetle and the blue stain fungus, each of which has been well known for some time as a serious pest in its own right, has been the work of three scientists in the U. S. Department of Agriculture, Dr. F. C. Craighead, R. M. Nelson and J. A. Beal. Dr. Craighead called especial attention to the fact that an onset of blue stain in a tree almost invariably followed a mass attack by small beetles, of the genus *Dendroctonus*, boring holes through the bark and mining galleries in the living inner bark tissue in which to lay their eggs. The blue stain started from these borings and in a short time the tree died, presumably through the choking up of the sap-carrying tubes in the wood.

Mr. Nelson and Mr. Beal demonstrated that the blue stain fungus can be planted in the wood of the tree through wounds, such as the bark beetle bores. They made artificial cultures of the fungus on sterilized rice paste, and brought this paste into contact with the wood of undiseased trees in various ways. From some trees they removed squares of bark, replacing them with poultices of the culture-paste. Other trees had holes bored in them and filled with the paste, and in still others the paste was planted by means of a grease gun. Typical blue stain infections developed as a result of all three types of inoculation.

Whether the association of bark beetles and blue stain is accidental, or whether the beetles get any benefit from the fungus, is something not yet determined. Dr. Craighead has pointed out that other beetles belonging to the same zoological group depend entirely for food on certain fungi that grow in their burrows. Or it may be that the benefits derived by the bark beetles are less direct; perhaps the best conditions for rearing their young are found in trees of just the stage of "deadness" induced by the fungus.

ITEMS

Two new diseases of potatoes, known as "Crinkle A" and "Para-crinkle," were described before a recent meeting of the Royal Society in London by R. N. Salaman and R. H. Le Pelley. Both diseases are related to such known plant ills as leaf mosaic, in that they are caused by filterable viruses, organisms so small that they pass through the pores of fine porcelain filters, and can not be detected with the highest powers of the microscope.

The conjecture that the direction sense or homing instinct of birds is connected in some way with their sex glands has received a setback at the hands of two Dutch ornithologists, G. J. van Oordt and C. J. A. C. Bol. They tried the simple experiment of releasing carrier pigeons which had been surgically unsexed. The birds found their way to the home loft as quickly and easily as did normal pigeons.

Calcium gluconate, a chemical made by the action of moulds once thought good for nothing but spoiling things, is a valuable addition to the feed of milch cows, it was reported to the American Chemical Society on April 9. The report was based on experiments conducted by W. A. Turner, E. A. Kane and W. S. Hale, of the U. S. Department of Agriculture. Calcium gluconate is a compound of gluconic acid, which is now made experimentally in quantities in the Department of Agriculture laboratories at Arlington, Virginia. A few years ago it was worth over $100 a pound, when it could be had at all; now its cost is down to about 35 cents a pound. This makes possible experiments looking toward its eventual practical use. The calcium gluconate was added to the feed of the cows as a possible source of additional lime for their blood and also for their milk. Lime salts are among the valuable mineral constituents in milk, especially in milk fed to young children.

Before the section on chemical education of the American Chemical Society, R. G. Woodbridge, of the du Pont company, told of the conversion of millions of pounds of surplus powder left over after the war into finishes useful in the arts of peace. The nitrocellulose base of smokeless powder is so close chemically to the new cellulose lacquers that such a conversion is easy and practicable. Mr. Woodbridge also told his hearers that if the war had not ended when it did, the 1918 crop of short-staple cotton would not have sufficed to supply the needs of America and the Allies for explosives, and that wood-pulp would have had to be used to supplement it. During the war only the Central Powers, their cotton supply cut off by the blockade, were forced to use wood-pulp in the making of smokeless powder.

As clocks punched by watchmen indicate that the rounds have been made at the right times, so the tactograph, a new instrument used on railway locomotives, tells whether the engineer has properly driven his iron horse over the run. Did he exceed the safe speed trying to make up time? Were the curves taken too fast? Were delays the fault of time allowance, roadbed or rolling stock? What was the average speed for the run? The instrument is mounted in the cab of the engine and is geared to the axle like an automobile speedometer, *The American Machinist* explains. Speed at any time, length of stops and slippage are shown on a record sheet.

How medical and psychological examinations have been given to motormen with good and bad traffic records was reported on April 12 by Dr. O. M. Hall, of the Personnel Research Federation, speaking before New York members of the American Psychological Association. Among the men who had high-accident records, 39 per cent. were found to have personality defects, the psychologist reported. That is, these men did not get along smoothly with other people. Among the men with superior records for keeping out of trouble only 5 per cent. were found to be "un-cooperative." Forty-nine per cent. of the high-accident motormen were found to have health defects, chiefly abnormal blood pressure and hernia. This was contrasted with only 9 per cent. of the low-accident motormen having such health defects. Aptitude for the work of running a car was also tested, and it was found that 40 per cent. of the drivers who ran into trouble made poor records on this test, whereas only 12 per cent. of the safe drivers showed lack of aptitude for the job.