SCIENCE NEWS

Science Service, Washington, D. C.

MEASUREMENTS OF A STAR'S MAGNITUDE

THE strange companion of Sirius, the dog-star, which is so dense that a cubic inch of the stuff of which it is made would weigh 25 tons if a piece could be transported to the earth's surface, is about three times as bright as astronomers have previously supposed.

Dr. A. N. Vyssotsky, of the Leander McCormick Observatory of the University of Virginia, has recently completed a new determination of the brightness of this remarkable little star. A full account of his researches will appear in the forthcoming issue of *The Astrophysical Journal.*

Though Sirius B, as the companion is called, is not very much fainter than stars that can be seen with the naked eye, it is very difficult to observe because of its proximity to Sirius, brightest of all the stars in the sky. Even with telescopes powerful enough to reveal it easily, measurements of its brightness are complicated by Sirius' overpowering glare.

The new method employed by Dr. Vyssotsky makes use of the fact that when a grating of fine parallel wires is placed over the lens of a telescope, and a star photograph taken, the image of the star is accompanied on either side by a series of images of its spectrum. The closer the wires, the more spread out are the spectral images.

Dr. Vyssotsky placed such a grating over the 26-inch lens of the McCormick Observatory's telescope and photographed Sirius and the companion. The arrangement of the wires was chosen so that the first spectral images were just as far from Sirius as the companion's image. On the resulting plate appears the main star image, spread out into a small disk because of the star's brilliance. On either side are the images of the spectrum, looking very much like the image of the companion, just below.

The brightness of such a spectrum image, in relation to the star itself, can be calculated, and thus Dr. Vyssotsky found how bright the images should appear. But they, like the image of Sirius B, are affected by proximity to the bright star. In this way he found how much of an effect the glare of Sirius produced, and when this correction was applied to the measured brightness of the image of the companion, he found its magnitude to be 7.25, instead of 8.44, which has previously been accepted.

This determination was checked in another way, by making double exposures, in the same way that a movie camera man can photograph an actor talking to himself. The plate was first exposed on a very bright star, and then exposed again on a cluster of faint stars, one of which came close to the bright one, and thus played the part of the companion. The brightness of the faint star was then determined separately, and the effect of the glare measured. This method gave a value for the magnitude of Sirius B as 6.91. The mean of the two determinations is 7.1, which Dr. Vyssotsky adopts as the best value for the brightness of Sirius B. With the naked eye, under good conditions, stars as faint as the sixth magnitude can be seen.

PHOTOCELL TO MEASURE THE SMOOTHNESS OF POLISHED METALS

DETERMINATIONS of the degree of smoothness of polished metals have recently been made by the French metallurgist, Dr. Albert Portevin, through the application of the photoelectric cell.

A beam of light is focused on the metal specimen so that it will be reflected to the sensitive cell. When the specimen is moved along in the path of the beam, any microscopic hills or valleys will register as fluctuations in the electric current produced by the cell due to the variations in intensity of the reflected light.

Extensive use is made of smoothness determinations in the examination of machine parts subject to frictional wear. They are valuable for indicating the relative efficiency of different abrasives employed in polishing metals. They are of great assistance in work in certain specialized fields.

Although numerous methods have been developed for studying the quality of polish, this latest adaptation of the ever popular photoelectric cell to the problem promises to supersede some of the laboratory methods now in vogue. This is particularly true in the case of the study of the surfaces of metals intended for corrosion tests. Here the initial degree of smoothness is of vital importance to the interpretation of the results of such tests.

Metals which have become colored during the process of corrosion, or upon heating as in the case of tempered steel, have to be examined with light consisting of only one wave-length (color) and a colored filter must be placed in the path of the reflected ray to insure accuracy of results. If white light were used, the result would be unsatisfactory due to the presence of many different wave-lengths.

A DISEASE RESISTANT BANANA

VICTORY over the dreaded Panama disease which has cost banana growers millions of dollars in the last few years appears to be within measurable sight of achievement, according to experiments carried out by Professor E. E. Cheesman, of the Imperial College of Tropical Agriculture, Trinidad.

Professor Cheesman believes he has created a fruit which is completely immune to Panama disease and at the present time samples are being sent out to growers for further and more complete tests. Known as 1.C.2, the new variety has been planted alongside trees severely stricken with Panama disease, yet no sign of the disease has been found.

In March, 1925, a variety known as 1.C.1 was evolved and this plant has proved to be completely resistant to Panama disease following continual close investigation ever since, but it has the grave commercial disadvantage that an occasional seed is noted as a result of self-

pollination when multiplied by suckers and grown under ordinary banana field conditions.

The primary economic end kept in view throughout the investigation has been the production of a new variety of banana combining resistance to Panama disease with the good commercial qualities of Gros Michel, the outstanding variety of northern markets.

Experiments carried out so far by Professor Cheesman have shown that the new variety, 1.C.2, is completely seedless, while it is hoped to produce fruit of a good size. Furthermore, it is hoped that it will have the other necessary required commercial qualities such as compactness of bunch, a fruit skin not abnormally sensitive to bruising, ability to stand up well to conditions of bulk transport, and an attractive appearance on ripening.

In regard to the seed aspect of the problem the difficulty is scientifically extremely complex for bananas are naturally reproduced by vegetative means. The plant breeder must first induce the formation of seeds and then, if he wishes, he must completely eliminate them again. A banana seed, which the great majority of banana-eaters in temperate countries have never seen, is about a quarter of an inch in diameter, black in color, and very hard. Naturally, the presence of these seeds in the fruit would not enhance its market value.

In attaining his present success, Professor Cheesman has had to explore the whole genetics of bananas and the breeding work has necessitated the introduction and study of a wide range of varieties. The Imperial College collection contains about one hundred "numbers" obtained from several parts of the Tropics. Tests have been made with all these during the effort to produce a specimen immune to Panama disease.

A Londoner by birth, Professor Cheesman has been engaged in his research work at the Imperial College for the past ten years.

A TWELVE-LEGGED SEA SPIDER

A SEA spider with six pairs of legs, instead of the customary four pairs, was captured by Sir Douglas Mawson in the Antarctic during the British, Australian and New Zealand Expedition. It was found at a depth of two hundred fathoms.

The discovery was announced at a meeting of the Royal Society by Dr. W. T. Calman, keeper of Zoology at the British Museum, who is in charge of the work of examining Sir Douglas Mawson's specimens.

Dodecolopoda mawsoni, as the new species of animal is named, was exhibited at the Royal Society. The interest aroused among biologists is gauged by the fact that there are some 400 known species of marine arthropidae, or insects, with the standard four pairs of legs, corresponding to the three pairs of legs of land insects. The only previous exceptions to this apparent law of nature had five pairs of legs. The first of the ten-legged "freaks" was found off South Georgia by the American scientist, Eights, approximately a century ago. Though a few others have since been found the existence of twelve-legged pycnogonidae had not been suspected.

Dr. E. W. MacBride, professor of zoology at the Imperial College of Science, suggested that the extra number of legs "may have been added as an afterthought," in the same kind of way as the North American starfish, which originally had five rays and still drops from its larva in five-rayed form, now has further rays that grow in between the primary five.

Both the ten-legged and twelve-legged arthropidae have been found in the Antarctic zone, suggesting that this environment may call for additional legs, possibly to facilitate food capture.

ELECTRICAL DEVICE FOR MEASURING "M" RAYS

ELECTRICAL measurement of the so-called "M" rays or Gurwitsch rays, given off by living cells, has been accomplished by Dr. Boris Rajewsky, docent of the Institute for the Physical Foundation of Medicine at Frankfurt-am-Main. Biologists and physicists have long been trying to construct a device that would give a physical measurement of these mysterious radiations, but until now without success, and they have had perforce to continue measuring them by the old way of exposing other living cells to their action.

The Rajewsky apparatus is based on the principle of the Geiger counter, which is a device for detecting traveling electrons and other charged particles by letting them hit a wire and thus give an electrical "kick," amplified to detectable magnitude by a radio-like hookup.

However, Dr. Rajewsky built several important modifications into his apparatus. Into the side of the tube through which the radiations were to be directed he set a quartz window, for the Gurwitsch rays are stopped by glass though they pass through quartz. The wire he covered with a semi-conducting material, to make it somewhat less sensitive. And between wire and window he installed a thin sheet of cadmium.

Cadmium is sensitive to rays of 3,000 Ångstrom unit wave-length, which is the approximate amplitude of the Gurwitsch rays. Whenever rays of this length fall on the metal, they release electrons, which in their turn electrically charge the air between the cadmium and the wire. Thus the cadmium becomes the means for the indirect expression of the Gurwitsch rays in electrical terms, and enables the experimenter to obtain a quantitative idea of their energy.

RATE OF SAP FLOW IN PLANTS

How to determine the rate that sap rises in trees and smaller plants has always been a difficult problem. And it is of great practical importance, too, in all applications of the science, from forestry to farming under irrigation. All methods hitherto in use have involved injuring the plant in some way, by boring holes or injecting foreign substances, and to that extent inrtoducing unnatural conditions with the risk of falsifying the result.

But now Professor Bruno Huber, of the Darmstadt Technical University, has devised a way to measure the speed of the transpiration stream in plants without injuring them. He wraps a wire around the stem and heats it electrically for several seconds, which causes the temperature of the sap to rise by fractions of a degree. A few inches higher up the passage of the heated sap

is registered by a tiny electrical thermometer which can be introduced between bark and wood without doing any harm. This method, of course, is efficient only if the sap flows more quickly than it loses its heat, which is the case when the speed is more than half an inch a minute.

In this way it is easy to observe the daily speed fluctuations in one and the same plant throughout the year. For instance, Professor Huber found that the sap in a vine moved with a speed of 30 inches an hour between 6 and 7 o'clock in the morning, that at 1 o'clock the speed rose to approximately 28 feet an hour and fell again to about 30 inches an hour at night.

In the case of conifers, the condition that the sap should move more quickly than it loses its heat is not fulfilled, so that measurements are impossible. But in the case of foliage trees he found speeds from the measurable minimum up to 36 feet per hour, with vines even up to 150 feet per hour.

THE CEPHALIC-MEDULAR ANGLE

THE height of a man's brow is no indication of his intelligence, but the angle at which his brain is attached to its stalk may be. Studies indicating that this cranial angle may prove a good method of rating intelligence have just been completed by Dr. Salvador Pérez Alvarez, of the Medical School of the Mexican National University.

Low in the zoological scale the angle between the brain and the stalk from the spinal column is almost a line, or in other words an angle of 180 degrees. The angle, called the cephalic-medular angle of the cranium, bends more and more closely in the higher animals until in man it is almost a 90 degree angle.

This fact suggested to Dr. Pérez a relationship between cerebral development and the size of the angle. He thought that the angle might be an index of mental development in individual human beings as it is in the zoological scale.

He therefore made measurements on 400 persons equally divided between children, adolescents, youths and adults. He found that in these 400 cases the angle varied between 93 and 104 degrees, and that sex was no factor in this variation. The angle reached its final value between the ages of ten and thirteen. Dr. Pérez applied regular mental tests to these same individuals, and found that those rating the highest in the tests had the smallest angles. Taking the four groups separately, there was improvement in mental ratings due to age. Experimentation is being continued to see how well this new method may be applied in place of the ordinary and complicated intelligence tests.

In a general demographic study to be begun in Mexico in September of this year under the direction of Dr. Manuel Gamio, the well-known Mexican anthropologist, Dr. Pérez will try his method on groups of Indians, mestizos and whites in order to see if this cephalic-medular angle is a racial characteristic as well. An instrument has been developed by Dr. Pérez to measure this angle in man.

ITEMS

RADIATIONS like x-rays or the gamma-rays from radium that destroy harmful growths in the body, or sometimes do injury to normal tissues, accomplish their often revolutionary work with very small amounts of actual energy expenditure, according to Professor Friedrich Dessauer, of Frankfurt-am-Main. A spoonful of hot tea brings more energy into the body in the form of heat than all the radiation reaching the inner tissues in a carcinoma treatment. From this fact Professor Dessauer infers that the work of such radiation is done practically at the instant of first impact, while they are still concentrated and before they have had opportunity to become dispersed into neighboring regions. Assuming that the primary result of any radiation is regularly to set free an electron somewhere, Professor Dessauer concludes that such an electron discharged from an atom and roaming around within a protein molecule should be expected to cause inner vibrations in it. This condition may be described by stating that the one individual molecule hit by the radiation has been raised to a higher temperature. Therefore, Professor Dessauer speaks of "point heat" as the actual cause of the devastating effects of radiation.

A NAME is wanted for the newest particle discovered by science, the positive electron. "Positron" has been suggested and is widely accepted. But many object to it, on the grounds that it lacks proper character. Professor Niels Bohr in his talks to the California Institute of Technology, where the positive electron was discovered, pointed out the desirability of a new name and mentioned "anti-electron" as a possibility but did not urge it. He said it had the advantage that it suggested the fact that the positive electron is, in a sense, merely the absence of the negative electron. The most brilliant suggestion, however, has come from Professor Herbert Dingle, of the Imperial College of Science and Technology in South Kensington, visiting in Pasadena. He recalled the fact that Electra had a brother Orestes and surely the positive and negative electrons are like brother and sister. He therefore suggested the name "Oreston" for the positive electron.

PLANTS given several light doses of x-rays in the laboratory of Professor Charles A. Shull, of the University of Chicago, proved more resistant to a "killing" dose of thirty minutes' duration than did similar plants which were not given the preparatory treatment. This was one of the experiments reported before the meeting of the American Society of Plant Physiologists. He cautioned against too-hasty generalizations on the basis of this one experiment, but suggested that if further tests confirm the possibility of self-immunization by x-rays the consequences may be very important biologically. In other experiments it was shown that x-raying wheat plants, under proper screening, resulted in more vigorous growth, larger production of plant tissue, and a considerable speeding up of the life cycle. The stalks always headed out earlier in rayed than in unrayed wheat plants.