SCIENCE NEWS

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THE GRAVITATIONAL CONSTANT

COMPLETION of a new measurement of the power of matter to attract other matter, known as the constant of gravitation, has been announced by Dr. Paul R. Heyl, physicist of the National Bureau of Standards.

The new figures for the constant (multiplied by 100,000,000) are 6.673 plus or minus 0.003, as compared with the generally accepted value of 6.670 plus or minus 0.005, which was also obtained by Dr. Heyl at the Bureau in 1930. The very small difference between the two values bespeaks the high accuracy of both measurements. That the new value is more accurate than the old is evidenced by the "probable error," 0.003 of the new value, as compared with 0.005 for the old.

This increase in accuracy, Dr. Heyl stated, was due to two improvements made in the apparatus, which otherwise was the same as that used in 1930. Many improvements were suggested and some were tried but only two adopted, Dr. Heyl said, and he believes that the limit of accuracy has about been reached and that any substantial further improvement will require that a radically different method be found.

The constant of gravitation may be defined as the force with which two particles of matter, each having a mass of one gram, attract each other when one centimeter apart. (A gram is the 28th part of an ounce and a centimeter is about 0.4 of an inch.)

Since, in the words of Newton, "Every particle of matter in the universe attracts every other particle . . . ," any two objects on the earth, of whatever material, should attract each other. They do, and this attraction is precisely what is used in determining the gravitational constant. But the force is so exceedingly small, as compared with that of the enormously greater earth which is evidenced as weight, that only an extremely sensitive instrument can detect or measure it.

This instrument has nearly always been a refined form of the torsion balance invented by Cavendish 150 years ago. It is a kind of pendulum whose time of swing is changed when the positions of two massive weights near-by are altered. It is very impressive to observe that when a bottle of mercury (which is very heavy) is removed from a near-by shelf and put somewhere else, the swing of the pendulum is altered.

THE FLUORESCENCE OF DIAMONDS

WHY some genuine diamonds fluoresce or glow a brilliant blue, others yellow and most of them not at all, when exposed to ultraviolet (or "black") light, was revealed by burning the precious stones in an electric arc.

This is the first time that so drastic a method has been used to determine the cause of fluorescence in diamonds which milder methods had failed to disclose. The light from the burning diamond was analyzed by a powerful spectrograph, an instrument which sorts out the light of the burning diamond according to its various wave lengths, and tells what elements are present in the stone as impurities.

These impurities were found to be the cause of the various types of fluorescence. The blue-glowing diamond was found to contain chromium and titanium as the principal impurities, the yellow-glowing gem contained aluminum, and the non-fluorescing stones were almost pure carbon.

The investigators were James M. Orr, spectroscopist, and Jack De Ment, chemist, both of Portland, Ore., who report full details of the investigation in the current issue of *The Mineralogist*.

LIGNITE A SOURCE OF HYDROGEN

HYDROGEN, used in welding torches, ammonia manufacture and a thousand other industrial applications, can be manufactured cheaply and abundantly from a natural resource possessed in great masses by this country, but at present very little used—lignite. A new process for obtaining hydrogen from this light-weight, coal-like substance has been recognized with a U. S. patent (no. 2,276,343), issued to Professor Lloyd H. Reyerson and Donald C. Gernes, of the University of Minnesota. Rights have been assigned to the incorporated regents of the university.

When steam is passed over any carbonaceous substance that has been heated to incandescence, it is cracked into hydrogen and oxygen. The oxygen combines with some of the carbon to form carbon monoxide. One of the methods of manufacturing cooking gas is to blow steam through heated coal or coke. The resulting mixture of carbon monoxide and hydrogen has high fuel value, but the high percentage of monoxide is undesirable when the objective is the production of commercial hydrogen.

Professor Reyerson and Mr. Gernes have discovered that an analogous process carried out with lignite can be performed at much lower temperatures than are necessary with coal or coke, and that the resulting gas contains far less of the troublesome carbon monoxide. It is therefore easier and cheaper to remove the monoxide. This is the key to their patent.

There are immense beds of lignite in the Northwest, some of those in North Dakota being 30 feet or more in thickness. At present, lignite is little used, except locally for domestic fuel. The Reyerson-Gernes process may tap this resource for the benefit of American hydrogen-using industries.—FRANK THONE.

STEEL, OIL AND LABOR

STEEL, oil and labor, the chief sinews of our war production, are saved by using recording or ticket-printing meters to measure oil as it flows through pipes, instead of pouring it into tanks. This was pointed out by L. R. Van Arsdale, of the Pittsburgh Equitable Meter Company, in an address to the American Society of Mechanical Engineers.

In the Army and Navy, trucks and warship tenders are equipped with these meters. They have been used for several years in some of the new oil fields, also in trunk pipelines and delivery trucks. Nevertheless, their use is somewhat in its infancy.

An oil refinery gathers up its crude through a vast system of pipelines coming from many fields. The contribution of each field must be measured. The oil in these pipes is under constant pressure, so that by measuring it by meters in the pipe, the oil is never exposed to atmospheric pressure as it is when poured into tanks. This prevents loss of valuable gasoline vapors, particularly important in the manufacture of 100-octane gasoline for aviators. It saves also a vast amount of steel in tanks and in pipes and pumps to serve them.

Leaks are quickly located by use of meters which record the pressure and the rate of flow on a chart. A drop in pressure means either a leak in the pipe ahead or trouble with the pumps behind. These meters distinguish between the two causes, thus avoiding sending out a crew of men to "walk the line" and another to investigate the pumps and saving many man-hours and long delays. The meters are more accurate than the older methods and the ticket-printing feature saves time and mistakes in keeping records and accounts. Further savings are effected by pumping natural gas back into the oil sands. The increased pressure thus obtained raises the oil in the wells and holds back the infiltration of water, which usually spells the end of an oil well. This gas is otherwise wasted by burning in flares.

COTTON PICKING MACHINES

COTTON must meet the harvester half way, if successful machine harvesting of this number one textile crop is ever to replace the present back-bending, neck-blistering, finger-wearying method of hand picking, was stated by H. P. Smith and D. T. Killough, of Texas A. and M. College, at the Houston meeting of the American Society of Mechanical Engineers.

Machines for harvesting cotton fall into two main classes—pickers and strippers. Pickers undertake to pull the lint out of the boll, duplicating the hand job by either mechanical or pneumatic means. Strippers tear boll and all from the plant, and try to extract the lint as cleanly as possible afterwards.

Both types of machines run into difficulties, because of the innate perverseness of the cotton plant itself. Wheat, corn and other crops now harvested by machinery are relatively simple jobs: they ripen all at the same time, they bear their fruit at or near the same level, they don't hang on too tightly. Cotton ripens unevenly at all levels on plants of varying height, with wide differences in "pluckability" of the lint.

Engineers, being mechanical-minded, have a tendency to build cotton-harvesting machines that really ought to do the job, and then are bewildered and annoyed when the cotton plant crosses them up. The answer, in the opinion of Messrs. Smith and Killough, lies partly in patiently trying to make the machine better adapted to its difficult crop, partly in trying to breed cotton varieties that will be less difficult for the machine to handle. Some success has been achieved in the latter direction, they indicated, but a great deal still remains to be accomplished before the perfect "machine" cotton can be proclaimed as ready for the fields.

MALNUTRITION

DESPITE record crops and meat and fish production, a large but unknown number of Americans are always hungry. This is the implication of a study of malnutrition in this country by Drs. Norman Jolliffe, James S. McLester and H. C. Sherman, of the Food and Nutrition Board of the National Research Council. The study is reported in the *Journal* of the American Medical Association.

After consideration of various surveys, records from hospitals, schools, population groups and mortality figures, the three physicians conclude: "... dietary inadequacies and malnutrition of varying degrees are of frequent occurrence in the United States ... and the nutritional status of an appreciable part of the population can be distinctly improved. If optimal nutrition is sought, not mere adequacy, then wide-spread improvement is possible."

From records of the Bureau of Home Economics, Department of Agriculture, of more than 2,000 families of wage earners, clerical workers and non-relief, non-share-cropper farm families from all sections of the country, it was learned that 43.6 per cent. of these families failed to receive a "fair" diet, and 76.2 per cent. did not get a "good" diet. Diets were generally better on the farm than in the city.

Evidence of poor eating habits from mortality statistics (1933–38) was less clear, although pellagra, beriberi, scurvy and rickets took their toll. Of these, pellagra caused by far the most deaths, the number in 1938 being 3,205 as compared to 244 for rickets, the next most frequent cause of death. However, poor nutrition is often a non-recorded cause of death, and the authors wonder how much malnutrition is concealed in the 370,600 deaths recorded in 1938 under the heading "diseases of the circulatory system," or in the 75,431 deaths entered under its sub-classification, "diseases of the heart, unspecified," etc.

Likewise uncertain is evidence of malnutrition based on hospital records. While the amount of actually diagnosed malnutrition was low, again the authors believe much was unobserved. They point out that the degree of malnutrition varies between "slight," a condition which even a physician may miss, and conditions so serious that death results.

A slight degree of malnutrition, known as "hidden hunger," is probably very prevalent among Americans, and the authors believe the rate is sufficiently high "to occasion genuine concern."

GLAND CONTROL

NEW discoveries in the field of gland control of the body's functions were described in a lecture at Louisiana State University by Professor Herbert M. Evans, of the University of California. The lecture was given under the auspices of the Society of the Sigma Xi, the national honor society for the promotion of scientific research. Professor Evans will lecture at a number of other universities in this country during the coming two months.

The particular subject which claimed his attention was the anterior lobe of the pituitary gland and its secretions. The pituitary is a small body located within the skull, just under the brain. Its influences, however, reach throughout the body, and are so numerous and so important that the pituitary is sometimes called the "master gland."

One pituitary substance which the speaker discussed is a secretion that controls body growth. It is suspected that this so-called growth hormone may in reality be two hormones. Animals deprived of growth hormone invariably make less efficient use of food in body building than do those receiving normal amounts of the substance.

Another pituitary hormone is active in promoting the production of milk, cooperating in this function with other hormones produced elsewhere in the body, especially in the female sex glands. "It may turn out," Professor Evans said, "to be a new and valuable drug in preventing the rare disorder known as habitual abortion shown by otherwise healthy women."

A third hormone produced by this same small gland, and quite recently discovered, plays an important part in the activities of the pancreas, which in turn control the efficiency of food utilization when normal, and result in diabetes when deficient.

ITEMS

FROM Finland comes news of a mysterious celestial object traveling rapidly northward in the same part of the sky that was traversed by Whipple's comet. If the new object turns out to be a comet, it will be the second one this year. The discovery was made on March 12 by Y. Vaeisaelae, director of the Observatory of Turku, Finland. The Harvard College Observatory, a clearing house for astronomical information, received the news and transmitted it to American observatories. None of these has as yet confirmed the discovery and the Harvard astronomers have been unable to find the object on their patrol plates.

AUTOMATIC recordings of electrical conditions in the upper atmosphere have made it possible to predict with accuracy the best frequency (or wavelength) to use in short-wave radio communication between given points, for a given season of the year and a given time of day. This announcement was made by Dr. T. R. Gilliland at a meeting of the Washington Academy of Sciences. The automatic multi-frequency recorder is a development of the technique used by Dr. Gregory Breit and Dr. M. A. Tuve in the United States and Professor E. V. Appleton in England about sixteen years ago to investigate the ionosphere or electrically conducting layers of the upper atmosphere. Their method was to send up short pulses of high-frequency waves of different wavelengths and measure the echo time or time for the waves to go up and back. These layers change greatly from day to night and from summer to winter and according to the number of sunspots on the sun, and greatly affect short-wave communication. Automatic recordings have now been made in several parts of the world for almost one complete sunspot cycle of eleven years. It is these recordings that now make it possible to specify the best wavelength to use under any particular circumstances.

SULFAGUANIDINE, one of the more recently developed drugs of the sulfa group, has been found effective by Dr. J. R. Beach, of the University of California College of Agriculture, in the treatment of cecal coccidiosis, one of the most troublesome of poultry diseases. He is now engaged in experiments to determine the possible value of the drug in other related poultry maladies. As yet, the treatment is on an experimental basis, for sulfaguanidine has not been released for general use and is still quite expensive. Its cost may be brought down, however, if a large-scale use can be found.

EXPERIMENTS in planting cork oak, from which cork is stripped, are planned by the Department of Agriculture, if the Forest Service can get acorns from the Mediterranean. Normally this country imports about $10,000,000 worth of cork every year from Spain, Portugal and North Africa. Parts of the Southwest—southern California, Arizona, New Mexico and Texas—have a similar climate, and cork should do well here. From a few cork oaks planted in California more than seventy years ago, good first-yield cork has been gathered under supervision of the Agricultural Extension Service of the University of California. Several native trees already produce a kind of cork suitable for several types of products, such as heat insulation and packing material. These include Southwestern fir, which produces a soft pure cork, and the more common Douglas fir, with its corky outer bark. White fir also offers some possibilities.

A CARGO of gold worth some $8,000,000 has been recovered from the strong room of the ship Niagara, sunk in June, 1940, by enemy mines 27 miles off the New Zealand Coast, according to the Australian News and Information Bureau. The gold was recovered in recent operations which located the ship under 438 feet of water. The salvage is believed to be the deepest ever undertaken and was accomplished by a Melbourne company in cooperation with the Australian Navy and the New Zealand Government. Members of the salvage crew recovered 150 mines which had been laid around the wreck area by the enemy.

MARKED relief from the familiar condition, "ringing in the ears," was obtained in a series of cases treated with the synthetic chemical, Prostigmin, Captain A. F. Judge, Medical Reserve, U. S. Army, reports in the current issue of the *Military Surgeon*, the official publication of the Association of Military Surgeons of the U. S. Captain Judge also treated cases of deafness, but obtained only a few improvements. He notes, however, that in view of the scarcity of drugs which relieve deafness to any extent, the use of Prostigmin should not be abandoned. Cause of the "ringing" or other noises in the ear is not always known. Sometimes it is a plug of wax. An overdose of quinine will do it. Sharp explosions such as gunfire and bombs will sometimes cause it. Neither is the action of Prostigmin clear, and there is much controversy over its value in relieving "ear noises." He, however, treated fourteen cases of ringing-in-the-ears with Prostigmin and gave complete relief to five, marked improvement to four, and some benefit to three. Two patients were in no wise helped.