Physicists Discuss Latest Advances

Following are reports of some of the highlights of the meeting of the American Physical Society by James Stokley. The meeting was held in Washington, April 22 and 23.

New Gravity Value

Astronomers can figure a little more accurately with how much force the earth and the moon pull on each other by gravity; or physicists can figure out more accurately the force with which their bodies would be pulled to the earth if they fell out of a second story window. This can now be done by means of the new value of what scientists call the "gravitational constant" announced at the meeting of the American Physical Society by Dr. Paul R. Heyl, of the U. S. Bureau of Standards.

As a result of three years' work, much of which was done in a subterranean chamber at the Bureau of Standards, Dr. Heyl has found this constant to be expressed by the fraction 6.664 over 100,000,000. The law of gravitation, stated many years ago by Sir Isaac Newton, says that two masses of matter attract each other by a force which is greater as they are more massive, and less as the distance between them becomes greater. The exact force is found mathematically by multiplying the masses of the two bodies by each other, and dividing by the distance, and then multiplying the result by the gravitational constant. As exact knowledge of the force of gravity is important in many different branches of science, all the way from study of projectiles fired from guns to study of the motions of the stars, the gravitational constant, which the physicist calls G, must be known very precisely.

About 1740 a Frenchman, named Pierre Bouguer, made the first attempt to measure G by experiment, but the first determination of value was made a quarter of a century later by an English astronomer, Nevil Maskelyne. His method was to observe a plumb bob on two sides of a mountain. The mass of the mountain tended to pull the bob towards it, and by measuring the deflection of the plumb line from exact vertical by comparisons with the positions of the stars, and knowing roughly the mass of the mountain, a value could be obtained. It was not very accurate, however, because the mass of the mountain could not be more than guessed at.

At the end of the 18th century, another English scientist, Henry Cavendish, used for the first time the method now employed by Dr. Heyl. By this system, two tiny masses are attached to the end of a rod, which is balanced at the end of a long wire. Two heavy spheres of lead near the ends of the rod pull on the little masses and twist the wire slightly. This twist can be measured by a little mirror attached to the wire. A spot of light may be reflected by this mirror across the room, and a slight twist will produce a much larger motion of the spot of light.

Essentially, this was the same method that Dr. Heyl has employed, but with the aid of all the improvements to be offered by a modern research laboratory. Previous to this, the most accurate result had been obtained by Prof. C. V. Boys, another Englishman, and an Austrian priest, Father K. Braun, who worked independently, each in his own country, about 1895. They both obtained the same result, with G equalling 6.66 divided by a hundred million.

In 1901, Dr. G. K. Burgess, now the director of the Bureau of Standards, in working for his doctor's degree at the Sorbonne, Paris, tried the experiment, and obtained 6.64 instead of 6.66, but as this was done under pressure of time, it was not very accurate. Dr. Burgess realized this, and when he became director of the Bureau, he saw to it that the experiment was performed more accurately than had ever been done before. This Dr. Heyl has now completed, confirming, as far as they went, the results of Prof. Boys and Father Braun, and carrying the value to another decimal place in accuracy.

Photoelectric Promptness

Dr. Heyl was not the only scientist who told the phvsicists about very small amounts, for when light falls on a surface of potassium metal, electrons, the minute atoms of electricity of which matter itself ultimately consists, start coming off the surface less than 3 one-billionths of a second later. This was announced by Drs. Ernest O. Lawrence and J. W. Beams, who have been working in the physical laboratory of

(*Just turn the page*)

ROBERT MEARNS YERKES

Simian Intelligence Tester

Many psychologists have devoted their energies to measuring the intelligence of human beings, from the youngest babies to mature adults, but Dr. Yerkes has done even more. During the war he was prominent in producing the army mental tests, but since then he has gone from human beings to an almost equally interesting group—the monkeys. Working first with chimpanzees, the chance finally came to make the first psychological study of a gorilla.

When Ben Burbridge returned to his home in Florida with Congo, a young mountain gorilla from Africa, the capture of which is depicted in a popular motion picture, Dr. Yerkes made two separate trips to Mr. Burbridge's home to meet and interview Congo. His results give an entirely new idea of gorilla intelligence, and show that the animal is not the vicious mankiller which we imagine him to be. The gorilla's bad reputation comes only from the tales of hunters who have seen the animal when he was fighting for his life, and are hardly a fair criterion.

Dr. Yerkes was born in Breadysville, Pa., on May 26, 1876, and graduated from Ursinus in 1897. In 1902 he received the Ph. D. from Harvard, After a number of years at Harvard, and as psychologist of the Boston Psychopathic Hospital, he went into military service during the war. After this he organized and ran the Research Information Service of the National Research Council until 1924, when he became professor of psychology at Yale.

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Yale. The importance of this study lies in the fact that the electric current which results from these light-liberated electrons makes television possible. Any lag that may be produced in transmitting faces of photographs by telephone or radio will not come from sluggishness in the electrons leaving the sensitive potassium surface of the photoelectric cell.

Jovian "Northern Lights?"

"Northern lights" on Jupiter may explain why that planet appears so much brighter than it should, if all the light from it is reflected sunlight, and if it isn't any lighter in color than a respectable planet should be. This was the suggestion made by Dr. W. F. G. Swann, director of the Sloan Physical Laboratory of Yale University. Dr. Swann thinks that a rapidly spinning sphere, even though it be of some material such as copper, which is not ordinarily magnetic, will become magnetized by its motion.

He works out his theory by a modification of the laws of electrodynamics, and by it explains not only the magnetism of the earth, but also that which is known to be associated with sunspots. These spots are like tornadoes on the earth, whirling masses of gas, and at the edge of the spot the whirling would cause magnetism, just as in a sphere of the same diameter, according to Dr. Swann's theory.

By what is known as the Zeeman effect, after the Dutch scientist who discovered it, it is possible to tell whether light from the sun started from a magnetic area or not. By studies at the Mt. Wilson observatory in California, and other places, scientists have learned how magnetic the spots on the sun really are.

According to the theory, magnetism as much as that observed, would be associated with the spots if their edges rotated with a speed of about 50 miles a second. While great, this speed is not unreasonable for a sunspot.

The magnetism of the earth is thus rather slight, because of our globe's comparatively small size and slow rotation, but the planet Jupiter, which is 87,000 miles in diameter, and revolves once in 10 hours instead of 24, has a tremendous surface motion. And by Dr. Swann's theory, this would cause an extremely intense magnetic field on Jupiter. Magnetic intensity is measured by a unit called the gauss; at the poles of the earth the intensity is about half a gauss, but at the poles of Jupiter, thinks Dr. Swann, it would be about 60,000 gausses.

As the light from Jupiter is scarcely bright enough to show any Zeeman effect, it is difficult to get any knowledge of the magnetization of the planet, but the aurora borealis, or "Northern Lights" are due to the earth's magnetism. Electrons, rapidly moving particles of electricity, are constantly bombarding the earth from the sun, and outside space, and as they get near the earth, the magnetic field pulls them in towards us, causing glow in the highly rarefied gases high overhead.

With the much greater magnetism of Jupiter, thinks Dr. Swann, many more electrons would be drawn in to the planet, and the "northern lights" there would be much brighter than any we see on the earth. Astronomers have observed that Jupiter is usually bright, compared with the other planets, if all its light is reflected sunlight, and have supposed that it might be giving out some light of its own. Dr. Swann makes the suggestion that the planet is surrounded by an intense aurora, which accounts for the great brightness.

Science News-Letter, April 30, 1927

American made shoes go out to 87 different foreign countries.

Aluminum street cars are said to be almost one-fourth lighter than steel cars.

Indians of the northwest used bark to make rope and to weave mats and blankets.

Naturalists say that chimpanzees and some monkeys laugh when they are pleased.

Two German firms are considering a weekly passenger air service across the Atlantic.

As recently as 1839 in this country a boy was put to death by law for stealing a sheep.

Thousands of pounds of citric acid are recovered from pineapple waste in California each year.

The radiator of an automobile goes through more than 2,000 steps in the manufacturing process.