

scientific departments in our State institutions, and I should be glad to call them generous. At least they have given Iowa the fame of men whose work in science has achieved national recognition. But these yearly appropriations, were they many times as great, could not supply the place of the great gifts, endowments to be for all time reservoirs of power transmuted constantly into the highest social service. It is the boast of American democracy that by such votive offerings it shows appreciation of education, charity and scientific research.

As members of a guild of workers in science, let us be thankful for even the humblest place. To discover any fact, however trivial, to add anything, however slight, to the sum of human knowledge, this is to shape and dress some stone for the building of science, the home and shelter of the race. Our contribution may go to chink some crevice, or at least some master builder may find in it the keystone of an arch or the cap stone of a column. But whatever its place, if our work was well and truly done it abides as a permanent service to society.

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*A NEW CONNECTION BETWEEN THE GRAVITY MEASURES OF EUROPE AND OF THE UNITED STATES.*

ABSOLUTE measures of gravity, repeated by different observers using different instruments at identical stations, have shown comparatively large disagreements. The general experience has been that differential measures of gravity are much more accurate than absolute measures, and there has, therefore, been a growing tendency to use the differential method rather than the absolute method. The results of such differential measures may be reduced to absolute units either by connecting by the

relative measures many stations at which absolute measures have been made and then making an adjustment to get a mean value, or a single determination of the absolute value of gravity, which is believed to be of a much higher degree of accuracy than any other, may be used in reduction to absolute units.

These general conditions, especially with respect to gravity stations in Europe and the United States, led naturally to the campaign of differential gravity measures carried out by Assistant G. R. Putnam, of the Coast and Geodetic Survey, in the summer of 1900, under the direction of the International Geodetic Association.

The compact and portable half-second differential pendulums known as A4, A5 and A6, and of the type developed under the direction of Dr. T. C. Mendenhall while he was superintendent of the Coast and Geodetic Survey, were swung at Washington in May and again in October, 1900. Between these dates they were also swung at the Kew University, Greenwich Observatory, London Polytechnic Institute, Paris Observatory and at Potsdam, Germany, and thus served to determine with considerable accuracy the relative values of gravity at these points. Some of the principal previous determinations of gravity which have been made at or near these stations, and are therefore connected by the observations of 1900, are at Washington, by Preston in 1889-90, and Defforges in 1893; at the Kew Observatory, by Heaviside in 1873-74, by Herschel in 1881-82, by Walker in 1888, by Von Sterneck in 1893; at Greenwich Observatory, by Von Sterneck in 1893; at the London Polytechnic Institute, by Sabine, Kater and Herschel; at the Paris Observatory, by Defforges in 1892, and Von Sterneck in 1893. At Potsdam the observations connect with a most elaborate and painstaking determination of the absolute value of gravity which is now in

progress under the direction of the International Geodetic Association, and which is expected to yield the most reliable value ever yet determined in absolute units.

Other connections of varying degrees of accuracy had previously existed between these six stations. The new measures furnish direct connections of a very high degree of accuracy. These six stations have directly or indirectly been connected by various observations with nearly all the gravity stations of the world.

The work of deducing from the numerous connections between the gravity measures of various countries the best absolute values of gravity at the many points of observation scattered over the whole globe is peculiarly the duty of the International Geodetic Association, and is being performed systematically by that organization. In this investigation the gravity observations of 1900 furnish important new evidence.

The special value of these gravity measures of 1900 to the Coast and Geodetic Survey lies in the fact that they furnish the means of reducing accurately to absolute units all the relative measures made in the United States with the half-second pendulums during recent years. These values have up to the present time been reduced approximately to absolute units by assuming that the value of gravity at the Coast and Geodetic Survey Office is 980.098 dynes. This approximate value was adopted in 1892 and depends upon an absolute determination of gravity at Hoboken, N. J., and three comparisons of Hoboken with Washington by relative measures with three different sets of pendulums, and finally an absolute determination at Washington in 1889-90. In 1894 Mr. Putnam derived twenty-nine different values for gravity at Washington by utilizing all the connections available at that time between Washington and various stations at which absolute

measures had been made by various observers from 1792 to date. The mean of these values was 980.107. As the individual determinations showed a wide range, 0.147, the value 980.098 cited above was retained. From the relative observations of 1900, combined with the preliminary published absolute value of gravity at Potsdam from the observations which are still in progress, the value of gravity at Washington is 980.111. This differs by one part in 77,000 from the approximate value adopted in 1892, and by only one part in 250,000 from the mean of the 29 values deduced in 1894.

JOHN F. HAYFORD.

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*THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.*

THE first conversazione of the Institute was held at Columbia University on the evening of April 12th. About 1,500 ladies and gentlemen attended and enjoyed a most pleasing entertainment. Through the courtesy of the University authorities every facility in the way of space, current supply and assistance in preparing exhibits was placed at the disposal of the exhibitors, so that the many new devices, etc., were shown in actual operation. The list of exhibitors was long and the character of the apparatus extremely varied, as might be expected from a function held under the auspices of a society which represents the connecting link between pure science and commercial engineering. Many of the names included are well known in scientific circles, but the exhibits were in every case novel and have created a standard which will tax the energies of the Institute to the utmost to repeat in future conversazioni. Many notable persons were present as guests of the Institute, among them President Low and numerous professors of Columbia. President Low was accompanied by Baron von Holleben the German Ambassador to this