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things, he anticipated and realized the attainment of regular reflection from a sufficiently dense absorbing vapor; while to the public in America he is known as the inventor of a practical method of thawing frozen pipes by an electric current. The idea of a gigantic telescope in the form of a sunk well, with a revolving pool of mercury at its base to constitute a truly parabolic mirror, may not be a new one, but Professor Wood has taken it out of the region of the chimerical and shown that it is possible, even if not practically useful. We in this country have reason to envy the splendid resources which the munificence of citizens in America, and of governments elsewhere, places at the disposal of scientific explorers, and we honor and admire the use which is being made of those resources in every branch of science. As one of the most brilliant experimental physicists of the world, I present for our honorary degree Robert Williams Wood.

THE NEW INTERNATIONAL DIAMOND
CARAT OF 200 MILLIGRAMS

THE importance of having uniform weights, and the great practical disadvantages resulting from the international use of a perplexing variety of standards, have long made themselves felt in the diamond market. This subject has just been very fully treated in a paper read before the American Institute of Mining Engineers, at the New York meeting, February, 1913, and at the Butte meeting, August, 1913.¹

Those unfamiliar with the system of weights employed by diamond-dealers can scarcely appreciate the confusion that has existed, and the necessity for complicated calculations thereby entailed. This state of things will be best illustrated by giving here the equivalents in milligrams and troy grains of the principal standard carats as used in various trade centers:

¹“The New International Metric Diamond Carat of 200 Milligrams (Adopted July 1, 1913, in the United States),” by George Frederick Kunz, New York, N. Y., author’s edition, 21 pp. (pp. 1225-1245 of the *Trans. of the Soc. of Min. Eng.*).

	Milligrams	Grains Troy
Turin	213.5	3.29480
Persia	209.5	2.23307
Venice	207.1	3.19603
Austro-Hungary	206.1	3.18060
France (old)	205.9	3.17752
France (later)	205.5	3.17135
France (modern)	205.0	3.16363
Portugal	205.8	3.17597
Frankfort and Hamburg	205.8	3.17597
Germany	205.5	3.17135
East Indies	205.5	3.17135
England and Brit. India	205.3	3.16826
Belgium (Antwerp)	205.3	3.16826
Russia	205.1	3.16517
Holland	205.1	3.16517
Turkey	200.5	3.09418
Spain	199.9	3.08492
Java and Borneo	196.9	3.03362
Florence	196.5	3.03245
Arabia	194.4	3.00004
Brazil	192.2	2.96610
Egypt	191.7	2.95338
Bologna	188.6	2.91054
Internat. Carat, year 1875	205.0	3.16363
New International Carat .	200.0	3.08647

A glance over this table will serve to show the crying need for the establishment of a uniform and rational standard, and a preliminary step in this direction was taken by the Parisian jewelers in 1877, when they adopted a carat of exactly 205 milligrams. However, such a carat could never become an integral part of the metric system, and as early as 1893 the writer suggested in a paper read at Chicago before the International Congress of Weights and Measures, held in connection with the World’s Columbian Exposition, that a carat of exactly 200 milligrams should be recognized as the standard carat weight. Many years, however, elapsed before there was any definite prospect that this idea would be realized. The fact that in the early part of 1905 the German imperial government refused to recognize the carat then used in Germany as a standard weight, when requested so to do by the German Federation of Jewelers, because such recognition would be a violation of the laws prescribing the exclusive use of the metric system, is said to have powerfully

stimulated French endeavors for the reform of the carat by bringing it within the scope of the metric system.

The most effective worker in this direction was M. C. E. Guillaume, director of the Bureau International des Poids et Mesures at Sèvres, who urged the adoption of a carat of 200 milligrams before the International Congress in April, 1905. In January of the succeeding year, the *Chambre Syndicale de la Bijouterie, Joaillerie et Orfèvrerie* of Paris passed a resolution favoring the adoption of the metric carat, and in August of the same year the German federation of gem-dealers and jewelers urged its general adoption. The movement thus initiated soon spread, and by 1908 Spain had given the new carat a definite legal status, to be followed in 1909 by Japan and Switzerland. The adhesion of Italy, Bulgaria, Denmark and Norway followed in 1910, that of Holland, Portugal, Roumania and Sweden in 1911. Although it was not until 1912 that it became the legal standard in France and Germany, the law providing for its institution in the former land was passed June 22, 1909.

As in the case of all efforts to introduce metric weights or measures, the advantages of the new metric carat only very gradually became apparent in England and the United States. However, its official adoption by our Treasury Department, on July 1, 1913, as the standard for customs purposes, definitely stamps it with the seal of official acceptance here.

Belgium has already provided for the use of the new carat and England is expected to fall into line before long, so that by next year it is confidently believed there will be but one standard weight for diamonds, precious stones and pearls, the metric carat of 200 milligrams.

The paper gives a simple and easy method for converting the old carats of 205 milligrams into the new ones of 200 milligrams, and also offers many interesting details as to the history of the carat and the origin of decimal notation, the first known examples of the latter being found in a translation, published by

Leonardo of Pisa in 1202, of a work by the ninth-century Arabian mathematician, Al-Khouârazmi. The first use of the decimal point is stated to occur in the arithmetic of Frances Pellos, printed at Turin in 1492.

There can be little doubt that the adoption of the metric carat in the United States will do much to favor the cause of the metric system generally in this country, as not only the thousands of jewellers but also the millions of people who buy jewelry will now learn, most of them for the first time, what a kilogram, a gram and a milligram are, when they are told that a carat equals 200 milligrams; five carats, one gram, and 5,000 carats (or 20,000 pearl grains), one kilogram.

Some additional particulars may be added from advance sheets of M. Guillaume's report to the International Conference of Weights and Measures. The Argentine Republic, Peru and Servia are all disposed to accept the new carat. In Belgium the law promulgated March 10, 1913, embraces the following article:

In transactions concerning diamonds, pearls and precious stones, the denomination "metric carat" can be given to the weight of 200 milligrams, in derogation of articles 1 and 3 of the law of October 1, 1855.

The employment of the word "carat" to designate any other weight is prohibited.

In regard to eventual results M. Guillaume believes that the day will come when the commerce in precious stones will be confined to the employment of the ordinary metric units; the establishment of the carat as a fiftieth part of a grain will then have constituted a stage in this definite reform, and one greatly favoring it.

GEORGE F. KUNZ

SPECIAL ARTICLES

THE MECHANISM OF FERTILIZATION

In previous papers¹ I have described the secretion of a substance by the ova of the sea-

¹ SCIENCE, N. S., Vol. 36, pp. 527-530, October, 1912, and *Journ. Exp. Zool.*, Vol. 14, No. 4, pp. 515-574, May, 1913.