Notes on the weight of the 'Cullinan' diamond, and on the value of the carat-weight

BY

LEONARD J. SPENCER, M.A., F.G.S.

ASSISTANT IN THE MINERAL DEPARTMENT OF THE BRITISH MUSEUM

[Reprinted from the *Mineralogical Magazine*, March, 1910, Vol. XV. No. 71, pp. 318–326.]

MINERALOGICAL SOCIETY.

Officers and Council for 1909–10.

PRESIDENT.

Prof. W. J. Lewis, M.A., F.R.S.

PAST-PRESIDENTS.

Rev. Prof. T. G. Bonney, D.Sc., LL.D., F.R.S. (1883–1885).
L. Fletcher, M.A., F.R.S. (1885–1888).
R. H. Scott, M.A., D.Sc., F.R.S. (1888–1891).
Prof. N. Story-Maskelyne, M.A., D.Sc., F.R.S. (1891–1898).
Sir A. H. Church, K.C.V.O., M.A., D.Sc., F.R.S. (1898–1901).
Hugo Müller, Ph.D., LL.D., F.R.S. (1901–1904).
Principal H. A. Miers, M.A., D.Sc., F.R.S. (1904–1909).

VICE-PRESIDENTS.

Prof. H. L. Bowman, M.A., D.Sc., F.G.S.
A. E. H. Tutton, M.A., D.Sc., F.R.S.

TREASURER.

W. Phipson Beale, K.C., M.P., F.G.S., F.C.S.
10 *New Court, Carey Street, London, W.C.*

GENERAL SECRETARY.

G. T. Prior, M.A., D.Sc., F.G.S., *Natural History Museum, South Kensington, London, S.W.*

FOREIGN SECRETARY.

Prof. W. W. Watts, M.A., Sc.D., F.R.S., *Royal College of Science, South Kensington, London, S.W.*

EDITOR OF THE JOURNAL.

L. J. Spencer, M.A., F.G.S.

ORDINARY MEMBERS OF COUNCIL.

W. Barlow, F.R.S.
G. Barrow, F.G.S.
J. H. Collins, F.G.S.
C. G. Cullis, D.Sc. F.G.S.
J. W. Evans, LL.B., D.Sc., F.G.S.
F. N. A. Fleischmann, M.A., F.C.S.
H. Hilton, M.A.
J. A. Howe, B.Sc., F.G.S.
A. Hutchinson, M.A., Ph.D., F.G.S.
B. Kitto, F.I.C., F.G.S.
Arthur Russell.
G. F. H. Smith, M.A., D.Sc., F.G.S.

TRUSTEES.

R. H. Scott, M.A., D.Sc., F.R.S.
Prof. N. Story-Maskelyne, M.A., D.Sc., F.R.S.

LIBRARIAN.

Prof. W. J. Lewis, M.A., F.R.S., *The New Museums, Cambridge* (to which address all publications intended for the Library of the Society should be forwarded).

Notes on the weight of the 'Cullinan' diamond, and on the value of the carat-weight.

By L. J. Spencer, M.A., F.G.S.

Assistant in the Mineral Department of the British Museum.

[Read January 25, 1910.]

THE history of famous diamonds has always been surrounded with mystery and uncertainty, and this is no less the case with the recently-discovered 'Cullinan', by far the largest of all diamonds, which was found in the Premier diamond mine, near Pretoria, in the Transvaal, on January 25, 1905. Whilst it is now no longer possible to arrive at the exact facts respecting the earlier-found stones, it is desirable to place on record any definite information respecting the more noteworthy stones found in our own time.

In the case of the 'Cullinan' a doubt exists not only as to the statement of its weight in carats, but also as to the exact equivalent, compared with standard weights, of the carat-weights in which this is expressed.

In the first of the two following tables the weight, as variously expressed in carats,[1] is quoted; and in the second the still more divergent values expressed in standard weights.

Carats.	
3,032	'The Times' and other London daily papers of January 28, 1905.
	'Nature,' February 16, 1905, vol. lxxi, p. 372.
	Sir A. H. Church, 'Precious Stones,' New edition, 1905, p. 57; and 3rd edit., 1908, p. 58.
	L. Claremont, 'The gem-cutter's craft,' 1906, pp. 98, 115.
3,030	'Daily Telegraph,' January 28, 1905.
	Centralblatt für Mineralogie, &c., March 1, 1905, p. 153.
3,024$\frac{3}{4}$	Dr. F. H. Hatch, Quart. Journ. Geol. Soc., 1905, vol. lxi, proc. p. lxxxix (meeting of March 8, 1905).
	Drs. F. H. Hatch and G. S. Corstorphine, Trans. Geol. Soc. South Africa, 1905, vol. viii, p. 26 (read March 13, 1905); Geological Magazine, April, 1905, vol. ii, p. 170; Mineralogical Magazine, 1905, vol. xiv, p. 119; 'Geology of South Africa,' 1905, p. 275, and 2nd edit., 1909, p. 270.

[1] In all these instances the weight is presumably expressed in English carats, but only in the article in 'The Times' of November 10, 1908, is this expressly stated.

Carats.

Dr. G. A. F. Molengraaff, Trans. Inst. Mining Engineers, 1906, vol. xxix, p. 507.

R. A. F. Penrose, 'The Premier diamond mine, Transvaal.' Economic Geology, 1907, vol. ii, p. 280.

Premier (Transvaal) Diamond Mining Co., Ltd., Report for the year ended October 31, 1905, Johannesburg, 1905.

Prof. Max Bauer, 'Edelsteinkunde,' 2nd edit., 1909, p. 321.

Dr. W. Goodchild, 'Precious stones,' 1908, p. 140.

A. P. Karpinsky, Verh. Russ. Mineral. Ges. St. Petersburg, 1905, vol. xliii Protoc., p. 37.

Mineral Industry (New York), for 1905 (1906), vol. xiv, p. 214; for 1906 (1907), vol. xv, p. 671.

Dr. F. Krantz, of Bonn, in pamphlet issued in 1908 with glass models.

Plateelbakkerij 'De Distel,' of Amsterdam, in pamphlet issued in 1909 with glass models.

British Museum (Natural History), General Guide, 12th edit., 1909, p. 91.

3,024½ Dr. G. F. Kunz, Annual Report on Precious Stones for 1904, in Mineral Resources of the United States, 1905, p. 947.

3,024 Dr. G. F. Kunz, ditto for 1905, ibid., 1906, p. 1329.

'Standard,' March 16, 1905.

3,025 'Daily Mail,' April 5, 1905.

3,025¾ Sir W. Crookes, MS. note with photographs shown at the Royal Society Conversazione on May 17, 1905; British Association lecture at Kimberley (September 5, 1905), in Chemical News, 1905, vol. xcii, p. 139, and reprint (London, 1905), p. 16; 'Diamonds,' 1909, p. 77. [The stone was examined and photographed, though not weighed, by Sir W. Crookes at the London office of the Premier Company in April, 1905. The statement of the weight was printed on the base on which the stone stood].

'The Times,' November 10, 1908 [in a long article giving the history of the stone and an account of its cutting].

Harrod's Stores, London, label with glass models sold in large numbers in 1909.

L. J. Spencer, Proc. Geologists' Association, 1909, vol. xxi, p. 159; English translation of Prof. R. Brauns's 'The Mineral Kingdom,' 1910, p. 211.

3253¾ J. Wodiska, 'A book on precious stones,' New York, 1909, pp. 52, 54.

The first weighing of 3,032 carats was probably made at the mine before the stone had been thoroughly cleaned; that of 3,024¾ was made at the Johannesburg office of the Premier (Transvaal) Diamond Mining Company, Ltd.; and that of 3,025¾ at the London Diamond Office of the Company.

In addition to the above, some other, and so far as I know unpublished, weights in carats may be here given. On the arrival of the stone in London it was weighed by Mr. S. Neumann at the offices of the

Premier Company, and in his letter of acknowledgement of March 31, 1905, he stated the weight to be 3,025½ carats, at the same time drawing attention to the difference of ¾ carat between his weighing and the weighing in Johannesburg.[1] The value 3,025¾ carats is the result of a more careful weighing made in April, 1905; and this weight is recorded on an engraved silver tablet accompanying the glass model of the 'Cullinan' presented by the Premier Company to the British Museum in 1906. Messrs. I. J. Asscher & Co., of Amsterdam, by whom the stone was so advantageously cut, have been good enough to inform me that their record of the weight of the original stone is 3,019¾ Dutch carats, or 3,025 English carats.

Coming now to the published statements of the weight of the 'Cullinan' as expressed in standard weights, we find:—

English avoirdupois.	
9,600·5 grains = 1·37 lb.	Drs. Hatch and Corstorphine (loc. cit.).
9,586·5 „ = 1·37 lb.	Sir W. Crookes (loc. cit.).
about 22 oz.	'Daily Telegraph,' January 28, 1905.
nearly 1½ lb.	'Nature' (loc. cit.).
slightly over 1½ lb.	'Daily Mail,' March 27, 1905.
1¼ lb.	'Daily Mail,' April 5, 1905.
over 1⅓ lb.	'The Times,' November 10, 1908.
about 1¾ lb.	British Museum Guide (loc. cit.).

Grams.	
676½	'Nature' (loc. cit.).
621½	Sir A. H. Church (loc. cit.).
620	Dr. F. Krantz (loc. cit.).
	Dr. P. A. Wagner, 'Die diamantführenden Gesteine Südafrikas,' 1909, p. 123.
610	Prof. Max Bauer (loc. cit.).

The equivalent of 9,600·5 English grains given by Drs. Hatch and Corstorphine was calculated from the value of the 'South African carat' (3·174 grains) quoted from Mr. Gardner F. Williams.[2] Such a value

[1] This difference between the weighings in Johannesburg and in London is considerably greater than might be accounted for by a correction of the weight of displaced air and the height of the barometer, and, moreover, is in the opposite direction. The stone would weigh more—that is, be less buoyed up—in the more rarefied air of Johannesburg; the difference (with brass weights) being about 0·014 gram or slightly more than $\frac{1}{16}$ carat.

[2] G. F. Williams, 'The diamond mines of South Africa,' 1902, p. 520; new edition, 1906, vol. ii, p. 160. Here we find the curious statement (copied from E. W. Streeter, 'The great diamonds of the world,' 1882, p. 35) that the carat is 'equivalent to 4 grains avoirdupois or 3·174 grains troy weight'. Grains avoirdupois and grains troy are, of course, identical. The confusion is no doubt

for the carat would correspond with 205·672 milligrams, and the weigth of the original stone would be 622·10 grams. On the other hand, the value of the carat calculated from the weights given by Sir W. Crookes (3,025¾ carats = 9,586·5 grains) is 205·303 milligrams, with 621·20 grams as the weight of the original stone.

A calculation from the weighing in Dutch carats (3019¾) gives still another result. In the books I have found no less than seven different values given for the Dutch carat; taking that adopted by the Association of Diamond Workers in Amsterdam on October 17, 1890 (namely, 1 kilogram = 4,875 carats, or 1 carat = 205·128 milligrams), the weight is 619·44 grams.

An attempt was made to arrive at the weight of the original stone by determining the volume of the models, by weighing them in air and water. Three glass models (which, as seen from the markings on the surface, must have been cast in as many different moulds) had volumes of 170·05 cubic centimetres, 173·19 c.c., and 178·97 c.c. Taking the specific gravity of diamond to be 3·52, the corresponding weights would be 598·56, 609·62, and 629·98 grams respectively.

The only method, therefore, of arriving at the weight of the original 'Cullinan' was to compare with known weights the actual carat-weights against which the stone itself had been weighed. In this direction every facility has been most courteously given to me by Mr. W. Busch, the manager of the London Diamond Office of the Premier (Transvaal) Diamond Mining Company, Ltd., and to him I desire in this place to express my thanks.

The 3,000 carat-weight in use at this office I found to be equivalent to 615·88 grams; hence 1 carat = 205·293 milligrams, which multiplied by 3,025¾ gives 621·17 grams. A dummy weight (of shot in a canister) was made up to this amount, and checked, first in one pan and then in the other, against the carat-weights (3,000 and 2,000 + 1,000) on the same balance on which the 'Cullinan' itself had been weighed. With this load the balance was sensitive to ¼ carat, or about 0·05 gram.

These carat-weights show considerable signs of wear, owing to the rough usage to which they are subjected; and it is probable that nearly five years ago, at the time of the weighing of the 'Cullinan', they were appreciably heavier. The weights were supplied by Messrs. De Grave, Short & Co., of Hatton Garden, London, who inform me that the

due to the division of the carat into 4 'diamond-grains'. We also have the 'pearl-grain', 600 of which equal one ounce troy. Such are the pitfalls of the English system of weights and measures!

standard they take for the English carat is 205·3 milligrams. Taking 205·304 (see below), this gives when multiplied by $3{,}025\frac{3}{4}$ the value 621·199 grams.

We may therefore safely place the weight [1] of the 'Cullinan' diamond in its original uncut form at

621·2 grams. = 3106 metric carats

This is equivalent to $9{,}586\frac{1}{2}$ English grains [2] (exactly as given by Sir William Crookes), or 1·3695 lb. avoirdupois, or nearly 1 lb. 6 oz. avoirdupois.

When expressed in carats, it is not sufficient to state that the weight is $3{,}025\frac{3}{4}$ English carats. It must at the same time be stated that the carat is one of 205·304 milligrams, as defined by the Standards Department of the Board of Trade [3] in 1888 and 1889; namely 1 ounce troy of 480 grains = $151\frac{1}{2}$ carats, or 1 carat = $3.\dot{1}68\dot{3}$ grains.

The weights of the brilliants cut from the 'Cullinan' diamond are given in [English] carats in the article in 'The Times' of November 10, 1908; and Messrs. I. J. Asscher & Co., of Amsterdam, have kindly supplied me with a statement of the weights in Dutch and English carats, as quoted in the following table. I find that these weights are in agreement when the Dutch carat is taken as one of 205·712 milligrams [4] and the English carat one of 205·304 milligrams.

No.		Dutch carats.	English carats.	Grams.
1	Pendeloque brilliant	$515\frac{1}{2}$	$516\frac{1}{2}$	106.04
2	Oblong ,,	$308\frac{5}{8}$	$309\frac{3}{16}$	63.48
3	Pendeloque ,,	$91\frac{3}{4}$	92	18.89
4	Square ,,	$61\frac{7}{8}$	62	12.73
5	Heart-shaped ,,	$18\frac{3}{8}$	$18\frac{3}{8}$	3.77
6	Marquise ,,	$11\frac{1}{4}$	$11\frac{1}{4}$	2.31
7	,, ,,	$8\frac{9}{16}$	$8\frac{9}{16}$	1.76
8	Oblong ,,	$6\frac{5}{8}$	$6\frac{5}{8}$	1.36
9	Pendeloque ,,	$4\frac{9}{32}$	$4\frac{9}{32}$	0.88
10	96 small brilliants	$7\frac{3}{8}$	$7\frac{3}{8}$	1.51

The total weight of the 9 larger and the 96 smaller cut stones is

[1] That is, the weight in air against brass weights. The absolute weight *in vacuo* would be about 621.33 grams, or about $\frac{5}{8}$ carat more.

[2] 1 gram = 15·43235 English grains.

[3] Weights and Measures—Report by the Board of Trade on their proceedings and business under the Weights and Measures Act of 1878; for 1888, p. 13; for 1889, p. 2.

A verbatim reprint of these statements is given by Mr. E. J. Vallentine in his recent paper, 'The carat weight.' Trans. Inst. Mining and Metallurgy, London, 1908, vol. xvii, pp. 430–434. Unfortunately he gives the equivalent in milligrams as 205·3022 instead of 205·304.

[4] Calculated from $3{,}019\frac{3}{4}$ Dutch carats = 621·20 grams (see above, p. 320).

1,036$\frac{5}{32}$ English carats, or 212·73 grams, corresponding to a yield from the rough stone of 34$\frac{1}{4}$ per cent.

Although it is well-known and recognized that the carat-weight varies in different countries and places[1], it does not appear to be generally known that there are slight differences in the English carat.[2] The value more usually given in the books on precious stones for the English carat is 205·409 milligrams, which multiplied by 3,025$\frac{3}{4}$ would give 621·52 grams for the weight of the 'Cullinan'.

In this connexion I have compared against gram-weights, eight different sets of carat-weights actually in use in London, obtaining values for the carat varying from 203·2 to 206·3 milligrams (a difference of about $\frac{1}{64}$ carat), the majority being, however, somewhere near 205·3 milligrams. This is perhaps not altogether surprising when one considers that the weights are not handled with any degree of care; and that, being cheap commercial weights for weighing to only $\frac{1}{64}$ carat (= 3·2 milligrams), they are not accurately adjusted. The more carefully handled and adjusted set of carat-weights in the Mineral Department of the British Museum correspond with 1 carat = 205·410 milligrams. This set was supplied by Mr. L. Oertling about the year 1851, but the carat-weights he now makes agree with the Board of Trade definition (205·304 mg.).

The carat[3] is a very ancient unit of weight, and was formerly used for weighing gold as well as diamonds and precious stones. The Greek weight κεράτιον (*ceratium*) and also the Roman siliqua were equivalent to $\frac{1}{144}$ ounce or 3$\frac{1}{3}$ grains of our present weights; that is, only slightly more than the present value of the carat (about 3$\frac{1}{6}$ grains).

Boetius de Boodt[4], Tavernier, and other writers in the seventeenth century mention that the carat (*ceratium*) is divided into four grains [these grains being, however, 'carat-grains', 'diamond-grains', or 'pearl-grains', and not the ordinary grain]. In 1750 David Jeffries[5] states that '150 carrats make about 1 ounce troy': this value of the carat is

[1] e. g. from 188·6 mg. in Bologna to 215·99 mg. in Livorno (to quote once more the statements that are copied from one book to another).

[2] This was clearly pointed out by Sir A. H. Church in 1883 ('Precious Stones,' 1st edit., p. 50).

[3] The term carat as used to express the fineness of gold, expresses merely a ratio (so many parts in 24), and is now quite distinct from carat-weight. The fact that the Roman siliqua was $\frac{1}{24}$ of the golden solidus of Constantine suggests a connexion between these two meanings of the word carat.

[4] A. Boetius de Boodt, 'Gemmarum et lapidum historia,' Hanoviae, 1609, p. 65.

[5] D. Jeffries, 'A treatise on diamonds and pearls,' London, 1750, p. i.

equivalent to 207·357 milligrams. J. Mawe[1] in 1823 gives 151¼ carats = 1 ounce troy; and P. Kelly[2] in 1835 gives 151½ English diamond carats = 1 ounce troy. There thus seems to have been a tendency for the carat-weight to decrease slightly in value in the course of time; and a further slight decrease will bring it to the metric carat to be mentioned below.

Since the carat-weight had its origin in the use of certain hard leguminous seeds, I thought it would be of interest to ascertain the average weight of such seeds. Fifty seeds taken at random were weighed together, with the following results :—

	Average weight per seed in grams.
Seeds of *Ceratonia Siliqua* (Linn.) ... ... (Chocolate-brown seeds of a flattened pyriform shape.)	0·197
„ *Erythrina Corallodendron* (Linn.) ... (Orange-red with black spot at one end; reniform.)	0·197
„ *Adenanthera pavonina* (Linn.) ... (Crimson; lenticular.)	0·274
„ *Abrus precatorius* (Linn.) ... ... (Scarlet with black spot at one end; ovoid.) This constitutes the Indian rati, and is used at the present day by the Indian goldsmiths for weighing gold.	0·094

The first two of these weights (0·197 grams = 3·04 English grains)[3] approximate very closely to the present value of the carat-weight.

Ceratonia Siliqua is the carob or locust-tree, the fruit of which is the well-known locust-bean or St. John's bread. The Greek name κεράτιον refers to the horn-like shape of the fruit-pods; and carat is an obsolete English name for the seed. The seeds are remarkably constant in weight, and those taken from the ends of the pulpy pods are not smaller than those taken from the middle. They would be quite suitable for use as approximate natural weights for weighing small objects. Both by their weight and their name it is at once suggested that they are the origin of the carat-weight (κεράτιον, *ceratium*), and probably also of the Roman siliqua.

[1] J. Mawe, 'A treatise on diamonds and precious stones,' 2nd edit., London, 1823, p. 2.

[2] P. Kelly, 'The Universal Cambist,' 2nd edit., London, 1835, vol. i, p. 220.

[3] Sir A. H. Church ('Precious stones,' 1883, p. 49, and later editions) gives 3⅕ grains as the average weight of the seeds of *Ceratonia Siliqua*.

Another suggested origin of the carat is from 'kuara[1]', a native African name for a species of *Erythrina* or coral-tree. This seems less probable; and I find that the seeds of various species of *Erythrina* are not so constant in size and weight as those of *Ceratonia Siliqua*.

We thus see that the carat is a very indefinite unit of weight, and this is all the more surprising when we consider that it is used exclusively for the weighing of such valuable objects as precious stones. It would surely be to the advantage of gem-merchants and jewellers if some definite standard were universally adopted. The carat is clearly a useful commercial unit, since precious stones are not of any considerable size, and those in common use rarely exceed one or two carats in weight. To express these small amounts in terms of some larger unit (e. g. a gram) would be less convenient in the trade. What is wanted is a unit of weight of approximately the same value as the present carat, but one which bears some definite relation to standard weights.

Attempts to standardize the carat-weight have so far not met with much success. An 'international carat' of 205 milligrams was proposed in 1871 by the Syndical Chamber of Jewellers, &c., in Paris, and accepted in 1877 by the Syndical Chamber of Diamond Merchants in Paris.

A **metric carat** of 200 milligrams, that is exactly one-fifth of a gram (= 3·08647 English grains), has often been suggested, and has recently been definitely proposed by the International Committee of Weights and Measures[2], and accepted at the fourth sexennial General Conference of the Metric Convention[3] held in Paris in October, 1907.

[1] James Bruce ('Travels to discover the source of the Nile in the years 1768–73,' Edinburgh, 1790, vol. v, p. 65 and plate) describes the tree called 'kuara', which takes its name from the province of Kuara in Abyssinia, a name that also signifies sun. He mentions that the bean or seed is called carat, and that it is used for weighing gold in Africa and diamonds in India. This is the species *Erythrina tomentosa* (R. Brown). Two rather withered seeds of this species, collected in Abyssinia in 1868, I found to weigh 0·106 and 0·119 gram respectively, that is, only slightly over half a carat.

The species *E. abyssinica* (mentioned in Professor Max Bauer's 'Edelsteinkunde,' 1896, p. 120, 2nd edition, 1909, p. 124, and English translation by L. J. Spencer, 1904, p. 103) is perhaps a synonym of *E. tomentosa*. For assistance in botanical details I have to thank my colleague Mr. E. G. Baker of the Botanical Department.

[2] Comité international des Poids et Mesures, Procès-verbaux des séances, Paris, 1907, sér. 2, vol. iv, p. 192. (See also 1905, vol. iii, p. 124.)

[3] Quatrième Conférence générale des Poids et Mesures, Comptes rendus des séances, Paris, 1907, p. 60.

See also C. E. Guillaume, 'Les récents progrès du système métrique.' Travaux et Mémoires du Bureau international des Poids et Mesures, Paris, 1907, vol. v,

The adoption of the metric carat would be an excellent solution of the problem, and by its universal use the existing confusion would be avoided. The difference between the old and the new units is only slight, the metric carat being approximately $2\frac{1}{2}$ per cent. less than the present carat. This means that the weight of a particular stone would be expressed by a slightly larger number when weighed against metric carats than when it is weighed against the present carat-weights. At the same time a further advantage would be gained by discarding the awkward fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$ in favour of decimal fractions (tenths and hundredths).

For example, a stone of

$$2\tfrac{1}{8}\ \tfrac{1}{16}\ \tfrac{1}{64} \text{ English (Board of Trade) carats}$$
$$= 0{\cdot}452 \text{ gram}$$
$$= 0{\cdot}452 \times 5 = 2{\cdot}26 \text{ (approx. } 2\tfrac{1}{4}\text{) metric carats,}$$

and a stone of

$$100 \text{ English (Board of Trade) carats}$$
$$= 20{\cdot}5304 \text{ grams}$$
$$= 20{\cdot}53 \times 5 = 102{\cdot}65 \text{ metric carats.}$$

The use of the metric carat has recently been made compulsory by law in France; but unfortunately the movement for its general adoption receives little support in England. It may be added that the English carat is not a legal unit of weight under the Weights and Measures Act of 1878, but that presumably the metric carat would be covered by the Weights and Measures (Metric System) Act of 1897.

pp. 62–66 ('La réforme du carat') of the separately issued reprint, Paris (Gauthier-Villars), 1907. A notice of this appeared in 'Nature,' 1908, vol. lxxvii, p. 611.

These recommendations are mentioned in the Weights and Measures Reports (1908, p. 4; 1909, p. 4) of the Board of Trade in London; and also in the paper by E. J. Vallentine quoted above.

PUBLICATIONS

OF THE

MINERALOGICAL SOCIETY.

The *Mineralogical Magazine* may be obtained from Messrs. Simpkin, Marshall, Hamilton, Kent & Co., Limited, Stationers' Hall Court, London, and of all Booksellers.

All the Numbers (with the exception of No. 22, Vol. V, 1882, which is out of print) can be supplied. The earlier Numbers vary in price from 1*s.* to 5*s.* each (except No. 21, price 21*s.*); for Numbers published since 1889 (No. 39, Vol. VIII) the price is 5*s.* each.

Volumes I, II, III, and IV may be obtained, bound in cloth; the prices of these are 13*s.* 6*d.*, 17*s.* (including map), 12*s.* 6*d.*, and 17*s.* 6*d.* respectively. Later Volumes are only supplied in unbound Numbers, of which four or five form a Volume.

A coloured geological and mineralogical Map of the Shetland Islands, by Prof. Heddle, issued with Vol. II (1879), may be had separately, mounted on cloth, with stiff covers, and 3 pages of description. Size 31 × 21 inches. Price 7*s.* 6*d.*; or unmounted, with description, 5*s.* 6*d.*

A coloured geological and mineralogical Map of Sutherland, by Prof. Heddle, issued as No. 21 (1881), mounted on cloth, in cloth case, with 8 pages of description. Scale 2 miles : 1 inch. Price 21*s.*

Index of Authors and Subjects, Vols. I to X. Price 5*s.*

Bye-Laws and List of Members. Price 6*d.*

Cloth cases for binding Volumes. Price 1*s.* 3*d.* each.

GENERAL NOTICES.

Members desiring to propose Candidates for Election are requested to send the names and qualifications of the Candidates to the General Secretary, G. T. Prior, M.A., D.Sc, F.G.S., *Natural History Museum, South Kensington, London, S.W.* All communications for the Magazine should also be sent to him.

Authors alone are responsible for the views set forth in their respective papers. Authors are allowed, free of charge, fifty separate copies of papers published in the Magazine.

MINERALOGICAL MAGAZINE.

CONTENTS OF NO. 71.

(MARCH, 1910.)