Eddington, who writes in "Space, Time and Gravitation": "It must be understood that there were two questions to answer: first, whether light has weight (as suggested by Newton), or is indifferent to gravitation; secondly, if it has weight, is the amount of the deflection in accordance with Einstein's or Newton's laws?" (page 110). Further, "It will be remembered that Einstein's theory predicts a deflection of 1″·74. . . . The simple Newtonian deflection is half this, 0″·87" (page 118).

I gladly admit that I am not competent to do justice to my father's scientific work, but I took the precaution of asking astronomical and other scientific friends to check my manuscript, so I shall be surprised if there are any definite errors of statement on scientific matters in my book. In other respects, the review is only too kind.

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[1] *Nature*, **168**, 440 (1951).

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THE use of the words "old Newtonian theory" in connexion with the value of the deflexion of light rays passing close to the sun predicted by Einstein's restricted theory of relativity was the cause of the critical remark of which Mrs. Wilson complains. Newton never developed any theory of the bending of light. He did raise a query whether bodies could bend rays of light. This was one of 22 which he propounded, but left to posterity to follow up. Eddington's reference to the value to be expected for the deflexion according to Newton's laws of gravitation is correct in form; his subsequent statement that "Newton's theory suggests no means for bringing about the bending but contents itself with predicting it on general principles" is misleading and accounts for the reference to "Newton's theory" criticized in my review.

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## The Clear Representation of Very Small Masses

MANY methods are used for representing small masses; some are not readily legible and others are not immediately comprehensible to those unfamiliar with the notation. Since few editors seem to have a settled policy in this matter, it may be profitable to set out some of the considerations involved.

Two main courses can be followed: we can use one unit of mass, such as the gram, and multiply it by a suitably expressed but complex number; or we can use a series of subunits, such as the milli- and micro-gram, and multiply by a simple number. When the first method was used in the older literature, we often had a long row of 0s. Now we generally have a simple number multiplied by 10 with a negative index, or a neater logarithmic form is used and the whole quantity appears in a negative non-integral index. The latter form has the advantage, shared by the *p*H notation, etc., that biological response often varies with the logarithm of a quantity rather than with the quantity itself, so that equal numerical intervals in the index correspond to similar changes in response. Each form has the defect that the most important part of the whole quantity, the index, is the least easily legible. With good printing and paper, one can by peering make out the quantity, but many publications now appear 'on grey paper with blunt type' and then the quantity can be lost irrevocably.

A new typographical convention is needed so that any number can be expressed briefly with type of normal size and on the line. The precise convention is a matter of detail which may await decision on the principle, but a strong case can be made for the general use of the prefix *p* to qualify any unit, as it qualifies hydrogen ion concentration in *p*H, and indicate that the number following is a negative logarithm.

Most microanalytical needs are satisfied by the subunits milligram and microgram. This sequence has now been[1] extended by the nanogram (ng $= 10^{-9}$ g) and picogram (pg $= 10^{-12}$ g), and it can be logically extended further to the picopicogram (ppg $= 10^{-24}$ g). With such a unit we have reached atomic dimensions, for the carbon atom weighs $2 \times 10^{-23}$ g or 20 ppg. By judicious use of a subunit, any mass can therefore be expressed by a simple number and there is no need ever to use indices or logarithmic notation at all.

The biologist is sometimes concerned with a small mass; but he is more often concerned with concentrations, so that both mass and volume are being specified. Here simplicity should surely be aimed at and, by the use of units of concentration such as mg or μg per litre, indices and complex numbers should be avoided. In terms of molarity we do not have quite the same flexibility; but even here the more cumbrous forms can be avoided by using m*M* and μ*M*. Few substances with definable molecular weights exert much action at the latter dilution.

There are obvious advantages in taking one-sixteenth of the mass of an oxygen atom as a unit. Various names and symbols have been proposed for this; for example, h [2], the Cannizzaro unit[3] and the Dalton (d) [4]. With such a unit, molecular masses have the same numerical form as the conventional molecular weight ratios, and there is no advantage in introducing a unit when small molecules are under consideration. But with not readily separable mixtures, for example, the higher fatty acids, the use of a unit increases the precision of a statement without the appearance of too much pedantry. The larger and the less well defined the particle the stronger becomes the case for a mass unit. Thus the application of the unqualified term 'molecular weight' to a protein may lead to a false certainty about what has been demonstrated. This can be avoided by some such phrase as 'particles of median mass 200,000 d or 0·2 Md'.

The points raised here can be summarized in the form of three complementary questions on which I invite comment. Do the advantages of avoiding indices outweigh the difficulties of establishing a new typographical convention? Is pico- a useful prefix, and should editors urge authors to use subunits wherever possible? Is the Dalton (d $= 1/16$ the mass of an oxygen atom $= 1{\cdot}65 \times 10^{-24}$ g) an acceptable and useful unit of mass?

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[1] A Report by the Symbols Committee of the Royal Society (1951).
[2] Pirie, *Biol. Rev.*, **15**, 377 (1940).
[3] Sborgi, *Gazz. chim. ital.*, **15**, 293 (1942).
[4] Landolt-Börnstein, "Tabellen" (19[illegible]).