Thus a small dog could probably carry on his back two or three dogs of his own size; but I believe that a horse could not carry even one of his own size."

"*Simplicio*: 'This may be so; but I am led to doubt it on account of the enormous size reached by certain fish, such as the whale, which, I understand, is ten times as large as an elephant; yet they all support themselves.'

"*Salv.*: 'Your question, *Simplicio*, suggests another principle. . . .'"—And thereupon the two disputants go on to discuss the effect of immersion in water, of how by reason of its density (*corpulenza*), or, "as others would say," its heaviness (*gravità*), the weight of bodies immersed in it is diminished; and how accordingly the body of the fish is rendered, so to speak, altogether devoid of weight, and is supported without any injury: though if a giant fish, or a great and heavy-laden ship, were drawn ashore, it would be apt to go all to pieces, crushed under its own mass.

Galileo points out that Aristotle had an inkling of the principle in that chapter of his "Mechanics" where he discusses the question, "Why a long beam is weaker than a short one"—even though the long beam be thick and the short one be thin. But at the beginning of his treatise Galileo makes it clear that he regards the general statement as a discovery of his own, and as one of great importance which moved him even to astonishment.

D'ARCY W. THOMPSON.

The Names of Physical Units.

A L'OCCASION de l'aimable analyse consacrée au "Recueil des Constantes physiques" (NATURE, May 13, p. 281), M. J.-A. Harker s'étonne de certaines expressions insérées dans le tableau dont je suis à moitié responsable, et qui sert de préface à tout l'ouvrage. Je dis "à moitié," car, à l'encontre de ceux qui se rapportent à des constantes proprement dites, le tableau des unités a été discuté et approuvé dans sa terminologie par la Commission tout entière; j'ai seulement proposé, la Commission a disposé.

Le terme *stéradian* n'a pas l'approbation de M. Harker. Evidemment, il n'est pas encore consacré par un usage international, et c'est là, peut-être, son plus gros défaut. Les physiciens français toutefois l'emploient couramment pour désigner l'angle solide découpant, sur la sphère, une superficie égale au carré du rayon, ou l'angle solide égal au quotient de l'espace entier par 4 π . On conviendra que l'une ou l'autre de ces expressions est encombrante, et qu'une contraction était au moins désirable.

Stéradian est logique, puisqu'il résulte de l'association de radian (angle plan unité) et du préfixe impliquant la solidité ou l'espace à trois dimensions. J'ose donc espérer, malgré l'étonnement de M. Harker, voir nos confrères britanniques adopter ce terme. Ce serait une aimable réciprocité à l'hospitalité donnée par les sportsmen continentaux au mot *starter*, grâce auquel ils évitent aujourd'hui la périphrase: *Fonctionnaire chargé de donner, dans une course, le signal du départ*; tout comme le titre qu'ils s'octroient abrégé cette autre appellation: *Gentlemen consacrant une partie de leurs loisirs aux exercices musculaires*.

La question du degré carré sera résolue avec celle du stéradian. C'est bien, si je ne me trompe, au moyen de cette unité que les astronomes évaluent, entre autres, l'espace de la sphère céleste que couvre un cliché photographique.

Une autre espèce d'expressions a frappé M. Harker: *masse volumique*, *volume massique*. Dans le tableau en question, ces expressions sont inscrites entre parenthèses, en subordination, pour ainsi dire,

des termes classiques mais bien peu satisfaisants: *Densité absolue* et *volume spécifique*. Si j'avais eu une entière liberté, j'aurais certainement franchi l'étape et renversé l'ordre. Quel qualificatif, en effet, laisse plus de vague à l'esprit que celui de spécifique? On dit masse spécifique: quotient de la masse par un volume; volume spécifique: quotient d'un volume par une masse; spécifique a, ici, les deux acceptions exactement opposées, sans compter, dans d'autres cas, une foule de sens divergents. En fait, spécifique signifie tout ce que l'on veut, et par conséquent ne signifie rien du tout. La vieille terminologie laisse encore traîner dans la physique des expressions telles que *chaleur spécifique* (capacité calorifique rapportée à la masse) et *résistance spécifique* (résistance rapportée aux dimensions) et tant d'autres, pour l'intelligence desquelles le physicien est chaque fois obligé de faire appel à sa mémoire, sans aucune certitude d'être d'accord avec un confrère dans le sens à attribuer à une même expression.

Il fallait rompre un jour avec ces errements; la plupart des physiciens français, sur la proposition d'Hospitalier, ont accepté depuis des années les expressions que j'ai insérées dans le tableau, comme les mécaniciens français ont adopté, dans la technologie, des termes tels que *puissance massique*, auxquels le lecteur non prévenu ne peut se tromper, tant ils font image.

Ne pouvons-nous, au contraire, regretter de voir nos confrères britanniques conserver des expressions telles que *specific gravity*, où *specific* est vague et où *gravity* n'a rien à voir? Je soumets le cas aux méditations de M. J.-A. Harker, avec la certitude qu'il m'approuvera, car il est métrologiste, c'est à dire homme de pensée claire et concise.

CH. ED. GUILLAUME.

Pavillon de Breteuil, Sèvres (Seine et Oise),
le 17 Mai.

It would appear from the interesting letter of the Director of the International Bureau of Weights and Measures that he has a little misunderstood my reference to the new expressions he employs in the preface to the "Recueil des Constantes Physiques." If he will refer again to the review to which he takes exception, he will see that, on the matter of nomenclature, all I wrote was:—

"Some eccentricities appear in the initial table on units; few physicists are familiar with such terms as 'volume massique' and 'masse volumique,' 'degré carré' and 'stéradian.'"

I expressed no opinion as to the suitability of any of the terms in question, but only pointed out that in my view they were as yet far from familiar to the average physicist.

I have taken an opportunity of testing the accuracy of this opinion by consulting six of my colleagues. Not one of these had a clear and definite idea of the meaning of all four of the terms in question.

The introduction of a new name for a unit or an alteration in nomenclature should be a matter for the most careful consideration, particularly if it is intended for general international use; more harm than good may easily be done by an injudicious choice, even if supported by a great authority.

"Stéradian," and the other terms too, may be logical, but it is impractical to attempt to build a language simply upon logic.

Dr. Guillaume will remember that some time after the use of the term *micron*, with its corresponding symbol, the overworked letter μ , had been introduced into metrology, as the name for the millionth part of a metre—I believe I am correct in saying, largely through the influence of Dr. Benoit—Lord Kelvin,

probably unaware of this, proposed that the name *micron* be given to the millionth of a second, while he suggested that the micrometre be termed the *microm*.

Similarly, many years ago Sir Benjamin Brodie attempted to induce the chemists to rationalise their nomenclature by re-naming CO carbonous oxide, and taking the name carbonic oxide for CO₂.

Had either of these proposals even partially materialised, it would undoubtedly have led to great confusion.

While to some extent I agree with Dr. Guillaume's remarks regarding the English use of "specific," I do not think he strengthens his general case by referring to "puissance massique," which, to my mind, conveys only the haziest sort of meaning.

I might point out that, according to a view I have heard frequently expressed, the general introduction of the metric system into England has been hindered by prejudice against what is considered the unnecessary number of names of units appearing in the usual books dealing with the subject. It may be desirable to have these for rare use, but it is surely inadvisable to mention them in the school books as if they were current. Thus, for example, among measures of length, one is accustomed to think in metres, centimetres, or millimetres, and of greater lengths in kilometres. The decimetre is rarely used except in connection with the litre, and the decametre, hectometre, and myriametre practically never.

In conclusion, I think I represent the views of readers of NATURE when I say that many of them will be glad to buy the French Physical Society's useful volume, if it is only to be able to get rid from their library table of one or other of the editions of its well-known predecessor, written in the language of the Huns, which at the present moment they are unable to tolerate.

J. A. HARKER.

Teddington, May 25.

University Appointments in War Time.

I VENTURE to direct attention to the advertisement for a professor of organic chemistry in the University of Liverpool. It appears to me, and I believe many share my opinion, that this is a very inopportune moment for filling a university chair when eligible men are away on active service. It may seem unfitting to criticise the internal policy of another university, but it is a matter which closely affects many who have no connection with the University of Liverpool. Professors of chemistry and others are being solicited for testimonials by candidates, and in many cases such requests cannot be granted except by doing a grave and irreparable injustice to more highly qualified men who have responded to the country's call for volunteers in the present national crisis. I trust that the University of Liverpool will in this matter follow the same course as has been pursued by the University of Birmingham in the case of the vacant chair of physics, and postpone the appointment of a professor until after the termination of the war.

PERCY F. FRANKLAND,

(Dean of the Faculty of Science).

The University, Birmingham, June 12.

Volunteers for Scientific Work.

CIVILIANS of all grades are being enrolled as volunteer workers in our ammunition factories. Are there no Government chemical factories where persons of a certain amount of scientific training could render

voluntary aid towards the production of chemical munitions of war? There must be many who, like myself, are beyond the fighting age, whose skilled labour might be of use at the present juncture.

EDWARD HERON-ALLEN.

Large Acres, Selsey Bill, Sussex, June 12.

SCIENTIFIC METHODS IN INDUSTRY.¹

THE publication of this volume is opportune, for it presents data which will tend to focus attention still further upon the present unsatisfactory recognition of science by the Government and manufacturing interests of this country.

A state of war has disclosed this in detail; and demonstrated that a nation which is ill-prepared against industrial expansion in the modern sense, finds itself in an inferior position in times of war. For reasons which are still somewhat obscure, the British manufacturer has shown in the past a distinct preference towards those industries which develop best on lines of empiricism. Many have held that this is a defect; the present position has proved this to the hilt. Our manufacturers have surrounded themselves with an atmosphere which demands their whole attention in directing their ventures as they exist, manufacturing articles which depend upon a market already existing and the low selling price which always goes with such conditions. If empiricism were the only law of manufacture (as it was some fifty years ago) they would by their application outdistance all competitors.

It has been to Germany's credit that she realised the great driving force behind this system as it has been practised in the northern part of these islands, and that to turn the shield concentration in other directions was demanded, where some new factor could be introduced and the methods of empiricism were useless. British methods were not so much improved upon as superseded; scientific supervision and investigation were the beginning and end of this development; industries were built up which could not even have been started under the old régime; industrially useful products were in the scientific sense in many cases created, and then introduced into commerce. The older method of improving existing manufacture by empirical methods gave place to a new system. Thus the British manufacturer found himself face to face with the German industrialist, who had already convinced the German banks that he was working for a new era, where profits would be large and developments world-wide. To-day we have to consider a position where many of these new industries (by chance, or design) have been of the first importance in the time of war. The manufacture of large quantities of ammonium nitrate and nitric acid from synthetic ammonia (or the nitrogen of the air), has made Germany free from outside supplies of nitrates, and thus to some extent counteracted

¹ "First Principles of Production... A Study of the First Principles of Production and the Relation of Science to Industry." By J. Taylor Peddie. Pp. 231. (London: Longmans, Green, and Co., 1915.) Price 5s. net.