dently determined in Austria, Russia, Egypt, and the United States. Coexistence of cardiac hypertrophy and kidney lesions simultaneously observed in England, France and Germany. Sphygmomanometer independently invented in Italy and England, and ten years later, simultaneously improved in Germany and France. The chemical nature of respiration simultaneously worked out in Holland, Sweden, Italy, and France. The hypodermic syringe independently invented in Ireland, France and Scotland.

If Dr. Stern's thesis is correct, the premature removal of Jenner would not have retarded the development of cowpox inoculation by a single year. It merely would have shifted the focus of popular reward to Schleswig-Holstein. Pasteur's removal would not have retarded the development of applied bacteriology, but would have shifted the central figure of national propaganda to Germany. Or to England. Lister's premature death would have deified his American contemporary, Guerini, the at present unknown though no less real father of aseptic surgery, without retarding in the least the historic development of modern surgical technique.

Popular reward of medical research plays some queer tricks with historic medical perspective. Richet, semi-deified with the Nobel prize for his duplication of Rosenau and Anderson's rediscovery of what was at the time referred to in European laboratories as the "Theobald Smith phenomenon," for which, ten years earlier, Theobald Smith had claimed no priority, since he knew that the same phenomenon had been fully described as early as 1838 by physiologists whose names are at present unknown to the newspaper public. Banting, honored for his confirmation and popularization of the work of a Chicago physiologist, at present unknown to reportorial fame, who ten years previously[3] had prepared and tested insulin, for which work this physiologist claimed no personal credit, knowing that it was but a logical application of the pioneer researches of a half dozen unexploited Allens and Opies. d'Herelle glorified for his picturesque nomenclature ("bacteriophage") with which he confirmed and popularized the well-known transmissible bacterial lysin of Twort. Widal immortalized in the "Widal reaction" for his service in popularizing Gruber's confirmation of Gruenbaum's discovery of a reliable diagnostic test for typhoid fever.

All honor to Dr. Free's hand-picked research "aces." Long may they wave. And equal honor to the scores of unexploited contemporary medical scientists, whose publications are too technical for Dr. Free's non-clinical appreciation. But clinical medicine may well congratulate itself that it is not dependent upon these alleged sporadic geniuses, but upon the more real though less picturesque cultural urge of ten thousand collateral scientists, an evolutionary force dwarfing the allegorical research demigods of conventional history.

[3] *J. A. M. A.*, 1923, *81*, 1303.

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σ

RECENT discussion in SCIENCE seems to make it quite clear that mμ, and not μμ, is the proper symbol for the millimicron, that the micron, μ, is properly conceived as a micrometer, and that the small Greek letter in general stands for the millionth part of the standard unit.[1] Thus I am informed that γ is used for the microgram and λ for the microliter.[2] This standardized usage raises an interesting question about the proper symbol for the millisecond (0.001 sec.). Psychologists and physiologists, at least, use σ for the millisecond.

This use of σ for the millisecond was explicitly introduced by Cattell in 1885 on the mistaken analogy that a thousandth of a second should have a symbol analogous to μ, which he then thought of (as have so many others since) as meaning a thousandth of a millimeter rather than a millionth of a meter.[3] Wundt adopted the symbol σ at once, giving it the weight of his authority at the time when reaction-times, expressed in milliseconds, were a very important topic in psychology.[4] I do not know how or when physiologists came to adopt the symbol.

Recently the matter has been complicated further by the necessity of psychologists for dealing with the microsecond in work on the localization of sound. Here the original error has been multiplied by the use of σσ for the microsecond.[5]

There is no simple solution of the difficulty. The usual symbol for the second is "sec.," but there is some authority for using "s." Logically then one might write ms. (not σ) for the millisecond, and σ (not σσ) for the microsecond.

A very different ambiguity arises because σ has come to be used in statistical work for the standard deviation. So far as I can discover, this use of the

[1] See the clarifying note by N. E. Dorsey, SCIENCE, n.s., 71, 1930, 67f., and the earlier discussion there cited.

[2] By Dr. G. K. Burgess, of the Bureau of Standards, and by Dr. Dorsey, who cites numerous references.

[3] J. McK. Cattell, *Philos. Stud.*, 3, 1885, 102: "My proposal that σ = 0.001″ is made on the analogy to the commonly used symbol μ = 0.001 mm." *Cf.* also, Cattell, *ibid.*, 3, 1886, 306.

[4] W. Wundt, "Physiologische Psychologie," 1887, II, 267.

[5] E. M. von Hornbostel and M. Wertheimer, *Sitzungsber. d. preuss. Akad. d. Wiss.*, 1920, 338. I must plead guilty to having been one of those who have helped in publication to establish this faulty symbol.

symbol was initiated by Pearson in 1894.[6] It was not used by Galton or Edgeworth. Ordinarily no confusion arises from the double meaning, but sometimes, as when the standard deviations of reaction-times are under consideration, there may be very real difficulty. Cattell seems to have antedated Pearson by nine years, but of course Wundt's and Galton's schools did fuse until comparatively recently.

There is no proposal for reform that I wish to make, unless it be that the word *millisecond* might be used more and the symbol σ less. I can not help wondering what others think about this matter.

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PEDOGRAPHY

IT is obvious that the students of soil science are not agreed on the term they will use for their division of natural science. There has been a trend toward the word *pedology,* but in some circles there is a protest because the term is now being used by a limited section of the medical profession.[1] It has been pointed out that *paedology* or *paidology* is the word which should be used by the medical profession.[2] The pronunciation of the two will be essentially the same, but this need not cause confusion. Furthermore, Brown[3] has pointed out that pedology was first used by the Russian soil scientists in 1865.

The term pedology has been presented to a larger audience than the students of soil science by the publication of Wolfanger's little book called, "The Major Soil Divisions of the United States."[4] He uses not only pedology, but several other words having the same root. These terms are: pedologist, pedologic, pedological, pedalfer, pedalferic, pedocal and pedocalic. The subtitle of his book is "A Pedologic-Geographic Survey." Since he has placed considerable emphasis upon the distribution of the soils, it is suggested that *pedography* be added to the list, and that the term shall have as its connotation the geographic aspects of soil science. How simple the title of Wolfanger's book would have been as "The Pedography of the United States"!

Geographers are frequently on the receiving end of jibes from the followers of the so-called pure or natural sciences, who imply that they are not contributors but borrowers. Whether or not this criticism is justifiable I will not debate, but assuming that there is a borrowing, it becomes imperative that the students of soils come to some agreement as to what they will call their division of science, for the geographers will borrow, and the success of the borrowing depends in a large measure upon the progress of pedology. In defense of the borrowers it is necessary to insist that the material selected should have some habitat significance. The student of modern geography is not qualified to undertake a regional analysis unless he has a rather systematic knowledge of the physical environment, and certainly soil is an important element in most parts of the world. Huntington and Carlson's "Environmental Basis of Social Geography"[5] is one of the first text-books of geography to treat soils according to the attributive system.

Geographers are generally agreed that climate is the most important element of the physical environment. The science of climatology is an important part of the training of a geographer if he is to understand the environment. The geographical distribution of climates or climatic types is of major importance, and here and there in the literature of geography and climatology appears the term *climatography* which connotes regional or geographical climatology.

If climatography is appropriate for that division of climatology which treats of regional climate, so pedography may be used for that division of pedology which treats the geographical distribution of soils.

The purists may insist that pedography should connote simply a description of soils, but geography is not a descriptive science simply. Just as geography, as an exact or social science, has become interpretative, so pedography may be considered as that division of soil science that treats of the regional distribution of soils. Pedology, then, may be concerned chiefly with the vertical attributes of soil types, and pedography with their distribution and delineation.

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OVERHEAD

RECENTLY I wrote a paper on the carpenter bees of the Philippine Islands and sent it to the Philippine Bureau of Science for publication. It was typewritten in Manila, and on November 21 Mr. R. C. McGregor sent me the typed copy for verification before printing. The package reached me on January 10 through the War Department, postmarked Washington, D. C. The letter accompanying it was endorsed as follows:

[6] K. Pearson, *Philos. Trans.*, 185A, 1894, 80. Dr. T. L. Kelley writes me that Dr. H. M. Walker also finds this place to be the first use of σ for the standard deviation.

[1] See W. A. Hamor's note in SCIENCE, 71: 70, January 17, 1930.

[2] See P. E. Brown's note in SCIENCE, 71: 243, February 28, 1930.

[3] *Ibid.*

[4] Published by John Wiley and Sons, Inc., New York, 1930.

[5] Published by Prentice-Hall, Inc., New York, 1929.