THE New York State Legislature has appropriated $285,000 for the erection of a laboratory building at the New York State Agricultural Experiment Station at Geneva. This building will house the divisions of horticulture and botany and will make possible the expansion of the other research divisions which will remain in the old laboratory buildings. It is expected that additional funds for equipment will be made available later.

Nature states that at the ninth annual dinner of the London section of the British Association of Chemists, held on March 1, Sir Arnold Wilson outlined a scheme which is now under consideration for a building to house the principal societies and institutions in London concerned with chemistry and chemical industry or related to them. The societies interested are the Institution of Mining and Metallurgy, the Institution of Mining Engineers, the Chemical Society, the Society of Chemical Industry, the Institution of Chemical Engineers, the Institution of Rubber Industry, the Institution of Petroleum Technologists, the Institute of Fuel, the Institute of Metals, the Iron and Steel Institution of Petroleum Technologists, the Institute ciety. It is proposed that all these societies should be housed under one roof and their libraries pooled for the common use of their members. As Sir Arnold pointed out, the scheme has the advantage that each society would retain its own individuality while giving its members facilities for informal meeting with members of related societies. It would thus be an important step towards the cooperation and coordination so necessary to-day in allied branches of science and technology. It was stated that £100,000 has already been promised in furtherance of the scheme.

DISCUSSION

OUR CONTEMPORARY RESEARCH "ACES"

CLINICAL medicine is justly proud of the four typical biologists mentioned in Dr. E. E. Free's recently published list[1] of the ten living scientists, whose removal at the present time would be "an irreparable loss" to future clinical science. Without questioning the limitations and bias that led this retired agricultural chemist to select these particular four experimenters from the scores of equally skilled contemporary scientists, whose published results are in many cases too technical for a non-clinical agriculturist to understand, one can still raise the question if his selected four, or any dozen scientists similarly selected, are in reality "irreplaceable." What effect would it have on medical progress if Dr. Free's hand-picked research "aces" were to-morrow "sunk without trace" in our historical archives?

It is, of course, a picturesque hypothesis of the lay mind that medical progress is due solely to the half dozen specially gifted individuals of each generation whose initiative and exceptional mentality make them the pace-makers of clinical evolution. Conventional history is rich in such alleged research giants, varying from the mythical therapeutic demigods of ancient Greece to the almost equally apochryphal Listers, Pasteurs, Oslers and Ehrlichs of recent decades. To the lay mind, the premature removal of any one of these semi-deified medical "wizards" would have retarded clinical evolution for untold centuries.

This picturesque hypothesis of the sporadic personal factor in medical evolution is, of course, not endorsed by competent sociologists who have made a real effort to determine the underlying factor in clinical progress. One of the most convincing studies of this evolutionary mechanism is Professor Stern's recent volume,[2] "Social Factors in Medical Progress," published under the auspices of the faculty of political science, Columbia University. Professor Stern cites historical evidence that so-called gifted individuals were not important factors in our historic medical development, and frankly contends that the same progress would have been made on the removal of any or all of the ancient popularly recognized research heroes.

Professor Stern's most convincing argument that important clinical inventions and discoveries are determined solely by the general rise in cultural level in a dozen collateral fields of non-clinical science is based on the simultaneous, independent, multiple discoveries, and inventions in all fields of practical medicine. He cites hundreds of such research duplicates, ranging from the ten practically simultaneous inventions of the laryngoscope to the five independent discoveries of adrenalin.

Eight simultaneous discoveries of the cellular basis of plant and animal life. At least three independent demonstrations of artificial immunity following inoculation with attenuated cultures of anthrax bacillus. Five officially recorded demonstrations of the clinical value of cowpox vaccinations, before Court Physician Jenner hogged the limelight. Five independent discoveries of the phenomenon of heartblock. Three simultaneous demonstrations of vasco-constrictor nerves. Five independent introductions of ether as a surgical anesthetic.

The ophthalmoscope simultaneously invented in Germany and England. Agglutination of typhoid bacilli independently discovered in England and France. The cause of amebic dysentery indepen-

[1] E. E. Free, "Who Are the Greatest in Science," *North American Review*, January, 1930.

[2] B. J. Stern, "Social Factors in Medical Progress," Columbia University Press, 1927.

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.