and rational mechanics. The applied mechanics division of the society is also arranging a tour of the most important European laboratories in mechanics. Following the Stockholm Congress there will be a congress on general mechanical engineering to be held in Liège, Belgium, from August 31 to September 7, which is being held at the same time as the Belgium International Exposition.

THE tenth summer term of ten weeks of the American School of Prehistoric Research, under the direction of Professor George Grant MacCurdy, of Yale University, assisted by Mr. J. Townsend Russell, Jr., of the U. S. National Museum, will open in Paris on July 1. The field to be covered includes Paris museums, Valley of the Soame at Amiens, Brittany, northern Spain with excavations near Santander, the Pyrenees, Dordogne with excavations at St. Leon-sur-Vézère and Switzerland. In addition, the students will have opportunities to do field work in Czechoslovakia under the supervision of Messrs. V. J. Fewkes, of the University of Pennsylvania, and Robert W. Erich, of Harvard University. Applications for enrollment should be made as soon as possible to Dr. George Grant MacCurdy, Peabody Museum, New Haven, Connecticut.

AFTER a stay of four months the Oxford University Expedition to British Guiana has decided to return to England. It is stated that the expedition, which is under the leadership of Major R. W. G. Hingston, has secured what is said to be the best botanical and bird collections yet made in the forests of British Guiana.

Industrial and Engineering Chemistry reports that a chemical research bureau, with American participation, has been established in Zurich, Switzerland, under the name of the Colloid Chemical Research, Inc. The purpose is not only to conduct chemical research, particularly in the colloid chemical field, but also to acquire patents and processes for commercial development and to erect laboratories in Switzerland and elsewhere.

THE U. S. Civil Service Commission announces examinations for associate and assistant agronomist, applications to be on file by February 12. The examinations are to fill vacancies occurring in the Bureau of Plant Industry, Department of Agriculture, for duty in the field. At present there is a vacancy in the associate grade at Bellingham, Washington, and there are vacancies in the assistant grade at Huntley, Montana, and Fort Collins, Colorado. The entrance salaries range from $3,200 to $3,700 a year for the associate grade and from $2,600 to $3,100 a year for the assistant grade.

DISCUSSION

THE MICROMETRIC MUDDLE

IN an article with this title published in a recent issue of SCIENCE,[1] Mr. John P. Camp discusses the use and the interpretation of the symbol μμ. One might infer from the penultimate sentence of his article that he thinks that such questions might properly be settled by the simple process of counting the noses of those on the two sides. However such a method may work in politics, it scarcely accords with scientific ideals and, if adopted, would lead to ever-increasing disorder and confusion. It is a matter of common experience that new terms and new uses of old ones are most enthusiastically proposed and most avidly seized upon by those least qualified to decide what is needed and what accords best with established custom.

The confusion to which he refers seems to have arisen from a very common, but incorrect, definition of the micron (μ). It is commonly defined as a thousandth of a millimeter, and this suggests that μ indicates the one thousandth part. Neither is correct. The length of a micron is equal to the one thousandth part of a millimeter, but the proper definition of the micron is the millionth part of a meter. In the metric system, all units of the same kind refer to the fundamental unit, in this case the meter. As we have the myriameter (10,000 m), the kilometer (1000 m), the hectometer (100 m), the dekameter (10 m), the decimeter (0.1 m), the centimeter (0.01 m), the millimeter (0.001 m), so we have the micro-meter—called the micron—(0.000,000,1 m). With but few exceptions, the symbol of each unit is the dyad formed from the initial letters of the prefix and the name of the fundamental unit. According to this rule, the symbol for the micron would be μm, but μ has been used universally, I believe. Not only here, but in every case, in the metric system the prefix micro- and the symbol μ denote the one millionth part; for example, microsecond, microgram, microfarad, micromicrofarad, microhenry, microhm, microlambert. Consequently, consistency demands that μμ shall indicate the millionth of a millionth, and nothing else, and that mμ shall indicate the thousandth of a millionth. Furthermore, both must refer to the basic unit, not to a subsidiary one.

The unfortunate use of μμ to indicate a thousandth part of a micron seems to have been introduced by Kayser in 1883. It is well sponsored and probably

[1] SCIENCE, 70: 453, November 8, 1929.

arose in the manner already indicated, but it violates two principles of the metric system: (1) The placing of a subsidiary unit on the same plane as its primary; (2) the introduction of two symbols to indicate the same thing. For these reasons its use should be discontinued.

It is difficult to see how the use of the correct symbols can lead to any misunderstanding, as they fit into a well-known and orderly scheme. Even if one suspected that a writer had used μμ incorrectly, the context would usually show unambiguously what he meant, and if it did not, then the writer should be given the benefit of the doubt and be made to bear the burden of any error so resulting. The only difficulty in discarding the incorrect use of μμ arises from the human disinclination to break a bad habit.

Mr. Camp seems to imply that the Bureau of Standards is primarily responsible for the use of mμ to indicate the thousandth part of a micron. Were that true, it would be one more reason for the citizens of this country to be proud of the bureau, for it is a move in the direction of order and simplicity. Sixteen years ago, Ch. Ed. Guillaume, who is the director of the International Bureau of Weights and Measures, stated,[2] "La notation μμ, souvent employée, est défectueuse et doit être abandonnée," and gave mμ as the proper symbol for the thousandth part of the micron.

To conclude: In the symbolism of the metric system, the prefix μ denotes the one millionth part, and the prefix m denotes the one thousandth part; a micron (μ) is the one millionth part of a meter and, consequently, is equal to 0.001 mm; a thousandth part of a micron is called a millimicron, it is the one thousandth part of a millionth of a meter, its symbol is mμ; a millionth part of a micron is called a micromicron, it is the millionth part of a millionth of a meter, its symbol is μμ. Any departure from this is a violation of principles identified with the metric system and is to be deprecated as leading to disorder and confusion.

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NATIONAL RESEARCH COUNCIL,
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THE EFFECTIVENESS OF A PLANT QUARANTINE

THE actual degree of effectiveness of plant quarantines in preventing the spread of insects is not known. Proponents of these quarantines will maintain that the presumption of effectiveness should be allowed them. The fact that the Mediterranean fruit-fly has not yet appeared in California will be ascribed by them solely to the vigilance of quarantine officers. The fly is not here. There has been a quarantine against it. Consequently the absence of the fly is to be credited to that quarantine. Opponents of the quarantines may doubt—or even sneer—as much as they please, but they can prove nothing.

Undoubtedly there are many peculiar factors entering into and influencing the spread of insects, even under natural conditions. Why, for example, should a single, isolated plant—as has been observed by the writer in field collecting—be heavily infested with a certain scale insect, while whole thickets of the same plant less than a hundred feet away have none of it at all? Why has the Mediterranean fruit-fly been so unexpectedly considerate as to confine its efforts in Florida purely to cultivated fruits, as is reported to be the case? We may agree whole-heartedly with a recent investigating committee which has remarked, "That infestations have not been found in adjoining states where much fruit was shipped previous to the discovery of the infestation [in Florida] is difficult to explain."[1]

One example which affords a clean-cut test of this matter is at hand. A mealybug (*Pseudococcus brevipes* Ckll.) occurs abundantly upon pineapples in the Hawaiian Islands. This insect is a general feeder and is established on various hosts in Florida, where it is quite common, and also in Texas, but is not known to occur in California. There is no reason to suppose that it will not live in at least some part of this state and upon some plants that are grown here, but although I have been identifying mealybugs for various county commissioners of horticulture for several years, it has never come to me, and it may be assumed that it is not in the state.

This insect is not supposed to pass the quarantine barriers and it is one of the insects that have commonly been reported as among the "pests intercepted" by the quarantine officials. The presumption would therefore be that its absence from California is due to the vigilance of these officials.

Yet I have several times taken this insect alive on bananas and pineapples in markets in this state. In order to check up once more I looked for it in a market a few days ago. The one pineapple in this market had several living specimens upon it.

The facts of the matter, then, are that this insect must have come into California alive many thousands of times since the quarantines were instituted. Yet it is not established in the state. Whatever credit the quarantine officials may assume to themselves for the exclusion of other pernicious species, they can not lay claim to such credit in this case. The presumption of their effectiveness can not be maintained. The

[2] "Recueil de Constantes Physiques," page 5, Gauthier-Villars, Paris, 1913.

[1] Official Record, U. S. Dept. Agriculture, Vol. 8, No. 46, p. 8. November 14, 1929.