always obtained by dividing the sum of all the positives except the highest by the highest, *e. g.*, 1/20 (18 + 8 + 1 + 0) = 1.35. That a mathematical treatment would improve and standardize the computation can be seen from the remark that a hasty study gives the following simpler result (subject to the doubt already expressed as to the validity of the theory): The aggregate per cent. of "positive" tubes gives the logarithm of the most probable average number of *B. coli* per 100 c.c., *e. g.*, 1/20 (20 + 18 + 8 + 1 + 0) = 2.35, and this is the logarithm of 224. This rule will explain, for example, why Mr. Wells's "reversion method" works, for it is the mathematical equivalent of the foregoing. A further implication is that the author would seem to be wrong in saying that the "percentage positive" (the aggregate percentage) gives the desired result for a test using a single dilution; to use a concrete example, 18 positives out of 20 at 1 c.c. together with 0 positives out of 20 at .1 c.c. should by any test be regarded as indicating a smaller number of *B. coli* than the 18 positives alone, yet the rule here commented on yields the same results for both.

It will be of undoubted value to have Mr. Wells's more complete presentation particularly of the experimental data which he mentions.

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SOME DEFECTS IN OUR AGRICULTURAL INSTRUCTION

In the preface to the text-book on agricultural botany ("Traité de Botanique Agricole et Industrielle") by J. Vesque, professor of agricultural botany in the National Institute of Agronomy of France, the following criticism on the agricultural instruction then (1885) given in France occurs:

> In France the agricultural instruction attaches itself more and more to rearing of livestock. It is too much forgotten that the animals are nourished by the plants, or, if it is not forgotten, it is taken for granted that the culture of plants consists merely in the production of a maximum mass of vegetables. The nature of the plants, the species which populate our fields, the seeds confined to the soil are far from preoccupying the cultivator as much as the nature of the soil and the fertilizers employed. All the agricultural instruction may at this point be summed up in three words: Zootechny, agricultural chemistry and rural engineering. The plant, the initiative in all agricultural pursuits, is almost excluded. How many cultivators know the herbs of their farms, how many are capable of distinguishing the good from the bad? Liebig was certainly not wrong in accusing the students of the agricultural schools of knowing neither the seeds of the grasses nor the grasses themselves.

These remarks, describing the character of the agricultural instruction in France in 1885, fit the condition prevailing in many of our American agricultural colleges at the present day to a strange degree of exactness. The same neglect of the scientific knowledge of plants is present, not only in courses in which animal industry is the major subject, but even in such courses as agronomy and horticulture, which from their very nature should deal largely with plants. We find the botanical equipment of the average graduate very meager indeed. He has not infrequently been the recipient of long lecture courses on forage plants without possessing definite knowledge of the distinction between grasses and legumes; or he has studied ornamentals in his horticultural courses without enough training in botany to appreciate either the meaning of the description of a plant or the importance of its scientific name; or he may have spent considerable time in judging corn without having clearly in his mind to which family of plants the Indian corn belongs, or what characteristics distinguish it from the other members of its family. Such vague knowledge of plants is not uncommonly met with among graduates from agricultural colleges claiming thoroughness for their preparation.

No one will deny the right of agriculture to the title of a generous place in the higher education, based as it is on those natural sciences, in which our country claims its proudest distinction in its progress. It is also undoubtedly the intention of all these agricultural colleges,

due to the land grant act, to furnish this higher education, for the equipment of which they are liberally supported by the state and national means. The claims upon the preparation for entering these colleges are also about the same as that required by schools of the higher order, or the university class, that is high-school graduation, or its equivalent. But in spite of these advantages and the numerous special courses offered by nearly all these colleges, a great many of our graduates are suffering from the deficiencies complained of by Professor Vesque, thirty years ago in France.

In glancing over the catalogues of the courses of the agricultural instruction given in these colleges, one is struck by the multitude of optional courses, which are frequently restricted to very narrow specialties. The time allotted to one of these petty subjects is frequently as much as that given to the whole of the science of botany, which constitutes one of the main foundations of the entire structure of higher agricultural education.

In further examining these special courses, we shall find that many of them presuppose a careful preparation in botany which, however, has not been granted by the general curriculum. It is not infrequent that a student in some of these colleges is receiving lectures in plant breeding without previously having received any instruction, worth his while, either in morphology or taxonomy. An examination of the curriculum of many of our agricultural colleges seems to reveal the fact that there is too much specializing upon the superstructure before a safe foundation is laid. If the student be equipped with a fair general knowledge of botany, chemistry and physics, including physical chemistry, he may be trusted to develop the specialties of agriculture resting upon these as opportunity and occasions arise, but if the fundamentals be lacking, he will always remain uncertain and giddy.

H. NESS
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PROFESSIONAL COURTESY

TO THE EDITOR OF SCIENCE: We appreciate your courtesy in submitting to us the criticism concerning ethics involved in the publication of the article referred to by Professor Hart. We do not feel that a reply to the charges contained in his statement is necessary, further than to say that the work referred to was planned entirely by one of us (McCollum) and was carried out by Mr. Steenbock, according to the usual practise in experimental work. The detailed records of the time of extractions, filtrations, evaporations, etc., were published verbatim from notes copied by Mr. Steenbock for me as requested, and should, of course, correspond closely with his notebooks.

In a case of this kind where the veracity of one of the statements must be questioned by those who read this charge and our reply, nothing better can be done than to leave the public to judge for itself on the basis of the research records of all concerned as to the probable responsibility for the planning of this work.

E. V. MCCOLLUM,
N. SIMMONDS

SCIENTIFIC BOOKS

Societies of the Plains Indians. Anthropological Papers of the American Museum of Natural History. Volume XI. New York, 1916. Edited by CLARK WISSLER. Issued in 13 parts; C. WISSLER, R. H. LOWIE, P. E. GODDARD, A. SKINNER, J. R. MURIE, contributors.

This volume probably does not represent the greatest undertaking in modern American ethnology: it does represent one of the most efficiently executed, and is therefore of interest as an example of the method to which the science has attained. In case the designation "science" seem as yet unearned, let us compromise on "study of uncivilized culture history."

There are still many students at the height of their activity who were trained in, and some who practise, the older ethnology: a discipline begot by an intrinsic interest in the phenomena of culture, but fathered and nourished by the doctrine of evolution after it had begun to transcend its proper biological