finance committee of the city of Philadelphia, and Morris L. Cook, director of the public works of Philadelphia.

THE trustees of Dartmouth College have voted, after the year 1914, to suspend for the present instruction in the last two or clinical years of the Medical School and to concentrate the resources of the school upon the first two years in medicine. Students thus trained will be well qualified to enter the third year of the courses offered by the best city medical schools and may there complete their clinical preparation for the degree of doctor of medicine. The reason given by the trustees for this action is that because of its location the school has found difficulty in meeting satisfactorily the steadily advancing requirements set by the medical profession for a larger supply and variety of clinical material for purposes of instruction. By the action of the trustees also provision is made to extend the work in business organization and management and in commerce. Principles of business management, heretofore a second-year course, will be given the first year. Professor Person and Henry Woods Shelton, appointed assistant professor, will offer new advanced courses in the application of principles of management in manufacturing and merchandizing, including selling, advertising and other specialized branches.

PROFESSOR ERNEST C. MOORE, head of the department of education at Yale University, has received an offer to become professor of education at Harvard University.

DR. JOEL H. HILDEBRAND, of the University of Pennsylvania, has been appointed assistant professor of chemistry in the University of California.

DR. ERNST HEDINGER, professor of pathological anatomy at Basle, has accepted a call to Königsberg in succession to Professor F. Henke.

MR. A. R. HINKS, F.R.S., chief assistant at the Cambridge University Observatory, has been appointed Gresham professor of astronomy, London, in succession to the late Mr. S. A. Saunder.

AT a meeting of the electors to the Plumian professorship of astronomy in the University of Cambridge, held on April 19, Mr. A. S. Eddington, chief assistant at the Royal Observatory, Greenwich, was elected to the professorship, in succession to the late Sir George Darwin.

## *DISCUSSION AND CORRESPONDENCE*

### THE NEED FOR ENDOWED AGRICULTURAL RESEARCH[1]

TO THE EDITOR OF SCIENCE: There exists a widespread confusion of thought in regard to what is needed for the advancement of the science of agriculture in distinction from what is needed for the promotion of the practise of scientific farming. Actually these two things are entirely distinct, and what is of great aid, or even essential to one, is usually of relatively little value to the other, and indeed may indirectly become a hindrance to it. To advance the science of agriculture means to make new and fundamental discoveries in regard to the natural laws on which crop production and animal production depend. To promote such advance plainly demands the conducting of scientific research of the highest type in the field of agriculture and the pure sciences—physics, chemistry and biology —which are fundamental to it. On the other hand, to advance or promote the practise of scientific farming means (*a*) to put into the hands of the practical farmer the most complete and authentic information which exists

[1] This communication was called forth by the discussion which has been going on in the newspapers regarding the proposed plan of Mr. Vincent Astor to utilize his estate for the promotion of agricultural science. It was originally published in the New York *Times* for February 21, 1913. The editor of that paper, however, saw fit to omit considerable portions of the communication as submitted to him, including the discussion of what I believe to be the most essential point indicating the need for endowed, as supplementary to tax-supported, agricultural research. The result was what I can only regard as an unfair and inadequate presentation of my views on the subject. Since the matter is unquestionably one of real significance to the cause of American science, I venture to offer here a complete statement of my position.

in regard to the scientifically correct principles and methods of farming, and (*b*) to stimulate him by every possible appeal to reason, ambition and thrift to put these methods into practise on his own farm.

From this brief statement it will be apparent that, broadly viewed, the successful promotion of scientific farming must depend in the long run on the advance made in the science of agriculture. The farmer can not be taught new principles and methods until these have been discovered by the investigator. All federal and state legislation in this country looking towards the development of our agricultural resources has included in its purview these two complementary, but in practise somewhat conflicting needs. But there has been comparatively little effective effort (aside from the Adams Act, which has unquestionably been of great aid to the cause of agricultural research) sharply to distinguish between these needs and to provide definitely and precisely for each. Generally speaking, and with the exception noted, the provisions for tax-supported agricultural work in the United States have attempted to kill two birds with one stone. The result has varied in different localities, but on the whole it may fairly be said that the effect has usually been much more marked on one of the birds than on the other. Undoubtedly this country leads the world today in the effective promotion of scientific farming. This enviable position has been gained through our splendidly organized system of agricultural education, comprising the colleges of agriculture in every state with their intramural instruction, on the one hand, and their extension activities, which reach an astonishingly large proportion of the farming population, on the other hand. Furthermore, to supplement the extramural work of the colleges we have the work of the experiment stations and state departments of agriculture and the federal department of agriculture. These institutions reach the farmer in many ways, but chiefly by the dissemination of useful information in the form of bulletins, and other (even more ephemeral) forms of literature. On the whole, it would be difficult, and indeed no one has ever done so, to devise a better and more effective system for the promotion of scientific farming than that which we now enjoy the benefits of in this country.

But what of the advancement of the science of agriculture? There we meet a totally different condition of affairs. Comparisons are proverbially odious, but I very much doubt if many *disinterested* scientific men acquainted with the field could be found to affirm that in this particular we lead the world. Theoretically it is a primary function of the state experiment stations to conduct researches of a fundamental character which shall be calculated to discover basic natural laws. Actually, with a few rare and partial exceptions, experiment stations do nothing of the sort. On the contrary, what they do engage in is experimental work of a kind carefully calculated to make as strong an appeal as possible on the basis of its supposed "practicality" to the scientifically uneducated and uncritical farmers who make up its constituency. The experiment station investigator in many cases (though happily not in all, as I am able personally to affirm after five years' experience in Maine) is compelled by force of circumstance over which he has no control to supplicate the great goddess Truth with one ear closely applied to the ground in order that he may catch the first and faintest murmur of "what the public wants." If he has the temerity to venture upon a piece of research for which by the most extreme sophistry no evidence of immediate practicality can be adduced, he must do the work *sub rosa* and publish the results in such place that by no possible chance can the constituency ever learn of it.

What has been said can not justly be regarded as a criticism of American experiment stations or their responsible managers. It is simply a fair and candid statement of an existing condition of affairs, which limits the usefulness of experiment stations in certain directions. The reason for the existence of this condition *primarily* lies *not* in any lack of high scientific ideals on the part of the directorate or the workers, nor in any mismanagement, either intellectual or material, of their institutions, *but is found in the fact that they are tax-supported.* The people who

support an institution by the payment of taxes rightly feel that it is their institution. If it engages for a considerable period of time in activities of which they do not approve, or which they regard as useless and frivolous they will either withdraw their support, or if this is practically impossible, they will, by the pressure of public opinion, bring about changes in its management until they get it controlled by men whose policy meets with their approval. Every experiment station worker knows this obvious fact. He must govern his actions in accordance with it if he desires to do *any* useful work in this field. Because of this fact, which is from one point of view a great advantage, the experiment stations have come to take a very important part in the promotion of scientific farming. Their achievements in this direction, viewed as a whole, over the past twenty-five years, are noteworthy in a high degree. But doing this has left but little time, energy, resources or brains available for fundamental research in agricultural science.

The greatest need of organized agricultural development in this country at the present time is, I venture to think, an endowed institution for agricultural research, which shall do for the science of agriculture what the Rockefeller Institute is doing for the science of medicine. This need the state experiment stations never can entirely fill, for the reason that the farmers of the country collectively are not and can not be expected to be qualified to judge either (*a*) what are fundamental problems or fields in which research should be carried on, or (*b*) what lines of investigation are likely to advance knowledge, or (*c*) what are appropriate methods of investigation in general and in particular. Yet these are matters which the interested tax-paying public in actual fact does, and will continue to pass judgment upon in the case of tax-supported institutions. I have no criticism to offer on this attitude of mind. It is human, and understandable, and has led to some excellent results, and I have no quarrel with it whatsoever. I merely affirm that it is not one well calculated to promote the advance of science. He who will endow on a scale in some degree commensurate with the importance of agriculture in the social and economic system, an institute for agricultural research and place its management in the hands of a board of directors, of which a majority shall be scientific men of standing, will do the world a service of inestimable value.

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## BLOCKS AND SEGMENTS

IN the issue of SCIENCE for January 31, 1913, Dr. Geo. I. Adams proposes the use of the word *segment* for a general term to be applied to a minor part of the earth having the dimensions of a solid. He finds that this term has already been used in Chamberlin and Salisbury's text-book of geology in discussing continental and oceanic segments and asks, "If it is applicable to major elements, why not to minor ones as well?" The note is not untimely, as it is evident that there are some divergent practices in the selection of terms to denote the categories in question. A quotation is given from a prominent geologist who uses the word *segment* in the way to designate a minor part of the earth's exterior marked off by some structure. It is not evident, however, if the writer of the quotation meant to use it in as wide a sense as proposed in Dr. Adams's note; for it appears that Dr. Adams would apply the name segment to all parts of the earth's exterior marked off by faults.

It seems that a term has long been in use, at least among American geologists, to denote a minor part of the earth's exterior marked off by faults. This term is *block,* a short, clear-cut, Anglo-Saxon word, very suitable for such use as is now proposed for segment. The use of the word segment by Chamberlin and Salisbury is, as it appears to me, for the purpose of denoting parts of the earth, more or less commensurate with the geosphere itself. The term seems very appropriate in that sense. Smaller parts of the earth's exterior, marked off by faults or sharp folds, especially when not discussed in connection