the exception of plant pathology it is exceedingly difficult to find graduates in botany whose training has given them either a taste or a qualification for the innumerable problems surrounding crop production. Almost none take the U. S. Civil Service examinations, the result being that the positions are mostly filled by graduates in agronomy with but meager botanical training.

The result of this condition of affairs is detrimental to the advance both of botany and of agronomy. The young botanist is neither trained nor encouraged to look upon the problems of crop production as the legitimate and greatest field for his future activities. Conversely, agronomy suffers because far too few botanists lend their aid to the study of plants under cultivation.

The charge has sometimes been made that botanists purposely avoid grappling with the enormously difficult physiological and ecological problems that every agronomist and horticulturist encounters. I do not believe that American botanists have ever consciously taken this attitude, but they have been willing to leave the work largely to chemists and others of very limited botanical training. In short, they have not asserted their rights to this field of plant phenomena nor proven them by actual accomplishment.

Botany has progressed greatly in America in the past twenty years, in spite of the fact that it has woefully neglected its greatest application; namely, crop production.

It is difficult to disagree with Dr. Copeland's proposition "that the best scientific foundation for plant industry is a knowledge of plant physiology," except to add that equally necessary is a knowledge of the adaptations of each plant, which is ecology. The fact remains, however, that plant industry or crop production far antedates botanical science, and most of its progress has been purely empirical; that even yet our knowledge of the physiology and ecology of any one crop plant is woefully incomplete.

I would go still further than Dr. Copeland, however, and assert that the whole field of plant culture or crop production is one of plant ecology and plant physiology. Until this is recognized by botanists progress in crop production will continue to be largely the work of non-botanists.

C. V. PIPER
U. S. DEPARTMENT OF AGRICULTURE

IN REGARD TO THE POISONING OF TREES BY POTASSIC CYANIDE

IN SCIENCE of October 9, 1914, was published a short letter telling of a successful attempt at poisoning the cottony cushion scale by inserting cyanide of potassium in a hole bored in the trunk of the tree. I have since received a number of letters asking for further information regarding my "process," and telling me of numerous cases where trees have been killed by poisoning the sap with something beside potassic cyanide. I would accordingly like to take this opportunity of stating that I am not experimenting in either entomology or horticulture; that I have no process, and that I gave in my letter to SCIENCE a plain statement of the method and results of my experiment. I did this in the hope that it might serve as a suggestion to others who are working in the same field.

I was told by several of my colleagues who are working in biological subjects that any poison fatal to insects would kill a tree before I put the cyanide in the trees, and I have read in a recent number of SCIENCE of the destructive effects of putting potassic cyanide and something else under the bark of fruit trees. I have accordingly chopped down the peach tree referred to in my former letter and have examined both the wood and the bark around the hole in which the cyanide was inserted. In both the wood and the bark there was a discoloration around the hole extending less than one eighth of an inch. Outside of this ring I could notice no change in either. I am not positive that as great an effect would not have been produced if the hole had been left empty. One proof that the bark was not seriously poisoned about the hole was seen in the fact that it had begun to grow over the opening. This is also true in the case of the broom and the orange tree referred to in the previous letter. The peach tree was cut down

ten months after the cyanide had been put into it. FERNANDO SANFORD

QUOTATIONS

THE ORGANIZATION OF SCIENCE

JUST before the beginning of the war much fruitful discussion was going on in the columns of *Nature*, the *Morning Post* and *Science Progress* on the subject of the encouragement of science; and those who are interested in the theme should read Dr. R. S. Woodward's address on the needs of research, delivered on the occasion of the dedication of the Marine Biological Laboratory, Woods Hole, Massachusetts (SCIENCE, August 14, 1914).

Dr. Woodward begins by exposing some of the popular fallacies regarding research—that it "is akin to necromancy"; and that "the more remarkable results of research are produced not by the better balanced minds, but by aberrant types of mind popularly designated by that word of ghostly, if not ghastly, implications, namely 'genius.'" He has also exposed the absurdity that research institutions should busy themselves in soliciting suggestions from the amateur public outside, that is "in casting drag-nets in the wide world of thought, or in dredging, as biologists would say, with the expectation that out of the vast slimy miscellanies thus collected there will be found by the aid of a corps of patient examiners some precious sediments of truth." He thinks that "important advances in knowledge are far more likely to issue from the expert than from the inexpert in research."

Dr. Woodward traverses the idea "that research is a harmless and a fruitless diversion in the business of education"; and gives some figures as to the comparative expenditure of the United States on education and research respectively.

> The number of higher, or degree-giving, establishments in the United States is now upwards of six hundred; the aggregate annual income of these is upwards of one hundred millions of dollars; and the number of officials connected with them is upwards of thirty thousand. On the other hand, the number of independent research organizations in the United States is less than half a dozen; their aggregate annual income is less than two million dollars; and the number of officials primarily connected with them is less than five hundred.

Something very like this holds also in Britain, and indeed throughout the world. Men can not be made to understand, even with the astonishing results which investigation has placed before us, the supreme importance of such effort. They still conceive that it is more important to teach boys how to do things than actually to get the things done.

The war now raging will at least demonstrate one thing to humanity—that in war, at least, the scientific attitude, the careful investigation of details, the preliminary preparation, and the well-thought-out procedure bring success, where the absence of these leads only to disaster. So also in everything. After all, the necessity for research is the most evident of all propositions. But the question (which I hope will receive still more careful attention when the war is over) is, What can the state do to make the machinery of investigation the most efficient possible? The mere citing of popular misconceptions is not enough; we need to have specific programs. The October number of *Science Progress* contains one such program, which I hope will receive the attention of men of science. Whether all the items are accepted or not remains to be seen; but until the discussion is earnestly undertaken, we can scarcely hope that the state will give more help than it has done hitherto. Dr. Woodward puts his finger upon a weak point in men of science as a body. "We are," he says, "as a class of too recent monastic descent to fit comfortably in our present social environment." That is just it. We are not strong enough in making our demands heard; and, in my opinion, this is not a virtue, but a neglect of duty.—Sir Ronald Ross in *Nature*.

SCIENTIFIC BOOKS

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