

Published February, 1920

## **THE TEACHING OF ELEMENTARY SOILS.<sup>1</sup>**

H. O. BUCKMAN.

The teaching of soils in the systematic and fundamental manner in which recognized university and college subjects have long been handled is a comparatively recent development and as a consequence the possibilities are as yet only partially realized. As with all new subjects, soil science is going thru a definite evolution and will con-

<sup>1</sup> Contribution from the Department of Soil Technology, Cornell University, Ithaca, N. Y. Received for publication December 4, 1917.

tinue to so evolve until it is placed on as sound a theoretical and pedagogic basis as its subject matter will permit. In general, new subjects lack both data and arrangement. Soil science is no exception to the rule. At the beginning, little scientific knowledge was available and even that little had no logical sequence. Taught in many places as a part of agricultural chemistry, no distinct laboratory development resulted, especially regarding the physical phenomena.

The need for teaching data has been acute and while this need stimulated research, it forced the teacher for the time being into a very practical and applied consideration of his subject. Lectures, demonstrations, and field explanations constituted most of the instruction. The agricultural colleges were growing rapidly and expansion was expected at every point. The teachers of soil technology felt the pressure and as most scientific subjects are taught with laboratory practice, a move in that direction seemed desirable. The chemical phases were, of course, developed with chemical equipment as a basis. The physical side of the work was, however, much handicapped by lack of apparatus and methods. Due to the difficulty of controlling physical reactions in the soil, the exercises were always unsatisfactory and often crude. To a student with a good knowledge of elementary physics such laboratory practice was not only a waste of time but almost an affront to his general education.

The chemical phase of the laboratory took a different turn, and involved analytical chemistry was often taught in an attempt to give the student a chemical viewpoint of soils. Time was wasted in chemical methods and the attention thus distracted from considerations invaluable in understanding the "why" of practical farm operations. Chemical principles that may apply to soils are a part of the science of chemistry and should be taught in a department of chemistry and not in a department of agronomy or soils. Free use of such principles, however, is the right of every soil teacher.

The time has come when many feel the necessity of revising the teaching methods which have developed during the infancy of the subject. Plenty of sound data is at hand for such courses. It is not a question of knowledge but a question of arrangement and coordination. The pedagogy of the subject so long neglected needs attention. How to teach is the pertinent question, not what to present. Recent scientific and theoretical advancements have a proper place in the more technical courses offered by a department.

The science of the soil is now on such a basis that one general fundamental course seems preferable to the two or even three that are

in many places offered in as many calendar terms to cover the subject. Good pedagogy demands such a change. Geology has long been taught in such a manner, as have other pure sciences. Is soil science so different that ordinary procedure does not apply? Has it such a large body of facts that three lectures a week for a term will not permit a clear presentation of the fundamentals?

The institution of recitation periods should be the next step. Here the principles explained and emphasized in the lectures can be expanded and discussed, preferably with a textbook as a basis. The old style laboratory "experiments" should be discarded and exercises substituted which emphasize fundamental points. In short, the whole course may be made a "follow-up," the recitations on the lectures and the laboratory on both. Few ideas not already explained in lecture or recitation should be introduced into the laboratory. The student should there be given a chance to handle, study, and experiment with the material previously discussed. The study of soil-forming rocks and minerals, the naming of soils, the estimation of organic matter, the testing for acidity, and the identification of fertilizers are only a few of the possible follow-up exercises. Such a correlation of lectures, recitations, and laboratory could not fail to raise the grade of the instruction, especially if the students are properly grounded in chemistry, general geology, and physics before registering for the course.

At present, the institutions that are seriously engaged in teaching soils are not closely enough in touch so that any of them realizes the problems which are confronting the others. Few opinions and views have been exchanged. The experiences of one institution, whether successful or otherwise, have gone for naught as far as the others are concerned. As a consequence, a conference for a thoro discussion of the points at issue seems not only desirable but almost a necessity. Such a conference would aid the science as well as the pedagogy of the subject.