

will take place about as rapidly as nitrogen becomes available, so that all possibilities of nitrogen losses through leaching are largely eliminated and a gradual increase in the organic matter proportional to the increase in nitrogen must and does follow and the 1:12 nitrogen-carbon ratio is maintained. It is only under conditions of intensive tillage where excessive amounts of nitrogen are removed regularly by cropping or leaching that there can be any very pronounced loss of organic matter. In this process of organic decomposition the carbon is lost more rapidly than nitrogen with the result that the nitrogen-carbon ratio is always slightly narrower in cropped than in virgin soil. The close relationship between nitrogen and carbon makes it impossible to increase or maintain organic matter in the soil unless nitrogen is increased or maintained in like proportion, and, conversely, it is impossible to increase the organic nitrogen without a proportional increase in the total organic matter.

Because of the fact that the benefits of soil organic matter in its relation to available plant food and to physical condition are thoroughly appreciated, attempts have been made to increase this material in the soil, but nearly always with disappointing results. To effect such increase in a measurable degree during the short periods over which records have been kept would require what in reality amounts to a change in climatic conditions. Under irrigated conditions, where the introduction of water on a soil well adapted to legume culture and decidedly deficient in nitrogen meant a heavy production of vegetation and a rapid fixation of nitrogen, it has been possible to increase the organic matter in the soil over and above that in the virgin state. This is practically the only condition under which increases are possible. Under other climatic conditions all attempts at even maintenance have been confronted with many difficulties and disappointments.

In the humid sections liberal annual applications of manure for long periods have had little or no permanent effect, while in the arid regions the return of straw to the soil can not be justified on the basis of improved physical condition of the soil resulting from an increase of soil organic matter. These results are readily explainable when it is realized that manure contains only about ten pounds of nitrogen per ton, and when applied at the rate of ten tons per acre will not more than supply the nitrogen removed by leaching and cropping. In the case of straw, which also contains about ten pounds of nitrogen per ton, and which is recommended for application at the rate of about one ton per acre, practically no influence is felt and little should be expected, because, true to the constant nitrogen-carbon ratio, these ten pounds of nitrogen can fix only about 120 pounds of carbon

or a total of about 200 pounds of organic matter, a smaller amount than needs to be decomposed to supply the nitrogen required for one crop.

To maintain soil organic matter, emphasis should be placed on the nitrogen, and if this element is maintained sufficient carbon will be fixed. Nitrogen can be maintained, in part at least, through the use of fertilizers and the growth of legume crops. Even where inorganic fertilizers like sodium nitrate or ammonium sulphate are applied in connection with straw or other low nitrogen-carrying residues much of the nitrogen will be fixed with the carbon in an organic form in the process of decomposition. In the case of maintenance with legumes, worn-out soils can be decidedly influenced, as is evidenced by the pronounced improvement in the physical condition following immediately after the legume sod is broken up. When manure or straw crop residues are applied this effect is not nearly as pronounced. In one case there is not sufficient carbon to fix all the nitrogen and large amounts are made available either to be lost by leaching or to cause a lodging or burning effect on the succeeding crop, while in the other case there is too much carbon for the nitrogen and in the process of decomposition much carbon is lost and little nitrogen is made available. This also results in decreased yields.

In sections where climatic conditions make it necessary to follow a legume sod with small grain, a crop that does not require excessive amounts of nitrogen, but nevertheless is decidedly dependent on small amounts of available nitrogen early in the season, difficulty is experienced in maintaining the organic matter supply.

The ill effects of legumes or straw used singly can be overcome by introducing the straw as a surface dressing on the legume sod before it is broken up. Besides this, it is reasonable to assume, consistent with the constancy of the nitrogen-carbon ratio, that much of the nitrogen and carbon that would be lost in the process of decomposition where the materials are used singly is now fixed, thus resulting in the more rapid accumulation of desirable soil organic matter.

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MEDICAL LICENSURE OF NON-MEDICAL DOCTORS

WHAT would result if most of our scientific laboratories were placed in charge of physicians? This question may be countered by saying that no one ever entertained such a thought; why raise needlessly a troublesome question? But House Bill No. 348 in the Pennsylvania legislature now in session provided

That no laboratory procedure for the diagnosis or treatment of human disease shall be performed or reported by persons who have not a license to practice Medicine and Surgery . . . , except under the direct supervision and upon the personal responsibility of a physician. . . .

The duty of the State was mapped out before the Section on Pathology and Physiology of the American Medical Association at St. Louis, May, 1922, and House Bill No. 348 was in accord with the view there expressed:

As long as non-medical laboratorians . . . submit reports to physicians only, it may be granted that it makes little difference to the State whom the physician calls on for these examinations or for even the interpretations of the results. . . . But provision should be made for the examination and licensure of the doctors of philosophy and hygiene and other technicians who are not doctors of medicine. . . .

Whatever appeal this naïve statement makes is changed when one reads further from the same hand:

Many physicians—probably the majority—give little or no attention to the qualifications of those to whom their laboratory work is entrusted. . . . As a general rule, practicing physicians do not realize the many chances for error in laboratory work; “to them a test is a test regardless of by whom or how it is made.”

The reader will find it an interesting excursion through the two papers presented and the discussion thereby evoked, in the meeting at St. Louis.¹ Doctors of philosophy and hygiene will find, supplied by doctors of medicine, details lacking in the definition of the word *technician*: “. . . a technician (perhaps some girl who has had a year or so training);” “usually some girl who is looking for a job or a relative of the doctors;” “. . . a girl, with or without a high school education.”

In Pennsylvania we had to meet a situation. House Bill No. 348 had passed first reading before the chemists learned of its existence. Its wording was found to include every laboratory procedure related in any way to human disease. It provided for the summary closing of a laboratory without hearing or appeal. It created a laboratory monopoly for physicians. By it doctors of philosophy were disqualified from practicing the laboratory procedures they are paid by physicians to teach young physicians how to do. Druggists and owners of pharmaceutical laboratories were compelled, on pain of closure, to take on physicians as partners. The genius of the evils this bill was said to remedy appeared to be *Frankenstein*, with the given name “Technician,” who is inflicting retribution upon his creators. All of the evils complained of were already capable of correction by

proper enforcement of the Medical Practice Act of the Commonwealth.

If my reader is himself a physician he may better picture the potentialities in such a bill by using an analogy. Let him suppose the State Bar Association has a law passed putting all laboratory procedures relating (ever so remotely, perhaps) to crime under the direct supervision of a lawyer. Let him follow out the analogy and try to select in his own community the lawyer honestly capable of such supervision over a biologist or chemist or physician. Let him see the lawyer-partner in every doctor's office, in every drug store and food factory and every other business or profession in which the crime of adulteration or any other malpractice may enter. The possibilities of this analogy are great, and its pursuit illuminating.

The many factors in law and medicine and religion that rest upon tradition or prejudice are, in time, doomed. The development of the essentials to civilization can not but be attended with great travail. But the methods of the middle ages are behind the times; and abuse of power (even with good intentions) is insufficient to solve difficulties incident to intellectual evolution.

The spectacle of House Bill No. 348 makes it wise for doctors of philosophy and hygiene and many others to watch their legislatures. Something may happen in any of the states any time. It would be inexplicable if a considerable number of physicians should support House Bill No. 348 or other bill equivalent to it. To do so would be to invite a fight that can end in but one way. A contest with highly trained men whose lives are spent in exact experiment and careful reasoning is not to be undertaken lightly. Considerations of policy, alone, would suggest caution. When enough has been done to lead doctors of philosophy and hygiene in this country to tell laymen convincingly the indisputable truth about the doubts and shortcomings and failures of medicine, to lead druggists to add to this what they know by experience of the physician in the prescribing and compounding and dispensing of medicines, to lead pharmaceutical manufacturers to add to this the facts of experience gained in making their advertising and sales campaigns among physicians successful—what will be the outcome financially for the average practicing physician?

House Bill No. 348 was *killed in committee* and escaped the publicity due it had it come before the House and Senate for discussion. But parties at interest over the whole country should know about it. “Forewarned is forearmed.”

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¹ *Journ. Amer. Med. Assoc.*, 1922, p. 861 ff.