DR. HENRY E. RADASCH, assistant professor of histology and embryology at Jefferson Medical College, has been appointed instructor of anatomy in the Pennsylvania Academy of Fine Arts to succeed the late Dr. George B. McClellan.

DR. C. C. LIPP, assistant professor of veterinary science at the University of Minnesota, has been elected head of the department of veterinary science of the South Dakota Agricultural College.

AT Norwich University Dr. S. F. Howard, formerly associate professor at Amherst College, is to be head of the chemistry department. J. E. Lear, B.S., formerly associate professor in the Texas College, Texas, has been appointed assistant professor of physics and mathematics.

AT the University of Pennsylvania Dr. Thomas D. Cope and Dr. E. A. Eckhardt have been promoted to assistant professorships in physics; Dr. Walter T. Taggart to the grade of professor of organic chemistry; Dr. Owen L. Shinn to be professor of applied chemistry, and Dr. Herman C. Berry to be professor of materials of construction.

HARRY WALDO NORRIS, A.M., professor of zoology at Grinnell College, has been appointed to give instruction in zoology in Harvard University during the year 1913–14, in accordance with the agreement with western colleges. His term of service will fall in the second half-year.

DR. M. BARTUZZI has been appointed to a newly established chair of medical history in the University of Siena.

DISCUSSION AND CORRESPONDENCE

THE BREAD SUPPLY

IN SCIENCE of August 22, 1913, appear twenty columns of words from Professor H. L. Bolley, entitled "Cereal Cropping: Sanitation, a New Basis for Crop Rotation, Manuring, Tillage and Seed Selection." Under this imposing and comprehensive title we find that eighteen columns are devoted chiefly to belittling the work of chemists, agronomists, bacteriologists, and also agricultural advisers who accept the findings of such scientists. Occasionally Professor Bolley hedges with the assertion that he knows plant food to be essential, and then renews the attack in such words as these:

On account of all these conditions of low yield and invariable deficiency in quality, there has gone up a great cry of "depleted" soils, "worn out" land, "bad agriculture," "shiftless methods," etc. This cry follows the plowman regardless of his improved tools and general farming improvements, regardless of better methods of tillage which we know now obtain on the farm, as against those which our forefathers were able to accomplish, and all regardless of hard work. It is all right for the banker and the lawyer, and even some professors, to berate the farmer for idleness and inefficiency in methods and lack of business, but I say let such men try to raise wheat of high grade under the present general understanding as laid down in books, or by our best agriculturists. In spite of all these directions, the wheat soon becomes soft and shows all of the peculiar characteristics which we find named in the literature of the chemical laboratory, or in the milling tests of wheat as previously indicated, "white-bellied," "piebald," or shrivelled, bleached and blistered, "black-pointed," in fact all of the qualities of deteriorated grain; and the chemist from his laboratory outlook cries out "depleted soils," "lost fertility," "bad physical texture," due to "worn-out humus," "lost nitrogen," "insufficient phosphates," "lime," etc., forgetting, as it were, that almost every field in these matters is a law unto itself and that every one of these fields in the next few years may contradict all these assertions by the growth of splendid crops for reasons no one seems to know. The expert agriculturist and agronomist, who take their cue largely from the chemists, cry out: "Give us intensified agriculture," "Apply phosphates," "Apply lime," "Apply potash," "Grow clover," "Raise corn," "Rotate," all in a confused jumble, and lately the bankers, afraid of their mortgages, have become very busy and tell how to farm and scold rather strongly about lack of business methods on the farm, berate the schools, etc.

These conditions of farm cropping, though not exclusively American, are especially in prominence at present because many of our most noted publicists are becoming, perhaps properly, alarmed. They say our farmers show no ability of maintaining the supply of wheat, the bread grain, a

permanent cropping element of old land agriculture, but rather, instead, are reaping lessened yields of poorer quality from larger acreages.

In columns one and twenty the "new basis" is revealed:

Deteriorated wheat, as seen in depressed yields and low quality, as now quite commonly produced in the great natural wheat-producing regions of this country, is not, primarily, a matter of lost fertility or of modified chemical content of the soil, but is specifically a problem of infectious disease which is superimposed upon the problems of soil and crop management.

My experience with cereal crops with reference to the application of fertilizers, the trial of varieties, experiments in seed selection, seed breeding and seed treatment, and seed purification furnish data which will allow me to say that I have no fear that all will eventually agree that sanitary considerations with reference to the characteristics of parasitic diseases which are now quite commonly resident in the seed and the soil will yet form the essential basis for the proper management of crops in rotation in series, and the same considerations will largely govern the type of tillage and the manner of handling waste materials on the farm, particularly farm manures.

Professor Bolley heartily commends himself for "having grown up on the farm, and never having allowed himself to get away from the real love of working in the dirt"; but he fears that "too many of our workers who are paid to investigate agricultural problems may only investigate for their own enjoyment—may again deal in formulas, and theories, books and philosophies, and thus give out to the working public fine philosophies which may yet leave the worker helplessly in the dark as to what to do."

As an average of sixty years where wheat has been grown year after year on the same land at Rothamsted, the unfertilized land produced 12.6 bushels per acre, while 35.4 and 37.0 bushels were the respective yields where farm manure and commercial plant food were applied.

As an average of twenty-four years the wheat yields at Pennsylvania State College varied from 10.1 bushels on unfertilized land to 24.1 with farm manure and 24.8 with commercial plant food, when grown in a four-year rotation.

As an average of nineteen years the wheat yields at the Ohio Experiment Station were 10.2 bushels on unfertilized land, 21.7 bushels with farm manure, and 26.9 bushels where commercial plant food was applied, the wheat being grown in a five-year rotation with clover, timothy, corn and oats, on five different series of plots, so that every crop might be represented every year.

As compared with Rothamsted, Pennsylvania and Ohio, the more extensive and very practical field experiments now being conducted by the University of Illinois in many different parts of the state are new and inconclusive, but the results secured in 1913 from fields that have been in operation twelve years (see the accompanying tabular statement) not only represent much field work, but they also support the equally valuable analytical data from the chemical laboratory involving analyses of thousands of representative soil samples collected in connection with the detail soil survey of more than forty counties.

1913 Wheat Yields: Bushels per Acre
From University of Illinois Experiment Fields

Location of Experiment Field	Number of Years in Crop Rotation	Soil Fertilization				
		None	Organic Manures	Organic Manures, Limestone	Organic Manures, Limestone, Phosphorus	Organic Manures, Limestone, Phosphorus, Potassium
Urbana....	Four	11.1	13.6	19.7	34.6	31.7
Odin.....	Four	17.3	20.4	29.8	36.0	37.0
DuBois.....	Four	7.2	no test	18.1	33.4	29.9
Cutler.....	Three	8.8	7.0	19.5	31.0	30.7
Mascoutah	Four	21.0	22.1	24.0	32.9	32.3
General average...		13.1	—	22.2	33.6	32.3
Average increase..		—	—	9.1	20.5	19.2

The unfertilized surface soil of these fields contains in two million pounds (corresponding to an acre of land about 6⅔ inches deep) from 700 to 1,200 pounds of total phosphorus and from 25,000 to 36,000 pounds of total potassium. Where organic manures are pro-

vided for supplying nitrogen and liberating mineral plant food in rational systems of farming, the relationship between the chemical composition of the soil and crop production is normally very apparent. Irrational systems often give abnormal results, and their correct interpretation requires that no important factor of influence shall be ignored.

It may be added that the wheat from our well-treated and high-yielding plots is not of poor quality, but of very high grade, and has been sold to the experienced grain buyer at a premium as high as 15 cents per bushel above that paid for wheat from unfertilized well-rotated land.

In Illinois, as in all other states, most of the soil and crop investigators are men of large practical farm experience, but we also have deep respect for the science of analytical chemistry, as the only means of determining the total stock of plant food in the soil, and for the science of biochemistry, as the chief means of making plant food available.

Chemists and agronomists must honor Jensen for the information and method which he gave to the world relating to the destruction of fungous diseases sometimes carried in seed grain, and we honor Bolley for his valuable contributions in this field of agricultural research; but we also recognize that the avoidance of fungous diseases as one among the many advantages and reasons for crop rotation and for the proper handling of crop residues is not a new idea, for it has been advanced, explained and emphasized by numerous investigators for many years. The persistent efforts to belittle the importance of positive soil enrichment and preservation in permanent rational systems of farming, whether by improvident landowners, by Whitney and Cameron, of the Bureau of Soils, or by Professor Bolley, are the greatest curse to American agriculture and the greatest danger to permanent prosperity in this country.

The fact that the earth is round became generally accepted two or three centuries after its discovery; and it required a full century for Europe to half appreciate the great discovery by De Saussure, so well expressed in the words of Liebig:

> It is not the land itself that constitutes the farmer's wealth, but it is in the constituents of the soil, which serve for the nutrition of plants, that this wealth truly consists.

The foundation principles for the restoration and preservation of the fertility and productive power of normal soils are simple and well-established, and no state in the union can afford to ignore or belittle these great fundamental truths, nor to have the minds of its farmers and landowners befogged in relation thereto.

CYRIL G. HOPKINS
UNIVERSITY OF ILLINOIS

SCIENTIFIC BOOKS

The Living Plant. By WILLIAM F. GANONG. New York, Henry Holt and Co. 1913. 17 × 23 cm. Pages xii + 478; 3 colored plates; 178 figures, many in text. Price, $3.50.

This book aims to attract popular interest and at the same time to tell the truth about its subject. The work is avowedly not intended for scientists, but "it seeks to present to all who have interest to learn an accurate and vivid conception of the principal things in plant life" (preface). Thus the author has "been at more pains to be clear than to be brief," and the book "has wandered through a leisurely course to a length quite shockingly great" (preface). Nevertheless, the depth in natural science to which the reader is here carried is so great as to make it probable that the book will find its greatest use among those who already possess considerable knowledge of plants and their processes.

The style of the book combines clearness with personal frankness, the reader being taken into the author's confidence from the very first; it is a conversational style of the highest type, becoming even chatty at points, and generally maintaining a logical clearness and definiteness that is rare in popular or even elementary treatises upon such complex subjects. The language possesses a characteristic quaintness, almost an archaic tang at some points. A few examples of quite col-