One of the great difficulties in the way of an intimate knowledge of the relations of plants to soils lies in our ignorance of the laws of assimilation in the plant. The conditions under which the chemist studies these are of necessity artificial. He cannot be assured that he has even measurably reproduced the conditions of nature, and hence cannot be sure that similar results will be attained under such most natural conditions. Those most complex and peculiar changes which occur in chemical compounds under what, for want of a better term, are denominated "vital forces" can never, at least under the present limitations of knowledge, be fully understood. And right here is the gist of the whole matter. A knowledge of the chemical constitution of a soil must precede a study of its relations to the full or incomplete, as the case may be, development of a plant dependent on it for nourishment. In other words, the constitution of a soil is a determinable quantity, the life-processes of the plant constitute an indeterminate quantity, and the relation of the two is the thing sought. No amount of chemical experimentation can bring into view the unknown factor.

The various experiment stations which are now established in every State in the Union can do much toward clearing away a great cloud of agricultural superstition relative to these subjects. There should be place for the theoretical as well as the practical in their work. It should be clearly shown that the constitution of a soil has far more to do with the growth of a crop of corn than the moon, or than any other of the oft-quoted and still entertained notions of strange and hidden forces. Tall oaks do not grow from little acorns except under the most favorable conditions of soil, and these conditions, again, are affected by the innumerable changes which occur in temperature, moisture or other variables, which render more or less tractable the various compounds on which the plant must feed.

The chemist who studies a soil does so by the same methods as those by which he would examine an unknown mineral, and usually with no greater care. He wishes, simply, to know what elements may occur in it, under what conditions, in what abundance, to what degree they may be dissociated, and whether there be present any substance which would interfere with their assimilation by the plant. In this way he arrives at a fair knowledge of the sample, but he can tell you little of its value for agricultural purposes. He here depends not on his knowledge of soil constitution or of its genesis, but on the facts of observation, which are familiar to every farmer, and which he unconsciously connects as cause and effect. It does not need a chemist to tell an observant farmer that he will not be likely to reap a strong growth of wheat from a sandbar. He has had as an instructor an experience in the relations of crops to the labor expended on them that led him to definite and valuable conclusions on this matter. But there are innumerable questions which he may put to the chemist and hope for a profitable answer. When once the soil has been exhausted of a necessary constituent he may learn from experience that this or that material judiciously applied will remedy the defect. The farmer, moreover, has yet to learn that, even in Iowa, there cannot be a constant draft on a soil and the same crop be produced with equal value each year for an indeterminate number of years. Each crop lessens the productive power of a soil by the amount of material which it removes from the soil each season. Here it is possible for the chemist to aid the producer by telling him exactly what has been taken from the soil, and thus indirectly telling him what is needed in the compost he may apply. This borders on organic chemistry and does not at present concern us.

Among the substances which must be present in a soil to give it an average degree of fertility stands pre-eminent the compound known as phosphoric acid. But this substance does not exist in the soil except in combination with some other substances, known technically as bases. These substances are commonly, if not always, iron and alumina, with which they are in such chemical combination as to form salts known as phosphates. It is, however, not sufficient to know that these compounds are present. We must further know whether they are so associated with other compounds as to be readily disintegrated and rendered soluble, for unless soluble they cannot be used as plant-food. Now, neither of these compounds of phosphoric acid — *i.e.*, iron and alumina phosphates — is available in that form. Experiment has shown that the form in which these substances are available is that of calcium (lime) phosphate. That this has a relation to the amount of calcium silicate in the soil is clearly proven, and that by a process of double decomposition of the three compounds the available one is obtained is also well known. But this process has not yet been certainly traced in nature. As stated at the beginning, it is right here that the processes of the laboratory and those of nature need to be connected. Whether they ever will be depends upon the support given to the great army of practical chemists whose attention is now directed to the theoretical features of agricultural chemistry.

It should be a matter of congratulation to the farmers of Iowa that work along these lines is now progressing very favorably at the experiment station at Ames. A vast amount of valuable information may be expected from this source, and in due course of time it will come.

CURRENT NOTES ON ANTHROPOLOGY. — X.

[*Edited by D. G. Brinton, M.D., LL.D.*]

The Ancient Libyan Alphabet.

In *Science*, May 8, I called attention to the new light thrown upon the history of our alphabet in its ancient form by the researches of Dr. Glaser among the ruined cities of Arabia. Another curious study in the same line is that offered by the Libyan alphabet. It appears to have been in common use among the Berber tribes of North Africa long before the foundation of Carthage, and is still employed constantly by the wild Touaregs of the Sahara. It is not the same as the Iberic alphabet of Spain, and in its forms is almost entirely independent of the Phœnician letters. It is composed of consonants, called *tifinar*, and vowel-points, known as *tiddebakin*. The latter are simple dots, the former are the lines of a rectangle, more or less complete. Several of them are found in the oldest Etruscan inscriptions, and on that known as the "inscription of Lemnos." Sepulchral epitaphs in this alphabet have been discovered dating two or perhaps three centuries before the Christian era; while rock-inscriptions of perhaps more ancient date, showing extremely archaic forms of the letters, have been copied from localities in the southern Atlas ranges.

The writers who have given especial attention to this little-known subject are Faidherbe, Duveyrier, Halevy, Bissuel, and, recently, Dr. Collignon, who has a brief summary of results in a late issue of *Les Sciences Biologiques*.

The Aborigines of Asia Minor.

The artistic and linguistic studies into the proto-ethnology of Asia Minor (see *Science*, May 20) are happily supplemented

by the investigations of Dr. F. von Luschan of Berlin, on the Tachtadschy of Lycia, published in the *Archiv für Anthropologie*. This *nomen gentile* is not ethnic, but means merely "wood-choppers," or "board-makers." It is applied to a shy, secluded people, who live in the mountains, and fell and dress trees as their main business.

On measuring them, Dr. von Luschan found that they had unusually short and high skulls,— hypsi-brachycephalic, —and were of small stature, with dark hair and eyes. Comparison with some skulls from very old Lycian graves, and with part of the present population of Armenia and other portions of the region, led him to the conviction that in this type — so markedly distinct from that of the Greeks and Semites — he had before him the original of the most ancient population of the land. He considers it certain that it extended over the whole southern half of Asia Minor; northeast to the Caucasus; east to the upper Euphrates; but its northern and western limits are not yet defined. He even hints that the short, dark, brachycephalic people of central Europe may be the western extension of the type.

As to whence it came, he is not without an opinion. Not from Europe, not from Africa, not from northern Asia, not from southern Asia; all are excluded for sufficient reasons; central Asia alone is left; and somewhere in that mysterious *matrix gentium* he expects will be found the ancestral connections of this well-marked type. There, then, we should search for the linguistic analogies of the Cappadocian words quoted from Professor Tomaschek in my previous article. It would be a brilliant corroboration of a purely physical study in anthropology to discover such analogy.

Work of the Eleventh Census Among the Indians.

It is not generally known — in fact, it is pretty hard to find out — how much excellent anthropologic material is annually collected and in part published by the various departments of our central government. The army, the navy, the surgeon-general's bureau, the Smithsonian, the National Museum, and the specially created Bureau of Ethnology, all pour forth every year quantities of valuable observations.

Nor has the Eleventh Census been behind in this good work, as is testified by the "Extra Census Bulletin," just out, on the Six Nations of New York. It is but the forerunner of a series of such Bulletins on the remnants of our aboriginal population, and is an excellent earnest of the merits of its successors.

The aim of these bulletins is to supply first-hand and accurate statements of the present social, religious, industrial, vital, and political condition of the tribes; in other words, they are ethnographic, in the right sense of the term. The general editor is Mr. Thomas Donaldson, and in this instance his collaborator is General Henry B. Carrington. A large quarto of 89 pages, well indexed, with maps and photographs, gives a most satisfactory account of the present status of the Cayugas, Mohawks, Oneidas, Onondagas, Senecas, and Tuscaroras. The action of the Census Bureau in this direction is the more welcome, as in the rapidly changing condition of the native tribes, not many censuses will have the material with which to occupy themselves in this direction.

The Extension and Study of the Nahuatl Language

If we may judge of the superiority of a language by its vitality, and by the impress it leaves on others with which it comes in contact, we must assign a high place to the Mexican or Nahuatl. It is still spoken in comparative purity by considerably over a million people, and it has made a deep impression on the Spanish of most of the Mexican and Central American States.

For Costa Rica, this has been shown in a work issued in the present year at San José de Costa Rica, by Señor Juan Fernandez Ferraz, formerly inspector-general of education in that republic. It is entitled, "Nahuatlismos de Costa Rica," and is a neat octavo of about 150 pages, with an introduction on Nahuatl grammar of 75 pages. The alphabetical list shows that a large number of terms in the current speech of Costa Rica, which have assumed the form of Spanish words, are derived from the Mexican tongue.

A similar work for Nicaragua, written by the late Dr. C. H. Berendt, is now preparing for the press under the efficient editorship of Dr. K. Lentzner of Berlin. The Nahuas, or a colony of them, once occupied a considerable tract on Lake Nicaragua, and left the marks of their occupancy not only in interesting ruins, but on the language of their conquerors as well. It was in this Nahuatl Spanish dialect that the comedy of Gueguence was written (published in Philadelphia, in 1883).

It is agreeable to note in this connection that the study of the Nahuatl finds zealous advocates in Mexico, among whom the names of Peñafiel, Palma, Hunt y Cortes, Altamirano, Caballero, and Rosa, hold conspicuous places.

Anthropology at the Columbian Exposition.

Anthropology does not appear by name at the Chicago "World's Columbian Exposition." This is to be regretted, as it is a fine opportunity lost to inform the people of the United States what this grand science is, and how its several branches stand related to each other.

It is represented, in fact, in "Department M," with a most competent chief, Professor F. W. Putnam of Cambridge. A descriptive pamphlet of this department which has just been issued announces that it includes "Ethnology, Archæology, History, Cartography, Latin-American Bureau, Collective and Isolated Exhibits,"— rather a miscellaneous stock. It is further stated that there will be a section on physical anthropology and an anthropological laboratory, which are classified as a subdivision under the section of ethnology. In spite of these defects in classification, no doubt abundant and excellent material will be provided for the student, which he can work up in his own way. A correspondent in Berlin informs me that Dr. U. Jahn, who has charge of the matter there, has prepared, among other things, a series of specimens of German houses of all varieties, to be erected at Chicago, and in one of them, the *rathhaus*, he will arrange a complete exhibition of ancient and modern German costumes, domestic utensils, home manufactures, etc. The sections at Chicago on Folk-Lore, Games, and Primitive Religions will be under the supervision of Stewart Culin Esq., of Philadelphia, who has lately been appointed General Director of the Museum of Archæology attached to the University of Pennsylvania.

NOTES AND NEWS.

VERY numerous experiments have been recorded to show that moisture is saved by cultivation. Frank E. Emery of the North Carolina Experiment Station says: "During this hot, dry weather every foot of plowed land should be kept well stirred on the surface with any tool which tends to keep it from baking. A loose, fine surface will hold down water like a wet blanket. A field kept thus may give an increase in crop over one not cultivated equal to that produced by a heavy application of fertilizers. Preservation of the soil-water thus becomes of great importance. A