members of the faculty. Professor Schaper denies that he has been disloyal.

Dr. William Allen Neilson, professor of English at Harvard University, has been elected president of Smith College. He succeeds Dr. Marion L. Burton, who has become president of the University of Minnesota.

James C. Nagle has been appointed dean of engineering and professor of civil engineering in the Agricultural and Mechanical College of Texas, succeeding D. W. Spence whose death occurred in June.

Professor W. S. Franklin, formerly of Lehigh University, has accepted a position as special lecturer and teacher at the Massachusetts Institute of Technology, partly in the department of physics and partly in the department of electrical engineering. Professor Franklin requests his correspondents to note his new address.

Dr. C. H. Shattuck, for the past eight years head of the department of forestry, University of Idaho, has accepted the position as professor of forestry with the University of California.

Dr. Wright A. Gardner, formerly associate professor of plant physiology in the University of Idaho, has been appointed professor of plant physiology and head of the department of botany in the Alabama Polytechnic Institute.

Dr. Alfred H. W. Povah, formerly instructor in botany in the University of Michigan, has been appointed special lecturer in forest mycology in The New York State College of Forestry at Syracuse University.

Mr. Ralph Hubbard, formerly of Cornell University, has been appointed assistant in the museum and zoological department of the University of Colorado.

Mr. Samuel Wood Geiser, formerly professor of biology and geology in Guilford College, has been appointed professor of biology in Upper Iowa University.

At the University of Oregon, Charles H. Edmondson, Ph.D. (Iowa, '06), assistant professor of zoology, and Albert E. Caswell, Ph.D., (Stanford, '11), assistant professor of physics, have been promoted to full professorships, and Raymond H. Wheeler, Ph.D. (Clark, '15), instructor in psychology, has been made an assistant professor. During the present summer Dr. Edmondson has been studying the clams of the North Pacific Coast with a view to their conservation for food purposes.

Dr. Lloyd Balderston, of Ridgway, Pa., has been appointed professor of leather chemistry and technology in the college of agriculture of the Tohoku Imperial University, at Sapporo, Japan.

DISCUSSION AND CORRESPONDENCE

ON THE "RAWNESS" OF SUBSOILS

In the interest of accuracy the writer feels impelled to call the attention of investigators of soils to some facts with reference to the infertility of subsoils which do not seem to be generally appreciated. This statement is called forth at this time by the recent paper of Alway, McDole and Rost[1]; the observations upon which it is based are of long standing but have not been described because of matters of greater importance which have intervened to prevent such description. The authors just cited call attention to the characteristic sterility of subsoils of humid regions with which every student of soils is of course familiar. No one can deny that fact. They go on, however, to cite Hilgard, and Wohltmann who had visited California, to the effect that subsoils of arid regions are not sterile, but serve just as well or better than surface soils in that region for the support of plant life whether the latter be of legume or non-legume order.

Neither Hilgard's nor Wohltmann's observations are in full accord with mine except in certain cases which I shall refer to below. In studying the soil conditions of the Great Valley of California and particularly those of the citrus and alfalfa growing districts, I have repeatedly observed the vegetation, natural or planted, which is to be found on the freshly graded fields. Grading is done, of

[1] *Soil Science*, Vol. 3, p. 9, January, 1917.

course, in preparation of soils for irrigation and may result frequently in the removal of several inches to two, three or even more feet of surface soil in order that a level field may be produced. This is particularly striking in the case of the well-known and, on genetic grounds, highly interesting "hog wallow" lands which comprise very large areas of the Sacramento and San Joaquin Valleys. On the citrus lands either barley or alfalfa may be grown for a year or more in the preparation of the soil for the citrus trees. Wherever barley is sown, it is always possible to distinguish between the spots in the field from which the surface soil has been removed and those which still consist of surface soil. On the latter the barley looks as nearly normal as the given soil type will permit it, whereas on the former the barley growth, if it is at all visible, is stunted and yellow and frequently does not live though the growing season. Only in places where considerable surface soil has in the process of grading become admixed with the subsoil, have I ever noted an approach to good barley growth.

In the case of alfalfa, however, I can only recall one or two instances of failure to grow as well on the raw subsoil as on the surface soil. The difference between the behavior of barley and alfalfa on the subsoil in question is probably to be ascribed to the paucity in *available nitrogen* which is known to characterize subsoils. Under such conditions, barley can, at best, only make very poor growth, whereas the alfalfa, if inoculated, is independent of the available nitrogen supply in the soil. It should be added that with the admixture to some extent of surface soil with the subsoil in the process of grading a large enough number of *B. radicicola* is introduced all through the graded land to insure to alfalfa the necessary nitrogen for its growth, an advantage which that legume in common with others does not share with non-legumes. The case noted in Berkeley by Hilgard regarding which the latter is quoted by Alway, McDole and Rost, is undoubtedly that of an observation on the campus of the University of California, on the surface of which there has been so much filling and cutting for a number of years as to render questionable in any instance the real origin of the soil or subsoil observed. In my knowledge of the campus, I have known the excavation of subsoil material which had not long before been surface soil to result in bringing it back to its original condition again. We should not expect such material to be as inert and as unresponsive in growing non-legumes as real subsoil material. Arguing, however, from direct observation, I should like to add that I have frequently observed on the same campus, in places in which deep excavations were accomplished, that very little vegetation appeared for a year or more after the true subsoil material had been opened to air, light and the sun's warmth, as well as to the effects of inoculation by dust from surface soils. Such vegetation as did establish itself consisted almost invariably of bur clover. *Medicago denticulata.* When other plants were present, they were usually found to be alfilaria, *Erodium cicutarium,* a plant which is most commonly associated with bur clover on California soils and which probably profits by the nitrogen fixed by the clover. The bur clover plants found on such sterile subsoil material as is above described have always been found to be abundantly supplied with nodules.

The writer's observations lead him to believe, therefore, that subsoils of arid regions are nearly if not quite as raw as those of humid regions and that despite the great differences between the two in many respects, the first will not support plant growth to a much greater extent than the latter. The close resemblance which obtains between our subsoils and our surface soils, and which does not characterize the soils and subsoils of humid regions, appears, therefore, to be no index to the productivity of our subsoils. I should judge, in fact, from the statements of Alway, McDole and Rost, that the California subsoils are not superior to the Nebraska subsoils in any respect from the point of view here under consideration. As above pointed out, it seems fairly certain that the chief cause of the rawness of subsoils is the lack of available nitrogen in them for the support of the non-legume.

This deduction seems to be supported by the fact that legumes when inoculated will grow in the raw subsoils, whereas the non-legumes will not. That legumes will not grow on subsoils of humid regions as is claimed by Alway, McDole and Rost is not, so far as I am aware, proved. In any case their claim that the failure of such inoculated legumes to develop on humid subsoils "is to be attributed to a lack of availability of the phosphoric acid or of the potash or of both," appears to be an assumption which is unsupported by fact. Data on the content of water-soluble phosphoric acid and potash in subsoils of humid regions give no indication, so far as the writer is aware, of a paucity in those respects which would at all account for the total failure to develop manifested by the inoculated legume plants mentioned above. If inoculated legume seeds do fail to develop on humid subsoils, such failure must be accounted for, it would seem, on other grounds than those proposed by Alway, McDole and Rost.

It may also be added here that Hilgard's explanation for the "rawness" of subsoils is probably neither correct nor necessary. One is not obliged to assume a washing down of fine clay and silt particles from the soil into the subsoil to account for very imperfect aeration in the latter. Indeed, the sands of nearly uniform texture for several feet in depth, which are common in California, exhibit similar rawness in the subsoil, to that of the loams and clays which are underlaid by almost impenetrable silty clays.

SUMMARY

1. Subsoils of arid regions are certainly no less "raw" than those of semi-arid regions, and probably only slightly less so than those of humid regions.

2. If, as seems as yet unproved, inoculated legume seeds fail to develop on humid subsoil material, such failure can not justifiably be attributed as is done by Alway, McDole and Rost, to a lack of available phosphoric acid and potash.

3. A lack of available nitrogen probably is sufficient to account for rawness of subsoils.

4. The poor aeration of subsoils which indirectly results in their rawness, may be accounted for more simply than by Hilgard's explanation of the washing down of fine particles into the subsoil, which prevents proper aeration.

Chas. B. Lipman
University of California

NORTHERN LIGHTS

To the Editor of Science: Readers of Science will be interested to note the following observation of the northern lights. We noted them here on the evening of August 9 at about 8:45. They extended across the sky from northwest to east by northeast. They appeared as streaks, not very wide, and there was little or no flickering. A diffuse glow in the sky was more evident than the streaks. The night was clear and bright, so that this may account for the fact that they were not very prominent. They seemed to extend from 40° to 70° in height. At 9:35 P.M. they were still visible, but shortly after 10 there was no trace of them.

The northern lights, of which so many accounts were published in Science about this time last year, were observed here also, although I do not recall that any one reported the fact.

Thomas Byrd Magath
U. S. Bureau of Fisheries
Biological Station,
Fairport, Iowa

THE NEW MOON

To the Editor of Science: In making some computations last March about the occurrence of New Moon, an error of statement was discovered in the 9th edition of the Encyclopædia Britannica under "Calendar," Vol. IV., p. 594, and repeated in the 11th edition, Vol. IV., p. 993; it is also given in Barlow & Bryan's "Mathematical Astronomy," p. 215. The erroneous statement is that New Moon occurred on January 1 in 1 B.C. New Moon in January, 1 B.C., occurred on January 25, 12^h 26^m Jerusalem Mean Civil Time.

Otto Klotz
Dominion Observatory,
July 31, 1917