cased in test-tubes in an atmosphere of air. Buds encased for 4 and 8 days, respectively, in illuminating gas were inhibited in their development or killed.

When the roots of dormant, potted red and black oak trees were washed free of soil and sealed in an atmosphere of illuminating gas with the stems and buds exposed to greenhouse air, the buds were hastened into active growth 3 to 4 weeks before those of control trees whose roots were sealed in an atmosphere of air. The roots of the gassed oak trees developed a large number of hypertrophied lenticels. Ailanthus trees treated in a similar manner did not show hypertrophied lenticels; the tap-roots of these trees split wide open due to the proliferation of parenchymatous cells. Information upon the behavior of the roots of American elm, Norway maple, sycamore, catalpa, white pine, red pine and bald cypress in atmospheres of illuminating gas has also been obtained.

When the soil-free roots of foliaged red and black oak trees were subjected to a sealed atmosphere of illuminating gas for one day and then repotted in soil, a slight wilting of the leaves occurred, followed by complete recovery. However, when the roots were so exposed for 2, 3, and 7 days, respectively, marked epinastic growth of the oak leaf petioles occurred and wilting of the tips and margins of the leaves took place. Within a few days, drying of the wilted tissue was observed together with a complete loss of leaf pigments proceeding from the distal ends of the leaves to the basal ends.

When dormant cuttings of Forsythia and lilac were enclosed in an atmosphere of illuminating gas for periods of 15 minutes up to 4 days, the shorter exposures hastened flower and leaf bud development and opening. The longer exposures inhibited or killed the terminal buds. In several experiments, gassed Forsythia cuttings developed few or no flowers but the leaf buds developed first and produced apparently normal leaves. At this time, a month after the exposures of the cuttings of Forsythia and lilac to gas, the cuttings exposed the longest periods are developing leaves from the lower buds and callus development is proceeding at the bases of the cuttings. The control cuttings have shriveled and died.

When dormant acorns of red, scarlet and black oaks were subjected to an atmosphere of illuminating gas for periods of 6 hours up to 4 days, respectively, a slight slowing of the rate of germination of the red oak acorns gassed the longest periods was observed. The black oak acorns, apparently the most dormant of the group, were distinctly hastened in their rate of germination by the longest exposures to illuminating gas.

The investigation is being continued with the object of determining the constituent or constituents of illuminating gas that may be responsible for the several plant stimulation responses recorded. Particular attention will be given to a study of the effects of known mixtures of oxygen, carbon dioxide and ethylene upon trees.

CARL G. DEUBER
OSBORN BOTANICAL LABORATORY,
YALE UNIVERSITY

OBSERVATIONS ON TASTE BLINDNESS

IT has been noted by Fox[1] that individuals vary to a remarkable degree with regard to their capacity to taste para-ethoxy-phenyl-thio-urea, 40 per cent. of the individuals he examined failing to find the substance bitter. These observations have been confirmed by Blakeslee[2] and Snyder.[3]

The latter two authors found that this difference in reaction to taste is inherited and that, genetically, taste deficiency is due to a single recessive gene (Snyder). In an examination of 100 families Snyder finds nine in which both parents and all the 17 children failed to perceive the bitter taste, and Blakeslee reports three matings with eight children, all of whom were non-tasters. The suggestion is also made that the test may be used in cases of disputed paternity in the same way as the blood groups (Blakeslee).

The findings quoted led to an investigation on possible racial differences as regards taste blindness. We have examined the incidence of tasters and non-tasters among American Indians at the Haskel Institute in Lawrence, Kansas. One hundred and eighty-three full-blooded Indians were tested, and of these 6 per cent. were non-tasters. Among 110 Indians with some white admixture there were 14, or 10.4 per cent., non-tasters. The incidence of non-tasters among the white population (150 individuals) in Lawrence, Kansas, was 42 per cent. The latter figure is to be compared with 32.2 per cent. non-tasters among 283 white individuals (Blakeslee), and 31.5 per cent. non-tasters among 440 white individuals (Snyder).

These results indicate another property in addition to the Landsteiner blood groups and the factors M and N which differ considerably in frequency in the American Indians, as compared to that of the white population.[4, 5, 6, 7]

1 A. L. Fox, *Science*, 73, supplement, p. 14, April 17, 1931.
2 A. F. Blakeslee and M. R. Salmon, *Eugenical News*, 16, 105, 1931.
3 L. H. Snyder, *Science*, 74, 151, 1931.
4 A. F. Coca and O. Deibert, *Jour. Immunol.*, 8, 478, 1923.
5 L. H. Snyder, *Am. Journ. Phys. Anthropol.*, 9, 233, 1926.
6 C. Nigg, *Jour. Immunol.*, 11, 319, 1926.
7 K. Landsteiner and Ph. Levine, *Jour. Immunol.*, 16, 123, 1929.

In addition it may be of interest to put on record the results of tests in two among a number of families[8] examined in which the results vary from those already published.

In one family both parents found the substance tasteless in each of three different tests, the father stating on two of these occasions that the substance was not at all bitter but only very slightly sour. Of the six children tested, five found the substance to be very bitter, the sixth child reporting the substance to be tasteless. On a retest of two of the children (one of whom was a non-taster), the results were confirmed.

In the second family the father found the substance to be very slightly bitter, remarking that he hardly would have noticed the taste. The mother found the substance tasteless. Of the six children tested, four children, the two oldest and two youngest, reported the substance to be tasteless, while two children, nine and seven years, respectively, found it to be bitter, in one case very bitter.

The parents and the children in each of the two families seemed to be quite intelligent and their responses to the test were definite. In neither of the two families was any suspicion of illegitimacy, either from the history or from blood tests.

It may be worth while mentioning that in his study Blakeslee found individuals who did not perceive a bitter taste but noticed a taste of another sort.

PHILIP LEVINE
NEW YORK
ARTHUR S. ANDERSON
LAWRENCE, KANSAS

THE DISTRIBUTION OF CAECAL SPIROCHETES

FOLLOWING the studies made on spirochetes in chickens,[1] further observations have been made on the distribution and morphology of these organisms. The caeca from recently killed ducks, turkeys, guinea-hens, geese, squabs, lambs, calves and pigs were obtained and studied. Examinations of caecal contents and scrapings of caecal walls mounted in Ringer's solution were made by means of dark-field illumination. Films of caecal scrapings were stained by the potassium permanganate-gentian violet method of staining spirochetes.[2] All specimens of duck caeca examined showed the presence of spirochetes—long active treponemas, also small delicate treponemas, spironemas and the fusi-spirochaeta types. In several specimens, still warm, these showed extreme activity and indications of transverse division. In turkeys the various forms of spirochetes were also present in all caeca examined. The same was also true of guinea-hens. The specimens of caecal scrapings from geese was markedly different, showing only an occasional spirochete, and many specimens showed none. Squabs showed no spirochetes in the intestinal tract at any point, and caeca were absent. The fresh warm caeca from lambs and calves were negative for spirochetes. In the caeca from pigs there was a variation, but in general spirochetes were only occasionally present in the specimens obtained.

The organisms observed in ducks, turkeys and guinea-hens appeared morphologically like those previously reported in the chickens—the treponemas being up to 0.5 micron in width and varying to about 7 microns in length. The organisms have closely wound spirals, pointed ends, and exhibit great activity. The spironema type is more loosely coiled, 0.75 to 1 micron in width and up to 10 microns in length, has pointed ends, is flexible, but does not possess the great activity of the treponemas. The fusi-spirochaeta forms previously described in chickens were also observed in all specimens containing spirochetes. The specimens of turkey and guinea-hen caeca showed the latter forms in especially large numbers and in a highly active state.

For a morphological study of spirochetes, such as is at present in progress, there is no difficulty whatever in obtaining suitable material, since these organisms may be obtained from a variety of birds. According to our present knowledge, they appear to be non-pathogenic. Although a detailed report on morphological observations is not completed, it might be mentioned that specimens of warm caecal scrapings mounted on a slide (in Ringer's), with a vaseline-sealed coverslip, and kept in a constant temperature chamber at 36° to 38° C., will still show forms of spirochetes, somewhat active after two months, in addition to the granular and other forms commonly observed.[3]

MINNIE B. HARRIS
THE JOHNS HOPKINS UNIVERSITY

BOOKS RECEIVED

BRAY, WILLIAM C. and WENDELL M. LATIMER. *A Course in General Chemistry.* Pp. x + 159. Macmillan. $1.60.

CREED, R. S. and others. *Reflex Activity of the Spinal Cord.* Pp. vi + 183. 71 figures. Oxford University Press. $3.25.

SCOTT, WILLIAM B. *An Introduction to Geology.* Vol. I: *Physical Geology.* Pp. xiii + 604. 264 figures. $3.50. Vol. II: *Historical Geology.* Pp. vii + 485. 124 figures. $3.00. Macmillan.

THOMSON, SIR J. ARTHUR. *Purpose in Evolution.* Pp. 55. Oxford University Press. $.75.

TORREY, RAY E. *General Botany for Colleges.* Pp. xxii + 449. 252 figures. Century. $3.50.

[8] For some of these families we are indebted to Dr. A. S. Wiener.

[1] *Amer. Jour. Hyg.*, Vol. xii, 3, 537–568, November, 1930.

[2] SCIENCE, Vol. lxii, 1863, 275, September 12, 1930.

[3] These studies were begun under a National Research Council Fellowship in Medicine.