But striation of the bed-rock or the glacial scratches and polishing of erratics apparently did not attract his attention. In view of the acuteness of his observations of other phenomena this oversight is astonishing. It should be added that Thomas's notes on bed-rock geology are no less illuminating and discriminating than are those devoted to the drift. Thus in the Appalachian Plateau west of Pittsburgh he observes:

> For mile after mile we saw strata . . . in both sides of these rounded hills at equal heights, we saw the same on the sides of the next hill, if equally elevated; but sometimes we passed a considerable distance over those which did not rise up to that level; and on ascending some which are higher, again the same strata appeared. . . . the idea is clearly presented that the vallies were cleared out after the strata had been formed by deposition. . . . These strata extended many miles, but at last disappeared, proving the notion of regular strata round the globe to be an erroneous extreme [pp. 76–77].

Thomas's time was one of much activity in geological science; his interest in such matters is therefore not difficult to understand. That, however, he saw so clearly and came so close to modern interpretations, not through random speculations, but from attempts, by long cogitation, to fit his observations to rational inferences, marks his work as deserving of a recognition it does not seem to have received.

O. D. VON ENGELN

CORNELL UNIVERSITY

TUMORS IN DROSOPHILA MELANOGASTER RESULTING FROM SOMATIC SEGREGATION

THE sex-linked gene, lethal-7, produces tumors in the male larvae at various stages of development. Tumor-bearing larvae do not survive to the adult stage and previously tumors of this origin have not been observed in the adults of either sex. To test the effect of this lethal-7 gene when exposed during development by the removal of its normal allele the following experiment was devised. Females carrying lethal-7 were crossed with buff, forked-5 males and the resulting females backcrossed to the same type of males. Forked females with red eyes from this backcrossing were mated to white-eyed, minute-w males. Nearly all the matings showed well-developed tumors in some of the larvae, and in every case half of the males failed to appear. Except for double crossing over, all the red-eyed, normal-bristled females were heterozygous for lethal-7, and such adults were examined for forked bristles and for tumors. Forked bristles appear as mosaics when the normal allele is removed from some of the cells either by deletion, non-disjunction or somatic crossing over.

In two cases forked bristles were found adjoining tumors. In one case a slightly depressed irregular area on the thorax showed small forked bristles on the margin. Underneath the epidermis in this depressed area there were several characteristic black tumors varying in size. The forked bristles were clearly bent at the tips. In the other case a peculiar outgrowth, somewhat resembling a balancer, grew out of the thorax near the base of the right wing. Both balancers were present and normal. This extra growth was accompanied by two large forked bristles near the base and on the outgrowth itself there were several dark-colored and thickened bristles. Apparently the normal allele of lethal-7 was also removed along with the gene for normal bristles.

Other offspring showed forked bristle mosaics without tumors, and tumors without any accompanying change in bristle formation. This is expected, since forked-5 is well removed from lethal-7. Somatic crossing over in Drosophila as shown by paired mosaics (twin spots) has been reported by several investigators. In this way as well as by deletion and other chromosomal irregularities, normal growth-regulating genes are removed from some cells during development in Drosophila as well as in maize and atypical growth results.

DONALD F. JONES

CALIFORNIA INSTITUTE OF TECHNOLOGY

RELATION OF ROOT PRESSURE TO PLANT DISEASE

A SATISFACTORY explanation for the occurrence of epidemics of many plant diseases is still lacking, despite a more clearly defined knowledge relative to the virulence of the pathogen, the inheritable susceptibility of the host and the relation of external environment. Evidence from many sources points toward factors making up the internal environment or "predisposition" of the host as being of fundamental significance. In this connection we wish to point out that the internal water relations of the host as determined by root-pressure may be an important determining factor in predisposition to infection and development of disease. The significance of this factor is naturally likely to be greatest with the less virulent parasites or the relatively more resistant hosts.

By means of the direct application of high-water pressure to the root system, high turgescence, guttation and water-soaking in various degrees may be readily induced for short periods with no permanent visible injury or wounding resulting. Tomato plants, for example, water-soaked in this manner are highly predisposed to infection with *Bacterium angulatum* Fromme and Murray, though they are difficult to in-

[4] Daniel Drake, "Picture of Cincinnati and the Miami Country," pp. 74–75, Cincinnati, 1815.

fect without water-soaking. Similarly, tobacco may be greatly predisposed to *B. angulatum* and *B. tabacum* Wolf and Foster, by the same method, resulting in large necrotic lesions comparable to those often noted under field conditions. Water-soaking as a consequence of water sprays or storm effects has recently been emphasized by Clayton,[1] and while the significance of this relation is not questioned, it lacks certain essentials as a satisfactory explanation in all cases of the epidemiology of the diseases in question. Infection through water-soaking by root pressure furthermore confirms Clayton's contention that the water-soaking is of greater consequence to infection than epidermal wounding.

Similar, though less striking, results have been secured through increasing root pressure by means of the simultaneous exposure of plants to a high soil temperature and a low air temperature, with the evaporation power of the air at a minimum. It should be emphasized that great differences between individual plants may exist with respect to the ease with which they become water-soaked, this being in part influenced by the ratio of the size of the root system to the leaves. High root pressures under field conditions, resulting from a particular sequence of weather conditions, are a fairly well-known phenomenon. That conditions of this type precede epidemics of disease in tobacco has been noted by the writer, whereas apparently more favorable external environmental conditions, including severe storms, in the presence of pathogens, have in many instances failed to result in expected epidemics of disease.

A more extensive account of the experiments bearing upon this problem will be presented later.

JAMES JOHNSON

WISCONSIN AGRICULTURAL EXPERIMENT STATION
BUREAU OF PLANT INDUSTRY
U. S. DEPARTMENT OF AGRICULTURE

A STUDY OF THE EFFECT OF DROUGHT ON TREES

THE 1936 drought is one of the most serious and widespread the nation has ever experienced. Not only have there been untold suffering by the local residents and terrific losses in crops, but other forms of life over considerable areas are showing the effects of abnormally high temperatures and deficient precipitation. Just how serious some of these effects are remains to be seen.

In forestry and plant ecology, droughts are of considerable significance because of their effects on survival, growth and behavior of trees and shrubs. Some species or individuals may be killed, others suffer severe injury, while still others may show remarkable ability to withstand the most adverse conditions. In times of severe drought, forest plantations suffer severely, especially those composed of species not native to the locality or those badly abused as by grazing. In addition many native species that have been slowly invading drier sites or localities may be eliminated over large areas.

As information on drought resistance of trees and shrubs is sadly lacking, the present affords an unusual opportunity to obtain data of outstanding value. Consequently, it is hoped that those who are in a position to do so will take notes on the reaction of various plants to the drought. Such information is not alone of scientific interest but has great practical value in many current operations, such as the reforestation program of the CCC, cultural operations in the forest, erosion and flood control, etc.

The Forest Service is undertaking the collection of data on the drought damage. In this it is seeking the aid of botanists, agronomists, foresters, meteorologists and other interested individuals throughout the drought area. Consequently, any one with observations on species behavior should communicate them to the Division of Silvics of the Forest Service at Washington, D. C. Data are desired especially on such features as the nature, extent and character of the damage, the relative resistance of trees growing on different sites, the comparative ability of native and exotic trees to withstand drought and the nature and extent of the damage to stands or to shade or ornamental trees, shrubs, etc. A questionnaire covering these points has been drawn up to aid observers in reporting the effects of the current drought.

E. N. MUNNS,
Chief

DIVISION OF SILVICS
U. S. FOREST SERVICE

REMARKABLE LIGHTNING BOLT

ON the evening of July 27, 1936, an exceptionally severe and spectacular electric storm passed over the Washington area, traveling very rapidly in a northwest-southeast course. The center of the storm kept somewhat west of the writer's position at Clarendon, Virginia, and at a point in the southwest, only a few miles away, there appeared a most spectacular frequency of discharges earthward. Some appeared as mere single sparks, but the majority were of the repeating or of the stream type of discharge of exceptional size, appearing like ribbons of flame searing the darkness.

One of these, which seemed almost to hang in the sky only a few miles away, appeared to ignite something high in its course, leaving wisps of flame which per-

[1] E. E. Clayton, *Jour. Agr. Research*, 52: 239–269, 1936.