DISCUSSION

EARLY OBSERVATION AND ATTEMPTED EXPLANATION OF THE GLACIAL DRIFT

ACCORDING to Merrill,[1] the "first recognition of or attempt to account for the glacial drift" was by Benjamin De Witt, who, in 1793, wrote a letter to the Philadelphia Academy, regarding a collection of sixty-four specimens (all different?) of stone found on the shore of Lake Ontario, saying "it is almost impossible to believe that so great a variety of stones should be formed in one place and of the same species of earth." His suggested explanations are an earthquake, or eruption, or that the lake was one of the fountains of the deep broken up when our earth was deluged with water. No more successful interpretation seems to have appeared until 1825 (Merrill, p. 273), when Peter Dobson, a cotton manufacturer, of Vernon, Conn., observed striated boulders and bed rock in the excavations for a new mill and inferred boulders held in grounding icebergs as the agency probably responsible for the phenomena.

But in 1816 (publication 1819) one David Thomas,[2] a farmer of Levanna, N. Y., and a student of botany and mathematics,[3] showed such discernment in observation of the depositional forms and composition of the drift that even though he was anticipated by DeWitt in recognizing the problem his contribution deserves recognition. Incidentally, Thomas's book made such an impression on DeWitt Clinton that he told a commissioner of the Erie Canal: "The man who wrote that book will make an excellent canal engineer." In consequence Thomas, though without training in engineering, was appointed chief of the exploring engineers of the Buffalo to Rochester Section (of the Erie Canal) and continued as chief engineer in that section until completion of the work.

Thomas and a companion left Levanna, near Auburn, N. Y., on May 21, 1815, on a journey to explore the "Wabash Lands" (Indiana) of the "New Purchase." They traveled north along the east shore of Cayuga Lake to its foot, then turned westward and, on the second day, nineteen miles from home, were approaching the north end of Seneca Lake. Here, after an introductory statement that "we eagerly contemplate traces of a period when matter was obedient to impulses that no longer exist," he begins his observations and comments on the drift by asserting:

> At least two facts appear certain:— that the summits of our mountains have been swept by a *deluge*, and that much of the surface of the country owes its form to that extraordinary movement. . . . the greatest violence of that flood was exerted on the south shore of *Lake Ontario*. Hills of earth, pebbles and rounded stones were arranged by the same surges. . . . The parallelism of these ridges is nearly preserved and the average variation is about ten degrees to the left of the meridian. As this determines *the line of the current* it becomes an interesting enquiry to ascertain which way it flowed. Though the country declines to the north, it appears that this deluge had an opposite direction.
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> The principal facts that support this opinion are that detached parts of every rocky stratum which is uncovered, from the shore of Lake Ontario to the north bounds of Genoa, are scattered to the south of these ranges; and that seldom if ever have any such fragments been found to the north. [Thomas has all this in small caps.] An enumeration is subjoined [pp. 6–7].

He then lists specifically six different rock varieties that conform to his dictum.

In this one note Thomas recognizes: (a) that the form as well as the composition of the hills is a product of the deluge; (b) that the deluge went contrary to the slope of the land; (c) that drumlin hills have a parallel orientation; and (d) that no rock fragments appear to the north of their line of outcrop. On page 8 he records that *granite* and *gneiss* abound on the surface, which he says are admittedly foreign species, and he adds, "it is a curious fact that none are contained in the mountains to the south."

In a note, fourteen pages long, beginning at page 247, given the running head "The Deluge," Thomas continues his discussion of the drift deposits and struggles manfully to reconcile his observations with the action of a great flood. He is forced to admit that the form and composition of the drumlins are such that to ascribe their accumulation to water action is quite fatuous. He then considers the possibility of ice as the responsible agency, holds that ice could transport the rocks, but can not understand how it could bring about the singular depositions. He finally concludes that an attraction exterior to the earth impelled the floods uphill. He notes that Dr. Drake[4] asserts "fragments of primitive rocks are said to be scattered extensively over the state of Ohio, the Indiana Territory, and Kentucky." He himself saw granite near the Wabash and in Madison County (Ohio). With Drake he agrees that the granite came from Canada. He notes also that native rocks are deposited on heights far above the strata from which they were taken and, "worthy of remark," all such occur in greatest abundance immediately south of their native beds. The steep northern ends and other characteristics of the drumlins are described in detail.

[1] G. P. Merrill, Ann. Rept. of the Smithsonian Institution, U. S. Nat. Mus., 1904, p. 211.

[2] David Thomas, "Travels through the Western Country in the summer of 1816," Auburn, N. Y., 1819. (This book and its account of the drift were brought to the attention of the author of this note by Professor A. H. Wright, of Cornell University.)

[3] J. J. Thomas, Cayuga County (N. Y.) Historical Society Collections, No. 6, p. 39, 1888.

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.

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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.

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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.