Comments and Communications

Improvement in Frost Resistance of Parsnip Tops Sprayed with Chemical Growth Substances

THERE is extensive literature on various responses of plants to synthetic growth substances, but, so far as we know, there have been no reports on apparent improvement in frost resistance of plant foliage sprayed with such chemicals. The present communication deals with evidence of this nature arising out of field experiments with parsnips (*Pastinaca sativa*) at Edmonton.

Test material was grown from seed of the variety Hollow Crown, planted May 22, 1952 in 40-ft rows per plot in quadruplicate randomized blocks and was sprayed with various chemicals on September 6 of the same year. A month later the first frosts occurred with minimum night temperatures of 25° F on Oct. 3, 17° F on Oct. 4, 17° F on Oct. 5, and 25° F on Oct 6. Observations on Oct. 7 showed that in every replicate, tops of plants sprayed with 2,4,5-trichlorophenoxypropionic acid (Dow, Color Set) or with sodium naphthaleneacetate (Dow, App-L-Set) at 1 lb active chemical in 50 gal water per acre, were virtually uninjured by frost. On the other hand, most of the leaves of check material were collapsed and darkened. Tops of treated plants remained erect and green until more severe frost occurred several weeks later (Nov. 26, 5° F).

Prior to the first frost the chemical treatments caused perceptible, but not severe, brittleness in leaf stalks together with retardation of growth of the main fleshy root and an abundant development of fine lateral roots.

Apparently a hardening-off process in the parsnips was intensified by the spray ingredients. Further research to determine range of variability of response and to study its nature during the first and second years' growth of this biennial and of other unrelated crops is underway.

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The First Circuit for an Electrical Logic-Machine[1]

IT IS usually assumed that the performance of logical inference by electrical relay machines is of comparative recent date. However, in Baldwin's *Dictionary of Philosophy and Psychology* (1902) there is a reference to an electrical logic-machine designed by Alan Marquand (1853–1924), fellow in philosophy, Johns Hopkins University, and afterwards professor of archeology and the history of art at Princeton University.

Professor Alonzo Church of Princeton recently looked through the Marquand manuscripts now in the Princeton University Library and discovered a wiring diagram which he thought important for us to see, as it was not mentioned in any of the published papers he could recall. Prepared about 1885, it is probably the first circuit of an electrical logic-machine, and is presumably the one referred to in Baldwin's dictionary article.

Marquand had originally constructed in 1883 a four-term logic-machine operated mechanically (*Proc. Am. Acad. Arts and Sci.*, 1885). The dial plate of Marquand's machine had 16 small pointers rather like watch hands, representing the 16 logical combinations of the four terms *A, B, C, D,* and their negations represented by the small letters, *a, b, c, d.* They were as follows:

		A		*a*	
		B	*b*	*B*	*b*
C	*D*	*1*	*5*	*9*	*13*
	d	*2*	*6*	*10*	*14*
c	*D*	*3*	*7*	*11*	*15*
	d	*4*	*8*	*12*	*16*

Each of the pointers numbered *1–16* is able to indicate the "truth" or "falsity" of the combinations they represent. When at the horizontal, the pointer has the value "truth," when at the vertical the value "falsity." Reading down each column in turn, the left uppermost pointer, *1*, represents the combination *A, B, C, D,* and so on until we reach the right lowermost pointer, *16,* which is *a, b, c, d.* We are thus given a mechanical truth table for four terms.

The diagram which was apparently meant to operate this machine is made up of two circuits both wired in series and parallel. As we now know switches wired in series can represent a logical product and in parallel a logical sum. Marquand probably made this application intuitively since this diagram is merely an electrical translation of his geometrical diagram for *n* terms. (*Philos. Mag.,* Oct., 1881).

Each circuit is operated by a separate battery. The letter key circuit connected to eight one-way switches (i.e., the letter keys, representing the terms and their negatives) is wired to *16* electro-magnets, each of which represents a combination from *1* to *16* (only one armature of the electro-magnets is shown). Each letter key functions negatively, actuating those electromagnets (and hence pointers) which include in their combinations the negation of this letter; the answer is read off in negative form from the fallen pointers. If,

[1] We have to thank Mr. Savage, archivist of Princeton University Library, Professor Church and Mrs. Eleanor Marquand Delanoy.