PLANT PHYSIOLOGY

$1,000 AAAS Award Given For Paper on Root Pressure

Young Rockefeller Institution Scientist's Demonstration Revives 210-Year-Old Theory; Upsets Modern Concept

FOR SHOWING that the pressure of sap in plants is "vital," resulting in processes that are living and not just mechanical;

For demonstrating that tiny roots develop enough pressure to send sap higher than the world's tallest trees;

For upsetting radically the most widely held theory of plant science and showing that the father of plant physiology, Stephen Hales, had the right idea in his historic but hitherto outmoded experiments of over 200 years ago;

Dr. Philip R. White, youthful scientist of the Rockefeller Institute for Medical Research laboratories at Princeton, N. J., was awarded the $1,000 prize of the American Association for the Advancement of Science. His paper titled: "Root-Pressure, An Unappreciated Force in Sap Movement" was selected from among the more than a thousand for this high honor.

Working with minute tomato roots grown in glass flasks upon liquid nourishment, with "orphan" roots never serving the stems, leaves and luscious red fruit of tomato plants, Dr. White has substantiated the centuries-old theory of root pressure. (*See SNL,* Jan. 1).

These roots growing detached, much as the famous chicken hearts of Dr. Alexis Carrell beat in tissue culture testtubes for years, develop vast pressures. They push out the water amazingly.

Whereas Stephen Hales, likewise young and experimenting in old England of 1727, was able to show root pressures of only 1.4 atmospheres, some 20 pounds per square inch, enough to raise water 48 feet high. Dr. White 210 years later has found his tomato roots continued to do their stuff, secreting liquid even when opposed by pressures sufficient to raise water 200 feet high. No tomato plant ever grew nearly that high. Yet it had the pressure necessary to deliver water from the earth to the utmost tops of California's big trees.

This great pressure is "insignificantly small" compared with what Dr. White expects to demonstrate when he can get his delicate apparatus attached to the tiny root vessels to withstand such stresses.

Whence comes this amazing pressure? It is a manifestation of life. It is a victory for the vitalists. It is "metabolic," the result of the root cells' feeding and growing.

It may do more than win prizes. It may throw important, needed light on the mechanism of secretion, one of the basic processes in living things.

Science News Letter, January 8, 1938

PLANT PHYSIOLOGY

Winner "Flabbergasted" Sees Many Problems Ahead

By DR. PHILIP WHITE

Rockefeller Institute for Medical Research Princeton, N. J.

I CAN ONLY say that I am quite flabbergasted at the award but it will certainly spur me to continue my research.

Interesting as this particular problem is, and great as are its potentialities in helping to solve problems of glandular action, my own feeling is that it should be considered only one phase, one small limb of the tree of problems growing out of the field of root cultures.

Most of my efforts in the past have been devoted to studying the nutrition of these roots, to laying of sound background of knowledge of their normal behavior. An initial result was reported in the Boston meetings of the American Association for the Advancement of Science in 1933. That background has not yet been fully completed, but it is sufficiently so to make it possible to branch out into promising applications of the method.

Applications

Cultivation of viruses of the type studied by Stanley in these roots, reported at the Microbiological Congress in London in 1936, was one such application. This study of the glandular activities of roots is a second application.

It would be bad psychology to suggest what other applications we may find, but such certainly will arise. I am sure there will be no dearth of future problems.

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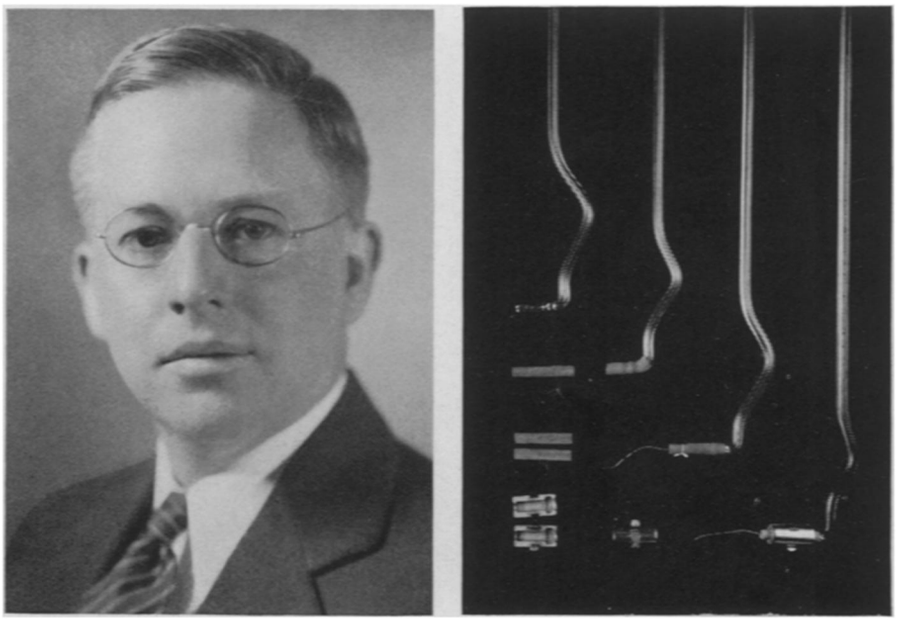

HONORED

Dr. Philip R. White upset a widely held theory of plant science and won distinction with his experiment demonstrating root pressure. On the right are shown four stages of assembling the manometer setup he used to measure the extremely high pressure generated by excised tomato roots. Particularly difficult was the problem of making the joint strong and tight without crushing the root.