Metabolic and Physical Control of Cell Elongation Rate: In Vivo Studies in *Nitella*—Commentary

Green PB, Erickson RO, Buggy J (1971) Metabolic and physical control of cell elongation rate. *In vivo* studies in *Nitella*. Plant Physiol **47:** 423–430

This seminal article from Paul Green and colleagues provided a conceptually and experimentally sophisticated and pioneering assessment of the dynamic relationship of plant cell expansion to turgor pressure. The study elegantly utilized an ingenious system for continuous and direct monitoring of cell elongation rate and turgor pressure in the large cells of the alga *Nitella* (Green, 1968) to test several possible models of the temporal response of cell elongation rate to abrupt changes in turgor pressure. The results provided groundbreaking evidence for the metabolic as well as physical control of plant cell expansion. In particular, the findings supported the concept of a minimum "yield threshold turgor" for cell wall extension that is subject to rapid compensatory metabolic adjustments following changes in turgor pressure, allowing relative constancy of elongation rate despite changes in cell water status. These findings provided a highly influential foundation for studies of the metabolic regulation of cell expansion in plants, particularly as affected by variations in water availability. The pioneering nature of the Green et al. study is exemplified by the fact that it was not until the late 1980s that the advent of the pressure microprobe allowed experiments of equivalent design and resolution, and that generated similar findings and conclusions, to be conducted in the smaller cells of vascular plants.

LITERATURE CITED

Green PB (1968) Growth physics in *Nitella*: a method for continuous in vivo analysis of extensibility based on a micro-manometer technique for turgor pressure. Plant Physiol **43:** 1169–1184

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