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- LETTERS

### Plant Biology and the Nobel Prize

The awarding of the 1998 Nobel Prize in Physiology or Medicine to R. F. Furchgott, L. J. Ignarro, and F. Murad for their discoveries of nitric oxide as a signaling molecule in the cardiovascular system is, without question, a highly deserved recognition of an important breakthrough in biomedical research. However, the citation by the Nobel Assembly is one more testimony to the fact that pioneering discoveries in plant biology are not counted among the milestones in biological research. The Nobel Assembly asserts, with respect to nitric oxide, that “signal transmission by a gas that is produced by one cell, penetrates through membranes and regulates the function of another cell represents an entirely new principle for signalling in biological systems” and that “this was the first discovery that a gas can act as a signal molecule in the organism.” In fact, ethylene, the simplest unsaturated hydrocarbon, was recognized by the Russian plant physiologist Neljubow in 1901 as a gas that affects plant growth, and by Gane in 1934 as a signal molecule produced by plant cells. Endogenously produced ethylene regulates many basic plant processes, ranging from seed germination to senescence. Most important from an agronomic aspect is the role of ethylene as inducer of fruit ripening and as a mediator of defense responses in plant pathogenesis. The enzymes that catalyze the biosynthesis of ethylene have been isolated and characterized biochemically. The genes that encode these enzymes have been cloned, and their regulation has been described (1). The ethylene receptor has been identified, and the ethylene signal transduction pathway is being elucidated in detail (2). These discoveries serve as the basis for biotechnological applications, for example, the genetic engineering of fruits whose ripening can be controlled and whose spoilage is, thereby, prevented. The discovery of ethylene as an endogenous signal molecule should be recognized as the first demonstration—by plant biologists—that a gas can serve as a signal molecule in the organism and that this constitutes an entirely new principle for signaling in biological systems.



#### Ethylene response in seedling

CREDIT: J.R. ECKER, G. AHLSTRAND, AND J. HAYDEN

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