

# This Week's Citation Classic

CC/NUMBER 48  
NOVEMBER 30, 1981

Scandalios J G. Isozymes in development and differentiation. *Annu. Rev. Plant Physiol.* 25:225-58, 1974. [Dept. Biology, Univ. South Carolina, Columbia, SC]

Detailed analyses of changing isozyme patterns and activities during development may lead to a better understanding of the underlying mechanisms of differential gene expression and cellular differentiation. A detailed knowledge of the physicochemical properties and genetic origin of specific isozymes is essential in understanding their evolutionary significance and possible physiological roles in cell metabolism and regulation. [The SC<sup>i</sup>® indicates that this paper has been cited over 120 times since 1974.]

John G. Scandalios  
Department of Genetics  
School of Agriculture and Life Sciences  
North Carolina State University  
Raleigh, NC 27650

August 27, 1981

"I am gratified by the response of the scientific community to this paper, and particularly pleased to learn that it has been classified as a *Citation Classic*.

"The invitation to write this review came while I was on the faculty of the Plant Research Laboratory, Michigan State University. However, it was written in part in Argentina, Brazil, and Chile where I was on leave as a visiting scholar under the auspices of the Organization of American States. The editors of *Annual Review* wanted a critical review of research on plant isozymes with particular emphasis on research from my own laboratory. Thus, the focal point of the paper revolved around the utility of isozymes as effective probes in studies of plant development and differentiation, gene regulation and expression during development, and their role in metabolism and growth. Its purpose was an attempt to discuss and evaluate experiments that appeared to be promising steps toward our un-

derstanding of some basic biological questions. Some emphasis was placed on the varied mechanisms by which isozymes can be generated, but throughout, my main and recurrent stress was that our understanding of the underlying mechanisms, genetic or epigenetic, was of paramount importance. The phenomenon of isozymes appeared to be universal in the biological world,<sup>1</sup> and as such offered unique opportunities to biologists to ask new questions and to rephrase old ones in an attempt to answer them in unique ways.

"The 1960s and early-1970s were an exciting period in which work from a relatively few laboratories defined a number of gene-enzyme systems in depth, and generated significant information on the nature of specific isozymes.<sup>2</sup> As is often the case with new techniques, the simplicity of separating enzymes on various electrophoretic matrices gave way to an avalanche of descriptive and comparative work. Although much of the initial work was essential in proving the universality of isozymes and in indicating the high degree of genetic polymorphism, it eventually became redundant, and reports on yet another polymorphic enzyme system added little new knowledge to the scientific library. However, the few well-defined gene-enzyme systems from various laboratories, including ours,<sup>3</sup> served as model systems for extracting significant information, and demonstrated that such systems could be put to rigorous molecular, genetic, and biochemical analyses. It was indeed my hope in writing this paper in 1974 that it would serve as an indicator of potentially significant questions which could be subjected to experimentation by using isozymes as markers and the entire battery of molecular and biochemical techniques available to us.

"It is always difficult to assess why a paper is referred to enough to make it a *Citation Classic*. One could take the optimistic view that it served some need within the scientific community by generating more questions than answers. In any event, I am honored and pleased that a paper I authored has received such attention, and has been of use to my fellow scientists."

1. Markert C L, ed. *Isozymes*. New York: Academic Press, 1975. Vols. I-IV.

2. Scandalios J G. Genetic control of multiple molecular forms of enzymes in plants. *Biochem. Genet.* 3:37-79, 1969.

3. .... Control of gene expression and enzyme differentiation. (Scandalios J G, ed.) *Physiological genetics*. New York: Academic Press, 1980. p. 63-107.