CC/NUMBER 7
FEBRUARY 13, 1984

This Week's Citation Classic™

Fox J E. Growth factor requirements and chromosome number in tobacco tissue cultures. *Physiologia Plantarum* **16**:793-803, 1963.
[Dept. Botany, Univ. Kansas, Lawrence, KS]

This paper describes three strains of tobacco tissue which, despite having a common origin, differ markedly in their requirement for growth regulators in tissue culture. The original tissue required an exogenous supply of plant hormones of both the auxin and cytokinin types, while derived strains had, in one case, lost the requirement for a cytokinin and, in a second, grew well in the absence of either hormone. The chromosome complement of each type was investigated and discussed in relation to the biosynthetic ability of the tissue. [The SCI® indicates that this paper has been cited in over 110 publications since 1963.]

J. Eugene Fox
ARCO Plant Cell Research Institute
6560 Trinity Court
Dublin, CA 94566

January 4, 1984

"This paper was published more than 20 years ago and represents the first work I did as a young assistant professor newly arrived at the University of Kansas. Small wonder then that I was very much disheartened when this, my initial solo effort, was rejected by the first journal to which it was submitted! (It was a journal on cancer research, the editor of which had published a previous paper dealing with plants but in the interim had decided such studies were not relevant to the subject.)

"The observation which led to this study came as a by-product of efforts in 1961 to isolate naturally occurring plant growth regulators of the class of plant hormones which later came to be known as cytokinins. Tobacco pith tissues required a cytokinin in the culture medium, as well as a representative of the class of plant hormones known as auxins, in order for growth to occur. Consequently, tobacco tissue was the system of choice at that time (and to some extent still is today) as a bioassay for cytokinins. During the course of one such study, a tissue explant grew well in one of my control flasks devoid of cytokinins where such growth should not occur. Although tobacco tissues had been previously observed to lose spontaneously their auxin requirement, a process termed *autonomy* or *habituation*, cytokinin habituation had not been previously described. I subsequently discovered that the tissue had at the same time lost its auxin requirement and thus exhibited the same range of properties as the crown-gall tumor tissues of tobacco incited by the activities of *Agrobacterium tumefasciens*. I then became very excited by the prospect of using this tissue as a model for tumorigenesis.

"In short order, other strains of tobacco tissue which had become autonomous for only one of the plant hormones appeared spontaneously in culture. These were important since they demonstrated that the elements regulating the endogenous synthesis of cytokinins and auxins were probably independent. In this paper, I described the strains and noted the characteristic chromosome complement associated with each.

"I saw in these strains, however, the experimental system for a number of long-term studies which might provide the answers to questions central to the understanding of the control of growth in plant systems: 1) what regulates the on-off switch controlling endogenous synthesis of the plant hormones; 2) how is tumorigenesis related to the action of the plant hormones; and 3) what is the biosynthetic pathway leading to the cytokinins? These and related questions continued to be asked with varying degrees of intensity in the 20 years following the publication of this paper, accounting, no doubt, for its frequent citation. Recently, the line of studies previewed by this paper has come full circle with the discovery that tumor induction by *Agrobacterium* involves insertion into the plant DNA of genetic elements regulating hormone biosynthesis.[1] This area now constitutes one of the hot spots of research by those interested in recombinant DNA in plants. For recent work in this field, see *Plant Molecular Biology*."[2]

1. **Garfinkel D J, Simpson R B, Ream L W, White F F, Gordon M P & Nester E W.** Genetic analyses of crown gall: fine structure map of the T-DNA by site directed mutagenesis. *Cell* 27:143-53, 1981.
2. **Hoekema A, van Haaren M J J, Hille J, Hoge J H C, Hooykaas P J J, Krens F A, Wullems G J & Schilperoort R A.** *Agrobacterium tumefasciens* and its Ti-plasmid as tools in transformation of plant cells. (Goldberg B. ed.) *Plant molecular biology*. New York: Alan R. Liss, 1983. p. 3-22.

