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Tobin E M & Silverthorne J. Light-regulation of gene expression in higher plants.
Annu. Rev. Plant Physiol. 36:569-93, 1985.
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This review article brought together for the first time in a readily accessible publication the literature on the regulation of gene expression by light using the methods of molecular biology. It included a historical perspective and considered the regulation at the levels of transcription, mRNA accumulation, and translation. [The *SCI*® indicates that this paper has been cited in more than 345 publications.]

Turning on Genes with Light

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When we began writing this review in 1984, Jane had been a postdoc in the lab since 1981, and had expanded the lab's work from showing that light, acting through the plant photoreceptor phytochrome, could affect accumulation of specific RNAs to demonstrating that transcription itself was increased by phytochrome action. These were technically difficult experiments and entailed long hours under a dim green safe light. Although she had initial success in 1982,[1] just before Elaine left for a six-month sabbatical, there were problems repeating the results, during which time Jane consoled herself by buying shoes. Upon Elaine's return, we found that there had been a minute light leak in the darkroom, thus solving the problem of variability in the level of transcription seen in darkness and preventing Jane from pursuing an alternative career path outside of science. By the time our findings were more fully published early in 1984,[2] Jane had accumulated quite a large collection of footwear.

Although Elaine had been studying the regulation of gene expression by light since her postdoc days at Brandeis, the questions that could be addressed experimentally were limited by existing techniques. But by 1984, cloned probes for two of the major light-regulated chloroplast proteins, the small subunit of ribulose bisphosphate carboxylase and the light-harvesting chlorophyll a/b-protein had been obtained from a number of plants. These tools, along with readily available in vitro translation extracts, meant that it was possible for the involvement of phytochrome and other photoreceptors in the regulation expression of these and other genes, from transcription through to translation, to be assayed.

In the space of about three years, from 1981 to 1984, a large body of papers on light-regulation of gene expression had appeared. The review summarized what had been established about light-regulation, for which responses the photoreceptor had actually been determined, and how the state of development of chloroplasts, a process itself dependent on light, could affect experiments on "light-regulation." The review appeared just as the field was rapidly expanding and when experiments with transgenic plants to analyze promoter elements responsible for responsiveness to light signals were beginning. Because light is such a nonintrusive, easily manipulable experimental parameter, and because it does play such an important role in the normal development of plants, the field has remained an active one. The most recent review on this topic[3] has approximately twice the number of pages and number of references as did ours. Although our review is now somewhat out of date, it is probably still frequently cited because it remains the most complete (and, we hope, clear and critical) summary of the work to the end of 1984.

1. **Tobin E M, Silverthorne J, Stiekema W J & Wimpee C F.** Phytochrome regulation of the synthesis of two nuclear-coded chloroplast proteins. (Ellis R J, ed.) *Chloroplast biogenesis. Proceedings of S.E.B. symposium.* March 1982, Leiden, The Netherlands. Cambridge, England: Cambridge University Press, 1984. p. 321-35.
2. **Silverthorne J & Tobin E M.** Demonstration of transcriptional regulation of specific genes by phytochrome action. *Proc. Nat. Acad. Sci. USA* 81:1112-6, 1984. (Cited 175 times.)
3. **Thompson W F & White M J.** Physiological and molecular studies of light-regulated nuclear genes in higher plants. *Annu. Rev. Plant Physiol.* 42:423-66, 1991.

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