

This Week's Citation Classic®

Lwoff A. Lysogeny. *Bacteriol. Rev.* 17:269-337, 1953.
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This exhaustive review covered the history of the discovery and definition of lysogeny, the prophage development, the relations between colicin-producing bacteria and lysogeny, the incompatibility of related prophages, loss of lysogeny, exclusion of temperate phage and between different temperate phages, "immunity" of lysogenic bacteria, and some general concepts about lysogeny. Moreover, the induction of prophage by carcinogens was the first example of induction of a latent group of genes—the future "operon"—and the first hypothesis that carcinogens could act by inducing the expression of a latent provirus or gene—the future "oncogene." [The SCI® indicates that this paper has been cited in over 400 publications since 1955.]

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It was a pleasant surprise to hear that my 33-year-old review on lysogeny was "among the most-cited works in the field." That, in other words, it has reached the status of live fossil. ISI® has asked me to comment on the whereabouts of this most remarkable phenomenon and to answer a few questions. As I am, like every Frenchman, highly disciplined, I have obeyed—that is, tried to obey—at least partly. But I was unable to conform to the tradition of writing a review of my review. This would have been the beginning of an endless, heliocidal adventure.

First I was asked why the publication is so highly cited. It is the first extensive review on the subject, and so far as I know, the only one including a comprehensive historical survey. Moreover, "La forme seule—wrote the poet Frédéric Mistral—conserve les oeuvres de l'esprit." (Only the form keeps the works of the mind.) The review—I have been told—is clearly written. Yet, when a scientific paper is concerned, the importance of its very substance—here, data and concepts—should not

be underestimated, and the success of a work is not necessarily a criterion of quality. However, perhaps, maybe, who knows, "Lysogeny" is a good review. The decision is in the hands, or the brains, of the readers, not of the author.

Then I was asked to discuss any obstacles encountered in research. First, one of the obstacles was the material—in my case the bacterium—which, for a few months, refused to cooperate. Second, after a deep, concentrated, intense, philosophical meditation regarding the concept of obstacle, I have reached the conclusion that research is a race against obstacles. So far as scientific research is concerned, the main obstacle is the problem. A rider has to negotiate obstacles; a scientist has to negotiate problems.

I was asked if I had encountered any obstacles in publication. I did. Each chapter of the manuscript carried an epigraph. For example, the epigraph of the chapter "Induction" was a quotation taken from Francis Bacon's *Instauratio Magna*: "Our only hope, therefore, lies in a true induction." Another epigraph was a quotation of Aeschylus: "Alas! Alas! Alas! Alas!" This was too much. The editor asked me to suppress *all* the epigraphs. Unthinkable. I refused. The editor gave up. Another deletion was asked. The review included a reference to Eugene and Elizabeth Wollman, who, during the war, "had been arrested by the Germans in the Pasteur Institute, deported to Germany where they disappeared in one of the extermination camps." "Extermination camps" was judged inadmissible. I proposed to replace it by *Vernichtungslager*—which sounds much worse—but was accepted. The mind of an editor is an unfathomable mystery.

Finally, I was asked to append any personal remarks I might have. First, I had proposed in this manuscript the hypothesis "that the potential power of a cell to become neoplastic may be perpetuated by a gene-like structure and that carcinogenic agents endure the expression of the potentiality of this genetic material." This is a unique occasion to say that I have never seen this hypothesis quoted. Second, I want to add that it was Alvin Pappenheimer who suggested that I write the review. As a matter of fact, he almost obliged me to write it. We are still on speaking terms. [Editor's note: The concept of lysogeny now permeates every aspect of contemporary molecular biology. See references 1-3 for recent examples.]

1. Alberts B, Bray D, Lewis J, Raff M, Roberts K & Watson J D. *Molecular biology of the cell*. New York: Garland Publications, 1983. 1146 p.
2. Darnell J, Lodish H & Baltimore D. *Molecular cell biology*. New York: Scientific American Books, 1986. 1187 p.
3. Ptashne M, Lodish H & Baltimore D. *A genetic switch*. Palo Alto, CA: Blackwell Scientific Publications, 1986. 128 p.

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