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This Week's Citation Classic®

Glasstone S, Laidler K J & Eyring H. *The theory of rate processes: the kinetics of chemical reactions, viscosity, diffusion and electrochemical phenomena.* New York: McGraw-Hill, 1941. 611 p.
[Frick Chemical Laboratory, Princeton University, NJ]

The first two chapters of the book deal with some general kinetic principles and with basic quantum mechanics. A chapter on the method of potential-energy surfaces is followed by a brief account of the methods of statistical mechanics, and this leads to derivations of the basic equations of transition-state theory. The remaining chapters of the book make applications of transition-state theory to a number of different processes: homogeneous gas reactions, reactions involving excited electronic states, reactions on surfaces, reactions in solution, viscosity and diffusion, and electrochemical processes, including the problem of overvoltage. [The *SCI*® indicates that this book has been cited in over 4,605 publications since 1955.]

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In 1938, at the age of 22, I arrived at Princeton University to work with Henry Eyring in theoretical chemical kinetics. My undergraduate work, with C.N. Hinshelwood at the University of Oxford, had led me to a deep interest in theories of reaction rates, especially in Eyring's theory that he had published in 1935. Hinshelwood had recommended that I apply for a Commonwealth Fund Fellowship (now called a Harkness Fellowship) to work with Eyring, and to my great good fortune I was successful.

Eyring's classical 1935 paper[1] had attracted great interest but also some controversy, and, initially, it had been rejected by the *Journal of Chemical Physics*. Some of the early struggles over the theory have been detailed elsewhere.[2] Eyring had come to the conclusion that there was a need for a book that would present the basic theory in a fairly detailed way, discuss its implications and assumptions, and apply it to rate processes of various kinds. Eyring knew that he would find it difficult to settle down to long sessions of writing, which are necessary to produce a book. He therefore invited me to collaborate with him on the book, with the arrangement to be that I would do the actual writing, in regular consultation with him. I was naturally very pleased and honored to be able to work with him on a book that I knew would exert considerable influence.

I at once started to prepare material for the book, while at the same time carrying out research for my PhD degree, particularly on the application of Eyring's theory to reactions in solution and to reactions on surfaces. I also drafted chapters on quantum and statistical mechanics and on the derivation of the rate equations.

In the summer of 1939 Samuel Glasstone arrived in Princeton as a research associate in the Department of Chemistry. Glasstone, then aged about 40, had already had a successful research career at the University of Sheffield and was the author of several very successful books on physical chemistry. In view of his background, it was natural to enlist his help with the writing of the book, especially since it would be necessary for me to leave Princeton in 1940 to carry out war research. I provided Glasstone with everything I had written and continued to give him material as I wrote it during my second year at Princeton. At the same time, Glasstone, Eyring, and I collaborated on research on overvoltage, a subject on which Glasstone had previously worked. Glasstone greatly supplemented the material I gave him for the book, and he put everything into final form. Eyring himself did hardly any of the writing, but he made numerous and valuable comments on everything we wrote, and I well remember many vigorous but always very friendly arguments on a number of fundamental points.

Although World War II interrupted most basic scientific work for a few years after the book's publication in 1941, the book attracted much attention from the start, particularly as it was the first comprehensive treatment of the new rate theory and of its applications to a variety of chemical and physical processes; it also contained a good deal of previously unpublished material. Records of sales during the war years have been lost, but probably at least 10,000 copies were sold during that period. After 1947 about 10,000 further copies were sold until the book went out of print in 1970. The *Science Citation Index*® shows that it has been frequently quoted and that it has been Eyring's most often cited publication. In 1948 a pirated Russian translation of the book appeared, and there have also been Japanese and Spanish editions.

There have been many extensions and modifications of the original theory; some of these have been reviewed in some detail,[3] and in lesser detail in a recent book.[4]

[Eyring and Glasstone are now deceased.]

1. **Eyring H.** The activated complex in chemical reactions. *J. Chem. Phys.* 3:107-15, 1935. (Cited 440 times since 1955.)
2. **Laidler K J & King M C.** The development of transition state theory. *J. Phys. Chem.* 87:2657-64, 1983. (Cited 20 times.)
3. **Truhlar D G, Hase W L & Hynes J T.** The current status of transition-state theory. *J. Phys. Chem.* 87:2664-82, 1983. (Cited 105 times.)
4. **Laidler K J.** *Chemical kinetics.* New York: Harper & Row, 1987. 531 p.

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