Lajos Takács, *Introduction to the Theory of Queues*. Oxford University Press, New York, 1962, $7.50. x +268 pp.

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The title of Lajos Takács' 1962 Oxford University Press book on queues is "Introduction to the Theory of Queues". To the reviewer this is hardly an apt title regardless of whether the book is good or bad. The book represents an intensive study of the time-dependent ($t < +\infty$) behavior of various queueing systems, most of which are non-Markov. This is a far more difficult undertaking than the study of the asymptotic (stationary) theory or merely the Markov case, which is what is customarily presented in elementary or "introductory" treatises. So to protect the unwary, who purchase books by their titles alone, the reviewer would recommend that the jacket be stamped "The Time-Dependent Theory of Queues" or something similar.

The primary stochastic variables which are studied are the standard ones: the waiting time of a customer, the queue size (i.e., length of line), and the busy period (i.e., time interval during which at least one server is busy). Wherever it is tractable the author studies the queue size both at a general time $t(0 < t < +\infty)$ and at those points in time which constitute regeneration points of the process, and similarly the waiting time at a general time t and for the nth customer. The stationary limiting probabilities are usually obtained from the time-dependent results by a Tauberian argument rather than as solutions to stationarity equations. A few other stochastic variables, which are pertinent in special situations, are studied in their appropriate contexts.

Various queueing models are dealt with, but the book is principally concerned with the single server model. Excluding the introduction, appendix, and solutions to problems, the chapter on the single server process comprises two-thirds of the length of the book. The single server queue is studied first in the completely Markov case (i.e., Poisson input-exponential service), then in the Poisson input-general service case, in the general input-exponential service, and briefly in the general input-general service case. Special forms of batch (bulk) arrival and batch service are also handled for the single server queue. In the remaining one-third of the book, the author treats the many server queue, the infinite server queue, the telephone traffic process in which arrivals are lost if the queue size exceeds a certain number, the process of servicing machines in which m machines are susceptible to randomly occurring breakdowns, and finally counter models. The degree to which each is treated depends upon the tractability of the model and the author's interests. Admittedly this list does not approach being a semi-complete catalogue of all queueing models which have been proposed and analyzed, but, as stated in the preface, such is not the author's aim.

The techniques employed in the book are primarily the ones currently used in queueing theory. They include recursion relations, generating functions, Markov chain theory, systems of differential equations, Blackwell's and Smith's