Finally, chapter 11 gives an excellent summary of the results and a list of some unsolved problems. This reviewer would recommend reading of chapter 11 before reading the other chapters. Reading this chapter is also recommended for those desiring a detailed summary.

Two appendices are included. Appendix A is a proof of a lemma, and Appendix B is a list of all the theorems and corollaries.

A certain lack of precision and uniformity between various parts of the book makes it rather difficult to read. This is particularly noticeable in differences, from one theorem to another, in assumptions concerning the timing of signals in various systems. Justification for the timing changes should be made, especially for skewed systems, so that the reader is not left to wonder about their possible effects.

Very few errors were found. On page 35, line 7, label set B_2 should be added. On page 55, at the end of section 3.3, confusion may result from the use of the index n both as the index of a sequence $i_1, i_2, \ldots, i_n$, and as the width of the network in theorem 4. In the proof of theorem 14, page 89, the argument about the lateral signals in the last $Q + 1$ cells does not prove that the last lateral signal must be identical with one of the others. However, a somewhat longer argument for this is easily constructed.

In conclusion, the book is recommended for its interesting undecidability theorems and its start toward classifying iterative systems. Undoubtedly it will act as a stimulus for further research on the many unsolved problems in this area.

RAYMOND E. MILLER
IBM Research Center
Yorktown Heights, New York

Proceedings of the Fourth Berkeley Symposium on Mathematical Statistics and Probability, Volume I: Theory of Statistics. Edited by JERZY NEYMAN. Univ. of California Press, 1961. 767 pp. $16.00.

The Berkeley symposia organized by Professor Neyman have a secure place in the literature of probability and statistics. But students of information theory, other than mathematicians, run the danger of not paying attention to these substantial volumes. They would be ill-advised, since the present Volume 1 contains—among many others—the following articles:

DAVID BLACKWELL: Exponential error bounds for finite state channels.

R. L. DOBRUSHIN: Mathematical problems in the Shannon theory of optimal coding of information.

ROY RADNER: The evaluation of information in organizations.

ALFRÉD RÉNYI: On measures of entropy and information.

CLAUDE E. SHANNON: Two-way communication channels.

A. J. THOMASIAN: The metric structure of codes for the binary symmetric channel.

J. WOLFOWITZ: A channel with infinite memory.

This wealth of material is in striking contrast with the previous symposia, two of which (1950 and 1955) were held after the birth of information theory.

Clearly, the mathematical community has been reached—with the usual time-lag—by the announcement of this birth. The message *must* travel faster in the other direction.

Book Review Editor

Self-Organizing Systems. Edited by M. YOVITS and S. CAMERON. Pergamon Press, New York, 1960. 322 pp. $8.50

As the subtitle indicates, this is the proceedings of an interdisciplinary conference held in Chicago, May 5 and 6, 1959. The 13 papers assume widely differing readership backgrounds and cover a diversity of topics. They might be classified according to reading prerequisites: engineering, mathematical, medical and biological, and general, although they are not organized in any discernible way in the book.

Starting with the mathematical papers, "Computation, Behavior and Structure in Fixed and Growing Automata," by A. W. Burks, presents some formal models for self-reproducing automata and raises some questions about minimum complexity and the amount of information that may be transmitted. In the "Reliability of Biological Systems,". W S. McCulloch describes a new notational device for logical truth functions, and summarizes very briefly some of his work on networks of idealized neurons which remain error-free even though the elements of the network err.

There are several general discussions of self-organizing systems. "The Natural History of Networks," by G. Pask, contains some very general views on how to study self-organizing systems and a description of a simple chemical device which illustrates the author's views in a rather limited way. F. Rosenblatt, in "Perceptual Generalization over Transformation Groups" says nothing whatever about groups, but does describe his Perceptron, a device inspired by neural nets, and outlines how the machine should form abstractions. Two papers which discuss generalization and learning in terms of practical algorithms on present digital computers are, "Self-Organizing Models for Learned Perception," by B. G. Farley, and, "A Variety of Intelligent Learning in a General Problem Solver," by A. Newell, J. Shaw and H. Simon.

H. vonFoerster, in "On Self-Organizing Systems and Their Environments," uses the terminology and principles of thermodynamics to argue that the "self-organizing" ability of any system depends very much on the amount of order in the system's environment. A second, very interesting, application of engineering thinking to biological problems is described in, "Further Consideration of Cybernetic Aspects of Homeostasis," by S. Goldman. Servomechanism theory is applied to several homeostatic problems, in particular the human glucose control system.

The biological and social sciences are represented by five papers. "Feedback through the Environment as an Analog of Brain Functioning," by G. H. Bishop, contains a discussion of the evolution of mammalian brains and a discussion of the relation between brain complexity and behavioral flexibility. There is a description of some interesting experiments on organization in cells and tissue in "The Organization and Reorganization of Embryonic Cells," by R. Auerbach.