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Theory of codes, by Jean Berstel and Dominique Perrin, Pure and Applied Mathematics, Vol. 117, Academic Press, Inc., New York, 1985, xiv + 433 pp., $60.00. ISBN 0-12-093420-5

The research of Shannon on information devices in the late 1940s, and in particular his paper [**Sha**] in 1948, formed a basis of quite extensive studies. The research inspired by his work has spread into several directions which by now are quite independent although there are, or at least should be, some connections. The theory of entropy is one of the directions and forms nowadays a branch in probability theory. The theory of error-correcting (and detecting) codes is another direction, and the theory of variable-length codes, which is the topic of this book, forms the third direction.

It should be made clear that despite their common origin the theory of error-correcting codes and the theory of variable-length codes have very little in common. The former is a beautiful application of commutative algebras, in particular the theory of finite fields, while the latter is connected to noncommutative structures such as free semigroups.

A systematic study of variable-length codes, or briefly codes, was initiated by M. P. Schützenberger in the mid 1950s, cf. [**Sc 1**]. It is not too much to say that without Schützenberger's contributions the theory of codes would not exist in the extent we know it today. Not only many of the major results of the theory are due to him, as is seen from the bibliographical notes of this book, but he also showed the direction in which to continue, via his original approaches in solving problems and via his conjectures.

In the past 30 years the theory of codes has developed into an interesting branch of discrete mathematics which provides a number of nice and deep results, as well as challenging problems. Certainly the theory is connected to many other areas of mathematics. In a broad sense the whole theory can be considered as a part of theoretical computer science, and its connections to areas like combinatorics on words, automata theory, formal language theory and semigroup theory are close and manifold.

It is a surprise to notice that *Theory of codes* is the first book devoted to the field. Of course parts of the theory have been included in other books, but so far it has been typical (and unfortunate) of the whole field that results have been seattered in the literature, and even some very important ones have not been easily available. In addition, many results have earlier been published only in French. So there definitely exists a need for a book on codes, and it is, in my opinion, very important that this book has appeared in such a highly respected series of mathematical textbooks.

In order to discuss the book we recall that a *code* over a finite alphabet A is any subset X of the free monoid A^* generated by A which satisfies:

$$\text{If } x_1 \cdots x_n = y_1 \cdots y_m \quad \text{with } x_i, y_j \in X,$$
$$\text{then } n = m \text{ and } x_i = y_i \quad \text{for } i = 1, \dots, n,$$