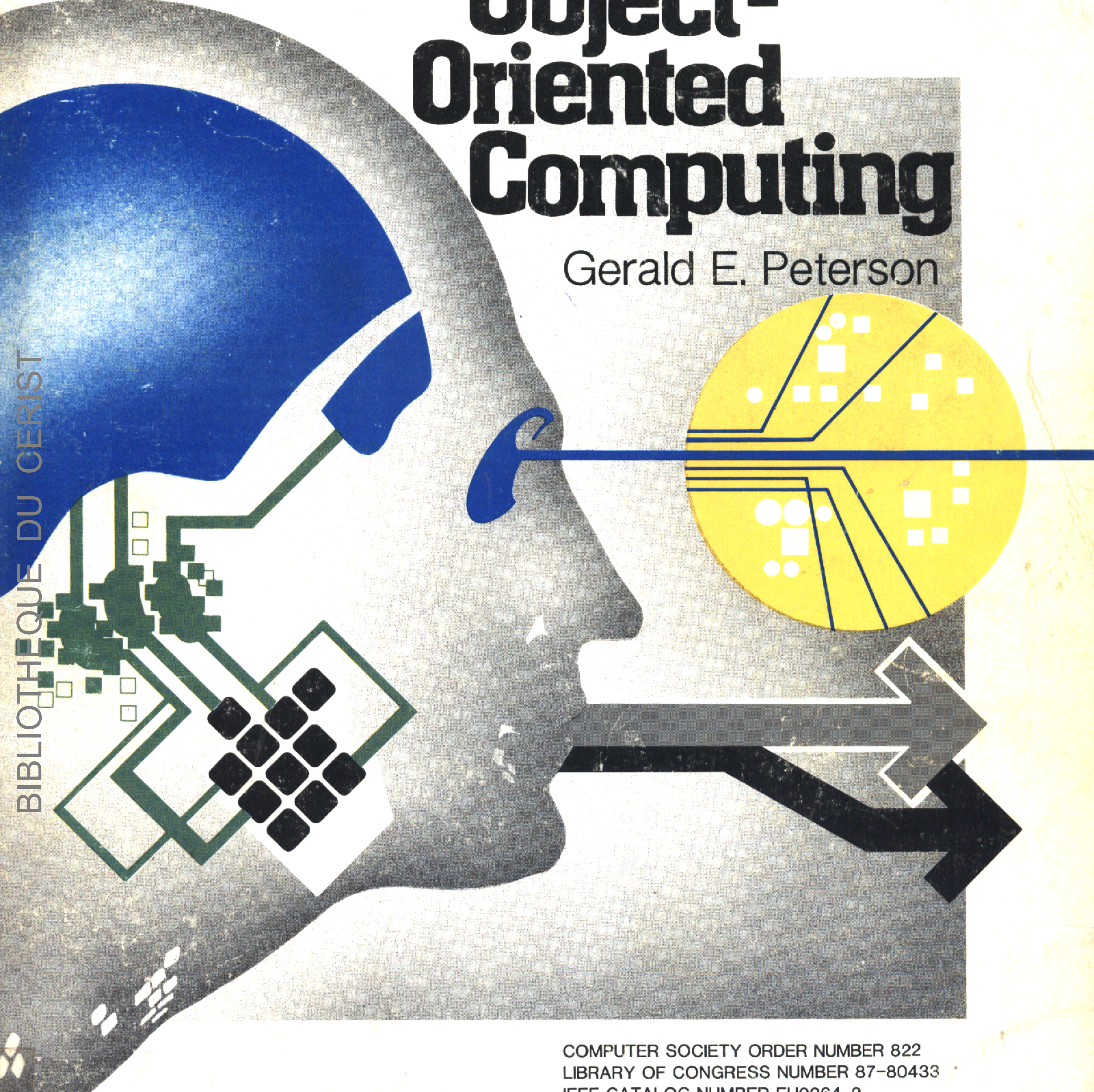
Volume 2: Implementations

TUTORIAL: Object-Oriented Computing

Gerald E. Peterson



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Preface

Object-oriented computing is a style of computing in which data and associated procedures are encapsulated to form an *object*. An object is a useful computing entity existing at a higher level than procedures or data structures.

Object-oriented computing has gained considerable interest in the last few years. This interest is being fanned by the U. S. Department of Defense's push of Ada, a common (partially) object-oriented language.

This tutorial should be of interest to that group of computer professionals who have heard the term "object-oriented," know it is important, and want to obtain a more substantial understanding of the concept. This group includes

- software engineers
- AI professionals
- professors and students of programming language and computer architecture courses
- those who are building or proposing new computer languages or architectures

Most of the papers are at the level of the practicing computer engineer. Some papers, especially those in Chapters 1 and 2 of Volume 1, are accessible to the computer-knowledgeable layman.

All aspects of object-oriented computing are considered, including object-oriented languages, object-oriented design and development, examples of object-oriented programming, object-oriented databases, and object-oriented computer architectures.

Volume 1 presents the basic concepts of object-oriented programming and describes several object-oriented languages.

An overview of the fundamental ideas of object-oriented programming is given in Chapter 1.

Smalltalk is a language based entirely on the use of objects. Everything in the language, including integers, is an object. A great deal of knowledge about object-oriented computing can be obtained by studying Smalltalk. Chapter 2 is devoted exclusively to this language.

Other languages are supportive of the object philosophy. These languages include Ada, in which objects can be created as packages; Modula-2, in which objects are created as modules; and some dialects of Lisp. The manner in which the object-oriented philosophy can be incorported in these languages is considered in Chapters 3 and 4.

Volume 2 is devoted to the manner in which programs are implemented using object-oriented methods, and the manner in which object-oriented languages are themselves implemented.

It has been found that many problems decompose naturally into objects and messages that pass between them. Object-oriented development is the process of decomposing a problem into objects and messages and maintaining these structures in the implementation. Object-oriented development techniques and examples of their use are presented in Chapter 1.

Much insight into the nature of object-oriented programming can be obtained by studying examples where it was successfully put to use. Several examples of object-oriented programming are considered in Chapter 2.

The biggest problem with languages that fully support the object-oriented philosophy is efficient implementation. On a dedicated processor costing in the neighborhood of $100K, Smalltalk runs satisfactorily. On less expensive machines, however, Smalltalk implementations have been too slow to be practical for large programs. Chapter 3 contains many ideas about how to overcome this problem.

Several important concepts and issues that did not fit in other chapters are considered in Chapter 4.

Object-oriented computer architectures have also been addressing, which have guided these implementations. Several examples of object-based architectures are described in Chapter 6. These include the Intel iAPX 432 and the IBM System/38.

Gerald E. Peterson

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