



Technical Editor:  
Marcin Paprzycki  
Dept. of Computer Science  
and Statistics  
Univ. of Southern Mississippi  
Southern Station 3506  
Hattiesburg, MS 39406-1506  
m.paprzycki@usm.edu

**Using Plapack: Parallel Linear Algebra Package**  
Robert A. Van de Geijn  
225 pages  
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Cambridge, Mass.  
1997  
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## Book Reviews

### Using Plapack: A solid part of the Scientific and Engineering Computation series

By Roman Wyrzykowski, Technical University of Czestochowa

The dominant cost in most large-scale computational science applications comes from writing new code. A pragmatic approach to overcoming this difficulty is to create an application-specific package (or library)—a software system that provides a coding interface to solve a target class of problems without focusing on implementation details. This approach originates from the era of sequential computers but has become especially popular for parallel machines, because their low-level programming was (and still is) a formidable task.

The library-based approach to programming parallel computers is especially widespread in computational linear algebra. Numerous parallel linear algebra packages exist, all differing in their orientation (a shared or distributed memory model of parallel programming), functionality (using direct or iterative methods, solving linear systems or eigenvalue problems), exploitation of sparsity of data, availability of support for using linear algebra methods in solving real-life problems, and so forth. Among these packages are Lapack and Scalapack, Plapack, Artec, PPARSLIB, PETSc, BlockSolve, and Parpack.

*Using Plapack: Parallel Linear Algebra Package* is part of the MIT Press's renowned *Scientific and Engineering Computation* series. The series includes such well-known publications as *Using MPI: Parallel Programming with the Message-Passing Interface* by William Gropp, Ewing Lusk, and Anthony Skjellum (1994) and *P3M: Parallel Virtual Machine*, by Al Geist, Adam Beguelin, Jack Dongarra, Weicheng Jiang, Robert Manchek, and Vaidy Sunderam (1994), both of which have played an impor-

tant role in the dissemination of the message-passing parallel-programming model. Van de Geijn's book follows the pattern established by these successful publications.

#### HOW TO BUILD AND USE PLAPACK

Van de Geijn's goal is to deliver the principles for building and using Plapack. This portable parallel linear-algebra library, developed at the University of Texas in Austin, is based on the MPI. However, thanks to object-based programming, Plapack hides many particulars from the user, such as indexing and the implementation details of data distribution and exchange.

Chapter 1 offers the most significant information, concisely summarizing Plapack's main ideas. It starts with the recursive formulation of the Cholesky factorization, and this simple example shows what programmers need to code parallel linear-algebra algorithms. The next four chapters—of which two and five are the most important—contain a guide to the basic routines of the Plapack infrastructure. Chapter 2 acquaints the reader with the routines Plapack provides. These routines initialize the environment, create a template describing the distribution of vectors and matrices among a logical topology of nodes, and create linear algebra objects that encapsulate the distributed vectors and matrices. Chapter 3 details the copy and reduce operations that Plapack uses to hide communication. Chapters 4 through 8 discuss the implementation of routines contained in the *Basic Linear Algebra Subprograms* library. Their contents are structured in accordance with the

# Using Plapack Scientific And Engineering Computation

**Rachel S Tattersall**



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### **Using Plapack Scientific And Engineering Computation Introduction**

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