

**THE INTERPLAY BETWEEN CLASSICAL ANALYSIS AND (NUMERICAL)
LINEAR ALGEBRA — A TRIBUTE TO GENE H. GOLUB***

WALTER GAUTSCHI[†]

*Dedicated in friendship, and with high esteem, to Gene H. Golub
on his 70th birthday*

Abstract. Much of the work of Golub and his collaborators uses techniques of linear algebra to deal with problems in analysis, or employs tools from analysis to solve problems arising in linear algebra. Instances are described of such interdisciplinary work, taken from quadrature theory, orthogonal polynomials, and least squares problems on the one hand, and error analysis for linear algebraic systems, element-wise bounds for the inverse of matrices, and eigenvalue estimates on the other hand.

Key words. Gauss-type quadratures, eigenvalue/vector characterizations, orthogonal polynomials, modification algorithms, polynomials orthogonal on several intervals, least squares problem, Lanczos algorithm, bounds for matrix functionals, iterative methods.

AMS subject classifications. 65D32, 33C45, 65D10, 15A45, 65F10.

*Received August 14, 2002. Accepted for publication August 20, 2002. Recommended by L. Reichel. Expanded version of a lecture presented in a special session honoring Professor Gene H. Golub at the Latsis Symposium 2002 on *Iterative Solvers for Large Linear Systems, celebrating 50 years of the conjugate gradient method*, held at the Swiss Federal Institute of Technology in Zurich, February 18–21, 2002.

[†]Department of Computer Sciences, Purdue University, West Lafayette, Indiana 47907-1398. E-mail: wxg@cs.purdue.edu