Special Volume on
Orthogonal Polynomials, Approximation Theory, and Harmonic Analysis

This special volume of ETNA contains 13 selected papers presented at the Third International Workshop on Orthogonal Polynomials, Approximation Theory, and Harmonic Analysis, April 14–18, 2000, in the Hotel Chiemgauer Hof, Inzell, Germany. The workshop was organized by Jürgen Prestin (Medical University Lübeck), Sven Ehrich, Frank Filbir, Roland Girgensohn, Rupert Lasser, and Josef Obermaier (GSF-National Research Center for Environment and Health, Neuherberg/Munich) who also serve as guest editors for this special issue. Located southeast of Munich in the German Alps, the conference venue provided a marvelous framework for both the scientific and the social parts of the workshop. 45 mathematicians from nine countries contributed to the success of the workshop during the talks and the very lively discussions. Eight invited one-hour lectures were given on recent trends in orthogonal polynomials, approximation theory, harmonic analysis, and applications:

- W. Freeden (Kaiserslautern): Regularization wavelets and multiresolution
- M. E. H. Ismail (Tampa): An extremal problem for zeros of orthogonal polynomials
- F. Marcellán (Madrid): Asymptotic properties of matrix orthogonal polynomials
- G. Mastroianni (Potenza): Polynomial approximation on the real axis
- L. Reichel (Kent): Orthogonal polynomials, quadrature and matrix functionals
- H. Stahl (Berlin): Multiple orthogonal polynomials
- V. Totik (Szeged): Asymptotics for Christoffel functions
- W. Van Assche (Leuven): Little q-Legendre polynomials: properties and applications

In addition, 26 half-hour lectures demonstrated the breadth, the relevance, and the vividness of these important fields of applied mathematics. The broad range of topics in these talks is also reflected by the papers in this special volume. Beckermann and Kuijlaars show that superlinear convergence can be observed for the conjugate gradient method with special right hand sides, applying results from discrete orthogonal polynomials and logarithmic potential theory. Calvetti, Hansen, and Reichel apply Gaussian quadrature for estimating the curvature of L-curves, being important tools for choosing regularization parameters for solving ill-conditioned linear systems. Delvos investigates approximation by minimum norm interpolation in harmonic Hilbert spaces. Forster introduces a new algorithm for nonharmonic signal analysis using Dirichlet series on convex polygons in the complex plane. Freeden and Maier review theoretical and numerical aspects of multiscale representations on the sphere in the presence of noise and give an application to a problem in geodesy. Junghanns and Rathsfeld derive necessary and sufficient conditions for the stability and convergence, in weighted L^2 spaces, of a collocation method for the numerical solution of Cauchy singular integral equations over the interval which is based on the zeros of Chebyshev polynomials of the second kind. Marcellán and Yakhlef give an overview about recent results on analytic properties of matrix orthogonal polynomials, focusing on their asymptotic behavior and on the distribution of their zeros. Mastroianni gives a survey, including also new results, on polynomial approximation on the real semiaxis with Laguerre weights. Schmeisser proves new upper and lower bounds for Vandermonde type determinants of orthogonal polynomials. Selig studies extensions of uncertainty principles to symmetric operators and to normal operators and in various function spaces. Sprengel compares, by the associated condition numbers, several multilevel grid coarsening strategies for solving elliptic boundary value problems. Stahl gives a short

introduction to Hermite–Padé approximation and then states results and conjectures in the special case of algebraic (quadratic) Hermite–Padé approximation. Stempak proves a maximal inequality for the partial sum operator of Fourier–Bessel series in weighted Lebesgue spaces and deduces divergence and convergence results. All papers in this issue were peer refereed. We would like to express our sincere gratitude to all referees for their excellent job. Moreover, we gratefully acknowledge financial support for the Inzell workshop from the GSF-National Research Center for Environment and Health and from the Volkswagen Foundation (reference number I/76 358).

Sven Ehrich