

## L. N. Trefethen, some key publications in one page

### BOOKS

*Numerical Linear Algebra*, with Bau, SIAM 1997 and 2022

SIAM's all-time bestselling textbook; also appeared in Chinese translation. Reissued in 2022 in a 25<sup>th</sup> anniversary edition.

*Spectral Methods in MATLAB*, SIAM, 2000

Textbook of Chebyshev spectral methods introducing a suite of 40 widely-used MATLAB programs. Also in Chinese translation.

*Schwarz-Christoffel Mapping*, with Driscoll, Cambridge 2002

The standard monograph on history, theory, algorithms, and applications for Schwarz-Christoffel mapping.

*Spectra and Pseudospectra*, with Embree, Princeton 2005

Monograph with sixty short chapters reviewing all aspects of theory and applications of pseudospectra and nonnormality.

*Approximation Theory and Approximation Practice*, SIAM 2013 and 2019

Chebfun-based textbook, which has brought a new concreteness to the study of polynomials and rational functions. With an annotated bibliography.

*Exploring ODEs*, with Birkisson and Driscoll, SIAM 2018

Chebfun-based textbook on ordinary differential equations, quite unlike other ODE texts. Freely available online.

*An Applied Mathematician's Apology*, SIAM 2022

Combined memoir and meditation on mathematics from the point of view of a numerical analyst. Chinese translation in progress.

### PAPERS

Group velocity in finite difference schemes, *SIREV* 1982

Survey of dispersion relations and group velocity effects for finite difference models of PDE. Discreteness makes finite difference schemes behave like crystals.

How fast are nonsymmetric matrix iterations?, with Nachtigal and Reddy, *SIMAX* 1992

The standard work on this question, identifying matrices for which methods of types CG, BiCG, and CGN maximally outperform the others.

Hydrodynamic stability without eigenvalues, with A. Trefethen, Reddy, and Driscoll, *Science* 1993

Computes pseudospectra for Couette and Poiseuille flow, explaining why eigenvalues do not determine stability; proposes attention to narrow basins of attraction.

Fourth-order time-stepping for stiff PDEs, with Kassam, *SISC* 2003

Shows that the ETDRK4 formula can give robust 4<sup>th</sup>-order convergence for PDEs including KdV, Kuramoto-Sivashinsky, Burgers, and Allen-Cahn.

Barycentric Lagrange interpolation, with Berrut, *SIREV* 2004

Survey of the barycentric formula: in principle old, but previously known and used by few. This article led to widespread recognition of barycentric formulas.

Is Gauss quadrature better than Clenshaw-Curtis?, *SIREV* 2008

Proves that C-C quadrature converges at the same rate as Gauss for non-analytic functions, and even in a practical sense for many analytic ones.

Numerical analysis, in *Princeton Companion to Mathematics* 2008

Survey of history and current state of the field, including a table of 29 major numerical algorithms and their originators.

Impossibility of fast stable approximation from equispaced samples, with Kuijlaars and Platte, *SIREV* 2011

Proves that no stable approximation scheme based on equispaced data, linear or nonlinear, can be geometrically convergent.

The exponentially convergent trapezoidal rule, with Weideman, *SIREV* 2014

Comprehensive review of the exponentially convergent trapezoidal rule and its use in scientific computing.

Mathematics of the Faraday cage, *SIREV* 2015

Faraday shielding is widely employed, but this is the first mathematical analysis, showing the effect is much weaker than thought by Feynman and others.

Multivariate polynomial approximation in the hypercube, *Proc. AMS* 2017

Proves that "Euclidean degree," rather than total or maximal degree, controls accuracy of multivariate polynomial approximation in the hypercube.

The AAA algorithm for rational approximation, with Nakatsukasa and Sète, *SISC* 2018

The first effective "black box" algorithm for rational approximation, opening up many new applications.

Solving Laplace problems with corner singularities via rational functions, with Gopal, *SINUM* 2019

Introduction of "lightning solvers" for Laplace and Helmholtz problems, with theorems establishing root-exponential convergence.

Smooth random functions, random ODEs, and Gaussian processes, with Filip and Javeed, *SIREV* 2019

Shows how technicalities of stochastic analysis can be circumvented by working with random Fourier series rather than Wiener processes: Chebfun `randnfun`.

Numerical conformal mapping with rational functions, *Comp Meth Func Th* 2020

Algorithms based on rational functions, including AAA approximation, are transforming the field of numerical conformal mapping.

Vandermonde with Arnoldi, with Brubeck and Nakatsukasa, *SIREV* 2021

Shows that for a wide variety of problems in data-fitting and solution of PDEs, Stieltjes orthogonalization eliminates the usual stability barrier.

Exactness of quadrature formulas, *SIREV* 2022

Proves that Gauss-Hermite quadrature is far from optimal, wasting most of its nodes and weights.

### SOFTWARE

Chebfun, [www.chebfun.org](http://www.chebfun.org) and [github.com/chebfun/chebfun](https://github.com/chebfun/chebfun)

Continuous overload of MATLAB (vectors  $\rightarrow$  functions, matrices  $\rightarrow$  operators and differential eqs.) with thousands of users around the world.