

# Moysey Brio

University of Arizona  
Department of Mathematics  
Tucson, AZ 85721

Office: (520) 621-4582  
Fax: (520) 621-8322  
Email: brio@math.arizona.edu, brio@acunum.com

## Professional Preparation

Latvian State University, Riga, Latvia, Diploma in Mathematics, 1977.

University of California, Los Angeles, Mathematics, M. A., 1981.

University of California, Los Angeles, Applied Mathematics, Ph.D., 1984.

University of California, Los Angeles, Plasma Physics, 1984-1985.

Rice University, Houston, Space Physics, 1985-1986.

Courant Institute of Mathematical Sciences, NYU, Applied Mathematics, 1986-1987.

## Appointments

*2010-present*: Co-founder, Acunum Algorithms and Simulations LLC, Tucson.

*1993-present*: Associate Professor, Department of Mathematics, University of Arizona, Tucson.

*1994-1995*: Visiting Research Mathematician, Inst. Pure and Appl. Math., Rio de Janeiro.

*1987-1993*: Assistant Professor, Department of Mathematics, University of Arizona, Tucson.

*1986-1987*: Associate Research Mathematician, Courant Institute of Mathematical Sciences, NY.

*1985-1986*: Associate Research Scientist, Dept. Space Phys. and Astr., Rice Univ., Houston.

*1984-1985*: Assistant Research Physicist, Department of Physics, UCLA.

*1979-1984*: Research and Teaching Assistant, Department of Mathematics, UCLA.

## Selected Publications

P. Kano and M. Brio, "Application of Post's formula to optical pulse propagation in dispersive media", Computers and Mathematics Applications, 59 (2010), pp. 629-50.

J. Liu, M. Brio, Y. Zeng, A. R. Zakharian, W. Hoyer and J. V. Moloney, "Generalization of the FDTD Algorithm for Simulations of Hydrodynamic Nonlinear Drude Model", J. Comput. Phys., 229 (2010), pp. 5921-32.

J. Liu, M. Brio and J. V. Moloney, "Overlapping Yee FDTD method on nonorthogonal grids", J. Sci. Comput., 39 (2009), pp.129-49.

P. Kano, D. Barker and M. Brio, "Accurate calculation of the density of states of a photonic crystal with an analytic dispersion relation", J. Phys. D: Applied Physics, 41 (2008) pp. 185106-27.

P. Kano, M. Brio, J.M. Moloney, "Numerical analysis of ab initio computation of the effects of ionization on the nonlinear susceptibility coefficients of the hydrogen atom", Comm. Math. Sci., 4 (2006), pp.53-80.

P. Kano, M. Brio, J.M. Moloney, “Applications of Weeks method for numerical conversion of the Laplace transform to the matrix exponential”, *Comm. Math. Sci.*, 3 (2005), pp. 335-372.

M Brio, A. Zakharian and G.M. Webb, *Numerical Partial Differential Equations for Scientists and Engineers*, to appear, Academic Press, New York, 2010.

M. Brio and C.C. Wu, “An Upwind Differencing Scheme for the Equations of Ideal Magnetohydrodynamics,” *J. Comput. Phys.*, 75 (1988) pp. 400–422.

A. Zakharian, M. Brio, J. K. Hunter and G. M. Webb, “The von Neumann paradox in weak shock reflection,” *J. Fluid Mech.*, 422 (2000), pp. 193–205.

A. Zakharian, M. Brio and G. M. Webb, “Two dimensional Riemann solver for Euler equations of gas dynamics,” *J. Comp. Phys.*, 167 (2001), pp. 177–195.

## Synergistic Activities

Prof. Moysey Brio of the Mathematics Department, University of Arizona has more than twenty years of research teaching experience in the area of computational methods with applications to optics and plasma physics. He recently published a book for graduate course on numerical partial differential equations, “Numerical Time-Dependent partial Differential equations for Scientists and Engineers”, Academic Press, 2010. He is an undergraduate research coordinator and mentor for the Mathematics Department, actively involved in promoting undergraduate research. He was a director of an Arizona NSF VIGRE Computational Photonics Summer 2009 research experience for undergraduates.

We have developed graduate Computational Photonics course, and NSF sponsored freely available software for numerical inversion of the Laplace transform, and a routine for the computation of Bell polynomials. Numerical methods that we have developed in the context of propagation of short pulses in arbitrary dispersive media have a widespread application beyond modeling of biological tissue.

## Collaborators And Other Affiliations

### *Collaborators:*

D. Barker (Raytheon), C. Dineen (Univ. Arizona), K. M. Gundu (Corning), W. Hoyer (Univ. Marburg, Germany), P. Kano (Acunum), M. Kolesik (Univ. Arizona), J.-J. Liu (Univ. Arizona), H. Li (Creative Optics Inc., Washington DC), J.M. Moloney (Univ. Arizona), N. Peyghambarian (Univ. Arizona), A. Schulzgen (Univ. Arizona), A.R. Zakharian (Corning), Y. Zeng (Univ. Arizona).

### *Graduate and Postdoctoral Advisors:*

S.J. Osher (UCLA), C.C. Wu (UCLA)

### *Thesis Advisor and Postgraduate-Scholar Sponsor:*

P. Kano (Acunum LLCs), K. M. Gundu (Corning Corp.), T. Rozewiecki (Stanford), M. Abrahmson (Raytheon Corp.), A. Bhullar (Univ. of Arizona), J. Gilbert (Univ. Arizona)

Total number of graduate students advised and postdoctoral scholars: 6