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Education

- *Ph.D., Applied Mathematics, University of Colorado at Boulder, 2003*
Thesis: Forward and Inverse Wave Propagation Using Bandlimited Functions and a Fast Reconstruction Algorithm for Electron Microscopy.
Supervisor: Dr. Gregory Beylkin
- *M.S., Mathematics, minor in Physics, Uppsala University, Sweden, 1998*
Thesis: Representation of Dynamical Systems Associated With Commutation Relations
Supervisor: Dr. Sergei Silvestrov (Royal Institute of Technology, Stockholm, Sweden)

Work history

- *Research Associate, University of Colorado at Boulder, August 2003-September 2005 (full-time), October 2005-present (part-time)*
I currently hold two post doc positions, one at the Boulder Laboratory for 3-D Electron Microscopy of Cells under the supervision of Dr. J. Richard McIntosh, where I develop an automated image segmentation program for 3-D visualizations of electron microscope tomograms. Secondly, at the Department of Applied Mathematics under the supervision of Dr. Gregory Beylkin, I develop fast algorithms for 3-D wave propagation, signal processing and inverse problems in electromagnetism and acoustics.
- *Owner of Computational Solutions, LLC, May 2004-present*
Computational Solutions (<http://www.computationalsolutions.com>) was founded in 2004 to meet the increasing demand for highly efficient scientific computing software. The company's expertise includes:
 - Signal and Image Processing/Analysis
 - Wave Propagation
 - Tomography

– GPGPU (General-Purpose computations on Graphical Processing Units)

The company develops cutting-edge algorithms and software in a wide variety of languages including Fortran 77/90/95, C/C++, Python, Matlab, and Mathematica.

Publications

- *Methods for Image Segmentation in Cellular Tomograms*
K.Sandberg, In "Methods in Cell Biology, Vol. 79 Cellular Electron Microscopy" (J.R. McIntosh, ed.), 767-798, Elsevier, 2007.
- *Segmentation of Thin Structures in Electron Micrographs Using Orientation Fields*
K. Sandberg and M. Brega, Journal of Structural Biology, 157:403-415, 2007.
- *Acoustic and Elastic Modeling Using Bases For Bandlimited Functions*
N. Coult, K. Sandberg, G. Beylkin, and A. Vassiliou, In "SEG Expanded Abstracts 2006 Technical Program", Society of Exploration Geophysicists, 2006.
- *Wave Propagation Using Bases for Bandlimited Functions*
G. Beylkin and K. Sandberg, Wave Motion, 41(3):263-291, 2005.
(<http://www.sciencedirect.com/science/journal/01652125>)
- *A Fast Reconstruction Algorithm for Electron Microscope Tomography*
K. Sandberg, D.N. Mastrorarde, and G. Beylkin, Journal of Structural Biology, 144:61-72, 2003. This algorithm is part of the IMOD software
(<http://bio3d.colorado.edu/imod>).

Teaching

All courses taught at the Dept. of Applied Mathematics, University of Colorado at Boulder, Fall 1998-Fall 2001 unless otherwise noted.

- Matrix Methods (teaching assistant)
- An Introduction to Wavelets for Computer Graphics (teaching assistant)
- Calculus 3 Computer Lab (instructor)
- Differential Equations Computer Lab (instructor)

- Differential Equations (teaching assistant)
- Calculus 3 (teaching assistant)
- Mathematics and physics (tutor), Dept. of Housing, University of Colorado at Boulder, Fall 1996-Spring 1997.

Serving on the committee for the preliminary examinations of graduate students in numerical analysis August 2004-present.

Selected presentations

- *Wave Propagation Using Bases for Bandlimited Functions*
Talk at the American Mathematical Society sectional meeting #995 in Athens, Ohio, March 26 2004.
- *A New Approach to Wave Propagation*
Talk at KLA-Tencor, San Jose, California, July 2003.
- *Visualizing Calculus*
Workshop at Extend Your Limits Summer Institute for school teachers, Dept. of Applied Mathematics, University of Colorado at Boulder, July 2000, July 2001, and July 2002.
- *Representations of Dynamical Systems via Commutation Relations*
Dept. of Mathematics at Lund Institute of Technology, Lund University, Sweden, December 2001.
- *Image Processing in Research and Education*
Talk for the NSF review panel for the Vertical Integration of Research and Education (VIGRE) program, Dept. of Applied Mathematics, University of Colorado at Boulder, November 2001.
- *Mathematical Methods in Biological Imaging*
Talk on tomography and image processing at the advisory committee meeting for the Boulder Laboratory for 3-D Electron Microscopy of Cells, University of Colorado at Boulder, July 2000 and November 2001.
- *Merging Dual Tilt Series Using Wavelets*
Talk on tomography at the Boulder Laboratory for 3-D Electron Microscopy of Cells, University of Colorado at Boulder, May 2001.

Supervising

All supervising at the Dept. of Applied Mathematics, University of Colorado at Boulder.

- Supervised the Master's thesis of Moorea Brega, Fall 2004-Spring 2005. The title of the thesis was "Orientation Fields and their Application to Image Processing".
- Supervision of undergraduate students, 2000-2002 Supervised eight undergraduate students working with image processing as part of the Summer Multicultural Access to Research Training (SMART) program.

Honors and awards

- *Certificate of excellence for outstanding teaching*
Presented by the Dept. of Applied Mathematics, University of Colorado at Boulder, Spring 2000.
- *Tutor of the year during 1996/1997 academic year*
Award presented by the Dept. of Housing, the committee of Learning, and Academic Support Services at University of Colorado at Boulder, Spring 2000.
- *The Priscilla and Bart Bok Awards in Astronomy*
First place award for an astronomy research project at the 1992 International Science and Engineering Fair presented by the American Astronomical Society and the Astronomical Society of the Pacific. The title of the project was Studies of Active Galaxy Jets and Astrophysical Applications.
- *ISEF Grand Award*
Third place award in earth and space sciences at the 1992 International Science and Engineering Fair.

Other experience

- *Programming skills*
Include C, C++, Fortran 77/90/95, Mathematica, Matlab and Python. Experience in developing graphical user interfaces in Matlab and Qt. Experience in programming of Graphical Processing Units using OpenGL and Cg.

- *Grant writing*
Contributed sections on image processing for grants for the Boulder Laboratory of 3-D Electron Microscopy of Cells.
- *Signal processing skills*
Solid knowledge of Fourier and wavelet methods, including methods for unequally spaced data.
- *Graduate course work*
Graduate course work at University of Colorado at Boulder includes courses in applied and pure mathematics, signal and image processing, astrophysics and cosmology.
- *Physics course work*
My education includes approximately 20 physics courses on both undergraduate and graduate level.
- *Web page development*
Various tutorials for image processing and scientific computation.
(<http://amath.colorado.edu/faculty/sandberg> and <http://www.computationalsolutions.com>).
- *Promoting the School of Engineering at CU Boulder by articles on analytical tools for biological imaging.*
Articles published in CU-Engineering, Number 19, 2002, and CU-Engineering Ahead of the curve, Special Edition 4, 2002 (<http://curve.colorado.edu/newsletter/Imaging>).
- *Presentation of applied mathematics at the Engineering Open House University of Colorado at Boulder*
October 2000 and November 2002.
- *Presentation of applied mathematics at the Women in Engineering Career Days University of Colorado at Boulder*
March 2000, October 2000, and March 2001.
- *Board member and accountant for the Swedish Federation of Young Scientists*
As the accountant I managed a budget with a turnover of approximately half a million USD, May 1993-May 1996.

References

- Dr. Gregory Beylkin
Dept. of Applied Mathematics
University of Colorado at Boulder
Phone 303-492-6935
- Dr. James Curry
Dept. of Applied Mathematics
University of Colorado at Boulder
Phone 303-492-6901
- Dr. J. Richard McIntosh
The Boulder Laboratory for 3-D Electron Microscopy of Cells
University of Colorado at Boulder
Phone 303-492-8533

Additional references available upon request.