

## MATTHIAS K. GOBBERT

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### Current Research Interests

Numerical methods for stationary and time-dependent partial differential equations  
Large-scale scientific computing and parallel programming for cluster computing  
Simulation techniques for the linear Boltzmann equation in gas dynamics  
Multiscale modeling in microelectronics manufacturing and other applications  
Numerical simulation of chemically reactive flows in life science and other applications

### Education

Ph.D.	1996	Arizona State University, Tempe, AZ, Mathematics Advisor Dr. Christian Ringhofer, "A Homogenization Technique for the Development of Mesoscopic Scale Models for Chemical Vapor Deposition"
M.N.S.	1993	Arizona State University, Tempe, AZ, Mathematics with minor in Control Engineering
Vordiplom (B.Sc.)	1990	Technische Hochschule Darmstadt, Darmstadt (Germany), Mathematics with minor in Mechanics

### Experience in Higher Education

2003–present	Associate Professor, Department of Mathematics and Statistics, University of Maryland, Baltimore County
1997–2003	Assistant Professor, Department of Mathematics and Statistics, University of Maryland, Baltimore County
1996–1997	Postdoctoral Associate, Institute for Mathematics and its Applications, University of Minnesota

### Other Appointments

2009–present	Affiliate Associate Professor, Department of Computer Science and Electrical Engineering, University of Maryland, Baltimore County
2005–present	Associate Director, Center for Interdisciplinary Research and Consulting, Department of Mathematics and Statistics, University of Maryland, Baltimore County
Fall 2004	University of Minnesota, general member (sabbatical leave), Institute for Mathematics and its Applications
Summer 2002	University of Vienna (Austria), research visitor (two weeks), Institute of Mathematics
Summer 2001	University of Vienna (Austria), research visitor (five weeks), International Erwin Schrödinger Institute for Theoretical Physics
Summer 2000	University of Minnesota, long-term visitor (one month), Institute for Mathematics and its Applications
Summer 1996	Motorola, Research Scientist (summer intern), Semiconductor Products Sector

## Research Support

### *External Support:*

- 2009–2011 \$194,283, National Science Foundation, DMS–0851749  
“REU Site: Interdisciplinary Program in High Performance Computing,”  
programs in 2010 and 2011, co-PI with PI Nagaraj K. Neerchal, [www.umbc.edu/hpcreu](http://www.umbc.edu/hpcreu)
- 2008–2011 \$285,714 (including \$85,714 cost-sharing), National Science Foundation, CNS–0821258,  
“MRI: Acquisition of an Interdisciplinary Facility for High-Performance Computing,”  
lead-PI for institutional proposal with 23 investigators from 10 departments and research centers
- 2008–2011 \$40,000, National Science Foundation, DMS–0821311, “SCREMS: Parallel Computing for  
Interdisciplinary Research in Mathematics and Statistics,” lead-PI for departmental proposal  
with Andrei Draganescu, Nagaraj K. Neerchal, and Florian Potra
- 2006 \$6,000, National Science Foundation, DMS–0620297, with Kathleen A. Hoffman (lead),  
“Conference: Advances in Control of Partial Differential Equations”
- 2002–2005 \$150,000 (including \$75,000 cost-sharing), National Science Foundation, DMS–0215373,  
“Scientific Computing Research Environments for the Mathematical Sciences (SCREMS),”  
with Jonathan Bell, Madhu Nayakkankuppam, and Florian Potra.  
See [www.math.umbc.edu/~gobbert/kali](http://www.math.umbc.edu/~gobbert/kali) for more information.
- 1999 \$1,000, SIAM travel grant to ICIAM 99 in Edinburgh, Scotland
- 1998–2001 \$68,000, National Science Foundation, DMS–9805547,  
“Computational Methods for the Simulation of Chemical Vapor Deposition on Rough Surfaces”

### *Internal Support:*

- 2008–2009 \$5,000, UMBC Alex. Brown Center for Entrepreneurship, “Development of Off-Campus  
Marketing for the Center for Interdisciplinary Research and Consulting,” with Nagaraj K.  
Neerchal, Faculty Innovation Grant, sub-grant of Kauffman Foundation grant to UMBC
- 2007 \$1,000, Alternate Delivery Program (ADP), Office of Summer, Winter, and Special Programs
- 2006 \$2,000, Alternate Delivery Program (ADP), Office of Summer, Winter, and Special Programs
- 2004–2005 \$13,545, UMBC DRIF Research Assistantship Support  
“Adaptive Mesh Refinement for Transient Problems with Non-Standard  
Refinement Criteria,” with Thomas I. Seidman
- 2004 \$2,500, UMBC DRIF Summer Faculty Fellowship
- 2002–2003 \$500, UMBC Office of the Provost, education stipend for faculty teaching a  
First-Year Seminar in AY 2002–2003
- 2002–2003 \$7,000, UMBC DRIF Research Assistantship Support “Parallel Multi Scale  
Simulation of Atomic Layer Deposition” (for Samuel G. Webster)
- 2001–2002 \$12,000, UMBC DRIF Research Assistantship Support “Numerical Modeling of  
Calcium Waves in Heart Cells,” with Thomas I. Seidman, for Alexander L. Hanhart
- 2001 \$4,000, UMBC DRIF Summer Faculty Fellowship
- 1998 \$5,000, UMBC DRIF Summer Faculty Fellowship

### *Student Awards:*

- 2008–2009 Michael J. Reid, B.S. December 2008, Undergraduate Research Award  
“Numerical Simulation of Silicon Wafer Etching Using Parallel Programming,” \$1,500
- 2003–2004 Tomasz J. Macura, B.S. May 2004, Undergraduate Research Award  
“Detecting Spheres in Computed Tomography using Parallel Computers,” \$1,500
- 2003–2004 Kevin P. Allen, B.S. May 2003, Undergraduate Research Award “A Matrix-Free  
Implementation of the Conjugate Gradient Method for Cluster Computing,” \$1,500
- 2001–2002 Steven C. Foster, B.S. August 2003, Undergraduate Research Award  
“Numerical Simulation of Atomic Layer Epitaxy using MPI,” \$1,500

## Ph.D. Students

David W. Trott, on-going (Fall 2009–present), *committee chair and research mentor*

Kyle Stern, on-going (Spring 2009–present), *committee chair and research mentor*

Zhibin Sun, Ph.D. August 2007, “Geomagnetic Data Assimilation Using Ensemble Methods to Estimate Forecast Error Covariance,” *committee co-chair* with Andrew Tangborn (NASA/JCET)

Samuel G. Webster, Ph.D. May 2004, “Stability and Convergence of a Spectral Galerkin Method for the Linear Boltzmann Equation,” *committee chair and research mentor* for publications [10, 19, 37, 39, 68]  
*Committee member* for Zhengtao Cui, on-going (Civil and Environmental Engineering);

Dan Wang, Ph.D. August 2008; Hai Zhang, Ph.D. (Physics) May 2006; Valeriy R. Korostyshevskiy, Ph.D. May 2005; Alexandra L. Chaillou, Ph.D. August 2003; Padmanabhan Seshaiyer, Ph.D. May 1998

## Master’s Students (Master’s Theses)

Neeraj Sharma, on-going (Spring 2009–present), *committee chair and research mentor* for publication [54]

Alexander L. Hanhart, M.S. May 2002, “Coarse-Grained Parallel Solution of a Three-Dimensional Model for Calcium Concentration in Human Heart Cells,” *committee chair and research mentor* for [15, 69]

*Committee member* for Marlene Roush, M.S. May 2007; Yevgen Tymofyeyev, M.S. December 2002;  
Jennifer Deering, M.S. May 2002

## Undergraduate Students (Senior Theses for graduation with departmental honors)

Peter Hinkey, *co-mentor* with Erricos C. Pavlis (NASA/JCET) for Practicum (Summer 2008) and senior thesis (Fall 2008–Spring 2009) “Improvement of numerically integrated satellite orbits by inclusion of temporal variations in Earth’s gravitational field from GRACE”

Michael J. Reid, B.S. December 2008, *research mentor* for [58, 75] and the senior thesis “Comparison of Parallel Performance between MVAPICH2 and OpenMPI Applied to a Hyperbolic Test Problem”

Steven C. Foster, B.S. August 2003, *research mentor* for [70, 77] and the senior thesis “Application of the Boltzmann Equation to the Modeling of Atomic Layer Deposition with Performance Studies”

Kevin P. Allen, B.S. May 2003, *research mentor* for the publications [35, 67, 76] and the senior thesis “A Parallel Matrix-Free Implementation of the Conjugate Gradient Method for the Poisson Equation”

## Additional Work with Students:

*Ph.D. students:* Andrew M. Raim, *research mentor* for [2, 47] and for his RA for HPCF in Fall 2009

Aaron Churchill, *research mentor* for [1, 28, 48, 52] and for his RA in CIRC from Spring to Summer 2009

Noemi Petra, *research mentor* for publications [29, 51]

Guan Wang, *research mentor* for [1, 28, 50, 52] and for his RA in CIRC from Summer 2008 to Fall 2008

Michael Muscedere, *research mentor* for publications [4, 5, 49, 59, 61]

Yushu Yang, *research mentor* for [61] and for her RA in CIRC in Summer 2008

Shiming Yang, *research mentor* for [6, 30, 57, 64] and for his RA in CIRC in Spring 2008

Alen Alexanderian, *research mentor* for [63] and for his RA in CIRC from Summer 2006 to Fall 2007

*Master’s students:* Amanda Gassman M.S. (non-thesis) May 2009, *research mentor* for [53]

Aaptha Murthy, M.S. (non-thesis) May 2007, *mentor* for her RA in CIRC in Spring 2006

Mark L. Breitenbach, M.S. (non-thesis) December 2004, *research mentor* for publication [32]

*Undergraduate students:* Zana Coulibaly, B.S. May 2009, *research mentor* for [49]

*Service to the community:* Greg E. McGlynn, Catonsville High School, graduated Spring 2007, *research mentor* for project on parallel programming during Winter 2006

Rachel E. Bauer, Villa Julie College, B.A. May 2006, *research mentor* for senior project during Fall 2005

## Service to the Department

Co-created the NSF-funded REU Site Interdisciplinary Program in High Performance Computing with Nagaraj K. Neerchal, eight-week programs in Summers 2010 and 2011 for eight students include a 3-credit transferable undergraduate course on parallel computing and team projects on projects from interdisciplinary applications, [www.umbc.edu/hpcreu](http://www.umbc.edu/hpcreu)

Initiated the Center for Interdisciplinary Research and Consulting (CIRC, [www.umbc.edu/circ](http://www.umbc.edu/circ)) with Nagaraj K. Neerchal in Fall 2005, originally as Scientific Computing and Statistical Data Analysis Laboratory (SCSDAL) in Fall 2003

Chaired the organizing committee for the conference “Advances in Control of Partial Differential Equations” in honor of colleague Thomas I. Seidman, October 28–29, 2006, [www.umbc.edu/seidman](http://www.umbc.edu/seidman), with Stuart S. Antman (University of Maryland, College Park) and Kathleen A. Hoffman (UMBC)

Editor of the semi-annual departmental newsletter *News@Math&Stat*, 2006–present

Member of the departmental committee for the Academic Program Review, 2006–2007

Departmental Advisory Committee, member 2007–2008

Departmental Graduate Program Committee, member 2005–2006

Departmental Computer Committee, member 1999–2004, 2005–2006

Organizer of the Differential Equations Seminar, 2001–2003

Departmental Undergraduate Program Committee, member 1998–2001, 2008–present

Departmental Hiring Committee, member 1999–2000

Departmental Administration Committee, member 1998–1999

Created and taught new courses (complete list at [www.math.umbc.edu/~gobbert/past.html](http://www.math.umbc.edu/~gobbert/past.html)):

- FYS 101A First-Year Seminar: Technological Disasters and Their Causes (Spring 2003),
- Math 426 Introduction to Mathematical Software Packages: Matlab (8 times),
- Math 627 Introduction to Parallel Computing  
(Fall 2001 as Math 700, Fall 2002, Spring 2004, Fall 2006, Spring 2008, Spring 2009),
- Math 490/710 Introduction to Asymptotic Analysis (Fall 1999)
- Math 750 Introduction to Interdisciplinary Consulting (Fall 2003 and Spring 2004 as regular class)

Other significant teaching (complete list at [www.math.umbc.edu/~gobbert/past.html](http://www.math.umbc.edu/~gobbert/past.html)):

- Math 221 Introduction to Linear Algebra redesigned in hybrid format (Summer 2006, Summer 2007)
- Math 621 Numerical Methods for Partial Differential Equations  
(Spring 2001, Fall 2003, Spring 2006, Fall 2007),
- Independent Studies on various topics (Math 699 10 times, Math 750 4 times)
- Math 497 Senior Thesis for graduating with departmental honors (4 times)

Posed comprehensive exams and made recommendations to the Graduate Program Director:

- Math 620 Numerical Analysis (16 times), Math 630 Matrix Analysis (10 times)

Member of the departmental Core Advising Team for undergraduate majors and minors, Fall 2007–present

Served as academic advisor for several non-thesis M.S. students:

- Mark L. Breitenbach (December 2004), Samuel G. Webster (May 2001), Jiaqiao Hu (May 2001),
- Michael Muscedere (May 2001), and Kevin Puckace (May 2000)

## Service to the University

Initiated the UMBC High Performance Computing Facility (HPCF, [www.umbc.edu/hpcf](http://www.umbc.edu/hpcf)) in 2008, a community-based, shared, interdisciplinary resource for scientific and parallel computing at UMBC, founded with involvement by over 20 faculty from more than ten departments and research centers across all colleges of UMBC and partially supported National Science Foundation grants

Faculty Senate, Senator 2006–present, Executive committee member 2006–2007, 2008–present

Faculty Senate Computer Policy Committee, member 1998–2004, 2005–2009, chair 2001–2004, 2005–2007

Provost Information Technology Steering Committee, member 2001–2004, 2005–present

Served on Provost Office Search Committee, Spring 2005

Academic advisor during Summer and Winter orientation for incoming freshmen and transfer students (Summer 2003, Winter 2004, Summer 2004, Summer 2005, Winter 2008, Summer 2008, Winter 2009)

Participated in Hybrid Course Design Workshop in Spring 2006 for the redesign of Math 221 in Summer 2006

Participated in reading group on Learner-Centered Teaching and several workshops on teaching techniques offered by the Faculty Development Center at UMBC

## Service to the Profession

Hosted the Finite Element Circus in Spring 2006 at UMBC, [www.math.umbc.edu/~gobbert/fecircus](http://www.math.umbc.edu/~gobbert/fecircus), (semi-annual regional conference series with 30+ years' tradition)

Organized minisymposia: (i) SIAM Annual Meeting 2004, July 12–16, 2004, Portland, OR, “Parallel Computing on Beowulf Clusters: Performance and Applications”

(ii) SIAM Annual Meeting 2006, July 10–14, 2006, Boston, MA, “Parallel Computing for the Numerical Solution of Partial Differential Equations on Extremely Fine Meshes”

Member of the review panel for the program review of the Department of Mathematics at Arizona State University, April 2001

Evaluation of the research outputs on behalf of the National Research Foundation of South Africa, 2007

Review of research proposal to the Technology Foundation STW, The Netherlands, 2007

Review of research proposal to the Austrian Science Fund (FWF), Austria, 2005 and 2006

Review of National Science Foundation proposals, 2009

Referee for various journals (Journal of The Electrochemical Society, SIAM Journal on Applied Mathematics, SIAM Journal on Scientific Computing, Applied Mathematics Letters, Computers and Mathematics with Applications, Mathematical and Computer Modelling, IEEE/ACM Transactions on Computational Biology and Bioinformatics, IEEE Transactions on Knowledge and Data Engineering, Computing in Science and Engineering, Applied Numerical Mathematics, Journal of Computational Physics, Numerical Methods for Partial Differential Equations, Journal of Structural Biology, International Journal of Parallel, Emergent and Distributed Systems, IEEE Transactions on Parallel and Distributed Systems) and conferences (ECS Reno 1995, IWCE ASU 1995, AMC Boston 1996, ECS Washington 2001, ICCS 2004, EuroCVD-16 2007)

Reviewer of several book proposals for the purpose of publication decisions

Reviewer for *Mathematical Reviews*, 2001–2004

Member of the Society for Industrial and Applied Mathematics (SIAM), the American Mathematical Society (AMS), the Mathematical Association of America (MAA), the Electrochemical Society (ECS), and the Phi Kappa Phi National Honor Society

## PUBLICATIONS

Links to reprints/preprints of many of the following publications are available at my homepage at <http://www.math.umbc.edu/~gobbert>. If any of these links do not work for you, do not hesitate to contact me. In the following list, student co-authors are indicated by superscripts, with  $^{UG}$  for an undergraduate and  $^G$  for a graduate student.

### Articles in Peer-Reviewed Journals

- [1] Aaron Churchill $^G$ , Guan Wang $^G$ , Matthias K. Gobbert, and Thomas I. Seidman. Efficient Simulation of a Reaction-Diffusion System with a Fast Reaction in the Asymptotic Limit. In preparation.
- [2] Andrew M. Raim $^G$  and Matthias K. Gobbert. Maximum Likelihood Estimation of Finite Mixture of Multinomials as Prototype Problem for Large-Scale Statistical Computing. In preparation.
- [3] Robin Blasberg and Matthias K. Gobbert. Clustering Large Data Sets with Parallel Affinity Propagation. Submitted.
- [4] Matthias K. Gobbert, Michael Muscedere $^G$ , Thomas I. Seidman, and Raymond J. Spiteri. A Non-Negativity Preserving Newton Method for High-Order Implicit Time Stepping. Submitted.
- [5] Michael Muscedere $^G$  and Matthias K. Gobbert. Parameter Study of a Reaction-Diffusion System Near the Reactant Coefficient Asymptotic Limit. *Dynamics of Continuous, Discrete and Impulsive Systems Series A Supplement*, pp. 29–36, 2009.
- [6] Shiming Yang $^G$  and Matthias K. Gobbert. The Optimal Relaxation Parameter for the SOR Method Applied to the Poisson Equation in Any Space Dimensions. *Applied Mathematics Letters*, vol. 22, pp. 325–331, 2009.
- [7] Matthias K. Gobbert. Long-Time Simulations on High Resolution Meshes to Model Calcium Waves in a Heart Cell. *SIAM Journal on Scientific Computing*, vol. 30, no. 6, pp. 2922–2947, 2008.
- [8] Matthias K. Gobbert and Timothy S. Cale. Modeling Multiscale Effects on Transients During Chemical Vapor Deposition. *Surface and Coatings Technology*, vol. 201, no. 22–23, pp. 8830–8837, 2007.
- [9] Timothy S. Cale, Max O. Bloomfield $^G$ , and Matthias K. Gobbert. Two Deterministic Approaches to Topography Evolution. *Surface and Coatings Technology*, vol. 201, no. 22–23, pp. 8873–8877, 2007.
- [10] Matthias K. Gobbert, Samuel G. Webster $^G$ , and Timothy S. Cale. A Galerkin Method for the Simulation of the Transient 2-D/2-D and 3-D/3-D Linear Boltzmann Equation. *Journal of Scientific Computing*, vol. 30, no. 2, pp. 237–273, 2007.
- [11] Matthias K. Gobbert and Timothy S. Cale. Effect of the Knudsen Number on Transient Times During Chemical Vapor Deposition. *International Journal for Multiscale Computational Engineering*, vol. 4, no. 3, pp. 319–335, 2006.

- [12] Matthias K. Gobbert and Timothy S. Cale. A Kinetic Transport and Reaction Model and Simulator for Rarefied Gas Flow in the Transition Regime. *Journal of Computational Physics*, vol. 213, pp. 591–612, 2006.
- [13] Ana Maria Soane<sup>G</sup>, Matthias K. Gobbert, and Thomas I. Seidman. Numerical Exploration of a System of Reaction-Diffusion Equations with Internal and Transient Layers. *Nonlinear Analysis: Real World Applications*, vol. 6, no. 5, pp. 914–934, 2005.
- [14] Matthias K. Gobbert. Configuration and Performance of a Beowulf Cluster for Large-Scale Scientific Simulations. *Computing in Science and Engineering*, vol. 7, no. 2, pp. 14–26, March/April 2005.
- [15] Alexander L. Hanhart<sup>G</sup>, Matthias K. Gobbert, and Leighton T. Izu. A Memory-Efficient Finite Element Method for Systems of Reaction-Diffusion Equations with Non-Smooth Forcing. *Journal of Computational and Applied Mathematics*, vol. 169, no. 2, pp. 431–458, 2004.
- [16] Matthias K. Gobbert and Christian Ringhofer. A Homogenization Technique for the Boltzmann Equation for Low Pressure Chemical Vapor Deposition. *SIAM Journal on Applied Mathematics*, vol. 64, no. 1, pp. 196–215, 2003.
- [17] Matthias K. Gobbert, Vinay Prasad, and Timothy S. Cale. Predictive Modeling of Atomic Layer Deposition on the Feature Scale. *Thin Solid Films*, vol. 410, pp. 129–141, 2002.
- [18] Matthias K. Gobbert, Vinay Prasad, and Timothy S. Cale. Modeling and Simulation of Atomic Layer Deposition at the Feature Scale. *Journal of Vacuum Science & Technology B*, vol. 20, no. 3, pp. 1031–1043, 2002.
- [19] Matthias K. Gobbert, Samuel G. Webster<sup>G</sup>, and Timothy S. Cale. Transient Adsorption and Desorption in Micrometer Scale Features. *Journal of The Electrochemical Society*, vol. 149, no. 8, pp. G461–G473, 2002.
- [20] Timothy S. Cale, Max O. Bloomfield<sup>G</sup>, David F. Richards, Kenneth E. Jansen, and Matthias K. Gobbert. Integrated Multiscale Process Simulation. *Computational Materials Science*, vol. 23, pp. 3–14, 2002.
- [21] Matthias K. Gobbert and Andreas Prohl. A Comparison of Classical and New Finite Element Methods for the Computation of Laminate Microstructure. *Applied Numerical Mathematics*, vol. 36, pp. 155–178, 2001.
- [22] Tushar P. Merchant, Matthias K. Gobbert, Timothy S. Cale, and Leonard J. Borucki. Multiple Scale Integrated Modeling of Deposition Processes. *Thin Solid Films*, vol. 365, no. 2, pp. 368–375, 2000.
- [23] Matthias K. Gobbert and Andreas Prohl. A Discontinuous Finite Element Method for Solving a Multiwell Problem. *SIAM Journal on Numerical Analysis*, vol. 37, no. 1, pp. 246–268, 1999.
- [24] Matthias K. Gobbert, Timothy S. Cale, and Christian A. Ringhofer. The Combination of Equipment Scale and Feature Scale Models for Chemical Vapor Deposition Via a Homogenization Technique. *VLSI Design*, vol. 6, nos. 1–4, pp. 399–403, 1998.
- [25] Matthias K. Gobbert and Christian A. Ringhofer. An Asymptotic Analysis for a Model of Chemical Vapor Deposition on a Microstructured Surface. *SIAM Journal on Applied Mathematics*, vol. 58, no. 3, pp. 737–752, 1998.

- [26] Matthias K. Gobbert, Tushar P. Merchant, Leonard J. Borucki, and Timothy S. Cale. A Multiscale Simulator for Low Pressure Chemical Vapor Deposition. *Journal of The Electrochemical Society*, vol. 144, no. 11, pp. 3945–3951, 1997.
- [27] Matthias K. Gobbert, Christian A. Ringhofer, and Timothy S. Cale. Mesoscopic Scale Modeling of Microloading During Low Pressure Chemical Vapor Deposition. *Journal of The Electrochemical Society*, vol. 143, no. 8, pp. 2624–2631, 1996.

### Articles in Refereed Proceedings

- [28] Matthias K. Gobbert, Aaron Churchill<sup>G</sup>, Guan Wang<sup>G</sup>, and Thomas I. Seidman. COMSOL Multiphysics for Efficient Solution of a Transient Reaction-Diffusion System with Fast Reaction. In: Yeswanth Rao, editor, *Proceedings of the COMSOL Conference 2009*, Boston, MA, 2009.
- [29] Noemi Petra<sup>G</sup> and Matthias K. Gobbert. Parallel Performance Studies for COMSOL Multiphysics Using Scripting and Batch Processing. In: Yeswanth Rao, editor, *Proceedings of the COMSOL Conference 2009*, Boston, MA, 2009.
- [30] Matthias K. Gobbert and Shiming Yang<sup>G</sup>. Numerical Demonstration of Finite Element Convergence for Lagrange Elements in COMSOL Multiphysics. In: Vineet Dravid, editor, *Proceedings of the COMSOL Conference 2008*, Boston, MA, 2008.
- [31] Matthias K. Gobbert. A Technique for the Quantitative Assessment of the Solution Quality on Particular Finite Elements in COMSOL Multiphysics. In: Vineet Dravid, editor, *Proceedings of the COMSOL Conference 2007*, Boston, MA, pp. 267–272, 2007.
- [32] Matthias K. Gobbert, Mark L. Breitenbach<sup>G</sup>, and Timothy S. Cale. Cluster Computing for Transient Simulations of the Linear Boltzmann Equation on Irregular Three-Dimensional Domains. In: Vaidy S. Sunderam, Geert Dick van Albada, Peter M. A. Sloot, and Jack J. Dongarra, editors, *Computational Science — ICCS 2005*, Lecture Notes in Computer Science, vol. 3516, pp. 41–48, Springer-Verlag, 2005.
- [33] Timothy S. Cale, Max O. Bloomfield<sup>G</sup>, David F. Richards, Sofiane Soukane<sup>G</sup>, Kenneth E. Jansen, John A. Tichy, and Matthias K. Gobbert. Integrated Multiscale Process Simulation in Microelectronics. In: Naoufel Ben Abdallah, Anton Arnold, Pierre Degond, Irene M. Gamba, Robert T. Glassey, C. David Levermore, and Christian Ringhofer, editors, *Dispersive Transport Equations and Multiscale Models*, The IMA Volumes in Mathematics and its Applications, vol. 136, pp. 51–76, Springer-Verlag, 2004.
- [34] Matthias K. Gobbert and Christian Ringhofer. Mesoscopic Scale Modeling for Chemical Vapor Deposition in Semiconductor Manufacturing. In: Naoufel Ben Abdallah, Anton Arnold, Pierre Degond, Irene M. Gamba, Robert T. Glassey, C. David Levermore, and Christian Ringhofer, editors, *Dispersive Transport Equations and Multiscale Models*, The IMA Volumes in Mathematics and its Applications, vol. 136, pp. 133–149, Springer-Verlag, 2004.
- [35] Kevin P. Allen<sup>UG</sup> and Matthias K. Gobbert. Coarse-Grained Parallel Matrix-Free Solution of a Three-Dimensional Elliptic Prototype Problem. In: Vipin Kumar, Marina L. Gavrilova, Chih Jeng Kenneth Tan, and Pierre L’Ecuyer, editors, *Computational Science and Its Applications — ICCSA 2003*, Lecture Notes in Computer Science, vol. 2668, pp. 290–299, Springer-Verlag, 2003.

- [36] Vinay Prasad, Matthias K. Gobbert, Max Bloomfield<sup>G</sup>, and Timothy S. Cale. Improving Pulse Protocols in Atomic Layer Deposition. In: B. M. Melnick, T. S. Cale, S. Zaima, and T. Ohta, editors, *Advanced Metallization Conference 2002*, pp. 709–715, Materials Research Society, 2003.
- [37] Samuel G. Webster<sup>G</sup>, Matthias K. Gobbert, and Timothy S. Cale. Transient 3-D/3-D Transport and Reactant-Wafer Interactions: Adsorption and Desorption. In: P. Timans, E. Gusev, F. Roozeboom, M. Ozturk, and D. L. Kwong, editors, *Rapid Thermal and Other Short-Time Processing Technologies III*, The Electrochemical Society Proceedings Series, vol. 2002–11, pp. 81–88, 2002.
- [38] Vinay Prasad, Matthias K. Gobbert, and Timothy S. Cale. Optimizing Pulse Protocols in Plasma-Enhanced Atomic Layer Deposition. In: G. S. Mathad, M. Yang, R. E. Sah, and M. D. Allendorf, editors, *Plasma Processing XIV*, The Electrochemical Society Proceedings Series, vol. 2002–17, pp. 25–34, 2002.
- [39] Samuel G. Webster<sup>G</sup>, Matthias K. Gobbert, Jean-François Remacle, and Timothy S. Cale. Parallel Numerical Solution of the Boltzmann Equation for Atomic Layer Deposition. In: Burkhard Monien and Rainer Feldmann, editors, *Euro-Par 2002 Parallel Processing*, Lecture Notes in Computer Science, vol. 2400, pp. 452–456, Springer-Verlag, 2002.
- [40] Vinay Prasad, Matthias K. Gobbert, and Timothy S. Cale. A Transport and Reaction Model for Atomic Layer Deposition. In: Andrew J. McKerrow, Yosi Shacham-Diamand, Shigeaki Zaima, and Takayuki Ohba, editors, *Advanced Metallization Conference 2001*, pp. 399–403, Materials Research Society, 2002.
- [41] Matthias K. Gobbert, Vinay Prasad, and Timothy S. Cale. A Feature Scale Model for Atomic Layer Deposition. In: T. Wade, editor, *Proceedings of the Eighteenth International VLSI Multilevel Interconnection Conference*, pp. 413–417, IMIC, 2001.
- [42] Matthias K. Gobbert and Timothy S. Cale. A Feature Scale Transport and Reaction Model for Atomic Layer Deposition. In: M. T. Swihart, M. D. Allendorf, and M. Meyyappan, editors, *Fundamental Gas-Phase and Surface Chemistry of Vapor-Phase Deposition II*, The Electrochemical Society Proceedings Series, vol. 2001–13, pp. 316–323, 2001.
- [43] T. S. Cale, T. P. Merchant, L. J. Borucki, M. K. Gobbert, and A. H. Labun. Integrated Multiscale Process Simulator for LPCVD. In: T. Wade, editor, *Proceedings of the Seventeenth International VLSI Multilevel Interconnection Conference*, pp. 233–242, IMIC, 2000.
- [44] Matthias K. Gobbert, Tushar P. Merchant, Leonard J. Borucki, and Timothy S. Cale. Vertical Integration of CVD Process Models. In: Mark D. Allendorf and Claude Bernard, editors, *Chemical Vapor Deposition: Proceedings of the Fourteenth International Conference and EUROCVI–11*, The Electrochemical Society Proceedings Series, vol. 97–25, pp. 254–261, 1997.
- [45] Matthias K. Gobbert, Tushar P. Merchant, Timothy S. Cale, and Leonard J. Borucki. Microloading in LPCVD: an Integrated Simulation Approach. In: Robert Havemann, John Schmitz, Hiroshi Komiyama, and Kazuo Tsubouchi, editors, *Advanced Metallization and Interconnect Systems for ULSI Applications in 1996*, pp. 511–515, Materials Research Society, 1997.

- [46] Matthias K. Gobbert, Timothy S. Cale, and Christian A. Ringhofer. One Approach to Combining Equipment Scale and Feature Scale Models. In: Meyya Meyyappan, Demetre J. Economou, and Stephanie W. Butler, editors, *Process Control, Diagnostics, and Modeling in Semiconductor Manufacturing*, The Electrochemical Society Proceedings Series, vol. 95–4, pp. 553–563, 1995.

## Other Publications

- [47] Andrew M. Raim<sup>G</sup> and Matthias K. Gobbert. Parallel Performance Studies for a Maximum Likelihood Estimation Problem Using TAO. Technical Report number HPCF–2009–8, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2009.
- [48] Aaron Churchill<sup>G</sup>, Matthias K. Gobbert, and Thomas I. Seidman. Efficient Computation for a Reaction-Diffusion System with a Fast Reaction in Two Spatial Dimensions Using COMSOL Multiphysics. Technical Report number HPCF–2009–7, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2009.
- [49] Zana Coulibaly<sup>UG</sup>, Michael Muscedere<sup>G</sup>, Matthias K. Gobbert, and Bradford E. Percy. Long-Time Simulation of Calcium Waves in a Heart Cell to Study the Effects of Calcium Release Flux Density and of Coefficients in the Pump and Leak Mechanisms on Self-Organizing Wave Behavior. Technical Report number HPCF–2009–6, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2009.
- [50] Guan Wang<sup>G</sup> and Matthias K. Gobbert. Performance Comparison between Blocking and Non-Blocking Communications for a Three-Dimensional Poisson Problem. Technical Report number HPCF–2009–5, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2009.
- [51] Noemi Petra<sup>G</sup> and Matthias K. Gobbert. Performance Studies with COMSOL Multiphysics via Scripting and Batch Processing. Technical Report number HPCF–2009–4, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2009.
- [52] Guan Wang<sup>G</sup>, Aaron Churchill<sup>G</sup>, Matthias K. Gobbert, and Thomas I. Seidman. Efficient Computation for a Reaction-Diffusion System with a Fast Reaction with Continuous and Discontinuous Initial Data Using COMSOL Multiphysics. Technical Report number HPCF–2009–3, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2009.
- [53] Amanda K. Gassman<sup>G</sup> and Matthias K. Gobbert. Solving a Two-Dimensional Elliptic Model Problem with the Conjugate Gradient Method Using Matrix-Free SSOR Preconditioning in Matlab. Technical Report number HPCF–2009–2, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2009.
- [54] Neeraj Sharma<sup>G</sup> and Matthias K. Gobbert. Performance Studies for Multithreading in Matlab with Usage Instructions on hpc. Technical Report number HPCF–2009–1, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2009.
- [55] Robin Blasberg and Matthias K. Gobbert. MVAPICH2 vs. OpenMPI for a Clustering Algorithm. Technical Report number HPCF–2008–7, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2008.

- [56] Robin Blasberg and Matthias K. Gobbert. Parallel Performance Studies for a Clustering Algorithm. Technical Report number HPCF–2008–5, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2008.
- [57] Shiming Yang<sup>G</sup> and Matthias K. Gobbert. Convergence Order Studies for Elliptic Test Problems with COMSOL Multiphysics. Technical Report number HPCF–2008–4, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2008.
- [58] Michael J. Reid<sup>UG</sup> and Matthias K. Gobbert. Parallel Performance Studies for a Hyperbolic Test Problem. Technical Report number HPCF–2008–3, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2008.
- [59] Michael Muscedere<sup>G</sup> and Matthias K. Gobbert. Parallel Performance Studies for a Parabolic Test Problem. Technical Report number HPCF–2008–2, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2008.
- [60] Matthias K. Gobbert. Parallel Performance Studies for an Elliptic Test Problem. Technical Report number HPCF–2008–1, UMBC High Performance Computing Facility, University of Maryland, Baltimore County, 2008.
- [61] Yushu Yang<sup>G</sup>, Michael Muscedere<sup>G</sup>, and Matthias K. Gobbert. Numerical Studies of the Asymptotic Behavior of a Reaction-Diffusion System with a Fast Reaction. Technical Report number TR2008–4, Department of Mathematics and Statistics, University of Maryland, Baltimore County, 2008.
- [62] Matthias K. Gobbert and Nagaraj K. Neerchal. Preparing Graduate Students for Interdisciplinary Careers. *Computing in Science and Engineering*, Education Department, vol. 10, no. 1, pp. 93–95, January/February 2008.
- [63] Alen Agheksanterian<sup>G</sup> and Matthias K. Gobbert. Modeling the Spread of Epidemic Cholera: an Age-Structured Model. Technical Report number TR2007–9, Department of Mathematics and Statistics, University of Maryland, Baltimore County, 2007.
- [64] Shiming Yang<sup>G</sup> and Matthias K. Gobbert. The Optimal Relaxation Parameter for the SOR Method Applied to a Classical Model Problem. Technical Report number TR2007–6, Department of Mathematics and Statistics, University of Maryland, Baltimore County, 2007.
- [65] Matthias K. Gobbert, Kathleen A. Hoffman, and Jinglai Shen. Advances in Control of Partial Differential Equations in Honor of Thomas I. Seidman. *IEEE Control Systems Magazine*, vol. 27, no. 2, pp. 92–93, April 2007.
- [66] Ana Maria Soane<sup>G</sup>, Matthias K. Gobbert, and Thomas I. Seidman. Design of an effective numerical method for a reaction-diffusion system with internal and transient layers. Technical Report number 2006, Institute for Mathematics and its Applications (IMA), University of Minnesota, 2004.
- [67] Kevin P. Allen<sup>UG</sup> and Matthias K. Gobbert. A Matrix-Free Conjugate Gradient Method for Cluster Computing. Technical Report, University of Maryland, Baltimore County, 2003.
- [68] Matthias K. Gobbert, Samuel G. Webster<sup>G</sup>, Jean-François Remacle, and Timothy S. Cale. A Spectral Galerkin Ansatz for the Deterministic Solution of the Boltzmann Equation on Irregular Domains. Technical Report, University of Maryland, Baltimore County, 2002.

- [69] Alexander L. Hanhart<sup>G</sup>, Matthias K. Gobbert, and Leighton T. Izu. Coarse-Grained Parallel Solution for a System of Reaction Diffusion Equations. Technical Report, University of Maryland, Baltimore County, 2002.
- [70] Steven C. Foster<sup>UG</sup>, Matthias K. Gobbert, and Jean-François Remacle. Performance Studies on the Discontinuous Galerkin Method for Solving the Scalar Transport Equation. Technical Report, University of Maryland, Baltimore County, 2002.
- [71] Matthias K. Gobbert. Numerical Simulation of Real-World Engineering Applications. *Development and Perspectives*, no. 1, pp. 65–74, Peust & Gutschmidt Verlag, Göttingen (Germany), 2001.
- [72] Matthias K. Gobbert. A Homogenization Technique for the Development of Mesoscopic Scale Models for Chemical Vapor Deposition. *Dissertation Summaries in Mathematics*, vol. 1, no. 1–2, pp. 299–306, Fall 1996.
- [73] Matthias K. Gobbert. *A Homogenization Technique for the Development of Mesoscopic Scale Models for Chemical Vapor Deposition*. Ph.D. thesis, Arizona State University, May 1996.
- [74] Matthias K. Gobbert. Robertson’s Example for Stiff Differential Equations. Technical Report, Arizona State University, 1996.

### **Student Publications**

- [75] Michael J. Reid<sup>UG</sup>. Parallel Performance Studies for a Numerical Simulator of Atomic Layer Deposition. *UMBC Review: Journal of Undergraduate Research and Creative Works*, submitted.
- [76] Kevin P. Allen<sup>UG</sup>. Efficient Parallel Computing for Solving Linear Systems of Equations. *UMBC Review: Journal of Undergraduate Research and Creative Works*, vol. 5, pp. 8–17, 2004.
- [77] Steven C. Foster<sup>UG</sup>. Performance Studies for the Discontinuous Galerkin Method Applied to the Scalar Transport Equation. *UMBC Review: Journal of Undergraduate Research and Creative Works*, vol. 4, pp. 36–47, 2003.

## LECTURES AND PRESENTATIONS

### Conference Presentations

1. *Conference presentation.* Matthias K. Gobbert, Aaron Churchill<sup>G</sup>, Guan Wang<sup>G</sup>, and Thomas I. Seidman. COMSOL Multiphysics for Efficient Solution of a Transient Reaction-Diffusion System with Fast Reaction. *COMSOL Conference 2008*, Boston, MA, October 08–10, 2009.
2. *Conference presentation.* Noemi Petra<sup>G</sup> and Matthias K. Gobbert. Parallel Performance Studies for COMSOL Multiphysics Using Scripting and Batch Processing. *COMSOL Conference 2008*, Boston, MA, October 08–10, 2009.
3. *Contributed talk.* Matthias K. Gobbert. Efficient and Accurate Long-Time Simulations of Calcium Waves in a Cardiac Cell. *SIAM Annual Meeting*, Denver, CO, July 06–10, 2009.
4. *Conference presentation.* Aaron Churchill<sup>G</sup>, Guan Wang<sup>G</sup>, Matthias K. Gobbert, and Thomas I. Seidman. Efficient Simulations for a Reaction-Diffusion System with a Fast Reaction in the Asymptotic Limit. *Finite Element Circus*, University of Delaware, April 24–25, 2009.
5. *Contributed talk.* Matthias K. Gobbert. Parallel Computing for Long-Time Simulations of Calcium Waves in a Heart Cell. *SIAM Conference on Computational Science & Engineering*, Miami, FL, March 02–06, 2009.
6. *Minisymposium talk.* Matthias K. Gobbert and Nagaraj K. Neerchal. Career Preparation of Mathematics and Statistics Students through Interdisciplinary Research and Consulting. *Joint Mathematics Meetings*, Washington, D.C., January 05–08, 2009.
7. *Conference presentation.* Matthias K. Gobbert, Guan Wang<sup>G</sup>, and Thomas I. Seidman. Equivalent Smooth Model for a Reaction-Diffusion System with a Fast Reaction. *Finite Element Circus*, Rensselaer Polytechnic Institute, October 24–25, 2008.
8. *Conference presentation.* Matthias K. Gobbert and Shiming Yang<sup>G</sup>. Finite Element Convergence in COMSOL Multiphysics for Smooth and Non-Smooth Elliptic Test Problems. *COMSOL Conference 2008*, Boston, MA, October 09–11, 2008.
9. *Minisymposium talk.* Matthias K. Gobbert. Numerical Methods for a Model of Calcium Waves in a Human Heart Cell. *SIAM Annual Meeting, MS56 Electrical and Reaction-Diffusion Modeling of Biological Cells*, San Diego, CA, July 07–11, 2008.
10. *Invited talk.* Matthias K. Gobbert and Michael Muscedere<sup>G</sup>. Efficient and Physically Accurate Numerical Methods for a Model of Calcium Waves in a Human Heart Cell. *6th International Conference on Differential Equations and Dynamical Systems*, Morgan State University, Baltimore, MD, May 22–26, 2008.
11. *Poster presentation.* Matthias K. Gobbert. Scientific Computing for Large-Scale Time-Dependent Models. *Undergraduate Years and Beyond 2007*, UMBC, October 20, 2007.
12. *Conference presentation.* Matthias K. Gobbert. A Technique for the Quantitative Assessment of the Solution Quality on Particular Finite Elements in COMSOL Multiphysics. *COMSOL Conference 2007*, Boston, MA, October 04–06, 2007.

13. *Conference presentation.* Matthias K. Gobbert. Screen Capture of Mathematics Examples with Voice Over using a Tablet Laptop. *Maryland Blackboard Users Group (MDBUG) Conference*, UMBC Technology Center, October 02, 2007.
14. *Invited plenary talk.* Matthias K. Gobbert and Timothy S. Cale. Modeling Multi Scale Effects on Transients During Chemical Vapor Deposition. *EuroCVD-16: Sixteenth European Conference on Chemical Vapor Deposition*, Den Haag (Scheveningen), The Netherlands, September 16–21, 2007.
15. *Conference presentation.* Matthias K. Gobbert. Efficient Cluster Computing for a Model of Calcium Flow in Heart Cells. *Finite Element Circus*, University of Maryland, College Park, April 20–21, 2007.
16. *Conference presentation.* Matthias K. Gobbert, Thomas I. Seidman, and Raymond J. Spiteri. A Non-Negativity Preserving Newton Method for High-Order Implicit Time-Stepping. *Finite Element Circus*, Pennsylvania State University, State College, PA, November 03–04, 2006.
17. *Minisymposium talk.* Matthias K. Gobbert. Efficient Cluster Computing for Time-Dependent Reaction-Diffusion Equations on High Resolution Meshes. *SIAM Annual Meeting, MS33 Parallel Computing for the Numerical Solution of Partial Differential Equations on Extremely Fine Meshes*, Boston, MA, July 10–14, 2006.
18. *Minisymposium talk.* Matthias K. Gobbert, Thomas I. Seidman, and Raymond J. Spiteri. Maintaining the Non-Negativity of Numerical Solutions of Time-Dependent Reaction-Diffusion Problems. *SIAM Annual Meeting, MS14 Numerical Techniques and Software for the Efficient Solution of Partial Differential Equations*, Boston, MA, July 10–14, 2006.
19. *Minisymposium talk.* Matthias K. Gobbert. A Kinetic Transport and Reaction Model for Process Models in Microelectronics Manufacturing. *SIAM Conference on Analysis of Partial Differential Equations, MS6 Quantum and Kinetic Transport Phenomena*, Boston, MA, July 10–12, 2006.
20. *Minisymposium talk.* Matthias K. Gobbert. Cluster Computing for a System of Time-Dependent Reaction-Diffusion Equations on a Three-Dimensional Domain with High Resolution. *12th SIAM Conference on Parallel Processing for Scientific Computing, MS Tools for High-Performance Scientific Computation in Cluster Environments*, San Francisco, CA, February 22–24, 2006.
21. *Conference presentation.* Matthias K. Gobbert. Towards a Non-Negativity Preserving Method for Systems of Reaction-Diffusion Equations. *Finite Element Circus*, Rutgers University, Piscataway, NJ, October 21–22, 2005.
22. *Contributed talk.* Matthias K. Gobbert, Mark L. Breitenbach<sup>G</sup>, and Timothy S. Cale. Cluster Computing for Transient Simulations of the Linear Boltzmann Equation on Irregular Three-Dimensional Domains. *International Conference on Computational Science (ICCS 2005)*, Atlanta, GA, May 22–25, 2005.
23. *Minisymposium talk.* Matthias K. Gobbert. Examples of Student Research Projects in CSE. *SIAM Conference on Computational Science & Engineering, MS20 CSE Undergraduate Programs*, Orlando, FL, February 12–15, 2005.

24. *Contributed talk.* Matthias K. Gobbert, Samuel G. Webster<sup>G</sup>, and Timothy S. Cale. Parallel Deterministic Numerical Simulations of the Linear Boltzmann Equation on Irregular Domains. *SIAM Conference on Computational Science & Engineering*, Orlando, FL, February 12–15, 2005.
25. *Contributed poster.* Matthias K. Gobbert, Ana Maria Soane<sup>G</sup>, and Leighton T. Izu. Parallel Simulations of a System of Reaction-Diffusion Equations Modeling Calcium Waves in a Human Heart Cell. *16th International Conference on Domain Decomposition Methods*, New York University, New York, NY, January 12–15, 2005.
26. *Contributed poster.* Matthias K. Gobbert. Multiscale Models for Production Processes in Microelectronics Manufacturing. *IMA Workshop: Future Challenges in Multiscale Modeling and Simulation*, Institute for Mathematics and its Applications (IMA), University of Minnesota, Minneapolis, MN, November 18–20, 2004.
27. *Minisymposium talk.* Matthias K. Gobbert. Configuration and Performance of a Beowulf Cluster with High-Performance Interconnect. *SIAM Annual Meeting, MS48 Parallel Computing on Beowulf Clusters: Performance and Applications*, Portland, OR, July 12–16, 2004.
28. *Contributed talk.* Matthias K. Gobbert, Kevin P. Allen<sup>UG</sup>, Ana Maria Soane<sup>G</sup>, and Leighton T. Izu. Numerical Modeling of Cellular Calcium Flow Involving Highly Non-Smooth Forcing Terms. *SIAM Conference on the Life Sciences*, Portland, OR, July 11–14, 2004.
29. *Conference presentation.* Ana Maria Soane<sup>G</sup>, Matthias K. Gobbert, and Thomas I. Seidman. Numerical Studies of a Reaction-Diffusion System with a Fast Reaction. *Finite Element Circus*, University of Pittsburgh, Pittsburgh, PA, April 16–17, 2004.
30. *Conference presentation.* Matthias K. Gobbert. Numerical Simulations of the Boltzmann Equation for Applications in Microelectronics Manufacturing. *Finite Element Circus*, Cornell University, Ithaca, NY, November 07–08, 2003.
31. *Contributed talk.* Matthias K. Gobbert, Samuel G. Webster<sup>G</sup>, and Timothy S. Cale. Numerical Simulations of the Boltzmann Transport Equation for Applications in Microelectronics Manufacturing. *SIAM Annual Meeting*, Montreal, Canada, June 16–20, 2003.
32. *Invited talk.* Matthias K. Gobbert. Numerical Simulations of the Boltzmann Transport Equation for Applications in Microelectronics Manufacturing. *Analysis and Numerics for Modeling Semiconductor Devices and Biological Channels*, Center for Scientific Computation and Mathematical Modeling (CSCAMM), University of Maryland, College Park, MD, May 19–23, 2003.
33. *Contributed talk.* Kevin P. Allen<sup>UG</sup> and Matthias K. Gobbert. Coarse-Grained Parallel Matrix-Free Solution of a Three-Dimensional Elliptic Prototype Problem. *2003 International Conference on Computational Science and its Applications (ICCSA 2003)*, Montreal, Canada, May 18–21, 2003.
34. *Conference presentation.* Matthias K. Gobbert. Parallel Numerical Simulations of the Linear Boltzmann Equation on Irregular Three-Dimensional Domains. *Finite Element Circus*, Pennsylvania State University, State College, PA, October 25–26, 2002.
35. *Contributed talk.* Matthias K. Gobbert, Alexander L. Hanhart<sup>G</sup>, Kevin P. Allen<sup>UG</sup>, and Leighton Izu. Parallel Computation for a Three-Dimensional Model of Calcium Waves. *SIAM Symposium on Computational Models and Simulation for Intra-Cellular Processes*, Washington, D.C., October 04, 2002.

36. *Contributed talk.* Samuel G. Webster<sup>G</sup>, Matthias K. Gobbert, Jean-François Remacle, and Timothy S. Cale. Parallel Numerical Solution of the Boltzmann Equation for Atomic Layer Deposition. *Euro-Par 2002*, Paderborn, Germany, August 29, 2002.
37. *Minisymposium talk.* Matthias K. Gobbert. A Transport and Reaction Model for Semiconductor Manufacturing Processes. *SIAM Annual Meeting, MS34 Non Classical Applications of Kinetic Theory*, Philadelphia, PA, July 09, 2002.
38. *Conference presentation.* Matthias K. Gobbert. Parallel Numerical Solution of the Boltzmann Equation for Atomic Layer Deposition. *Finite Element Circus*, University of Maryland, College Park, MD, March 09, 2002.
39. *Conference presentation.* Matthias K. Gobbert. A Feature Scale Transport and Reaction Model for Atomic Layer Deposition. *Finite Element Circus*, University of Delaware, Newark, DE, March 30, 2001.
40. *Contributed talk.* Matthias K. Gobbert and Timothy S. Cale. A Feature Scale Transport and Reaction Model for Atomic Layer Deposition. *199th Meeting of The Electrochemical Society*, Washington, D.C., March 28, 2001.
41. *Contributed talk.* Matthias K. Gobbert and Christian Ringhofer. A Homogenization Technique for the Boltzmann Equation for Low Pressure Chemical Vapor Deposition. *SIAM Annual Meeting*, Puerto Rico, July 2000.
42. *Invited talk.* Matthias K. Gobbert and Christian Ringhofer. A Homogenization Technique for the Boltzmann Equation for Low Pressure Chemical Vapor Deposition. *IMA Workshop: Multiscale Models for Surface Evolution and Reacting Flows*, Institute for Mathematics and its Applications (IMA), University of Minnesota, Minneapolis, MN, June 2000.
43. *Contributed talk.* Matthias K. Gobbert and Andreas Prohl. A Comparison of Classical and Discontinuous Finite Element Methods for the Computation of Laminate Microstructure. *Third SIAM Conference on Mathematical Aspects of Materials Science*, Philadelphia, PA, May 2000.
44. *Conference presentation.* Matthias K. Gobbert. Models for the interaction of reactor and feature scale phenomena in CVD processes. *Finite Element Circus*, Cornell University, Ithaca, NY, October 1999.
45. *Minisymposium talk.* Matthias K. Gobbert and Christian Ringhofer. A Homogenization Technique for a Kinetic Model of Chemical Vapor Deposition. *The Fourth International Congress on Industrial and Applied Mathematics*, Edinburgh, Scotland, July 1999.
46. *Invited talk.* Matthias K. Gobbert and Andreas Prohl. A Survey of Finite Elements for the Computation of Crystalline Microstructure. *Workshop on Numerics for Microstructures*, Mathematical Research Institute Oberwolfach, Germany, April 1999.
47. *Conference presentation.* Matthias K. Gobbert and Andreas Prohl. A New Finite Element Method for the Computation of Crystalline Microstructure. *Finite Element Circus*, University of Maryland, College Park, MD, November 1998.
48. *Contributed poster.* Matthias K. Gobbert, Tushar P. Merchant, Timothy S. Cale, and Leonard J. Borucki. Microloading in LPCVD: An integrated simulation approach. *Advanced Metallization and Interconnect Systems for ULSI Applications*, Boston, MA, October 1996.

49. *Conference presentation.* Matthias K. Gobbert. Robertson's example for stiff differential equations. *Volterra Centennial*, Tempe, AZ, May 1996.
50. *Conference presentation.* Matthias K. Gobbert, Timothy S. Cale, and Christian A. Ringhofer. Models for the interaction of reactor and feature scale phenomena in CVD processes. *Fourth International Workshop on Computational Electronics*, Tempe, AZ, November 1995.
51. *Contributed talk.* Matthias K. Gobbert, Timothy S. Cale, and Christian A. Ringhofer. One approach to combining equipment scale and feature scale models. *187th Meeting of The Electrochemical Society*, Reno, NV, May 1995.

### Seminar and Colloquium Talks

52. *Seminar talk.* Matthias K. Gobbert. COMSOL Multiphysics Features in Scripting and Batch Processing. Differential Equations Seminar, Department of Mathematics and Statistics, University of Maryland, Baltimore County, April 06, 2009.
53. *Seminar talk.* Matthias K. Gobbert. Parallel Computing for Long-Time Simulations of Calcium Waves in a Heart Cell. Numerical Analysis Seminar, Department of Mathematics, University of Maryland, College Park, March 03, 2009.
54. *Seminar talk.* Matthias K. Gobbert. Parallel Computing on the Distributed-Memory Cluster hpc for Large-Scale Simulations of Transient Partial Differential Equations. Research seminar, Department of Biological Sciences, University of Maryland, Baltimore County, September 10, 2008.
55. *Colloquium talk.* Matthias K. Gobbert. Parallel Computing for Long-Time Simulations of a Model for Calcium Waves in a Heart Cell. Departmental Colloquium, Department of Mathematics and Statistics, University of Maryland, Baltimore County, September 05, 2008.
56. *Seminar talk.* Matthias K. Gobbert. Parallel Computing for a Model of Calcium Waves in a Human Heart Cell. Research group seminar, National Institutes of Health, March 11, 2008.
57. *Colloquium talk.* Matthias K. Gobbert. Parallel Computing on Distributed-Memory Clusters for Large-Scale Simulations of Transient Partial Differential Equations. Departmental Colloquium, Department of Physics, University of Maryland, Baltimore County, March 05, 2008.
58. *Seminar talk.* Matthias K. Gobbert and Shiming Yang<sup>G</sup>. A Tutorial Introduction to COMSOL Multiphysics. Departmental seminar, Department of Mathematics, U.S. Naval Academy, January 31, 2008.
59. *Colloquium talk.* Matthias K. Gobbert. Efficient Non-Negativity Preserving High-Order Implicit Time-Stepping for Reaction-Diffusion Equations. Departmental Colloquium, Department of Mathematics and Statistics, University of Maryland, Baltimore County, September 28, 2007.
60. *Seminar talk.* Matthias K. Gobbert. Efficient Cluster Computing for Reaction-Diffusion Equations on High Resolution Meshes. Analysis and PDE Seminar, Department of Mathematical Sciences, University of Delaware, April 13, 2006.

61. *Seminar talk.* Matthias K. Gobbert. MATLAB's `ode15s` Function and the Efficient and Effective Solution of Time-Dependent Reaction-Diffusion Equations Using It. Differential Equations Seminar, Department of Mathematics and Statistics, University of Maryland, Baltimore County, December 05, 2005.
62. *Seminar talk.* Matthias K. Gobbert. Configuration and Performance of a Beowulf Cluster with High-Performance Interconnect. Department of Statistics, Iowa State University, Ames, IA, December 03, 2004.
63. *Seminar talk.* Matthias K. Gobbert. Parallel Simulations of the Linear Boltzmann Equation for Models in Microelectronics Manufacturing. Applied Mathematics and Numerical Analysis Seminar, School of Mathematics, University of Minnesota, Minneapolis, MN, December 02, 2004.
64. *Colloquium talk.* Matthias K. Gobbert. Numerical Simulations of Process Models in Microelectronics Manufacturing on Beowulf Clusters with High-Performance Networks. Departmental Colloquium, Department of Mathematics, Boise State University, Boise, ID, October 15, 2004.
65. *Seminar talk.* Matthias K. Gobbert. Configuration and Performance of the Math Department's SCREMS Cluster. Differential Equations Seminar, Department of Mathematics and Statistics, University of Maryland, Baltimore County, October 13, 2003.
66. *Invited panel participant.* Matthias Gobbert, Sue Dwyer, Tim Brennan, and Philip Rous. Panel Discussion: Teaching First Year Seminars: Experiences from the Program's First Year. TLT Brownbag Workshop, University of Maryland, Baltimore County, September 29, 2003.
67. *Seminar talk.* Matthias K. Gobbert. Parallel Numerical Simulation of Calcium Waves in Human Heart Cells. Computational and Applied Mathematics Proseminar, Department of Mathematics and Statistics, Arizona State University, Tempe, AZ, January 23, 2003.
68. *Seminar talk.* Matthias K. Gobbert. A Taste of MPI and Some General Lessons for Parallel Computing. Differential Equations Seminar, Department of Mathematics and Statistics, University of Maryland, Baltimore County, October 14, 2002.
69. *Colloquium talk.* Matthias K. Gobbert. Parallel Numerical Simulations of the Linear Boltzmann Equation. Departmental Colloquium, Department of Mathematics and Statistics, University of Maryland, Baltimore County, September 27, 2002.
70. *Colloquium talk.* Matthias K. Gobbert. Mathematical Modeling of Deposition Processes in Semiconductor Manufacturing. Departmental Colloquium, Department of Mathematics and Statistics, University of Maryland, Baltimore County, October 12, 2001.
71. *Seminar talk.* Matthias K. Gobbert. Mathematical Modeling of Deposition Processes in Semiconductor Manufacturing. Numerical Analysis Seminar, Department of Mathematics, University of Maryland, College Park, May 03, 2001.
72. *Seminar talk.* Matthias K. Gobbert. Some Show-and-Tell on FEMLAB. Differential Equations Seminar, Department of Mathematics and Statistics, University of Maryland, Baltimore County, May 01, 2001.
73. *Seminar talk.* Matthias K. Gobbert. Mathematical Modeling of Deposition Processes in Semiconductor Manufacturing. Numerical and Applied Mathematics Seminar, Department of Mathematics, University of Tennessee, Knoxville, TN, April 30, 2001.

74. *Seminar talk.* Matthias K. Gobbert. A Feature Scale Transport and Reaction Model for Atomic Layer Deposition. Differential Equations Seminar, Department of Mathematics and Statistics, University of Maryland, Baltimore County, March 27, 2001.
75. *Colloquium talk.* Matthias K. Gobbert. Mesoscopic Scale Modeling for Chemical Vapor Deposition. Departmental Colloquium, Department of Mathematics and Computer Science, Clarkson University, Potsdam, NY, November 2000.
76. *Seminar talk.* Matthias K. Gobbert. A Numerical Solution of the 2-D/2-D Linear Boltzmann Equation, a series of three talks. Differential Equations Seminar, Department of Mathematics and Statistics, University of Maryland, Baltimore County, April 2000.
77. *Invited lecture.* Matthias K. Gobbert. Homogenization Techniques for the Development of Mesoscopic Scale Models for Chemical Vapor Deposition. Bell Laboratories, Lucent Technologies, Morristown, NJ, December 03, 1999.
78. *Colloquium talk.* Matthias K. Gobbert and Andreas Prohl. Discontinuous Finite Element Methods for Martensitic Phase Transformations. Departmental Colloquium, Department of Mathematics and Computer Science, Clarkson University, Potsdam, NY, September 1999.
79. *Seminar talk.* Matthias K. Gobbert. A Homogenization Technique for the Derivation of Mesoscopic Scale Models for Chemical Vapor Deposition. Numerical Analysis Seminar, Department of Mathematics, University of Kiel, Germany, January 1998.
80. *Seminar talk.* Matthias K. Gobbert. A Homogenization Technique for the Development of Mesoscopic Scale Models for Chemical Vapor Deposition. Graduate Seminar, Department of Computer Science and Electrical Engineering, University of Maryland, Baltimore County, December 1997.
81. *Seminar talk.* Matthias K. Gobbert. A New Finite Element Method for Computing Crystalline Microstructure. Numerical Analysis Seminar, Department of Mathematics, University of Maryland, College Park, October 1997.
82. *Colloquium talk.* Matthias K. Gobbert. A New Finite Element Method for Computing Crystalline Microstructure. Departmental Colloquium, Department of Mathematics and Statistics, University of Maryland, Baltimore County, September 1997.
83. *Colloquium talk.* Matthias K. Gobbert. A New Finite Element Method for Computing Crystalline Microstructure. Departmental Colloquium, Department of Mathematical Sciences, George Mason University, Fairfax, VA, September 1997.
84. *Seminar talk.* Matthias K. Gobbert. An Integrated Simulation Procedure for Chemical Vapor Deposition in Semiconductor Manufacturing. Numerical Analysis Seminar, School of Mathematics, University of Minnesota, Minneapolis, MN, October 1996.
85. *Seminar talk.* Matthias K. Gobbert. A Homogenization Technique for the Derivation of Mesoscopic Scale Models for Chemical Vapor Deposition. Applied Math Modelling Seminar, Department of Mathematics, University of Arizona, Tucson, AZ, April 1996.
86. *Invited lecture.* Matthias K. Gobbert. A Homogenization Technique for the Derivation of Mesoscopic Scale Models for Chemical Vapor Deposition. SGS-Thomson Microelectronics Research Center and Department of Mathematics, Università di Catania, Catania, Italy, January 1996.

87. *Seminar talk.* Matthias K. Gobbert. A Homogenization Technique for the Derivation of Mesoscopic Scale Models for Chemical Vapor Deposition. Department of Mathematics, Technische Universität Berlin, Berlin, Germany, December 1995.
88. *Seminar talk.* Matthias K. Gobbert. A Homogenization Technique for the Derivation of Mesoscopic Scale Models for Chemical Vapor Deposition. Advanced Modeling Group, Motorola, Mesa, AZ, December 1995.

## LIST OF COURSES TAUGHT

- Fall 2009:** Math 225 Introduction to Differential Equations  
Math 441 Introduction to Numerical Analysis
- Spring 2009:** Math 627 Introduction to Parallel Computing
- Fall 2008:** Math 225 Introduction to Differential Equations  
Math 620 Numerical Analysis I
- Spring 2008:** Math 221 Introduction to Linear Algebra  
Math 627 Introduction to Parallel Computing
- Fall 2007:** Math 441 Introduction to Numerical Analysis  
Math 621 Numerical Analysis II:  
Numerical Methods for Partial Differential Equations
- Summer 2007:** Math 221 Introduction to Linear Algebra
- Spring 2007:** Math 630 Matrix Analysis
- Fall 2006:** Math 221 Introduction to Linear Algebra  
Math 627 Introduction to Parallel Computing
- Summer 2006:** Math 221 Introduction to Linear Algebra
- Spring 2006:** Math 621 Numerical Analysis II:  
Numerical Methods for Partial Differential Equations
- Fall 2005:** Math 221 Introduction to Linear Algebra  
Math 441 Introduction to Numerical Analysis  
Math 620 Numerical Analysis I
- Summer 2005:** Math 426 Introduction to Mathematical Software Packages: Matlab
- Spring 2005:** *Sabbatical leave*
- Fall 2004:** *Sabbatical leave*
- Spring 2004:** Math 627 Introduction to Parallel Computing  
Math/Stat 750 Introduction to Interdisciplinary Consulting,  
team-taught with Nagaraj K. Neerchal
- Fall 2003:** Math 621 Numerical Analysis II:  
Numerical Methods for Partial Differential Equations  
Math/Stat 750 Introduction to Interdisciplinary Consulting,  
team-taught with Nagaraj K. Neerchal
- Spring 2003:** FYS 101A First-Year Seminar: Technological Disasters and Their Causes,  
team-taught with Ted M. Foster  
Math 441/620 Introduction to Numerical Analysis

- Fall 2002:** Math 426 Introduction to Mathematical Software Packages: Matlab  
 Math 430/630 Matrix Analysis  
 Math 627 Introduction to Parallel Computing,  
 team-taught with Madhu Nayakkankuppam
- Spring 2002:** Math 426 Introduction to Mathematical Software Packages: Matlab  
 Math 441/620 Introduction to Numerical Analysis
- Winter 2002:** Math 426 Introduction to Mathematical Software Packages: Matlab
- Fall 2001:** Math 426 Introduction to Mathematical Software Packages: Matlab  
 Math 430/630 Matrix Analysis  
 Math 700 Special Topics in Numerical Analysis:  
 Introduction to Parallel Computing using MPI,  
 team-taught with Susan E. Minkoff and Madhu Nayakkankuppam
- Spring 2001:** Math 441/620 Introduction to Numerical Analysis  
 Math 621 Numerical Analysis II:  
 Numerical Methods for Partial Differential Equations
- Winter 2001:** Math 426 Introduction to Mathematical Software Packages: Matlab
- Fall 2000:** Math 426 Introduction to Mathematical Software Packages: Matlab
- Spring 2000:** Math 441/620 Introduction to Numerical Analysis  
 Math 490 Special Topics in Mathematics:  
 Mathematical Computer Packages: Matlab
- Fall 1999:** Math 341 Computational Methods  
 Math 430/630 Matrix Analysis, team-taught with Weijia Kuang  
 Math 490/710 Special Topics in Applied Mathematics:  
 Introduction to Asymptotic Analysis and Singular Perturbations,  
 team-taught with Thomas I. Seidman and Weijia Kuang
- Spring 1999:** Math 225 Introduction to Differential Equations  
 Math 441/620 Introduction to Numerical Analysis
- Fall 1998:** Math 251 Multivariable Calculus  
 Math 341 Computational Methods  
 Introduction to Matlab, taught for Northrop Grumman  
 through the Office of Continuing Education
- Spring 1998:** Math 152 Calculus and Analytic Geometry II  
 Math 441/620 Introduction to Numerical Analysis
- Fall 1997:** Math 151 Calculus and Analytic Geometry I  
 Math 341 Computational Methods