

## James V. Lambers

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Energy Resources Engineering  
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### Education

Ph.D. in Scientific Computing and Computational Mathematics, September 2003  
Stanford University, Stanford, CA, USA  
Advisors: Joseph E. Olinger and Gene H. Golub

M.S. in Scientific Computing and Computational Mathematics, June 1994  
Stanford University, Stanford, CA, USA

B.S. in Mathematics and Computer Science, *Summa Cum Laude*, May 1991  
Purdue University, West Lafayette, IN, USA

### Faculty Positions

University of Southern Mississippi  
Department of Mathematics  
Assistant Professor  
Courses taught: Numerical Analysis I (MAT 460/560)  
Hattiesburg, MS, USA  
Fall 2009–present

Stanford University  
Energy Resources Engineering  
Acting Assistant Professor  
Courses taught: C++ Programming for Earth Scientists and Engineers (ENERGY 211/CME 211), Introduction to Large Scale Computing (CME 212), Applied Mathematics of Reservoir Engineering (ENERGY 281), Introduction to Scientific Computing (CME 108), Numerical Linear Algebra (CME 302), Modeling and Simulation (ENERGY 125), Advanced Topics in Numerical Linear Algebra (CME 335). Research groups: SUPRI-B (Reservoir Simulation), SUPRI-C (Gas Injection). Co-advisor to students of Prof. Margot G. Gerritsen.  
Stanford, CA, USA  
Fall 2006–Summer 2009

### Research Positions

Stanford University  
Department of Petroleum Engineering  
Research Associate  
Supervisor: Professor Margot G. Gerritsen. Topic: Industrial Compositional Streamline Simulation for Efficient and Accurate Prediction of Gas Injection and WAG Processes  
Stanford, CA, USA  
Fall 2004–Summer 2006

University of California, Irvine  
Department of Mathematics  
Postgraduate Researcher  
Supervisors: Professor Patrick Guidotti and Professor Knut Sølna. Topic: Wave Propaga-  
Irvine, CA, USA  
Summer 2003–Spring 2004

tion in Inhomogeneous and Random Media

Purdue University West Lafayette, IN, USA  
Department of Computer Sciences  
Research Assistant Fall 1988–Spring 1991  
Supervisors: Professor John R. Rice, Professor Greg N. Frederickson, and Professor Franz-Erich Wolter. Topics: Graph Algorithms, Numerical Quadrature for General 2-D Domains, and Differential Geometric Modeling of Surfaces

### Teaching Positions

University of California, Irvine Irvine, CA, USA  
Department of Mathematics  
Lecturer Fall 2003–Fall 2004  
Pre-Calculus (Math 1B), Calculus (Math 2A and 2B), Discrete Mathematics (Math 6A), Numerical Analysis (Math 105A). Supervisor: Paul Eklof.

Stanford University Stanford, CA, USA  
Department of Computer Science  
Teaching Fellow/Teaching Assistant Winter 2001–Summer 2003  
Courses: Introduction to Scientific Computing (CS 137), Eigenvalue Computations (CS 339), Numerical Linear Algebra (CS 237A), Design and Analysis of Algorithms (CS 161), Ten Great Algorithms of Scientific Computing (CS 339), Compilers (CS 143), Scientific Computing with Matlab and Maple (CS 138). Supervisors: Gene Golub and Persi Diaconis.

Iowa State University Ames, IA, USA  
Department of Mathematics  
Instructor Fall 1994–Summer 1996  
Courses: Single-Variable Calculus (Math 165 and 166), Multivariable Calculus (Math 265), Differential Equations (Math 267), Trigonometry (Math 142). Supervisor: E. James Peake.

Stanford University Stanford, CA, USA  
Department of Computer Science  
Teaching Assistant Winter 1993–Spring 1994  
Courses: Compilers (CS 143), Numerical Methods for Initial Value Problems (CS 237C), Numerical Methods for Boundary Value Problems (CS 237B). Supervisors: Joe Olinger, Andrew Stuart, and David Dill.

### Other Employment

Starbase Corporation Santa Ana, CA, USA  
Senior Software Engineer March 1999–August 2002  
Projects: Starbase Replication Manager (lead engineer), Starbase Server 5.x for Solaris (lead engineer). Supervisor: Alan Kuchek.

Site Technologies Scotts Valley, CA, USA  
Senior Software Engineer November 1997–March 1999  
Projects: SiteMaster 4.x (chief architect), SiteSweeper 2.0 Enterprise Edition. Supervisor: Ron Sauers.

Inlet  
Software Engineer

Cedar Rapids, IA, USA  
June 1996–November 1997

Projects: CurrentIssue 3.0, author of compiler for its markup language for building web applications. Supervisor: Todd Millard.

## Journal Articles

1. J. V. Lambers, “Krylov Subspace Spectral Methods for Variable-Coefficient Initial-Boundary Value Problems”, *Electronic Transactions on Numerical Analysis* **20** (2005), p. 212-234.
2. P. Guidotti, J. V. Lambers, and K. Sølna, “Analysis of Wave Propagation in 1D Inhomogeneous Media”, *Numerical Functional Analysis and Optimization* **27** (2006), p. 25-55.
3. J. V. Lambers, “Practical Implementation of Krylov Subspace Spectral Methods”, *Journal of Scientific Computing* **32** (2007), p. 449-476.
4. J. V. Lambers, “Derivation of High-Order Spectral Methods for Time-dependent PDE using Modified Moments”, *Electronic Transactions on Numerical Analysis* **28**, Special Volume in Honor of Gene Golub’s 75th Birthday (2008), p. 114-135.
5. J. V. Lambers, “Implicitly Defined High-Order Operator Splittings for Parabolic and Hyperbolic Variable-Coefficient PDE Using Modified Moments”, *International Journal of Computational Science* **2**, Special Issue on Multiplicative and Additive Operator Splitting (2008), p. 376-401.
6. M. G. Gerritsen and J. V. Lambers, “An Integration of Multilevel Local-Global Upscaling with Grid Adaptivity”, *Computational Geosciences* **12** (2008), p. 193-208.
7. J. V. Lambers, M. G. Gerritsen, and B. T. Mallison, “Accurate Local Upscaling with Variable Compact Multi-point Transmissibility Calculations”, *Computational Geosciences* **12**, Special Issue on Multiscale Methods for Flow and Transport in Heterogeneous Porous Media (2008), p. 399-416.
8. P. Guidotti and J. V. Lambers, “Eigenvalue Characterization and Computation for the Laplacian on General 2-D Domains”, *Numerical Functional Analysis and Optimization* **29** (2008), p. 507-531.
9. P. Guidotti and J. V. Lambers, “A New Nonlinear Nonlocal Diffusion For Noise Reduction”, *Journal of Mathematical Imaging and Vision* **33** (2009), p. 27-35.
10. J. V. Lambers, “Enhancement of Krylov Subspace Spectral Methods Using Block Lanczos Iteration”, *Electronic Transactions on Numerical Analysis* **31**, Special Volume on Computational Methods with Applications (2008), p. 86-109.
11. J. V. Lambers, “An Explicit, Stable, High-Order Spectral Method for the Wave Equation Based on Block Gaussian Quadrature”, *IAENG Journal of Applied Mathematics* **38**, Special Issue on the World Congress of Engineering (2008), p. 233-248.
12. T. Chen, M. Gerritsen, J. V. Lambers and L. J. Durlofsky, “Performance of Upscaling Methods on Irregular Grids”, *Computational Geosciences*, in press.
13. J. V. Lambers, “Krylov Subspace Spectral Methods for the Time-Dependent Schrödinger Equation with Non-Smooth Potentials”, *Numerical Algorithms*, in press.

## Refereed Conference Papers

1. J. V. Lambers, “Krylov Subspace Spectral Methods for Systems of Variable-Coefficient PDE”, *American Institute of Physics Conference Proceedings* **936**, Proceedings of the Fifth International Conference on Numerical Analysis and Applied Mathematics, Corfu, Greece (2007), p. 332-335.
2. J. V. Lambers, “Implicitly Defined High-Order Operator Splittings for Parabolic and Hyperbolic Variable-Coefficient PDE Using Modified Moments”, *Proceedings of the World Congress on Engineering*, London, 2008 (Winner, Best Paper Award, 2008 International Conference on Applied and Engineering Mathematics).
3. J. V. Lambers, “Enhancement of Krylov Subspace Spectral Methods Using Block Lanczos Iteration”, *American Institute of Physics Conference Proceedings*, Proceedings of the Sixth International Conference on Numerical Analysis and Applied Mathematics, Kos, Greece (2008), p. 347-350.
4. J. V. Lambers, “A Spectral Time-Domain Method for Computational Electrodynamics”, *Proceedings of the International Multiconference of Engineers and Computer Scientists*, Hong Kong (2009), p. 2111-2116.
5. J. V. Lambers, “Block Krylov Subspace Spectral Methods for Variable-Coefficient Elliptic PDE”, *Proceedings of the World Congress on Engineering*, London, 2009.
6. K. T. Chu, J. V. Lambers, “Using Optimal Time Step Selection to Boost the Accuracy of FD Schemes for Variable Coefficient PDEs”, *Proceedings of the World Congress on Engineering*, London, 2009.

## Non-refereed Conference Papers

1. J. V. Lambers, M. G. Gerritsen, “An Integration of Multilevel Local-Global Upscaling with Grid Adaptivity”, *Proceedings of the SPE Annual Technical Conference and Exhibition*, Dallas, 2005, SPE 97250.
2. M. G. Gerritsen, K. Jessen, B. T. Mallison, and J. V. Lambers, “A Fully Adaptive Streamline Framework for the Challenging Simulation of Gas-Injection Processes”, *Proceedings of the SPE Annual Technical Conference and Exhibition*, Dallas, 2005, SPE 97270.
3. M. G. Gerritsen, J. V. Lambers, and B. T. Mallison, “A Variable and Compact MPFA for Transmissibility Upscaling with Guaranteed Monotonicity”, *Proceedings of the 10th European Conference on the Mathematics of Oil Recovery*, Amsterdam, 2006.
4. J. V. Lambers, “Recent Advances in Krylov Subspace Spectral Methods”, *Proceedings in Applied Mathematics and Mechanics* **7**, No. 1, Proceedings of the Sixth International Congress on Industrial and Applied Mathematics, Zurich (2007), p. 2020143-2020144.
5. J. V. Lambers, “Recent Advances in Krylov Subspace Spectral Methods”, *International Journal on Pure and Applied Mathematics* **42**, No. 4, Proceedings of the Fourth International Conference on Applied Mathematics and Computing, Plovdiv, Bulgaria (2007), p. 495-500.
6. J. V. Lambers, M. G. Gerritsen, “Spatially-Varying Compact Multi-Point Flux Approximations for 3-D Adapted Grids with Guaranteed Monotonicity”, *Proceedings*

of the 2008 ASME International Mechanical Engineering Congress and Exposition, Boston, in press.

7. J. V. Lambers, M. G. Gerritsen, “Spatially-varying Compact Multi-point Flux Approximations for 3-D Adapted Grids with Guaranteed Monotonicity”, *Proceedings of the 11th European Conference on the Mathematics of Oil Recovery*, Bergen, 2008.
8. J. V. Lambers, M. G. Gerritsen, and D. Fragola, “Multiphase, 3-D Flow Simulation with Integrated Upscaling, MPFA Discretization, and Adaptivity”, *Proceedings of the SPE Reservoir Simulation Symposium*, The Woodlands, Texas, 2009, SPE 118983.
9. T. Chen, M. G. Gerritsen, L. J. Durlofsky, and J. V. Lambers, “Adaptive local-global VCMP methods for coarse-scale reservoir modeling”, *Proceedings of the SPE Reservoir Simulation Symposium*, The Woodlands, Texas, 2009, SPE 118994.
10. J. V. Lambers, “Implicitly Defined High-Order Operator Splittings for Parabolic and Hyperbolic Variable-Coefficient PDE Using Modified Moments”, *International Journal on Pure and Applied Mathematics* **50**, No. 2, Proceedings of the Fifth International Conference on Applied Mathematics and Computing, Plovdiv, Bulgaria (2009), p. 239-244.

### Submitted Papers

1. J. V. Lambers and M. Gerritsen, “Spatially-Varying Compact Multi-Point Flux Approximations for 3-D Adapted Grids with Guaranteed Monotonicity”, submitted.
2. J. V. Lambers, “A Spectral Time-Domain Method for Computational Electrodynamics”, submitted.

### Working Papers

1. P. Guidotti and J. V. Lambers, “De-blurring of Images Through Nonlinear Nonlocal Diffusion”, in preparation.
2. J. V. Lambers, M. G. Gerritsen, J. M. Kozdon and D. Fragola, “Multiphase, 3-D Flow Simulation with Integrated Upscaling, MPFA Discretization, and Adaptivity”, in preparation.
3. K. T. Chu and J. V. Lambers, “High-Order Accurate Finite Difference Schemes for Variable-Coefficient PDEs Via Optimal Time Step Selection”, in preparation.
4. J. V. Lambers, “Block Krylov Subspace Spectral Methods for Variable-Coefficient Elliptic PDE”, in preparation.
5. J. V. Lambers, “Approximating Diagonalization of Variable-Coefficient Differential Operators”, in preparation.

### Technical Reports

1. J. V. Lambers and J. R. Rice, *Numerical Quadrature for General Two-Dimensional Domains*, Purdue University Technical Report CSD-TR-91-067, 1991.
2. J. V. Lambers, *QUAD2D: A Two-Dimensional Quadrature Routine*, Purdue University Technical Report CSD-TR-91-069, 1991.
3. G. R. Kreiss, W. Sawyer, J. V. Lambers, et al. *Computation of Eigenvalues of Burgers Equation*, Swiss Scientific Computing Center Technical Report, 1992.

## Sponsored Research

P. Guidotti (PI) and J. V. Lambers (Senior Personnel), “Nonlinear Diffusions and Image Processing”, NSF Award 0712875, 07/15/2007-present

## Presentations

*Multiresolution Methods for Variable-Coefficient Initial Value Problems*, Midwest Numerical Analysis Day, University of Iowa, 1995

*Krylov Subspace Methods for Variable-Coefficient Initial-Boundary Value Problems*, Mathematics Colloquium, University of New Orleans, April 2003

*Krylov Subspace Spectral Methods for Variable-Coefficient Initial-Boundary Value Problems*, Southern California Applied Mathematics Symposium, Harvey Mudd College, April 2004

*Krylov Subspace Spectral Methods for Variable-Coefficient Initial-Boundary Value Problems*, SIAM Annual Meeting, Portland, July 2004

*An Integration of Multilevel Local-Global Upscaling with Grid Adaptivity*, Stanford University School of Earth Sciences Research Review, April 2005

*An Integration of Multilevel Local-Global Upscaling with Grid Adaptivity*, Stanford University Petroleum Research Institute Industrial Affiliates Meeting, May 2005

*Eigenvalue Characterization and Computation for the Laplacian on General Domains*, SIAM Annual Meeting, New Orleans, July 2005

*An Integration of Multilevel Local-Global Upscaling with Grid Adaptivity*, Society of Petroleum Engineers Annual Technical Conference and Exhibition, October 2005

*Eigenvalue Characterization and Computation for the Laplacian on General Domains*, and its Application to Inverse Spectral Problems, AMS/MAA Joint Annual Meeting, San Antonio, January 2006

*A Multi-Pronged Research Strategy for Numerical Solution of Variable-Coefficient PDE: Recent Successes and Upcoming Challenges*, CCT Computing the Future Seminar Series, Louisiana State University, April 2006

*Diagonalizing Similarity Transformations for Variable-Coefficient Differential Operators*, AMS Western Section Meeting, San Francisco, April 2006

*Adaptive Pressure Solves: on Specialized Upscaling and Faults*, Stanford University Petroleum Research Institute Industrial Affiliates Meeting, May 2006

*Diagonalizing Similarity Transformations for Variable-Coefficient Differential Operators*, SIAM Conference on Analysis of PDE, Boston, July 2006

*Krylov Subspace Spectral Methods for Conservation Laws*, SIAM Annual Meeting, Boston,

July 2006

*Derivation of High-Order Methods for Time-Dependent PDE using Modified Moments*, GAMM-SIAM Applied Linear Algebra Meeting, Dusseldorf, July 2006 (minisymposium co-organizer, “Applications of Moments”)

*Transmissibility upscaling with compact, spatially varying multi-point flux stencils*, SIAM Conference on Mathematical and Computational Issues in the Geosciences, Santa Fe, March 2007

*The Evolution of Krylov Subspace Spectral Methods (Or: How the Ideas of Gene Golub and Joe Olinger Collided)*, Stanford 50 Conference, March 2007 (as winner of poster competition)

*Stability of Krylov Subspace Spectral Methods*, AMS Western Section Meeting, Tucson, April 2007

*Transmissibility upscaling on Adapted Grids for Gas Injection Processes*, Summer School on Multiscale Modeling and Simulation in Science, Stockholm, June 2007

*Recent Advances in Krylov Subspace Spectral Methods*, ICOSAHOM 07, Beijing, June 2007

*Recent Advances in Krylov Subspace Spectral Methods*, ICIAM '07, Zurich, July 2007

*Recent Advances in Krylov Subspace Spectral Methods*, 4th International Conference of Applied Mathematics and Computing, Plovdiv, Bulgaria, August 2007

*Stability of Krylov Subspace Spectral Methods*, Harrachov 07 (Computational Methods with Applications), Harrachov, Czech Republic, August 2007

*Krylov Subspace Spectral Methods for Systems of Variable-Coefficient PDE*, ICNAAM '07, Corfu, Greece, September 2007

*Krylov Subspace Spectral Methods for Hyperbolic Systems*, SIAM Conference on Analysis of PDE, Phoenix, December 2007

*Implicitly Defined High-Order Operator Splittings for Time-Dependent Variable-Coefficient PDE Using Modified Moments*, BASCD '08, Berkeley, March 2008

*Robust Computation of Off-Diagonal Elements of Functions of Matrices*, Householder '08, Berlin, Germany, June 2008

*Matrices, Moments, and Quadrature...and now, PDE!*, FoCM '08, Hong Kong, June 2008

*Implicitly Defined High-Order Operator Splittings for Time-Dependent Variable-Coefficient PDE Using Modified Moments*, World Congress on Engineering, London, July 2008

*Enhancement of Krylov Subspace Spectral Methods by Block Lanczos Iteration*, SIAM Annual Meeting, San Diego, July 2008

*Two Novel Nonlocal Nonlinear Diffusions for Image Denoising II*, SIAM Conference on Imaging Science, San Diego, July 2008

*Implicitly Defined High-Order Operator Splittings for Time-Dependent Variable-Coefficient PDE Using Modified Moments*, 5th International Conference of Applied Mathematics and Computing, Plovdiv, Bulgaria, August 2008

*Spatially-varying Compact Multi-point Flux Approximations for 3-D Adapted Grids with Guaranteed Monotonicity*, ECMOR XI, Bergen, September 2008

*Enhancement of Krylov Subspace Spectral Methods by Block Lanczos Iteration*, ICNAAM '08, Kos, Greece, September 2008

*Spatially-varying Compact Multi-point Flux Approximations for 3-D Adapted Grids with Guaranteed Monotonicity*, ASME Congress, Boston, November 2008

*A Spectral Time-Domain Method for Computational Electrodynamics*, 3rd International Conference on Scientific Computing and Differential Equations, Hong Kong, December 2008

*Multiphase, 3-D Flow Simulation with Integrated Upscaling, MPFA Discretization, and Adaptivity*, SPE Reservoir Simulation Symposium, The Woodlands, Texas, February 2009

*A Spectral Time-Domain Method for Computational Electrodynamics*, International Multi-conference of Engineers and Computer Scientists, Hong Kong, March 2009

*Upscaling for Multiphase Flow on 3-D Adapted Grids*, SIAM Conference on Mathematical and Computational Issues in the Geosciences, Leipzig, June 2009

*A Spectral Time-Domain Method for Computational Electrodynamics*, ENUMATH, Uppsala, June 2009

*Block Krylov Subspace Spectral Methods for Variable-Coefficient Elliptic PDE*, World Congress on Engineering, London, July 2009

*A Spectral Time-Domain Method for Computational Electrodynamics*, SIAM Annual Meeting, Denver, July 2009

*Multiphase Flow Simulation with Integrated Upscaling, MPFA Discretization, and Adaptivity*, IMACS, Athens, Georgia, August 2009

## **Honors and Awards**

- Winner, Best Paper Award, 2008 International Conference on Applied and Engineering Mathematics, World Congress of Engineering
- Winner, Junior Scientist Category, Stanford 50 Conference Poster Competition, 2007
- Professor of the Month, UCI Campus Village, December 2004

- Professor Recognition, Delta Delta Delta, UC Irvine chapter, May 2004
- Teacher of the Month, Kappa Alpha Delta, UC Irvine chapter, February 2004
- Professor Recognition, Pi Beta Phi, UC Irvine chapter, Fall quarter 2003
- NSF Graduate Research Fellowship, 1991
- 100 Outstanding Seniors of Purdue, 1991
- Science-4000 Scholarship, Purdue University School of Science, 1987

### **Professional Memberships**

- American Mathematical Society
- Society for Industrial and Applied Mathematics
- Society of Petroleum Engineers
- Mathematical Association of America

### **Professional Service**

- Doctoral Dissertation Oral Examination Committee, Paul Constantine, Institute for Computational and Mathematical Engineering, Stanford University, 2009
- Reviewer, Computational and Applied Mathematics, 2009-
- Doctoral Dissertation Reading Committee, Tianhong Chen, Department of Energy Resources Engineering, Stanford University, 2008
- Reviewer, SPE Reservoir Evaluation and Engineering, 2008-
- Reviewer, Transactions on Image Processing, 2008-
- Reviewer, SIAM Review, 2008-
- Reviewer, Transactions on Signal Processing, 2008-
- Organizing Committee, “Symposium on Gene Golub’s Legacy”, Stanford, March 1, 2008
- Organizing Committee, “Remembrances in Celebration of Gene Golub”, Stanford, February 29, 2008
- Reviewer, International Journal on Computational Science, 2008-
- Reviewer, Water Resources Research, 2006-
- Reviewer, Mathematical Reviews, 2006-
- Reviewer, Journal of Computational Physics, 2005-
- Reviewer, World Scientific Publishing, 2004
- Reviewer, Houghton-Mifflin Co., 2004
- SIAM Web Committee, 2002-
- Author of Finding an Academic Job for SIAM web site, Student section