

SIGAL GOTTLIEB

- CONTACT INFORMATION University of Massachusetts Dartmouth (401) 339-5010
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285 Old Westport Road
North Dartmouth MA 02747 USA
- EDUCATION Brown University, Providence Rhode Island:
1998 Ph.D. in Applied Mathematics, *Chi-Wang Shu, Advisor*
1995 Sc.M. in Applied Mathematics
1993 Sc.B. with honors in Applied Mathematics, *Magna Cum Laude*
- CURRENT APPOINTMENTS 7/1/2017 – present: Deputy Director, NSF ICERM, Brown University
NSF Institute for Computational and Experimental Research in Mathematics
1/1/2013 – present: Founding Director, CSCVR at UMass Dartmouth
Center for Scientific Computing and Visualization Research
9/1/2008 – present: Professor of Mathematics, UMass Dartmouth
9/1/2008 – present: Visiting Professor, Division of Applied Mathematics,
Brown University, Providence RI
- APPOINTMENT HISTORY 9/1/2004 - 8/31/2008 Associate Professor
9/1/1999 - 8/31/2004 Assistant Professor
Department of Mathematics, University of Massachusetts Dartmouth
- PEER REVIEWED PUBLICATIONS L. Isherwood, S. Gottlieb, Z. Grant, “Strong Stability Preserving Integrating Factor Runge–Kutta Methods.” *Submitted* (2017).
S. Conde, S. Gottlieb, Z. Grant, J.N. Shadid, “Implicit and Implicit-Explicit Strong Stability Preserving Runge–Kutta Methods with High Linear Order.” *Journal of Scientific Computing* (2017) **73(2)**: pp. 667-690.
A. Ditkowski and S. Gottlieb, “Error Inhibiting Block One-step Schemes for Ordinary Differential Equations.” *Journal of Scientific Computing* (2017) **73(2)**: pp. 691-711.
C. Bresten, S. Gottlieb, Z. Grant, D. Higgs, D.I. Ketcheson, and A. Nemeth, “Explicit strong stability preserving multistep Runge-Kutta methods.” *Mathematics of Computation* (2017), **86**: pp. 747-769.
B. Dong, S. Gottlieb, Y. Hristova, Y. Jiang, and H. Wang, “The Effect of the Sensitivity Parameter in Weighted Essentially Non-Oscillatory Methods.” *Topics in Numerical Partial Differential Equations and Scientific Computing*, Editor S. Brenner, The IMA Volumes in Mathematics and its Applications. Springer International Publishing Switzerland (2016).
A.J. Christlieb, S. Gottlieb, Z. Grant, and D. C. Seal, “Explicit Strong Stability Preserving Multistage Two-Derivative Time-Stepping Schemes.” *Journal of Scientific Computing* (2016) **68(3)**: pp.914-942.
Y. Chen, S. Gottlieb, A. Heryudono and A. Narayan, “A Reduced Radial Basis Function Method for Partial Differential Equations on irregular domains”. *Journal of Scientific Computing* (2016) 66(1):67-90
S. Gottlieb, “Strong Stability Preserving Time Discretizations: A Review.” *Spectral and High Order Methods for Partial Differential Equations ICOSAHOM 2014* editors R. Kirby, M. Berzins, and J. S. Hesthaven, Volume 106 of Lecture Notes in Computational Science and Engineering, pp. 17-30. Springer International (2015).

- S. Gottlieb, Z. Grant, and D. Higgs, "Optimal Explicit Strong Stability Preserving Runge–Kutta Methods with High Linear Order and optimal Nonlinear Order." *Mathematics of Computation* (2015) 84: 2743-2761.
- K. Cheng, W. Feng, S. Gottlieb, and C. Wang. "A Fourier Pseudospectral Method for the "Good" Boussinesq Equation with Second Order Temporal Accuracy". *Numerical Methods for Partial Differential Equations* (2015) 31 (1), 202-22.
- Y. Chen, S. Gottlieb, and Y. Maday, "Parametric Analytical Preconditioning and its Applications to the Reduced Collocation Methods". *Comptes Rendus Mathématique* (2014) 352(7-8):661-666.
- Y. Chen and S. Gottlieb, "Reduced Collocation Methods: Reduced Basis Methods in the Collocation Framework." *Journal of Scientific Computing* (2013) **55**(3), pp. 718–737.
- S. Gottlieb, F. Tone, C. Wang, X. Wang, and D. Wirosoetisno, "Long time stability of a classical efficient scheme for two dimensional Navier-Stokes equations." *SIAM Journal on Numerical Analysis* (2012) **50**, pp. 126-150
- S. Gottlieb and C. Wang, "Stability and convergence analysis of fully discrete Fourier collocation spectral method for 3-D viscous Burgers' equation." *Journal of Scientific Computing* (2012) **53**(1), pp. 102-128.
- D.I. Ketcheson, S. Gottlieb, and C. B. Macdonald, "Strong stability preserving two-step Runge-Kutta methods." *SIAM Journal on Numerical Analysis*. (2012) 49, pp. 2618-2639.
- S. Gottlieb, J.-H. Jung, and S. Kim, "Iterative adaptive RBF methods for detection of edges in two dimensional functions." *Applied Numerical Mathematics*. (2011) 61(1), pp. 77-91.
- S. Gottlieb, J.-H. Jung, and S. Kim, "A review of David Gottlieb's work on the resolution of the Gibbs phenomenon" *Communications in Computational Physics* 9 (2011), pp. 497-519.
- J.-H. Jung, S. Gottlieb, S. O. Kim, C. L. Bresten and D. Higgs, "Recovery of High Order Accuracy in Radial Basis Function Approximations of Discontinuous Problems." *Journal of Scientific Computing*, (2010) 45(1-3), pp. 359–381.
- D. Gottlieb and S. Gottlieb "Spectral methods". *Scholarpedia*, (2009) 4(9):7504.
- S. Gottlieb, D. Ketcheson, and C.-W. Shu "High Order Strong Stability Preserving Time Discretizations." *Journal of Scientific Computing* , vol **38**, No. 3 (2009), pp. 251–289.
- J.-H. Jung and S. Gottlieb, "On the Numerical Implementation of spectral Galerkin Penalty Methods." *Communications in Computational Physics* vol. **5**, No. 2-4, (2009) pp. 600-619
- D. Ketcheson, C. Macdonald, and S. Gottlieb, "Optimal implicit strong stability preserving Runge-Kutta methods." *Applied Numerical Mathematics*, vol. **59**, No. 2, (2009) pp. 373-392.
- C. Macdonald, S. Gottlieb, and S. J. Ruuth, "A numerical study of diagonally split Runge–Kutta methods for PDEs with discontinuities." *Journal of Scientific Computing* vol, **36**, No. 1 (2008) , pp. 89-112.
- R. Archibald, A. Gelb, S. Gottlieb and J. Ryan, "One-sided post-processing for the Discontinuous Galerkin Method Using ENO-type stencil choice and the Edge Detection Method." *Journal of Scientific Computing* vol. **28** (2006), pp.167-190.
- S. Gottlieb, D. Gottlieb and C.-W. Shu, "Recovering High Order Accuracy in WENO Computations of Steady State Hyperbolic Systems" *Journal of Scientific Computing* vol. **28** (2006), pp.307-318.

- S. Gottlieb and S. J. Ruuth, "Optimal strong-stability-preserving time-stepping schemes with fast downwind spatial discretizations." *Journal of Scientific Computing* **vol. 27** (2006), pp. 289-304.
- S. Gottlieb, J. S. Mullen and S. J. Ruuth, "A fifth order flux-implicit WENO method." *Journal of Scientific Computing* **vol. 27** (2006), pp. 271-288.
- S. Gottlieb, "On High Order Strong Stability Preserving Runge-Kutta and Multi Step Time Discretizations." *Journal of Scientific Computing* **vol. 25** (2005), pp. 105-128.
- D. Gottlieb and S. Gottlieb, "Spectral Methods for Compressible Reactive Flows" *Comptes Rendus Mecanique* **333** (2005), pp. 3-16.
- D. Gottlieb and S. Gottlieb, "Spectral Methods for Discontinuous Problems." *Proceedings 20th biennial Conference on Numerical Analysis*, D.F. Griffiths and G. A. Watson, editors. University of Dundee Numerical Analysis Report NA/217 (2003).
- S. Gottlieb and L.-A. J. Gottlieb, "Strong Stability Preserving Properties of Runge-Kutta Time Discretization Methods for Linear Constant Coefficient Operators" *Journal of Scientific Computing* **18 (1)** (2003), pp. 89-109.
- S. Gottlieb, C.W. Shu and E. Tadmor, "Strong Stability Preserving High Order Time Discretization Methods." *SIAM review* **vol. 43 no. 1** (2001), pp. 89-112
- P.F. Fischer and S. Gottlieb, "Solving $Ax = b$ using a modified conjugate gradient method based on the roots of A ." *Journal of Scientific Computing* **vol. 15 no. 4** (2000), pp.441-456.
- S. Gottlieb and C.W. Shu, "Total Variation Diminishing Runge-Kutta Schemes." *Mathematics of Computation* **vol. 67** (1998), pp.73-85.
- P. F. Fischer and S. Gottlieb "A Modified Conjugate Gradient Method for the Solution of $Ax = b$." *Journal of Scientific Computing* **vol. 13 no. 2** (1998), pp.173-183.
- C.R. Johnson, I.M. Spitkovsky and S. Gottlieb "Inequalities Involving the Numerical Radius." *Linear and Multilinear Algebra* **vol. 37** (1994), pp.13-24.

BOOKS

- Jan S. Hesthaven, Sigal Gottlieb, David Gottlieb *Spectral Methods for Time Dependent Problems*. Cambridge Monographs on Applied and Computational Mathematics (No. 21) Cambridge University Press (2006). ISBN 0521792118
- Sigal Gottlieb, David Ketcheson and Chi-Wang Shu *Strong Stability Preserving Runge-Kutta and Multistep Time Discretizations*. World Scientific Press. January 2011. ISBN 978-981-4289-26-9

BOOK CHAPTERS

- S Gottlieb and D.I. Ketcheson "Time discretization techniques." Chapter 21 in *Handbook of Numerical Methods for Hyperbolic Problems*, pp. 549-583. Editors: Remi Abgrall and Chi-Wang Shu. Volume 17 of the Handbook of Numerical Analysis, Elsevier (2016).
- A. Gelb and S. Gottlieb, "The Resolution of the Gibbs Phenomenon for Fourier Spectral Methods." Chapter 7 in *Advances in The Gibbs Phenomenon with Detailed Introduction*, Abdul J. Jerri, Editor, Σ Sampling Publishing, Potsdam, New York (2007), ISBN 0967301-0-8.

REFEREED CONFERENCE PROCEEDINGS

- S. Gottlieb and J. S. Mullen, " An Implicit WENO Scheme for Steady-State Computation of Scalar Hyperbolic Equations" in **Computational Fluid and Solid Mechanics 2003** (ed. **K.J. Bathe**) , (2003) *Proceedings Second MIT Conference on Computational Fluid and Solid Mechanics June 17-20, 2003* Pages 1946-1950.

U. Qidwai and S. Gottlieb, “An efficient hole-filling algorithm for c-scan enhancement.” Review of the progress in Quantitative Nondestructive Evaluation (RQNDE), Maine, 2001.

OTHER
PUBLICATIONS

S. Gottlieb and D. Gottlieb, Review of “Spectral Methods for Incompressible Viscous Flow” by Roger Payret, *SIAM Review* **vol. 45** (2003), pp.147-148
D. Gottlieb and S. Gottlieb, Review of “High-Order Methods for Incompressible Fluid Flow” by M.O. Deville, P.F. Fischer and E.H. Mund., *Mathematics of Computation* **vol. 73** (2003), pp. 1039-1040

SELECTED
RESEARCH GRANTS

co-PI with Yanlai Chen on NSF grant DMS-1719698 “Rigorous Development of an Efficient Reduced Collocation Approach for High-Dimensional Parametric Partial Differential Equations” August 1, 2017– July 31, 2020 for \$158,494.
PI on AFOSR grant FA9550-15-1-0235 “High Order Strong Stability Time Discretizations Beyond the Method-of-Lines Framework” July 1, 2015 – June 30, 2018 for \$271,299.
PI on AFOSR grant FA9550-12-1-0224 “Tailoring High Order Time Discretizations for use with spatial discretizations of hyperbolic PDEs” May 1, 2012 – April 30, 2015 for \$248,636.
PI on King Abdullah University of Science and Technology (KAUST) Award No. FIC/2010/05, “Positive Numerical Solutions of ODEs.” October 2010-October 2013, for a total of \$202,362.34.
Co-PI with Saeja Kim on award number NSF DMS-1040883 NSF/CBMS Regional Conference in the Mathematical Sciences.” Radial Basis Functions: Mathematical Developments and Applications.” December 2010-November 2011, for a total of \$35,000.
PI on AFOSR grant FA9550-09-1-0208 “High Order Strong Stability Preserving Time Discretizations for the Time Evolution of Hyperbolic Partial Differential Equations.” March 2009-December 2011, for a total of \$148,187.
PI on AFOSR DURIP grant FA9550-10-1-0354 “A Heterogeneous Terascale Computing Cluster for the Development of GPU Optimized High Order Numerical Methods.” July 15, 2010-July 14, 2011 for a total of \$199,800.
co-PI on NSF grant CNS-0959382 “MRI-R2 : Acquisition of a Heterogenous Terascale Shared Campus Computing Facility.” June 1, 2010- May 31, 2011 for a total of \$199,480.
PI on NSF grant DMS- 0802974 “RUI: CSUMS: Research in Scientific Computing in Undergraduate Education (RESCUE).” September 2008-August 2011 for a total of \$788,985 .
Co-PI with Chi-Wang Shu (Brown University) on NSF grant DMS-0940863 “International Conference on Advances in Scientific Computing.” October 2009-September 2010 for a total of \$19,686.
Co-PI with Jae-Hun Jung on NSF grant DMS-0608844 “RUI: Adaptive High Order Methods for Solution of PDEs.” August 2006 - July 2010 for a total of \$197,713.
PI on AFOSR grant FA9550-0610255 “Implicit High Order Strong Stability Preserving Runge-Kutta Time Discretizations.” March 2006-December 2008, for a total of \$98,005.
PI on NSF grant DMS-0106743 “Development of Numerical Methods for Semiconductor Device Simulation and Electron Microscopy.” August 2001- August 2003 for a total of \$50,000.

SELECTED INVITED
PRESENTATIONS

Lecture on “Strong Stability Preserving Time Discretizations” at the *Mathematics, Computing, and Design – Where Analysis and Creativity Combine* Symposium in Honor of A. Jameson’s 80th birthday, Stanford University Nov. 20-21, 2014.
Plenary Lecture on “Strong Stability Preserving Time Discretizations” at ICOSA-HOM, June 23-27, 2014, Salt Lake City, Utah.

Workshop talk on “Strong Stability Preserving Time Discretizations” at The Statistical and Applied Mathematical Sciences Institute (SAMSI) Interface Problems Workshop November 15th, 2007 in Research Triangle Park, NC.

Lecture on “SSP Runge-Kutta Time Discretizations” at the AFOSR workshop on “Advances and Challenges in Time-Integration of PDE’s” at Brown University in August 2003.

PROFESSIONAL
ACTIVITIES

2007–present: Associate editor of *Journal of Scientific Computing*.

2010–present: Associate editor of *SIAM Journal of Numerical Analysis*.

2012–2017: Associate editor of *Applied Numerical Mathematics*.

2011–present: Member of SIAM Education Committee.

2012–2014: Member of the Association for Women in Mathematics (AWM) Conference Committee.

2015–2017: Member of the Association for Women in Mathematics (AWM) Research Networks Committee.

2015–2017: Member of the Association for Women in Mathematics (AWM) Research Collaborative Conference for Women Committee.

Reviewed proposals for AFOSR, NSF, and NSERC

CONFERENCE
ORGANIZATION

Organized the Massachusetts High Performance Computing (HPC) Day on May 25, 2017 at UMass Dartmouth.

Co-organized the “Frontiers in Applied and Computational Mathematics” conference in honor of Chi-Wang Shu’s 60th birthday, January 4-6, 2017 at ICERM, Brown University.

Organized the Massachusetts High Performance Computing (HPC) Day on May 17, 2016 at UMass Dartmouth.

Organized the first UMass High Performance Computing (HPC) Day on November 14, 2014 at UMass Dartmouths ATMC.

Co-organized (with Adi Ditkowsky) the “International conference on advances in the analysis and numerical analysis of partial differential equations in Honor of Saul Abarbanel’s 80th birthday, June 27-28, 2011 at Tel Aviv University.

Co-organized (with UMass colleagues) the CBMS conference on Radial Basis Functions: Mathematical Developments and Applications June 20-24, 2011

Co-organized (with Jan Hesthaven and Chi-Wang Shu) a conference in memory of David Gottlieb in December 2009 at Brown University.