Timo Heister: Curriculum Vitae

Email:	heister@clemson.edu
Homepage:	http://www.clemson.edu/~heister/
Phone:	+1 (864) 3052-8613
Born:	December 30th, 1983 in Hannover, Germany
Nationality:	German
Address:	Mathematical and Statistical Sciences, O-110 Martin Hall, Clemson University, Clemson, SC 29634-0975

Education

2008 – 2011	PhD in Science (Dr. rer. nat.), University of Göttingen, Germany - "magna cum laude"
2003 – 2008	Diploma in Mathematics, University of Göttingen, Germany

Appointments

2018 –	Associate Professor with tenure, School of Mathematical and Statistical Sciences, Clemson University
2018 – 2019	Assistant Professor, University of Utah, Department of Mathematics
2013 – 2018	Assistant Professor, Department of Mathematical Sciences, Clemson University
2011 – 2013	Visiting Assistant Professor, Department of Mathematics, Texas A&M University
2008 – 2011	Research Assistant, University of Göttingen, Germany

Related Professional Experience

2012 –	Maintainer of the deal.II software project: http://www.dealii.org
2007	Teaching Assistant, University of Göttingen, Germany
2003 – 2008	Software Developer (.net), Meier Consult, Braunschweig, Germany
2001 – 2003	Software Developer (C++), Exortus Software GmbH, Letter, Germany

Awards

2016/2017	Mathematical Sciences Departmental Teaching Award, Clemson University
2011 – 2013	Postdoctoral Fellowship, Institute for Applied Mathematics and Computational Science (IAMCS) through King Abdullah University of Science and Technology (KAUST)
2009 – 2011	Associated Fellow of the Research Training Group 1023: Identification in Mathematical Models: Synergy of Stochastic and Numerical Methods (German Research Foundation, DFG)

Support

→ since 2013: **1.9 million USD** in 7 NSF awards/subawards, **125k USD** Navy SBIR

2024 – 2027	Subaward from UC Davis "Computational Infrastructure for Geodynamics", PI: $ 60,000 (to be awarded)
2022 – 2023	additional funding "Computational Infrastructure for Geodynamics" (subaward from NSF-funded research center at UC Davis) PI: $ 15,000
2020 – 2021	additional funding "Innovative Multi-scale/Multi-physics based Tool for Predicting Fatigue Crack Initiation and Propagation in Aircraft Structural Components using Phase Field Model Technique" with Technical Data Analysis, Inc, PI, $26,091
2020 – 2021	additional funding "Computational Infrastructure for Geodynamics" (subaward from NSF-funded research center at UC Davis) PI: $ 61,819
2019 – 2024	Collaborative Research: Development and Application of a Framework for Integrated Geodynamic Earth Models, NSF EAR-1925575 PI: $ 393,570 (joint proposal, total $2.48m)
2019 – 2020	"Computational Infrastructure for Geodynamics" (subaward from NSF-funded research center at UC Davis) PI: $ 102,040
2018 – 2023	Collaborative Research: Frameworks: Software: Future Proofing the Finite Element Library Deal.II – Development and Community Building - NSF OAC-2015848, PI: $700,000, (joint with W. Bangerth at CSU, total $1,500,000) (former OAC-1835452, OAC-1902308)
2018 – 2021	Collaborative Research: Efficient Coupling of Multilevel Partial Differential Equation Solvers and Advanced Sampling Methods - DMS-1901529, PI: $80,000, joint with W. Bangerth, total $260,000 (former DMS-1820958)
2018 – 2020	"Innovative Multi-scale/Multi-physics based Tool for Predicting Fatigue Crack Initiation and Propagation in Aircraft Structural Components using Phase Field Model Technique" with Technical Data Analysis, Inc (US Navy SBIR), PI, $99,297
2018-2019	"Computational Infrastructure for Geodynamics" (subaward from NSF-funded research center at UC Davis), at University of Utah, PI: $77,648
2016 – 2018	"Computational Infrastructure for Geodynamics" (subaward from NSF-funded research center at UC Davis) PI: $91,322
2015 – 2018	National Science Foundation, DMS1522191/1522192, "Collaborative Research: Variational Structure Preserving Methods for Incompressible Flows: Discretization, Analysis, and Parallel Solvers", co-PI, $117,390, 2015-2018 (PI in Clemson: Leo Rebholz, PI at UofH: Maxim Olshanskii, total $324,780)
2015 – 2016	Extension with additional funding: "Geoinformatics: Facility Support: Computational Infrastructure for Geodynamics" (subaward from NSF-funded research center at UC Davis), PI: $22,000
2014	Workshop funding for the ASPECT Hackathon 2014 at Texas A&M, funded by CIG through UC Davis, together with W. Bangerth, $20,000.
2013	Post-CIDER 2012 project "BurnMan", with S. Cottaar, I. Rose, C. Unterborn, $5,000, 2013/2014
2013 – 2015	"Geoinformatics: Facility Support: Computational Infrastructure for Geodynamics" (subaward from NSF-funded research center at UC Davis), PI, $140,000

2012	Post-CIDER 2012 project "BurnMan", with S. Cottaar, I. Rose, C. Unterborn, $3,000, 2012/2013
2013	IAMCS Innovation Award: "Simulating chemically reactive, laminar flow" with Wolfgang Bangerth, Markus Bürg, and Fabrizio Bisetti ($25,000 + $15,000 for travel)
2012	IAMCS Innovation Award: "Simulating chemically reactive, laminar flow" with Wolfgang Bangerth and Fabrizio Bisetti ($25,000 + $15,000 for travel)

Activities

2022	Member of the organizing team of the 2022 ASPECT hackathon (online), May
2022	online ASPECT workshop organizer, January
2015 –	Member of the Clemson Computational Advisory Team (CU CAT)
2021	Member of the organizing team of the 2021 ASPECT hackathon (online), July
2021	deal.II hackathon and workshop organizer, June
2020	Member of the organizing team of the 2020 ASPECT hackathon (online), August
2020	deal.II hackathon and workshop organizer, May (online)
2020	online ASPECT workshop organizer, January
2018	Member of the organizing team of the 6th deal.II workshop in Trieste, Italy July 2018
2018	Member of the organizing team of the 2018 ASPECT hackathon, Petaluma, CA, June 2018
2017	Member of the organizing team of the 2017 ASPECT Hackathon in Blue Ridge, GA, May 2017
2016	Scientific committee, PDESoft 2016, Warwick, UK, July 4-8, 2016
2016	Member of the organizing team of the 2016 ASPECT Hackathon at Lake Tahoe, CA, June 24-July 2, 2016
2015	Member of the organizing team of the 2015 ASPECT Hackathon in Bodega Bay, CA, May 19-30, 2015
2015	help with the 2015 Clemson Calculus Challenge
2014	Member of the organizing team of the 2014 ASPECT Hackathon in College Station, TX, May 14-23
2013	Member of the organizing team of the deal.II Workshop 2013 in College Station, TX, August 19-23
2013	Member of the working group "Computational Science" for CIG (Computational Infrastructure for Geodynamics), starting April 2013
2012	Member of the organizing team of the deal.II Workshop 2012 in Heidelberg, Germany, August 6-10
2010	Member of the organizing team of the deal.II Workshop 2010 in Heidelberg, Germany, August 23-27

Publications

Articles about my Work

[1] Schmitt, L.
Clemson mathematician helps deepen understanding of Earth's mysterious mantle. online.

https://newsstand.clemson.edu/mediarelations/clemson-mathematician-helps-deepen-understanding-of-earths-mysterious-mantle/.
Jan. 2020.

[2] Cary, N. *Clemson, Furman professors done with pricey textbooks.* Greenville News. http://www.greenvilleonline.com/story/news/local/2015/07/01/clemson-furman-professors-done-pricey-textbooks/29587417/.
July 2015.

[3] Patel, V. Researchers Turn to Texas A&M Software to Visualize Earth's Interior. *College of Science, Texas A&M University, News & Events* (2013).

[4] Patel, V. Texas A&M Researcher Receives $1.3 Million to Make Supercomputing Easier. *College of Science, Texas A&M University, News & Events* (2013).

Papers in Refereed Journals

[5] Munch, P., Heister, T., Saavedra, L. P., and Kronbichler, M. Efficient distributed matrix-free multigrid methods on locally refined meshes for FEM computations. *accepted for publication in ACM Transactions on Parallel Computing* (2022).

[6] Arndt, D. et al. The `deal.II` Library, Version 9.4. *Journal of Numerical Mathematics* 30, 3 (2022), 231–246.

[7] Heister, T., Mang, K., and Wick, T. Schur-type preconditioning of a phase-field fracture model in mixed form. *PAMM* 21, 1 (Dec. 2021).

[8] Arndt, D. et al. The `deal.II` Library, Version 9.3. *Journal of Numerical Mathematics* 29, 3 (2021), 171–186.

[9] Clevenger, T. C. and Heister, T. Comparison Between Algebraic and Matrix-free Geometric Multigrid for a Stokes Problem on an Adaptive Mesh with Variable Viscosity. *Numerical Linear Algebra with Applications* (Mar. 2021).

[10] Arndt, D. et al. The deal.II finite element library: design, features, and insights. *Computers & Mathematics with Applications* 81 (2021), 407–422. ISSN: 0898-1221.

[11] Heister, T. and Wick, T. pfm-cracks: A parallel-adaptive framework for phase-field fracture propagation. *Software Impacts* (Nov. 2020), 100045.

[12] Clevenger, T. C., Heister, T., Kanschat, G., and Kronbichler, M. A Flexible, Parallel, Adaptive Geometric Multigrid Method for FEM. *ACM Trans. Math. Softw.* 47, 1 (Dec. 2020).

[13] Schröder, J. et al. A Selection of Benchmark Problems in Solid Mechanics and Applied Mathematics. *Archives of Computational Methods in Engineering* (2020).

[14] Arndt, D. et al. The `deal.II` Library, Version 9.2. *Journal of Numerical Mathematics* 28, 3 (2020), 131–147.

[15] Wang, F., Marshak, N., Usher, W., Burstedde, C., Knoll, A., Heister, T., and Johnson, C. R. CPU Ray Tracing of Tree-Based Adaptive Mesh Refinement Data. *Computer Graphics Forum* (2020).

[16] Gassmöller, R., Dannberg, J., Bangerth, W., Heister, T., and Myhill, R.
On Formulations of Compressible Mantle Convection.
Geophysical Journal International 221, 2 (Feb. 2020), 1264–1280. ISSN: 0956-540X.

[17] Arndt, D. et al. The `deal.II` Library, Version 9.1.
Journal of Numerical Mathematics 27, 4 (2019), 203–213.

[18] Dannberg, J., Gassmöller, R., Grove, R., and Heister, T.
A new formulation for coupled magma/mantle dynamics.
Geophysical Journal International 219, 1 (May 2019), 94–107. ISSN: 0956-540X.

[19] Kellogg, L. H., Hwang, L. J., Gassmöller, R., Bangerth, W., and Heister, T. The Role of Scientific Communities in Creating Reusable Software: Lessons from Geophysics.
Computing in Science Engineering 21, 2 (Mar. 2019), 25–35. ISSN: 1521-9615.

[20] Charnyi, S., Heister, T., Olshanskii, M. A., and Rebholz, L. G. Efficient discretizations for the EMAC formulation of the incompressible Navier-Stokes equations.
Applied Numerical Mathematics 141 (July 2019), 220–233.

[21] Heister, T. and Wick, T. Parallel solution, adaptivity, computational convergence, and open-source code of 2d and 3d pressurized phase-field fracture problems.
Proc. Appl. Math. Mech. 18, 1 (2018), e201800353.

[22] Davydov, D., Heister, T., Kronbichler, M., and Steinmann, P.
Matrix-Free Locally Adaptive Finite Element Solution of Density-Functional Theory With Nonorthogonal Orbitals and Multigrid Preconditioning. *physica status solidi (b)* 0, 0 (2018).

[23] Alzetta, G. et al. The `deal.II` Library, Version 9.0.
Journal of Numerical Mathematics 26, 4 (2018), 173–183.

[24] Heister, T., Dannberg, J., Gassmöller, R., and Bangerth, W.
High Accuracy Mantle Convection Simulation through Modern Numerical Methods. II: Realistic Models and Problems. *Geophysical Journal International* 210, 2 (2017), 833–851.

[25] Arndt, D. et al. The `deal.II` Library, Version 8.5.
Journal of Numerical Mathematics 25, 3 (2017), 137–146.

[26] Charnyi, S., Heister, T., Olshanskii, M. A., and Rebholz, L. G.
On conservation laws of Navier-Stokes Galerkin discretizations.
Journal of Computational Physics 337 (2017), 289–308. ISSN: 0021-9991.

[27] Rose, I., Buffett, B., and Heister, T.
Stability and accuracy of free surface time integration in viscous flows.
Physics of the Earth and Planetary Interiors 262 (2017), 90–100. ISSN: 0031-9201.

[28] Dannberg, J. and Heister, T.
Compressible magma/mantle dynamics: 3D, adaptive simulations in ASPECT.
Geophysical Journal International 207, 3 (2016), 1343–1366.

[29] Heister, T., Mohebujjaman, M., and Rebholz, L. G.
Decoupled, unconditionally stable, higher order discretizations for MHD flow simulation.
J Sci Comput 71 (1 2017), 1–23. ISSN: 1573-7691.

[30] Bangerth, W. et al. The `deal.II` Library, Version 8.4.
Journal of Numerical Mathematics 24, 3 (2016), 135–141.

[31] Heister, T., Rebholz, L. G., and Xiao, M.
Flux-preserving enforcement of inhomogeneous Dirichlet boundary conditions for strongly divergence-free mixed finite element methods for flow problems.
Journal of Mathematical Analysis and Applications 438, 1 (2016), 507–513.
ISSN: 0022-247X.

[32] Heister, T., Olshanskii, M. A., and Rebholz, L. Unconditional long-time stability of a velocity-vorticity method for the 2D Navier-Stokes equations.
Numerische Mathematik (2016), 1–25. ISSN: 0945-3245.

[33] Bangerth, W., Heister, T., Heltai, L., Kanschat, G., Kronbichler, M., Maier, M., and Turcksin, B. The `deal.II` Library, Version 8.3.
Archive of Numerical Software 4, 100 (2016), 1–11. ISSN: 2197-8263.

[34] Olshanskii, M. A., Heister, T., Rebholz, L. G., and Galvin, K. J.
Natural vorticity boundary conditions on solid walls.
Computer Methods in Applied Mechanics and Engineering 297 (2015), 18–37.
ISSN: 0045-7825.

[35] Frohne, J., Heister, T., and Bangerth, W. Efficient numerical methods for the large-scale, parallel solution of elastoplastic contact problems.
Int. J. Numer. Meth. Engng 105, 6 (2016). nme.4977, 416–439. ISSN: 1097-0207.

[36] Heister, T., Wheeler, M. F., and Wick, T.
A primal-dual active set method and predictor-corrector mesh adaptivity for computing fracture propagation using a phase-field approach.
Computer Methods in Applied Mechanics and Engineering 290, 0 (2015), 466–495.
ISSN: 0045-7825.

[37] Dykema, K., Heister, T., and Juschenko, K.
Finitely Presented Groups Related to Kaplansky's Direct Finiteness Conjecture.
Experimental Mathematics 24, 3 (2015), 326–338.

[38] Cottaar, S., Heister, T., Rose, I., and Unterborn, C.
BurnMan: A lower mantle mineral physics toolkit.
Geochemistry, Geophysics, Geosystems 15, 4 (2014), 1164–1179. ISSN: 1525-2027.

[39] Bangerth, W. and Heister, T.
What Makes Computational Open Source Software Libraries Successful?
Computational Science & Discovery 6 (2013), 015010/1–18.

[40] Kronbichler, M., Heister, T., and Bangerth, W.
High Accuracy Mantle Convection Simulation through Modern Numerical Methods.
Geophysical Journal International 191 (2012), 12–29.

[41] Heister, T. and Rapin, G. Efficient augmented Lagrangian-type preconditioning for the Oseen problem using Grad-Div stabilization. *Int. J. Num. Meth. Fluids* 71 (2013), 118–134.

[42] Bangerth, W., Burstedde, C., Heister, T., and Kronbichler, M.
Algorithms and Data Structures for Massively Parallel Generic Finite Element Codes.
ACM Trans. Math. Softw. 38, 2 (Jan. 2011), 14:1–14:28. ISSN: 0098-3500.

[43] Olshanskii, M., Lube, G., Heister, T., and Löwe, J. Grad-div stabilization and subgrid pressure models for the incompressible Navier-Stokes equations. *Comp. Meth. Appl. Mech. Engng.* 198, 49-52 (2009), 3975–3988. ISSN: 0045-7825.

Submitted or in Preparation

[44] Weerdesteijn, M., Naliboff, J., Conrad, C., Reusen, J., Steffen, R., Heister, T., and Zhang, J. Viscoelastic solid earth deformation due to ice loading across timescales in ASPECT. *submitted* (2022).

[45] Saxena, A., Dannberg, J., Gassmoeller, R., Fraters, M., Heister, T., and Styron, R. High-resolution mantle flow models reveal importance of plate boundary geometry and slab pull forces on generating tectonic plate motions. *submitted* (2022).

[46] Euen, G. T., Liu, S., Gassmöller, R., Heister, T., and King, S. D. A Comparison of 3-D Spherical Shell Thermal Convection results at Low to Moderate Rayleigh Number using ASPECT (version 2.2.0) and CitcomS (version 3.3.1). *submitted* (2022).

[47] Myhill, R., Cottaar, S., Heister, T., Rose, I., Unterborn, C., Dannberg, J., and Gassmoeller, R. BurnMan - a Python toolkit for planetary geophysics, geochemistry and thermodynamics. *submitted to JOSS* (2022).

[48] Heister, T., Mang, K., and Wick, T. Robust preconditioning for a mixed formulation of phase-field fracture problems. *submitted* (2022).

Papers (Not Refereed)

[49] Zhao, L. and Heister, T. A preconditioner for the incompressible Navier-Stokes equations in velocity-vorticity form. *submitted* (2019).

[50] Turcksin, B., Heister, T., and Bangerth, W. Clone and graft: Testing scientific applications as they are built. *ArXiv e-prints* (Aug. 2015).

[51] Heister, T., Kronbichler, M., and Bangerth, W. Massively Parallel Finite Element Programming. In: *Recent Advances in the Message Passing Interface.* Ed. by Keller, R., Gabriel, E., Resch, M., and Dongarra, J. Vol. 6305. Lecture Notes in Computer Science. 10.1007/978-3-642-15646-5_13. Springer Berlin / Heidelberg, 2010, 122–131.

[52] Heister, T., Kronbichler, M., and Bangerth, W. Generic Finite Element Programming for Massively Parallel Flow Simulations. *Eccomas 2010 Proceedings* (2010).

[53] Heister, T., Lube, G., and Rapin, G. On Robust Parallel Preconditioning for Incompressible Flow Problems. In: *Numerical Mathematics and Advanced Applications, ENUMATH 2009.* Springer, Berlin, 2010.

Software

[33] Bangerth, W., Heister, T., Heltai, L., Kanschat, G., Kronbichler, M., Maier, M., and Turcksin, B. The `deal.II` Library, Version 8.3.
Archive of Numerical Software 4, 100 (2016), 1–11. ISSN: 2197-8263.

[54] Bangerth, W., Heister, T., Heltai, L., Kanschat, G., Kronbichler, M., Maier, M., Turcksin, B., and Young, T. The dealii Library, Version 8.2.
Archive of Numerical Software 3, 1 (2015). ISSN: 2197-8263.

[55] Cottaar, S., Heister, T., Rose, I., and Unterborn, C. *BurnMan, Technical Reference.* `http://burnman.org/`. 2013.

[56] Bangerth, W., Heister, T., et al.
ASPECT: Advanced Solver for Problems in Earth's ConvecTion.
`http://aspect.dealii.org/`. 2015.

[57] Bangerth, W., Heister, T., and Kanschat, G.
`deal.II` *Differential Equations Analysis Library, Technical Reference.*
`http://www.dealii.org`. 2013.

Books and Miscellanea

[58] Heister, T., Rebholz, L. G., and Xue, F. *Numerical Analysis: An Introduction.*
De Gruyter Textbook. De Gruyter, Mar. 2019. ISBN: 9783110573336.

[59] Heister, T. and Rebholz, L. G. *Scientific Computing. For Scientists and Engineers.*
De Gruyter Textbook. De Gruyter, 2015. ISBN: 9783110359428.

[60] Bangerth, W., Dannberg, J., Gassmöller, R., and Heister, T.
Computational Modeling of Convection in the Earth's Mantle. Editorial, SIAM News.
Mar. 2016.

[61] Bangerth, W. and Heister, T. *Quo Vadis, Scientific Software?* Editorial, SIAM News.
Jan. 2014.

[62] Heister, T.
A Massively Parallel Finite Element Framework with Application to Incompressible Flows.
PhD thesis. University of Göttingen, 2011.

[63] Heister, T. Preconditioning the Stabilized Oseen Problem (in German).
MA thesis. University of Göttingen, 2008.

Presentations and Posters at Conferences

($*$ = invited, † = invited including travel support)

2022-07-13	Strategies for Massively Parallel Solvers for Stokes Flow in Mantle Convection, SIAM AM
2022-01-20 $*$	Efficient Matrix-free solvers in ASPECT, ASPECT online workshop
2021-09-19	Geometric Multigrid for massively parallel, adaptive, large scale Stokes flow problems, SIAM SEAS (online)
2021-06-23	Adaptive, Large-Scale, Geometric Multigrid in the Mantle Convection Code ASPECT, SIAM Geosciences (online)

2021-03-04 Best practices for Testing and Continuous Integration in Computational Science, SIAM CSE (online)

2020-07-20 Speaker at the p4est 2020 Summer school: three lectures about deal.II and p4est. Online.

2020-05-26 deal.II one day workshop (host and speaker)

2020-02-13 Poster at NSF CSSI meeting, Seattle, Washington

2019-12-13 poster at AGU conference, San Francisco

2019-10-25 † invited talk, University of Goettingen, Germany

2019-08-02 † organizer of deal.II workshop in Fort Collins

2019-06-17 conference talk, MAFELAP, London, UK

2019-06-12 conference talk, invited, PASC 2019, Zurich, Switzerland

2019-06-11 seminar talk, geoscience, invited, ETH Zurich, Switzerland

2019-04-27 † invited talk, University of Goettingen, Germany

2019-03-21 ∗ Guy F. Atkinson Distinguished Lecture, Dept of Geology and Geophysics, University of Utah

2018-12-11 poster at AGU conference, Washington DC

2018-10-08 † invited talk: Leibniz University Hannover, Germany

2018-03-27 † invited seminar talk, University of Utah

2018-03-20 † invited talk at TDA Inc., Washington DC

2018-01-29 † invited seminar talk, University of Utah

2017-12-14 poster at AGU conference, New Orleans

2017-10-01 talk at SIAM central conference at Fort Collins, CO

2017-06-13 *On Conserving FEM Discretizations for Fluid Flow*, Seminar, University of Goettingen, Germany

2017-05-31 *A parallel solution approach for crack propagation using adaptive mesh refinement*,Seminar, University of Erlangen, Germany

2017-03-21 ∗ *Flexible, Parallel, Adaptive Geometric Multigrid in deal.II*
Seminar, CSU, Fort Collins, CO

2017-03-11 *Flexible, Parallel, Adaptive Geometric Multigrid*
AMS Sectional Meeting, Charleston, SC

2017-03-01 *Poster: Regression and Performance Testing and Continuous Integration for Scientic Codes*
SIAM CSE, Atlanta, GA

2016-12-14 *Sustaining Open Source Communities through Hackathons*
AGU 2017, San Francisco, CA

2016-09-16 Poster with Benjamin Smith: *Investigating Linear Solvers and Parallel Performance in ASPECT*, Undergraduate Research Showcase, Clemson, SC

2016-07-04 *Testing Scientific Software*, PDESoft 2016, Warwick, UK

2016-06-10 † with Juliane Dannberg: *3D Numerical Modelling of Compressible Coupled Magma/Mantle Dynamics With Adaptive Mesh Refinement*, Melt in the Mantle Workshop, Cambridge, UK

2016-05-19 † *An Introduction to the Mantle Convection Community Project ASPECT*, Seminar, Cambridge, UK

2016-03-15 † *Managing Open Source Scientific Software Projects*, ICTP workshop, Trieste, Italy

2016-01-27 † *Numerical Methods in the Finite Element Mantle Convection Code ASPECT*, SPPEXA annual meeting in Munich, Germany

2015-11-11 † *Numerical Methods in the Finite Element Mantle Convection Code ASPECT* Seminar, University of Houston, TX

2015-10-16 † *How to organize successful Scientific Software Projects?* Poster at CSESSP, Washington DC

2015-10-08 *An introduction to BurnMan - a mineral physics toolkit* online CIG Webinar

2015-08-12 *A parallel solution approach for crack propagation using adaptive mesh refinement* ICIAM 2015, Beijing, China

2015-08-11 *Flux-preserving Boundary Conditions for Navier-Stokes and Grad-Div Stabilization* ICIAM 2015, Beijing, China

2015-08-05 Keynote: *Parallel computations in deal.II* deal.II workshop at Texas A&M, College Station, TX

2015-04-20 † *A parallel solution approach for crack propagation using adaptive mesh refinement* USC, Columbia, SC

2015-03-28 *A parallel solution approach for crack propagation using adaptive mesh refinement* AMS Southeast, Huntsville, AL

2015-03-16 T. Heister, W. Bangerth, G. Kanschat, M. Maier: *The deal.II Finite Element Library* poster at SIAM CSE 2015, Salt Lake City, Utah

2015-03-16 *Parallel and Adaptive Mantle Convection Simulation in ASPECT* SIAM CSE 2015, Salt Lake City, Utah

2015-03-15 R. Grove, T. Heister: *Comparison of Nonlinear and Linear Stabilization Schemes for Advection-Diffusion Equations* poster at SIAM CSE 2015, Salt Lake City, Utah

2015-03-15 *What Makes Computational Open Source Libraries Successful?* SIAM CSE 2015, Salt Lake City, Utah

2014-11-19 *Massively Parallel, Adaptive Finite Element Computations in deal.II* SC14, New Orleans, LA

2014-11-08 *An active set algorithm for crack propagation in phase-field formulation* AMS Southeast, Greensboro, NC

2014-10-07 † *Massively Parallel, Adaptive Finite Element Computations in deal.II* Seminar, University of Maryland, College Park, MD

2014-07-16 *Parallel Geometric Multigrid in deal.II* PDESOFT 2014, Heidelberg, Germany

2014-05-14 *ASPECT Hackathon 2014* ASPECT workshop, College Station, TX

2014-05-05 † *Mantle Convection Simulation in ASPECT* (keynote) CIG workshop, Banff, Canada

2014-04-10 *ASPECT Science Highlights* online CIG Webinar

2014-03-29 *A massively parallel active-set algorithm for phase-field crack propagation with adaptive mesh refinement*
SIAM SEAS 2014, Melbourne, FL

2013-11-13 † *Efficient Augmented Lagrangian-type Preconditioning using Grad-Div Stabilization*
Seminar, University of Tennessee, Knoxville, TN

2013-08-20 *Parallel Linear Algebra in deal.II*
deal.II workshop, College Station, TX

2013-07-09 *Effcient Augmented Lagrangian-type Preconditioning using Grad-Div Stabilization*
SIAM annual meeting, San Diego, CA

2013-02-28 *Efficient Augmented Lagrangian-type Preconditioning for the Oseen Problem using Grad-Div Stabilization*
SIAM CSE13, Boston, Massachusetts, USA

2013-02-15 † *Large Scale Computational Fluid Dynamics*
Seminar, Rice University

2013-01-28 † *Large Scale Computational Fluid Dynamics*
Seminar, Southern Methodist University

2013-01-24 † *Large Scale Computational Fluid Dynamics*
Seminar, Clemson University

2012-11-15 *An Introduction to Aspect*
CIG Webinar (online)

2012-10-09 † *Numerical Dynamos with deal.II and/or Aspect*
CIG HPC Dynamo Workshop, Boulder, Colorado (USA)

2012-07-18 † *Aspect: Advanced Solver for Problems in Earth's ConvecTion*
Wolfgang Bangerth, Thomas Geenen, Timo Heister, Martin Kronbichler
poster at CIDER 2012 Summer Program, Santa Barbara, California (USA)

2012-06-19 † *Massively Parallel Finite Element Programming in deal.II* (keynote)
PDE Software Frameworks, Münster (Germany)

2012-06-12 * *Modern Numerical Methods for Modeling Convection in the Earth's Mantle*
Seminar on Applied Mathematics, University of Goettingen (Germany)

2012-05-07 *Modern Numerical Methods for Modeling Convection in the Earth's Mantle*
IAMCS Annual Spring Symposium, KAUST (Saudi Arabia)

2012-04-05 ∗ *Modern Numerical Methods for Modeling Convection in the Earth's Mantle*
IAMCS-KAUST Workshop on Computational Biomedicine and Geophysics, Salt Lake City, Utah (USA)

2012-02-16 ∗ *Massively Parallel Finite Element Simulations with deal.II*
SIAM PP12, Savannah, Georgia (USA)

2011-12-06 *3D high resolution mineral phase distribution and seismic velocity structure of the transition zone: predicted by a full spherical-shell compressible mantle convection model*
Thomas Geenen, Timo Heister, Martin Kronbichler, Arie van den Berg, Michael Jacobs, Wolfgang Bangerth
poster at AGU Fall Meeting, San Francisco, California (USA)

2011-02-25 *Augmented Lagrangian based preconditioning using Grad-Div stabilization*
Finite Element Rodeo 2011, College Station, Texas (USA)

2010-11-26 ∗ *Augmented Lagrangian based preconditioning using Grad-Div stabilization*
Nonstandard Discretizations for Fluid Flows, invitation workshop, Banff (Canada)

2010-10-08 *Less painful turbulence benchmarks - solvers, parallelization, and more*
Workshop on Calibration of Viscosity Models for Turbulent Flows, Göttingen (Germany)

2010-10-04 *Parallel Solvers for Incompressible Flow Problems*
Research Group Meeting 2010, Goslar (Germany)

2010-09-13 *Massively Parallel Finite Element Programming*
EuroMPI 2010, Stuttgart (Germany)

2010-09-01 *Massiv-parallele Finite Elemente Simulation mit deal.II*
SourceTalk 2010, Göttingen (Germany)

2010-08-24 *Massive Parallel Computations with deal.II*
deal.II Workshop 2010, Heidelberg (Germany)

2010-06-14 *Generic Finite Element Programming for Massively Parallel Flow Simulations*
Eccomas 2010, Lisbon (Portugal)

2010-03-09 *Algorithms and Data Structures for Massively Parallel Finite Element Codes*
Research Seminar, Texas A&M, College Station, Texas (USA)

2010-03-06 *Algorithms and Data Structures for Massively Parallel Finite Element Codes*
Finite Element Rodeo 2010, Dallas, Texas (USA)

2009-12-21 *On Robust Parallel Preconditioning for Incompressible Flow Problems*
Texas A&M, College Station, Texas (USA)

2009-06-30 *On Robust Parallel Preconditioning for Incompressible Flow Problems*
ENUMATH 2009, Uppsala (Sweden)

2008-04-10 *Preconditioning for the stabilized Oseen Problem*
Mini-Workshop on Local Projection Stabilization: Theory and Applications, Göttingen (Germany)

Research Visits and Guest Lectures

Research visit, Colorado State University, CO, August 2017
Research visit, University of Erlangen, Germany, May 2017
Research visit, Colorado State University, CO, March 2017
Research visit, University of Cambridge, UK, April-June 2016
Research visit, University of Houston, April 2016
Lecturer at deal.II users and Developers Training, Trieste, Italy, March 2016
Lecturer at Geometric PDE workshop, Texas A&M, TX, Jan 2016
Research visit, RICAM, Linz, Austria, June 2015
Research visit, Texas A&M University, Department of Mathematics, September-November 2009
Research visit, Texas A&M University, Department of Mathematics, February 2010

Teaching

Courses taught

Fall 2022 Introduction to Scientific Computing (MATH 8600)
Fall 2022 Data Structures (MATH 8650)
Spring 2021 Introduction to Scientific Computing (MATH 8600)

Fall 2020	High-performance computing and the Finite Element Method (MATH 9830)
Spring 2020	Numerical Methods for Engineers (MATH 3650)
Fall 2019	Data Structures (MATH 8650)
Spring 2019	PDEs for Engineering Students, University of Utah (MATH 3150)
Spring 2019	Survey of Numerical Analysis, University of Utah (MATH 5600)
Spring 2018	Efficient Implementation of the Finite Element Method, Clemson University (MATH 9830)
Fall 2017	Data Structures at Clemson University (MATH 8650)
Fall 2017	Numerical Methods for Engineers at Clemson University (MATH 3650)
Spring 2017	Numerical Methods for Engineers at Clemson University (MATH 3650)
Fall 2016	Data Structures at Clemson University (MATH 8650)
Fall 2016	Numerical Methods for Engineers at Clemson University (MATH 3650)
Fall 2015	Data Structures at Clemson University (MATH 8650)
Fall 2015	Numerical Methods for Engineers at Clemson University (MATH 3650)
Spring 2015	Sparse Matrix Algorithms and Advanced Topics in FEM at Clemson University (MATH 9830)
Fall 2014	Introduction to Scientific Computing at Clemson University (MATH 8600)
Fall 2014	Numerical Methods for Engineers at Clemson University (MATH 3650)
Spring 2014	The Finite Element Method in Scientific Computing at Clemson University (MATH 9830)
Spring 2014	Numerical Methods for Engineers at Clemson University (MATH 365)
Fall 2013	Numerical Methods for Engineers at Clemson University (MthSc 365)
Spring 2013	Methods of Applied Mathematics I at Texas A&M (MATH 601)
Fall 2012	UGST 181: Outdoor Adventures: Geocaching! at Texas A&M, (Co-)Instructor (high impact first year seminar)
Spring 2012	Ordinary Differential Equations at Texas A&M (MATH 308)
Fall 2010/11	Assisting Numerical Analysis at University of Göttingen (create homework and exams, grade, supervise TAs, substitute for lectures)
Spring 2010	Short deal.II introduction at University of Göttingen
Spring 2010	Assisting Mathematics in Computer Science II at University of Göttingen
Fall 2009/10	Assisting Mathematics in Computer Science I at University of Göttingen
Spring 2009	Assisting Mathematics in Computer Science II at University of Göttingen
Fall 2008/09	Assisting Mathematics in Computer Science I at University of Göttingen

Teaching related conferences and workshops

2012-03-30	Participant: Wakonse South Conference on College Teaching, Canyon of the Eagles, Texas
2011-09-16	Participant: Lecturing Well, Workshop, Center for Teaching Excellence, Texas A&M

Student Advising

Graduates

2019	Thomas Clevenger (Ph.D.), *On Scalable, Parallel, Adaptive, Geometric Multigrid Partitioning*

2018	Liang Zhao (Ph.D.), *A numerical method for the Navier Stokes equations in a velocity-vorticity form*
2018	Emma Cinatl (Masters), *Finite Element Discretizations for Linear Elasticity*
2018	co-advising: Sergey Charnyi (Ph.D.) (advisor: Leo Rebholz), *Large scale vorticity-based numerical methods for Navier-Stokes equations*
2018	co-advising: Mengying Xiao (Ph.D.) (advisor: Leo Rebholz), *Splitting methods and divergence-free finite elements for fluid flow problems*
2017	co-advising: Muhammad Mohebujjaman, (Ph.D.) (advisor: Leo Rebholz)
2017	Ryan Grove (Ph.D.), *Discretizations and efficient linear solvers for problems related to fluid flow*
2017	Thomas Clevenger (Master), *Parallel, Adaptive, Geometric Multigrid Partitioning*

Current

Pengfei Jia (Summer 2023)
Sean Ingimarson (co-advising, Spring 2023)
Quang Hoang (PhD, TBA)

Undergraduate and other Research

Spring 2019	Nathan Marshak (semester project, CS, University of Utah)
Fall 2017	John Rowe
Spring 2016	Benjamin Smith
Fall 2015	Benjamin Smith

Post Doctoral Research Advisees

20222 -	Vladimir Yushutin
2020 - 2023	Jiaqi Zhang
2019	Thomas C. Clevenger

Other Experience

- Languages: German (native) and English (fluent)
- Profound knowledge in object oriented programming with C++
- Expert in parallel computing (MPI, massive scalability, multi-threading)
- Knowledge of many other programming languages, systems, libraries, and tools
- Membership: Society for Industrial and Applied Mathematics (SIAM)

last update: January 5, 2023