

# Timo Heister: Curriculum Vitae

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Homepage: <http://www.clemson.edu/~heister/>  
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

2024 – Professor, School of Mathematical and Statistical Sciences, Clemson University  
2018 – 2024 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: **\$2.1 million** in 8 NSF awards/subawards, **\$125k** Navy SBIR

- 2024 – 2028 Collaborative Research: Frameworks: Coupling bulk and surface processes in simulating the solid earth with ASPECT and LandLab, NSF OAC-2410848, PI: \$260,056 (joint proposal, total \$3m)
- 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] Heister, T., Olshanskii, M. A., and Yushutin, V.  
An adaptive stabilized trace finite element method for surface PDEs.  
*Computers & Mathematics with Applications* 171 (Oct. 2024), 164–174. ISSN: 0898-1221.
- [6] Arndt, D. et al. *The deal.II Library, Version 9.5.*  
*Journal of Numerical Mathematics* 31, 3 (2023), 231–246.
- [7] 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.  
*Journal of Geophysical Research: Solid Earth* 128, 8 (2023), e2022JB025877.
- [8] 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.  
*Journal of Open Source Software* 8, 87 (2023), 5389.
- [9] Euen, G. T., Liu, S., Gassmüller, 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).  
*Geoscientific Model Development* 16, 11 (2023), 3221–3239.
- [10] Munch, P., Heister, T., Saavedra, L. P., and Kronbichler, M. *Efficient Distributed Matrix-free Multigrid Methods on Locally Refined Meshes for FEM Computations.*  
*ACM Transactions on Parallel Computing* 10, 1 (Mar. 2023), 1–38.
- [11] Weerdesteijn, M. F. M., Naliboff, J. B., Conrad, C. P., Reusen, J. M., Steffen, R., Heister, T., and Zhang, J. *Modeling Viscoelastic Solid Earth Deformation Due To Ice Age and Contemporary Glacial Mass Changes in ASPECT.*  
*Geochemistry, Geophysics, Geosystems* 24, 3 (2023), e2022GC010813.
- [12] Arndt, D. et al. *The deal.II Library, Version 9.4.*  
*Journal of Numerical Mathematics* 30, 3 (2022), 231–246.

- [13] Heister, T., Mang, K., and Wick, T.  
Schur-type preconditioning of a phase-field fracture model in mixed form.  
*PAMM* 21, 1 (Dec. 2021).
- [14] Arndt, D. et al. The `deal.II` Library, Version 9.3.  
*Journal of Numerical Mathematics* 29, 3 (2021), 171–186.
- [15] 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).
- [16] 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.
- [17] Heister, T. and Wick, T.  
pfm-cracks: A parallel-adaptive framework for phase-field fracture propagation.  
*Software Impacts* (Nov. 2020), 100045.
- [18] Clevenger, T. C., Heister, T., Kanschä, G., and Kronbichler, M.  
A Flexible, Parallel, Adaptive Geometric Multigrid Method for FEM.  
*ACM Trans. Math. Softw.* 47, 1 (Dec. 2020).
- [19] Schröder, J. et al.  
A Selection of Benchmark Problems in Solid Mechanics and Applied Mathematics.  
*Archives of Computational Methods in Engineering* (2020).
- [20] Arndt, D. et al. The `deal.II` Library, Version 9.2.  
*Journal of Numerical Mathematics* 28, 3 (2020), 131–147.
- [21] 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).
- [22] Gassmüller, 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.
- [23] Arndt, D. et al. The `deal.II` Library, Version 9.1.  
*Journal of Numerical Mathematics* 27, 4 (2019), 203–213.
- [24] Dannberg, J., Gassmüller, 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.
- [25] Kellogg, L. H., Hwang, L. J., Gassmüller, 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.
- [26] 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.
- [27] 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.

- [28] 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)* 255, 9 (2018).
- [29] Alzetta, G. et al. The `deal.II` Library, Version 9.0. *Journal of Numerical Mathematics* 26, 4 (2018), 173–183.
- [30] Heister, T., Dannberg, J., Gassmüller, 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.
- [31] Arndt, D. et al. The `deal.II` Library, Version 8.5. *Journal of Numerical Mathematics* 25, 3 (2017), 137–146.
- [32] 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.
- [33] 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.
- [34] Dannberg, J. and Heister, T. Compressible magma/mantle dynamics: 3D, adaptive simulations in ASPECT. *Geophysical Journal International* 207, 3 (2016), 1343–1366.
- [35] 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.
- [36] Bangerth, W. et al. The `deal.II` Library, Version 8.4. *Journal of Numerical Mathematics* 24, 3 (2016), 135–141.
- [37] 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.
- [38] 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.
- [39] Bangerth, W., Heister, T., Heltai, L., Kanschä, 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.
- [40] 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.

- [41] 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.
- [42] 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.
- [43] Dykema, K., Heister, T., and Juschenko, K. Finitely Presented Groups Related to Kaplansky’s Direct Finiteness Conjecture. *Experimental Mathematics* 24, 3 (2015), 326–338.
- [44] 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.
- [45] Bangerth, W. and Heister, T. What Makes Computational Open Source Software Libraries Successful? *Computational Science & Discovery* 6 (2013), 015010/1–18.
- [46] Kronbichler, M., Heister, T., and Bangerth, W. High Accuracy Mantle Convection Simulation through Modern Numerical Methods. *Geophysical Journal International* 191 (2012), 12–29.
- [47] 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.
- [48] 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.
- [49] 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

- [50] Heister, T., Olshanskii, M. A., and Yushutin, V. An adaptive stabilized trace finite element method for surface PDEs. *submitted* (2023).
- [51] Heister, T., Mang, K., and Wick, T. Robust preconditioning for a mixed formulation of phase-field fracture problems. *submitted* (2022).

### Papers (Not Refereed)

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

- [53] Turcksin, B., Heister, T., and Bangerth, W.  
Clone and graft: Testing scientific applications as they are built.  
*ArXiv e-prints* (Aug. 2015).
- [54] 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.
- [55] Heister, T., Kronbichler, M., and Bangerth, W.  
Generic Finite Element Programming for Massively Parallel Flow Simulations.  
*Eccomas 2010 Proceedings* (2010).
- [56] 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

- [39] 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.
- [57] 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.
- [58] Cottaar, S., Heister, T., Rose, I., and Unterborn, C. *BurnMan, Technical Reference*.  
<https://geodynamics.github.io/burnman/>. 2013.
- [59] Bangerth, W., Heister, T., et al.  
*ASPECT: Advanced Solver for Problems in Earth's ConvecTion*.  
<http://aspect.dealii.org/>. 2015.
- [60] Bangerth, W., Heister, T., and Kanschat, G.  
*deal.II Differential Equations Analysis Library, Technical Reference*.  
<http://www.dealii.org>. 2013.

## Books and Miscellanea

- [61] Heister, T. and Rebholz, L. G. *Scientific Computing. For Scientists and Engineers*.  
second edition. De Gruyter Textbook. De Gruyter, 2023. ISBN: 9783110988451.
- [62] Heister, T., Rebholz, L. G., and Xue, F. *Numerical Analysis: An Introduction*.  
De Gruyter Textbook. De Gruyter, Mar. 2019. ISBN: 9783110573336.
- [63] Heister, T. and Rebholz, L. G. *Scientific Computing. For Scientists and Engineers*.  
De Gruyter Textbook. De Gruyter, 2015. ISBN: 9783110359428.



- [64] Bangerth, W., Dannberg, J., Gassmüller, R., and Heister, T.  
*Computational Modeling of Convection in the Earth's Mantle*. Editorial, SIAM News.  
Mar. 2016.
- [65] Bangerth, W. and Heister, T. *Quo Vadis, Scientific Software?* Editorial, SIAM News.  
Jan. 2014.
- [66] Heister, T.  
A Massively Parallel Finite Element Framework with Application to Incompressible Flows.  
PhD thesis. University of Göttingen, 2011.
- [67] 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)

- 2024-03-05 SIAM PP, Baltimore
- 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 Scientific 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*  
PDESOFTE 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 *Efficient 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

- Spring 2024 Numerical Methods for Engineers (MATH 3650)
- Spring 2024 High-performance computing and the Finite Element Method (MATH 9830)
- Fall 2023 Introduction to Scientific Computing (MATH 8600)
- Spring 2023 Numerical Methods for Engineers (MATH 3650)
- 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

2023 Pengfei Jia (Masters) *Null Space Removal in Finite Element Discretizations*

2023 co-advising: Sean Ingimarson (Ph.D.) (advisor: Leo Rebholz), *Advancements in Fluid Simulation through enhanced conservation schemes*

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

Anna Long (Master, TBA)

Quang Hoang (PhD, TBA)

Ryan Moulday (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**

2023 - 2024    Arushi Saxena  
2022 - 2024    Vladimir Yushutin  
2020 - 2023    Jiaqi Zhang  
2019            Thomas C. Clevenger

### **Other Service and Experience**

- Editorial board: AIMS ACSE and IJNAM (since 2023).
- 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: September 26, 2024