Wolfgang Bangerth: Curriculum Vitae

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1 Education

1979–1983	Primary School Wolfschlugen.
1983–1992	Gymnasium Nürtingen.
1992–1993	Military Service.
1993–1995	Undergraduate studies in physics, University of Stuttgart, Germany; Degree: Vordiplom.
1995–1999	Undergraduate studies in physics, University of Heidelberg, Germany; Degree: Diplom.
1999–2002	Graduate studies in mathematics, University of Heidelberg, Germany. Degree: PhD; grades: "summa cum laude" ("with distinction").

2 Appointments

2001	Exterior Research Fellow with Industrial Research Ltd., Wellington, New Zealand.
2002–2003	Postdoctoral Research Fellow at the Institute for Computational Engineering and Sciences (ICES), University of Texas at Austin.
2003–2005	Postdoctoral Research Fellow with joint position at the Institute for Computational Engineering and Sciences (ICES) and the Institute for Geophysics, University of Texas at Austin.
2005	Consultant (Research Scientist) for the Department of Chemistry, Texas A&M University.
2006–2007	External Research Fellow, Institute for Geophysics, University of Texas at Austin.
2005–2009	Assistant Professor, Department of Mathematics, Texas A&M University.
2009–2012	Associate Professor, Department of Mathematics, Texas A&M University.
2013–2017	Professor, Department of Mathematics, Texas A&M University.
2016–	Professor, Department of Mathematics, Colorado State University.
2019–	Professor (by courtesy), Department of Geosciences, Colorado State University.

3 Professional experience

1998–	Principal author and maintainer of the deal.II finite element library (see http://www.dealii.org/).
2005–2015	Elected member of the Science Steering Committee (2005–2008, 2008–2011) and Executive Committee (2011–2015), Computational Infrastructure in Geodynamics, an NSF-funded center devoted to the creation of open source software in geophysics (see http://www.geodynamics.org/).
2009–2011	Member, Executive Committee of the Department of Mathematics, Texas A&M University.

2009–2014	Member, editorial board, SIAM Journal on Scientific Computing (SISC).
2010–2014	Member, Executive Committee of the Institute for Applied Mathematics and Computational Science (IAMCS), Texas A&M University.
2011–	Member, editorial board, ACM Transactions on Mathematical Software (ACM TOMS).
2013–2015	Member, Executive Committee, Council of Principal Investigators, Texas A&M University.
2016–2019	Member, NSF Advisory Committee on Software Infrastructure for Heterogeneous Computing.
2017–2020, 2024–2025	Member, Executive Committee of the Department of Mathematics, Colorado State University.
2018–2024	Editor-in-Chief, ACM Transactions on Mathematical Software (ACM TOMS).
2020–2022	Member, NSF Advisory Committee on Reproducibility.

4 Awards

1999–2001	Ph.D. fellowship from Graduiertenkolleg "Modellierung und Wissenschaftliches Rechnen in Mathematik und Naturwissenschaften" (Modeling and scientific computing in mathematics and natural sciences), University of Heidelberg, Germany
2002–2003	Postdoctoral Research Fellowship from the Institute for Computational Engineering and Sciences (ICES), University of Texas at Austin
2003–2005	Palisades Geophysical Institute (PGI) Postdoctoral Fellowship from the Institute for Geophysics, University of Texas at Austin
2006	A program of mine based on deal.II finite element library software is accepted into the computing industry standard SPEC CPU2006 benchmark (see `http://www.spec.org/`); the award is $5,000
2007	J. H. Wilkinson Prize for Numerical Software for the development of the deal.II software (jointly with G. Kanschat and R. Hartmann); the award is for $3,000
2008	Alfred P. Sloan Research Fellowship; the award consists of unrestricted research funds to the amount of $50,000
2014	Outstanding Teaching Award, Dept. of Mathematics, Texas &M University
2017	A program of mine based on deal.II finite element library software is accepted into the computing industry standard SPEC CPU2017 benchmark (see `http://www.spec.org/`); the award is $5,000
2019 and 2020	Outstanding Professor in Graduate Education, Dept. of Mathematics, Colorado State University
2024	Interdisciplinary Scholarship Award, Colorado State University; the award consists of unrestricted research funds to the amount of $10,000
2025	SIAM/ACM Prize in Computational Science and Engineering for the development of the deal.II software (jointly with the other deal.II Principal Developers: Daniel Arndt, Bruno Blais, March Fehling, Rene Gassmoeller, Timo Heister, Luca Heltai, Guido Kanschat, Martin Kronbichler, Matthias Maier, Peter Munch, Jean-Paul Pelteret, Bruno Turcksin, David Wells); the award is for $5,000. (For the prize lecture, see here.)

5 Teaching and mentoring

5.1 Regular courses

I have taught a broad array of regular courses, including Calculus I for Engineers, Calculus for Physical Scientists, Analysis, Advanced Analysis, Partial Differential Equations, Numerical Analysis I and II, Mathematical Modeling (at the math undergraduate level); Partial Differential Equations I and II, Numerical Analysis I and II, Advanced Numerical Analysis, Optimization I and II, Advanced Real Analysis, Variational Methods (at the math graduate level); and Optimization (at the undergradate level in the data sciences program).

5.2 Summer and short courses

I have taught short courses on deal.II or the mantle convection course ASPECT in most years since 2012, including in Heidelberg (Germany), Aachen (Germany), Cape Town (South Africa), Seoul (South Korea), Tokyo (Japan), Beijing (China), Trieste (Italy), Chennai (India).

5.3 Supervision of students and postdocs

I have been or am currently the principal adviser of 11 graduate students, with degrees in mathematics, mechanical engineering, and nuclear engineering.
I have mentored 8 postdocs.

6 Community involvement

6.1 Editorial boards

- Member, editorial board, SIAM Journal on Scientific Computing (SISC), 2009–2014.
- Member, editorial board, SIMAI Springer Series (a book series on computational science and applied mathematics; editor-in-chief: Luca Formaggia), 2012-2014.
- Member, editorial board, ACM Transactions on Mathematical Software (ACM TOMS), since 2011.
- Editor-in-Chief, ACM Transactions on Mathematical Software (ACM TOMS), 2018-2024.
- Member, editorial board, Archive of Numerical Software (ANS), 2011-2017.

6.2 Advisory councils, evaluation panels, reviewing

I have been a member on numerous advisory councils for the National Science Foundation (NSF) and the Department of Energy (DOE), and I have been a panelist for NSF and DOE for a variety of applied mathematics, computational science, and earth science programs nearly every year since 2010.
I have also been an external reviewer of the progress towards its stated goals of DOE's Exascale Computing Project (ECP) every year since 2018.
Finally, I have been on the Executive Committee of the Departments of Mathematics at Texas A&M University and Colorado State University, of the Institute for Applied Mathematics and Computational Science at Texas A&M University, of the Computational Infrastructure in Geodynamics, and on many other departmental, university-wide, and national committees. I have been on the organizing committee of too many workshops to count, including the upcoming SIAM CSE'23 conference in Amsterdam, The Netherlands, in March 2023.
I review about a dozen articles per year for a wide variety of journals in mathematics and computational science.

7 Support

Currently funded support:

- NSF award OAC-1835673: "Collaborative Research: Frameworks: Software: Future Proofing the Finite Element Library deal.II – Development and Community Building" (10/1/2018–9/30/2023): PI; $1,700,000 (of this, $1,000,000 go to Colorado State University).
- NSF award EAR-1925595: "Collaborative Research: Development and Application of a Framework for Integrated Geodynamic Earth Models" (9/1/2019–8/31/2024): PI; $2,480,242 (of this, $679,697 go to Colorado State University).
- Subcontract from Computational Infrastructure for Geodynamics (an NSF-funded research center): "Facility: Computational Infrastructure for Geodynamics IV" (2/1/2021–1/31/2028): PI; $59,879.
- NSF award OAC-2410847: "Collaborative Research: Frameworks: Coupling bulk and surface processes in simulating the solid earth with ASPECT and LandLab" (9/1/2024–8/31/2028): PI; $3,040,598 (of this, $326,371 go to Colorado State University).

Past support:

- Deutsche Forschungsgemeinschaft (DFG, German Science Foundation) postdoctoral stipend for research at the University of Texas at Austin (9/2002–8/2003); declined in favor of a stipend from the Institute for Computational Engineering and Sciences, The University of Texas at Austin.
- NIH: "Diagnostic cancer imaging with NIR fluorescence" (7/1/2005–6/30/2008): PI; subaward over $173,124 to a grant of $3M.
- NSF award DGE-0549487: "IGERT: New materials and mathematical modeling" (6/1/2006–5/31/2011): Research advisor; PI: Joe Ross, Texas A&M; $2,817,300.
- DoE: "3-D deep penetration neutron imaging of thick absorbing and diffusive objects using transport theory" (5/1/2007–4/30/2011): co-PI; PI: Jean Ragusa, Texas A&M; $283,093.
- NSF award DMS-0604778: "Mathematical Methods for Novel Modalities of Medical Imaging" (9/1/2006-8/31/2009), co-PI; PI: Peter Kuchment, Texas A&M; $330,276 + a supplement of $55,905.
- NSF award CBET-0736202 (transferred to the Department of Homeland Security, grant 2008-DN-077-ARI018-02): "A framework for developing novel detection systems focused on interdicting shielded HEU" (9/1/2007–8/31/2012): co-PI; PI: Warren Miller, Texas A&M; $7,496,076.
- Computational Infrastructure in Geodynamics (an NSF-funded research center): "A suite of simple geodynamics applications using adaptive finite element methods" (4/1/2008–10/31/2009): PI; $100,458.
- King Abdullah University of Science and Technology: "Institute for Applied Mathematics and Computational Science (IAMCS) at Texas A&M University" (6/1/2008–5/31/2014): collaborator; $24,720,657.
- Sloan Foundation Research Fellowship: "Inverse Problems and Computational Science" (9/1/2008–8/31/2010): PI; $50,000.
- NSF award DMS-0834176: "NSF/CBMS Regional Conference in the Mathematical Sciences - Adaptive Finite Element Methods for Partial Differential Equations" (5/18/09–5/22/09): co-PI; PI: Guido Kanschat, Texas A&M; $33,731.
- NSF award DMS-0922866: "Cluster Computing for Mathematical Sciences at Texas A&M University" (6/1/2009-5/31/2010): co-PI; PI: Frank Sottile, Texas A&M; $59,480.
- Institute for Applied Mathematics and Computational Science (Texas A&M University) Innovation Award: "Exploiting sparsity in solving geoscience inverse problems" (1/1/2010–8/31/2010): PI; $20,000.

- Institute for Applied Mathematics and Computational Science (Texas A&M University) Innovation Award: "Simulating chemically reactive, laminar flow" (6/1/2012–5/31/2013): PI; $25,000 + $15,000 for travel.

- Computational Infrastructure for Geodynamics: Workshop support for "Developer meeting for the ASPECT code" (5/14–23/2014): PI; $20,000.

- NSF award EAR-0949446: "Geoinformatics: Facility Support: Computational Infrastructure for Geodynamics" (7/1/2010–6/30/2016): Member of proposal writing committee; PI is Louise Kellogg, University of California, Davis; $8,175,001.

- Subcontract from Computational Infrastructure for Geodynamics (an NSF-funded research center): "Geoinformatics: Facility Support: Computational Infrastructure for Geodynamics" (7/1/2010–6/30/2016): PI; $814,221.

- NSF award OCI-1148116: "Collaborative Research: SI2-SSI: Open source support for massively parallel, generic finite element methods" (7/1/2012–6/30/2018): PI; $1,493,420 (of this, $1,311,834 go to Texas A&M University/Colorado State University).

- Korean National Science Foundation: "Implementation of nonconforming finite elements in the adaptive finite element package deal.II and development of nonconforming finite element library for the simulation of semiconductor" (11/2014-10/2016): Investigator; PI is Dongwoo Sheen; 200,000,000 Won (approximately $180,000).

- NSF award EAR-1550901: "Computational Infrastructure for Geodynamics" (8/15/2016–7/31/2021): Member of proposal writing committee; PI is Louise Kellogg, University of California, Davis; $8,500,000.

- Subcontract from Computational Infrastructure for Geodynamics (an NSF-funded research center): "Geoinformatics: Facility Support: Computational Infrastructure for Geodynamics" (8/15/2016–7/31/2021): PI; $595,051.

- NSF award OAC-1743188: "SI2-S2I2 Conceptualization: Conceptualizing a US Research Software Sustainability Institute (URSSI)" (12/15/2017–6/30/2019): Senior personnel; PI is Karthik Ram, University of California, Berkeley; $499,999.

- NSF award DMS-1821210: "Collaborative Research: Efficient Coupling of Multilevel Partial Differential Equation Solvers and Advanced Sampling Methods" (9/1/2018–8/31/2022): PI; $260,000 (of this, $180,000 go to Colorado State University).

8 Publications

The following is a list of all my publications. Metrics and citation counts can be found on my Google Scholar page.

Books

[1] W. Bangerth and R. Rannacher. *Adaptive Finite Element Methods for Differential Equations*. Birkhäuser Verlag, 2003.

Editorials

[1] W. Bangerth and T. Heister. Quo vadis, scientific software? Editorial, SIAM News, January 2014.

[2] W. Bangerth, J. Dannberg, R. Gassmöller, and T. Heister. Computational modeling of convection in the earth's mantle. Editorial, SIAM News, March 2016.

Peer reviewed articles

[1] W. Bangerth and R. Rannacher. Finite element approximation of the acoustic wave equation: Error control and mesh adaptation. *East–West Journal of Numerical Mathematics*, 7(4):263–282, 1999.

[2] W. Bangerth and R. Rannacher. Adaptive finite element techniques for the acoustic wave equation. *Journal of Computational Acoustics*, 9(2):575–591, 2001.

[3] W. Bangerth. Starting threads in a C++ compatible fashion. *C/C++ Users Journal*, pages 21–24, October 2003.

[4] W. Bangerth, M. Grote, and C. Hohenegger. Finite element method for time dependent scattering: Non-reflecting boundary condition, adaptivity, and energy decay. *Computer Methods in Applied Mechanics and Engineering*, 193:2453–2482, 2004.

[5] G. F. Carey, W. Barth, J. A. Woods, B. Kirk, M. L. Anderson, S. Chow, and W. Bangerth. Modeling error and constitutive relations in simulation of flow and transport. *International Journal for Numerical Methods in Fluids*, 46:1211–1236, 2004.

[6] H. Klie, W. Bangerth, M. Wheeler, M. Parashar, and V. Matossian. Parallel well location optimization using stochastic algorithms on the grid computational framework. In *Proceedings of the 9th European Conference on the Mathematics of Oil Recovery (ECMOR IX), Cannes, France*, 2004.

[7] A. Joshi, W. Bangerth, and E. M. Sevick-Muraca. Adaptive finite element modeling of optical fluorescence-enhanced tomography. *Optics Express*, 12(22):5402–5417, November 2004.

[8] A. Joshi, W. Bangerth, A. B. Thompson, and E. M. Sevick-Muraca. Experimental fluorescence optical tomography using adaptive finite elements and planar illumination with modulated excitation light. *Progress in Biomededical Optics and Imaging*, 6:351–358, 2005.

[9] W. Bangerth, A. Joshi, and E. M. Sevick-Muraca. Adaptive finite element methods for increased resolution in fluorescence optical tomography. *Progress in Biomededical Optics and Imaging*, 6:318–329, 2005.

[10] W. Bangerth, H. Klie, V. Matossian, M. Parashar, and M. Wheeler. An autonomic reservoir framework for the stochastic optimization of well placement. *Cluster Computing*, 8:255–269, 2005.

[11] M. Anderson, W. Bangerth, and G. F. Carey. Analysis of parameter sensitivity and experimental design for a class of nonlinear partial differential equations. *International Journal for Numerical Methods in Fluids*, 48:583–605, 2005.

[12] M. Parashar, H. Klie, U. Catalyurek, T. Kurc, W. Bangerth, V. Matossian, J. Saltz, and M. F. Wheeler. Application of grid-enabled technologies for solving optimization problems in data-driven reservoir studies. *Future Generation Computer Systems*, 21:19–26, 2005.

[13] A. Joshi, W. Bangerth, K. Hwang, J. C. Rasmussen, and E. M. Sevick-Muraca. Plane wave fluorescence tomography with adaptive finite elements. *Optics Letters*, 31:193–195, 2006.

[14] A. Joshi, W. Bangerth, and E. M. Sevick-Muraca. Non-contact fluorescence optical tomography with scanning area illumination. In *Proceedings of the IEEE International Symposium on Biomededical Imaging, Arlington, VA, 2006*, pages 582–585. IEEE, 2006.

[15] A. Joshi, W. Bangerth, K. Hwang, J. C. Rasmussen, and E. M. Sevick-Muraca. Fully adaptive FEM based fluorescence optical tomography from time-dependent measurements with area illumination and detection. *Medical Physics*, 33(5):1299–1310, 2006.

[16] A. Joshi, W. Bangerth, and E. M. Sevick-Muraca. Non-contact fluorescence optical tomography with scanning patterned illumination. *Optics Express*, 14(14):6516–6534, 2006.

[17] W. Bangerth, H. Klie, M. F. Wheeler, P. Stoffa, and M. Sen. On optimization algorithms for the reservoir oil well placement problem. *Computational Geosciences*, 10:303–319, 2006.

[18] H. Klie, W. Bangerth, X. Gai, M. F. Wheeler, P. L. Stoffa, M. Sen, M. Parashar, U. Catalyurek, J. Saltz, and T. Kurc. Models, methods and middleware for Grid-enabled multiphysics oil reservoir management. *Engineering with Computers*, 22:349–370, 2006.

[19] K. Hwang, T. Pan, A. Joshi, J. C. Rasmussen, W. Bangerth, and E. M. Sevick-Muraca. Influence of excitation light rejection on forward model mismatch in optical tomography. *Physics in Medicine and Biology*, 51(22):5889–5902, 2006.

[20] W. Bangerth, R. Hartmann, and G. Kanschat. deal.II – a general purpose object oriented finite element library. *ACM Transactions on Mathematical Software*, 33(4):24/1–24/27, 2007.

[21] A. Joshi, W. Bangerth, R. Sharma, W. Wang, and E. M. Sevick-Muraca. Molecular tomographic imaging of lymph nodes with NIR fluorescence. In *Proceedings of the IEEE International Symposium on Biomededical Imaging, Arlington, VA, 2007*, pages 564–567. IEEE, 2007.

[22] W. Bangerth, A. Joshi, and E. M. Sevick-Muraca. Inverse biomedical imaging using separately adapted meshes for parameters and forward model variables. In *Proceedings of the IEEE International Symposium on Biomededical Imaging, Arlington, VA, 2007*, pages 1368–1371. IEEE, 2007.

[23] W. Bangerth. A framework for the adaptive finite element solution of large inverse problems. *SIAM Journal on Scientific Computing*, 30:2965–2989, 2008.

[24] W. Bangerth and A. Joshi. Adaptive finite element methods for the solution of inverse problems in optical tomography. *Inverse Problems*, 24:034011/1–22, 2008[1]

[25] M. Bartels, A. Joshi, J. C. Rasmussen, E. M. Sevick-Muraca, and W. Bangerth. Post-image acquisition excitation light mitigation in NIR fluorescent tomography. In *Proceedings of the IEEE International Symposium on Biomededical Imaging, Arlington, VA, 2008*. IEEE, 2008.

[26] A. Joshi, W. Bangerth, and E. Sevick. Non-contact fluorescence optical tomography with adaptive finite element methods. In Y. Censor, M. Jiang, and A. K. Louis, editors, *Mathematical Methods in Biomededical Imaging and Intensity-Modulated Radiation Therapy (IMRT)*, pages 185–200. Birkhäuser, 2008.

[1] This article was selected for the Editorial Board Highlights 2008 of the Journal "Inverse Problems".

[27] W. Bangerth and O. Kayser-Herold. Data structures and requirements for *hp* finite element software. *ACM Transactions on Mathematical Software*, 36(1):4/1–4/31, 2009.

[28] Y. Wang, W. Bangerth, and J. Ragusa. Three-dimensional *h*-adaptivity for the multigroup neutron diffusion equations. *Progress in Nuclear Energy*, 51:543–555, 2009.

[29] B. Turcksin, J. C. Ragusa, and W. Bangerth. Goal-oriented *h*-adaptivity for the multigroup SP_N equations. *Nuclear Science and Engineering*, 165:305–319, 2010.

[30] W. Bangerth, M. Geiger, and R. Rannacher. Adaptive Galerkin finite element methods for the wave equation. *Computational Methods in Applied Mathematics*, 10:3–48, 2010.

[31] C.-C. Chueh, M. Secanell, W. Bangerth, and N. Djilali. Multi-level adaptive simulation of transient two-phase flow in heterogeneous porous media. *Computers & Fluids*, 39:1585–1596, 2010.

[32] W. Bangerth, C. Burstedde, T. Heister, and M. Kronbichler. Algorithms and data structures for massively parallel generic adaptive finite element codes. *ACM Transactions on Mathematical Software*, 38:14/1–28, 2011.

[33] M. Allmaras and W. Bangerth. Reconstructions in ultrasound modulated optical tomography. *Journal on Inverse and Ill-posed Problems*, 19:801–823, 2011.

[34] M. Kronbichler, T. Heister, and W. Bangerth. High accuracy mantle convection simulation through modern numerical methods. *Geophysical Journal International*, 191:12–29, 2012.

[35] M. Allmaras, W. Bangerth, J. M. Linhart, J. Polanco, F. Wang, K. Wang, J. Webster, and S. Zedler. Estimating parameters in physical models through Bayesian inversion: A complete example. *SIAM Review*, 55:149–167, 2013.

[36] C.-C. Chueh, N. Djilali, and W. Bangerth. An h-adaptive operator splitting method for two-phase flow in 3d heterogeneous porous media. *SIAM Journal on Scientific Computing*, 35:B149–B175, 2013.

[37] W. Bangerth and T. Heister. What makes computational open source software libraries successful? *Computational Science & Discovery*, 6:015010/1–18, 2013.

[38] J. Zarestky and W. Bangerth. Teaching high performance computing: Lessons from a flipped classroom, project-based course on finite element methods. In *EduHPC '14: Proceedings of the Workshop on Education for High-Performance Computing*, pages 34–41, Piscataway, NJ, USA, 2014. IEEE Press.

[39] O. Aguilar, M. Allmaras, W. Bangerth, and L. Tenorio. Statistics of parameter estimates: A concrete example. *SIAM Review*, 57:131–149, 2015.

[40] J. Frohne, T. Heister, and W. Bangerth. Efficient numerical methods for the large-scale, parallel solution of elastoplastic contact problems. *International Journal for Numerical Methods in Engineering*, 105:416–439, 2016.

[41] B. Turcksin, M. Kronbichler, and W. Bangerth. *WorkStream* – a design pattern for multicore-enabled finite element computations. *ACM Transactions on Mathematical Software*, 43(1):2/1–2/29, 2016.

[42] J. Bartlett, J. DeVinney, E. Pudlowski, and W. Bangerth. Mathematical modeling of the 2014/2015 Ebola epidemic in West Africa. *SIAM Journal of Undergraduate Research Online*, 9:87–102, 2016.

[43] W. Bangerth, D. Davydov, T. Heister, L. Heltai, G. Kanschat, M. Kronbichler, M. Maier, B. Turcksin, and D. Wells. The `deal.II` library, version 8.4. *Journal of Numerical Mathematics*, 24:135–141, 2016.

[44] W. Bangerth, I. Kim, D. Sheen, and J. Yim. On hanging node constraints for nonconforming finite elements using the Douglas-Santos-Sheen-Ye element as an example. *SIAM Journal on Numerical Analysis*, 55:1719–1739, 2017.

[45] R. Agelek, M. Anderson, W. Bangerth, and W. L. Barth. On orienting edges of unstructured two- and three-dimensional meshes. *ACM Transactions on Mathematical Software*, 44:5/1–22, 2017.

[46] D. Arndt, W. Bangerth, D. Davydov, T. Heister, L. Heltai, M. Kronbichler, M. Maier, J.-P. Pelteret, B. Turcksin, and D. Wells. The `deal.II` library, version 8.5. *Journal of Numerical Mathematics*, 25(3):137–146, 2017.

[47] T. Heister, J. Dannberg, R. Gassmöller, and W. Bangerth. High accuracy mantle convection simulation through modern numerical methods. ii: Realistic models and problems. *Geophysical Journal International*, 210:833–851, 2017.

[48] D. S. Katz, K. E. Niemeyer, S. Gesing, L. Hwang, W. Bangerth, S. Hettrick, R. Idaszak, J. Salac, N. C. Hong, S. Núñez-Corrales, A. Allen, R. S. Geiger, J. Miller, E. Chen, A. Dubey, and P. Lago. Fourth workshop on sustainable software for science: Practice and experiences (wssspe4). *Journal of Open Research Software*, 6:10/1–10, 2018.

[49] G. Alzetta, D. Arndt, W. Bangerth, V. Boddu, B. Brands, D. Davydov, R. Gassmoeller, T. Heister, L. Heltai, K. Kormann, M. Kronbichler, M. Maier, J.-P. Pelteret, B. Turcksin, and D. Wells. The `deal.II` library, version 9.0. *Journal of Numerical Mathematics*, 26:173–183, 2018.

[50] R. Gassmöller, H. Lokavarapu, E. Heien, E. G. Puckett, and W. Bangerth. Flexible and scalable particle-in-cell methods with adaptive mesh refinement for geodynamic computations. *Geochemistry, Geophysics, Geosystems*, 19(9):3596–3604, September 2018.

[51] A. Ghesmati, W. Bangerth, and B. Turcksin. Residual-based a posteriori error estimation for *hp*-adaptive finite element methods for the stokes equations. *Journal of Numerical Mathematics*, 27(4):237–252, 2019.

[52] W. Bangerth, L. Hwang, T. Heister, and L. Kellogg. The role of scientific communities in creating reusable software: lessons from geophysics. *Computing in Science and Engineering*, 21:25–35, 2019.

[53] M. R. T. Fraters, W. Bangerth, C. Thieulot, A. C. Glerum, and W. Spakman. Efficient and practical Newton solvers for nonlinear Stokes systems in geodynamics problems. *Geophysical Journal International*, 218:873–894, 2019.

[54] D. Arndt, W. Bangerth, T. C. Clevenger, D. Davydov, M. Fehling, D. Garcia-Sanchez, G. Harper, T. Heister, L. Heltai, M. Kronbichler, R. M. Kynch, M. Maier, J.-P. Pelteret, B. Turcksin, and D. Wells. The `deal.II` library, version 9.1. *Journal of Numerical Mathematics*, 27(4):203–213, 2019.

[55] R. Gassmöller, H. Lokavarapu, W. Bangerth, and E. G. Puckett. Evaluating the accuracy of hybrid finite element/particle-in-cell methods for modelling incompressible Stokes flow. *Geophysical Journal International*, 219(3):1915–1938, September 2019.

[56] R. Gassmöller, J. Dannberg, W. Bangerth, T. Heister, and R. Myhill. On formulations of compressible mantle convection. *Geophysical Journal International*, 221(2):1264–1280, February 2020.

[57] D. Arndt, W. Bangerth, B. Blais, T. C. Clevenger, M. Fehling, A. V. Grayver, T. Heister, L. Heltai, M. Kronbichler, M. Maier, P. Munch, J.-P. Pelteret, R. Rastak, I. Thomas, B. Turcksin, Z. Wang, and D. Wells. The `deal.II` library, version 9.2. *Journal of Numerical Mathematics*, 28(3):131–146, 2020.

[58] D. Arndt, W. Bangerth, D. Davydov, T. Heister, L. Heltai, M. Kronbichler, M. Maier, J.-P. Pelteret, B. Turcksin, and D. Wells. The deal.II finite element library: design, features, and insights. *Computers & Mathematics with Applications*, 81:407–422, 2021.

[59] Luca Heltai, Wolfgang Bangerth, Martin Kronbichler, and Andrea Mola. Propagating geometry information to finite element computations. *ACM Transactions on Mathematical Software*, 47(4):32/1–30, December 2021.

[60] D. Arndt, W. Bangerth, B. Blais, M. Fehling, R. Gassmöller, T. Heister, L. Heltai, U. Köcher, M. Kronbichler, M. Maier, P. Munch, J.-P. Pelteret, S. Proell, K. Simon, B. Turcksin, D. Wells, and J. Zhang. The deal.II library, version 9.3. *Journal of Numerical Mathematics*, 29(3):171–186, September 2021.

[61] Danny K. Long, Wolfgang Bangerth, Derek R. Handwerk, Christopher B. Whitehead, Patrick D. Shipman, and Richard G. Finke. Estimating reaction parameters in mechanism-enabled population balance models of nanoparticle size distributions: A Bayesian inverse problem approach. *Journal of Computational Chemistry*, 43:43–56, 2022.

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Software

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Freely available versions of the Open Source deal.II software are periodically released. The latest release 9.6 was made available in August 2024, see

https://dealii.org/about/news/

deal.II is widely used around the world in research and teaching. An attempt at listing all publications prepared using the library can be found at

http://www.dealii.org/publications.html

I am also the author of the ASPECT code to simulate convection in the earth mantle and that is used in the geosciences, see http://aspect.geodynamics.org. It is accompanied by an extensive manual. Its version 3.0 was released in December 2024.

Video lectures

Starting in the spring 2013 semester, I have recorded a sequence of 71 lectures on computational science that are available on YouTube. The YouTube channel for these lectures can be found here. The primary site for these videos, providing a description of every lecture and other material is at https://www.math.colostate.edu/~bangerth/videos.html.
The videos are used in teaching at a number of universities around the world, as well as by users of the deal.II library referenced in the previous section. Collectively, they are viewed approximately 1,500 times per month.

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