Jed Brown

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Research Interests

Brown's research interests are in fast algorithms and community software infrastructure to enable reliable prediction, inference, and design for science and engineering applications using physically-based models. These activities include multiscale modeling, multilevel linear and nonlinear algebraic solvers, compatible discretization in space and time, discrete and continuous adjoints, numerical optimization, material modeling, and multiphysics coupling disseminated in robust community software packages providing performance on massively parallel and emerging architectures.

Academic Honors & Awards

2015 SIAM/ACM Prize in Computational Science and Engineering (PETSc team)

2014 IEEE TCSC Young Achiever

2014 SIAG/SC Junior Scientist Prize

2004 Outstanding Mathematics Student of the Year, University of Alaska Fairbanks

2004 Outstanding Physics Student of the Year, University of Alaska Fairbanks

2000–2004 Alaska Scholar

Education

Doctor of Science, ETH Zürich, 2011.
Thesis: Computational Methods for Ice Flow Simulation.

M.S. Mathematics, University of Alaska Fairbanks, 2006.

B.S. Mathematics, *magna cum laude*, University of Alaska Fairbanks, 2004.

B.S. Physics, *magna cum laude*, University of Alaska Fairbanks, 2004.

Professional Experience

Asst. Professor, Department of Computer Science, University of Colorado Boulder, Aug 2015–present

Asst. Computational Mathematician, MCS Division, Argonne National Laboratory, 2013–2015

Asst. Professor Adjoint, Department of Computer Science, University of Colorado Boulder, 2013–2015

Argonne Scholar, MCS Division, Argonne National Laboratory, 2012–2013

Postdoctoral Appointee, MCS Division, Argonne National Laboratory, 2011–2012

Research Assistant, ETH Zürich, 2007–2011

Research Technician, University of Alaska Fairbanks, 2006–2007

Research Assistant, University of Alaska Fairbanks, 2003–2006

Teaching Assistant, University of Northern British Columbia, 2003

Journal Papers Published

[1] Paul Fischer, Misun Min, Thilina Rathnayake, Som Dutta, Tzanio Kolev, Veselin Dobrev, Jean-Sylvain Camier, Martin Kronbichler, Tim Warburton, Kasia Świrydowicz, and Jed Brown. Scalability of high-performance PDE solvers. *International Journal of High Performance Computing Applications*, 34:562–586, 2020.

[2] Jed Brown, Yunhui He, and Scott MacLachlan. Local Fourier analysis of BDDC-like algorithms. *SIAM Journal on Scientific Computing*, 41:S346–S369, 2019.

[3] Mark F Adams, Eero Hirvijoki, Matthew G Knepley, Jed Brown, Tobin Isaac, and Richard Mills. Landau collision integral solver with adaptive mesh refinement on emerging architectures. *SIAM Journal on Scientific Computing*, 39(6):C452–C465, 2017.

[4] Mark F. Adams, Jed Brown, Matthew G. Knepley, and Ravi Samtaney. Segmental refinement: A multigrid technique for data locality. *SIAM Journal on Scientific Computing*, 38(4):C426–C440, 2016.

[5] Debojyoti Ghosh, Emil M. Constantinescu, and Jed Brown. Efficient implementation of nonlinear compact schemes on massively parallel platforms. *SIAM Journal on Scientific Computing*, 37(3):C354–C383, 2015. Also preprint ANL/MCS-P5121-0414.

[6] David A. May, Jed Brown, and Laetitia Le Pourhiet. A scalable, matrix-free multigrid preconditioner for finite element discretizations of heterogeneous Stokes flow. *Computer Methods in Applied Mechanics and Engineering*, 290(0):496–523, 2015.

[7] Jed Brown, Matthew G. Knepley, and Barry F. Smith. Run-time extensibility and librarization of simulation software. *IEEE Computing in Science and Engineering*, 17(1):38–45, 2015.

[8] Jed Brown, Barry F. Smith, and Aron Ahmadia. Achieving textbook multigrid efficiency for hydrostatic ice flow. *SIAM Journal on Scientific Computing*, 35(2):359–375, 2013. Also preprint ANL/MCS-P743-1298.

[9] David E. Keyes, Lois Curfman McInnes, Carol Woodward, William Gropp, Eric Myra, Michael Pernice, John Bell, Jed Brown, Alain Clo, Jeffrey Connors, Emil Constantinescu, Don Estep, Kate Evans, Charbel Farhat, Ammar Hakim, Glenn Hammond, Glen Hansen, Judith Hill, Tobin Isaac, Xiangmin Jiao, Kirk Jordan, Dinesh Kaushik, Efthimios Kaxiras, Alice Koniges, Kihwan Lee, Aaron Lott, Qiming Lu, John Magerlein, Reed Maxwell, Michael McCourt, Miriam Mehl, Roger Pawlowski, Amanda Peters Randles, Daniel Reynolds, Beatrice Rivière, Ulrich Rüde, Tim Scheibe, John Shadid, Brendan Sheehan, Mark Shephard, Andrew Siegel, Barry Smith, Xianzhu Tang, Cian Wilson, and Barbara Wohlmuth. Multiphysics simulations: Challenges and opportunities. *International Journal of High Performance Computing Applications*, 27(1):4–83, Feb 2013. Special issue.

[10] Tareq M. Malas, Aron J. Ahmadia, Jed Brown, John A. Gunnels, and David E. Keyes. Optimizing the performance of streaming numerical kernels on the IBM BlueGene/P PowerPC 450 processor. *International Journal of High Performance Computing Applications*, 27(2):193–209, 2013.

[11] Rodney Biezuner, Jed Brown, Grey Ercole, and Eder Martins. Computing the first eigenpair of the p-Laplacian via inverse iteration of sublinear supersolutions. *Journal of Scientific Computing*, 52:180–201, 2012.

[12] Jed Brown. Efficient nonlinear solvers for nodal high-order finite elements in 3D. *Journal of Scientific Computing*, 45:48–63, 2010.

[13] Jason M. Amundson, Mark Fahnestock, Martin Truffer, Jed Brown, Martin P. Lüthi, and Roman J. Motyka. Ice mélange dynamics and implications for terminus stability, Jakobshavn Isbræ, Greenland. *J. Geophys. Res*, 115:F01005, 2010.

[14] E. Bueler and J. Brown. Shallow shelf approximation as a "sliding law" in a thermomechanically coupled ice sheet model. *Journal of Geophysical Research-Earth Surface*, 114(F3):F03008, 2009.

[15] E. Bueler, J. Brown, and C. Lingle. Exact solutions to the thermomechanically coupled shallow ice approximation: effective tools for verification. *J. Glaciol*, 53:499–516, 2007.

[16] E. Bueler, C.S. Lingle, and J. Brown. Fast computation of a viscoelastic deformable Earth model for ice-sheet simulations. *Ann. Glaciol*, 46:97–105, 2007.

[17] E. Bueler, C. S. Lingle, J. A. Kallen-Brown, D. N. Covey, and L. N. Bowman. Exact solutions and numerical verification for isothermal ice sheets. *J. Glaciol.*, 51(173):291–306, 2005.

Refereed Proceedings Papers *(students marked with *)*

[1] Valeria Barra, Jed Brown, Jeremy Thompson, and Yohann Dudouit. High-performance operator evaluations with ease of use: libCEED's Python interface. In Meghann Agarwal, Chris Calloway, Dillon Niederhut, and David Shupe, editors, *Proceedings of the 19th Python in Science Conference*, pages 85 – 90, 2020.

[2] Tristan Konolige* and Jed Brown. A parallel solver for graph Laplacians. In *Proceedings of the Platform for Advanced Scientific Computing (PASC)*, 2018. Best Paper Award.

[3] Dmitry Duplyakin*, Jed Brown, and Donna Calhoun. Evaluating active learning with cost and memory awareness. In *2018 IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, pages 214–223. IEEE, 2018. Acceptance Rate 24.4%.

[4] Dmitry Duplyakin*, Jed Brown, and Robert Ricci. Active learning in performance analysis. In *Proceedings of the IEEE Cluster Conference*, September 2016. Acceptance Rate 24.1%.

[5] Dave A. May, Jed Brown, and Laetitia Le Pourhiet. pTatin3D: High-performance methods for long-term lithospheric dynamics. In *Proceedings of SC14: International Conference for High Performance Computing, Networking, Storage and Analysis*. ACM, 2014. Acceptance Rate 21%.

[6] Matthew G. Knepley, Jed Brown, Lois Curfman McInnes, and Barry F. Smith. Accurately citing software and algorithms used in publications. In *Workshop towards Sustainable Software for Science: Practice and Experiences (WSSSPE)*, 2013.

[7] Barry F. Smith Jed Brown, Matthew G. Knepley. Run-time extensibility: anything less is unsustainable. In *Workshop towards Sustainable Software for Science: Practice and Experiences (WSSSPE)*, 2013.

[8] Jed Brown and Peter Brune. Low-rank quasi-Newton updates for robust Jacobian lagging in Newton-type methods. In *International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering*, pages 2554–2565, 2013.

[9] J. Brown, M. G. Knepley, D. A. May, L. C. McInnes, and B. F. Smith. Composable linear solvers for multiphysics. In *Proceeedings of the 11th International Symposium on Parallel and Distributed Computing (ISPDC 2012)*, pages 55–62. IEEE Computer Society, 2012.

[10] K. Burckhardt, D. Szczerba, J. Brown, K. Muralidhar, , and G. Székely. Fast implicit simulation of oscillatory flow in human abdominal bifurcation using a schur complement preconditioner. In H. Sips, D. Epema, , and H.-X. Lin, editors, *Euro-Par 2009 Parallel Processing*, volume 5704 of *Lecture Notes in Computer Science*, pages 747–759. Springer, August 2009.

Technical Reports and Book Chapters

[1] Ahmad Abdelfattah, Valeria Barra, Natalie Beams, Jed Brown, Jean-Sylvain Camier, Veselin Dobrev, Yohann Dudouit, Leila Ghaffari, Tzanio Kolev, David Medina, Thilina Rathnayake, Jeremy L Thompson, and Stanimire Tomov. libceed user manual, September 2020.

[2] Satish Balay, Shrirang Abhyankar, Mark F. Adams, Jed Brown, Peter Brune, Kris Buschelman, Lisandro Dalcin, Alp Dener, Victor Eijkhout, William D. Gropp, Dinesh Kaushik, Matthew G. Knepley, Dave A. May, Lois Curfman McInnes, Richard Tran Mills, Todd Munson, Karl Rupp, Patrick Sanan, Barry F. Smith, Stefano Zampini, Hong Zhang, and Hong Zhang. PETSc users manual: Revision 3.14. Technical Report ANL-95/11 - Rev 3.14, Argonne National Laboratory, 2020.

[3] Tristan Konolige and Jed Brown. Multigrid for bundle adjustment, 2020.

[4] Tzanio Kolev, Paul Fischer, Ahmad Abdelfattah, Valeria Barra, Natalie Beams, Jed Brown, Jean-Sylvain Camier, Noel Chalmers, Veselin Dobrev, Stefan Kerkemeier, Yu-Hsiang Lan, Elia Merzari, Misun Min, Malachi Phillips, Thilina Ratnayaka, Kris Rowe, Jeremy Thompson, Ananias Tomboulides, Stanimire Tomov, Vladimir Tomov, and Tim Warburton. CEED ECP Milestone Report: Support CEED-enabled ECP applications in their preparation for Aurora/Frontier, September 2020.

[5] Tzanio Kolev, Paul Fischer, Ahmad Abdelfattah, Shreyas Ananthan, Valeria Barra, Natalie Beams, Ryan Bleile, Jed Brown, Robert Carson, Jean-Sylvain Camier, Matthew Churchfield, Veselin Dobrev, Jack Dongarra, Yohann Dudouit, Ali Karakus, Stefan Kerkemeier, YuHsiang Lan, David Medina, Elia Merzari, Misun Min, Scott Parker, Thilina Ratnayaka, Cameron Smith, Michael Sprague, Thomas Stitt, Jeremy Thompson, Ananias Tomboulides, Stanimire Tomov, Vladimir Tomov, Arturo Vargas, Tim Warburton, and Kenneth Weiss. CEED ECP Milestone Report: Improve performance and capabilities of CEED-enabled ECP applications on Summit/Sierra, May 2020.

[6] Lorena A. Barba, Lecia J. Barker, Douglas S. Blank, Jed Brown, Allen B. Downey, Timothy George, Lindsey J. Heagy, Kyle T. Mandli, Jason K. Moore, David Lippert, Kyle E. Niemeyer, Ryan R. Watkins, Richard H. West, Elizabeth Wickes, Carol Willing, and Michael Zingale. *Teaching and Learning with Jupyter*. GitHub, 2019.

[7] Lorena Barba, Juanjo Bazán, Jed Brown, Roman V Guimera, Melissa Gymrek, Alex Hanna, Lindsey J Heagy, Kathryn D Huff, Daniel S Katz, Christopher R Madan, and et al. Giving software its due through community-driven review and publication, Apr 2019.

[8] Stanimire Tomov, Ahmad Abdelfattah, Valeria Barra, Natalie Beams, Jed Brown, Jean-Sylvain Camier, Veselin Dobrev, Jack Dongarra, Yohann Dudouit, Paul Fischer, Ali Karakus, Stefan Kerkemeier, Tzanio Kolev, YuHsiang Lan, Elia Merzari, Misun Min, Aleks Obabko, Scott Parker, Thilina Ratnayaka, Jeremy Thompson, Ananias Tomboulides, Vladimir Tomov, and Tim Warburton. CEED ECP Milestone Report: Performance tuning of CEED software and 1st and 2nd wave apps, October 2019.

[9] Mark Shephard, Valeria Barra, Jed Brown, Jean-Sylvain Camier, Yohan Dudouit, Paul Fischer, Tzanio Kolev, David Medina, Misun Min, Cameron Smith, Morteza H. Siboni, Jeremy Thompson, and Tim Warburton. CEED ECP Milestone Report: Improved Support for Parallel Adaptive Simulation in CEED, July 2019.

[10] Jed Brown, Ahmad Abdelfattah, Valeria Barra, Veselin Dobrev, Yohann Dudouit, Paul Fischer, Tzanio Kolev, David Medina, Misun Min, Thilina Ratnayaka, Cameron Smith, Jeremy Thompson, Stanimire Tomov, Vladimir Tomov, and Tim Warburton. CEED ECP Milestone Report: Public release of CEED 2.0, March 2019.

[11] Jean-Sylvain Camier, Paul Fischer, Ali Karakus, Stefan Kerkemeier, Tzanio Kolev, Yu-Hsiang Lan, David Medina, Elia Merzari, Misun Min, Aleks Obabko, Thilina Ratnayaka, Dillon Shaver, Ananias

Tomboulides, Vladimir Tomov, and Tim Warburton. CEED ECP Milestone Report: Engage second wave ECP/CEED applications, March 2019.

[12] Katherine Barnhart, Thorsten Becker, Mark Behn, Jed Brown, Eunseo Choi, Catherine Cooper, Juliane Dannberg, Nicole Gasparini, Rene Gassmoeller, Lorraine Hwang, Boris Kaus, Louise Kellogg, Luc Lavier, Eric Mittelstaedt, Louis Moresi, Adina Pusok, Greg Tucker, Phaedra Upton, and Pedro Va. CTSP: Coupling of tectonic and surface processes. Technical report, University of Colorado, 2018.

[13] Samuel Williams, Mark F. Adams, and Jed Brown. High-performance geometric multigrid: An HPC performance benchmark. *SIAM News*, 51(3), 2018.

[14] Jed Brown. Higher standards on the control of numerical accuracy, 2016. Whitepaper accepted to the DOE Advancing X-cutting Ideas for Computational Climate Science (AXICCS).

[15] M. Knepley, D. A. May, J. Brown, and B. Smith. Extensibility in PETSc. *SIAM News*, 49(9), 2016.

[16] Satish Balay, Jed Brown, Matthew G. Knepley, Lois McInnes, and Barry Smith. *Software Engineering for Science*, chapter Providing Mixed Language and Legacy Support within a Library. Taylor & Francis, 2015.

[17] Matthew G. Knepley, Jed Brown, Lois Curfman McInnes, Barry Smith, Karl Rupp, and Mark Adams. Exascale computing without threads, 2015. Whitepaper for the DOE High Performance Computing Operational Review (HPCOR) on Scientific Software Architecture for Portability and Performance.

[18] Matthew G. Knepley, Jed Brown, Lois Curfman McInnes, Barry Smith, Karl Rupp, and Mark Adams. Overview of the PETSc library, 2015. Whitepaper for the DOE High Performance Computing Operational Review (HPCOR) on Scientific Software Architecture for Portability and Performance.

[19] Karl Rupp, Satish Balay, Jed Brown, Matthew G. Knepley, Lois Curfman McInnes, and Barry F. Smith. On the evolution of user support topics in computational science and engineering software. *ArXiv e-prints*, 2015. Whitepaper for Computational Science & Engineering Software Sustainability and Productivity Challenges.

[20] M. F. Adams, J. Brown, J. Shalf, B. Van Straalen, E. Strohmaier, and S. Williams. HPGMG 1.0: A benchmark for ranking high performance computing systems. Technical Report LBNL-6630E, LBNL, Berkeley, 2014.

[21] Debojyoti Ghosh, Emil M. Constantinescu, and Jed Brown. Scalable nonlinear compact schemes. Technical Report ANL/MCS-TM-340, Argonne National Laboratory, 2014.

[22] J. Brown. Scalable repository workflows, 2013. Whitepaper submitted to DOE Workshop on Software Productivity for Extreme-Scale Science, available via `http://www.orau.gov/swproductivity2014/papers.htm`.

[23] Jed Brown. Vectorization, communication aggregation, and reuse in stochastic and temporal dimensions. In *Exascale Mathematics Workshop, Aug 21–22, Washington, DC*. DOE Office of Advanced Scientific Computing Research, 2013.

[24] Mark F. Adams, Jed Brown, and Matthew G. Knepley. Low-communication techniques for extreme-scale multilevel solvers. In *Exascale Mathematics Workshop, Aug 21–22, Washington, DC*. DOE Office of Advanced Scientific Computing Research, 2013.

[25] Jennifer Arrigo, Jed Brown, Louise Kellogg, Lorraine Hwang, Scott Peckham, and David Tarboton. EarthCube modeling workshop results. Technical report, Computational Infrastructure for Geodynamics, 2013.

[26] M. G. Knepley, J. Brown, K. Rupp, and B. F. Smith. Achieving high performance with unified residual evaluation. *ArXiv e-prints*, September 2013.

[27] Jed Brown. User-defined non-blocking collectives must make progress. *IEEE Technical Committee on Scalable Computing*, 2012.

[28] Barry Smith, Lois Curfman McInnes, Emil Constantinescu, Mark Adams, Satish Balay, Jed Brown, Matthew Knepley, and Hong Zhang. PETSc's software strategy for the design space of composable extreme-scale solvers. Preprint ANL/MCS-P2059-0312, Argonne National Laboratory, 2012. DOE Exascale Research Conference, April 16-18, 2012, Portland, OR.

[29] Mark Adams, Jed Brown, and Barry F. Smith. Exascale programming models must vigorously enable libraries. In *DOE Exascale Research Conference*, 2012.

[30] Mihai Anitescu, Jed Brown, Paul Fischer, Sven Leyffer, Lois Curfman McInnes, Todd Munson, and Barry F. Smith. Exascale co-design opportunities: Multilevel approaches for hierarchical models, architectures, algorithms, and software. In *DOE Exascale Research Conference*, 2012.

[31] L. Ridgway Scott, Jed Brown, George W. Bergantz, Dan Cooley, Clint Dawson, Maarten de Hoop, Donald Estep, Natasha Flyer, Efi Foufoula-Georgiou, Michael Ghil, Matthew Knepley, Randall J. LeVeque, Lek-Heng Lim, Serge Prudhomme, Adrian Sandu, Frederik J. Simons, Philip B. Stark, Michael Stein, Seth Stein, Toshiro Tanimoto, Daniel Tartakovsky, Jonathan Weare, Robert Weiss, Grady B. Wright, and Dave Yuen. Fostering interactions between the geosciences and mathematics, statistics, and computer science. Technical Report 2012-02, University of Chicago, 2012.

Papers In Review

[1] Jed Brown, Yunhui He, Scott MacLachlan, Matt Menickelly, and Stefan M Wild. Tuning multigrid methods with robust optimization. *SIAM Journal on Scientific Computing*, 43:A109–A138, 2021.

[2] Tzanio Kolev, Paul Fischer, Misun Min, Jack Dongarra, Jed Brown, Veselin Dobrev, Tim Warburton, Stanimire Tomov, Mark S. Shephard, Ahmad Abdelfattah, Valeria Barra, Natalie Beams, Jean-Sylvain Camier, Noel Chalmers, Yohann Dudouit, Ali Karakus, Ian Karlin, Stefan Kerkemeier, Yu-Hsiang Lan, David Medina, Elia Merzari, Aleksandr Obabko, Will Pazner, Thilina Rathnayake, Cameron W. Smith, Lukas Spies, Kasia Swirydowicz, Jeremy Thompson, Ananias Tomboulides, and Vladimir Tomov. Efficient exascale discretizations: High-order finite element methods. *International Journal of High Performance Computing Applications*, 2020 (submitted).

[3] Richard Tran Mills, Mark F. Adams, Satish Balay, Jed Brown, Alp Dener, Matthew Knepley, Scott E. Kruger, Hannah Morgan, Todd Munson, Karl Rupp, Barry F. Smith, Stefano Zampini, Hong Zhang, and Junchao Zhang. Toward performance-portable PETSc for GPU-based exascale systems. *International Journal of High Performance Computing Applications*, 2020 (submitted).

Grants and Contracts

T. Kolev (Lead PI), P. Fischer, M. Min, J. Dongarra, T. Warburton, J. Brown (CU Boulder PI), M. Shepherd, *Center for Efficient Exascale Discretization*, DOE Exascale Computing Project, 2020–2022, CU Boulder Award $210k.

R. Regueiro (PI), J. Brown, A. Clarke, A. Doostan, H. Tufo, *Center for Micromorphic Multiphysics Porous and Particulate Materials Simulations within Exascale Computing Workflows*, 2020-06-01 to 2025-05-31, DOE PSAAP, Total Award $13,158k.

Tzu-Wei Fang (PI), A. Doostan, T. Fuller-Rowell, D. Hysell, E. Sutton, J. Brown, *Collaborative Research: Forecasting the small-scale plasma structures in the Ionosphere-Thermosphere system*, NSF, 2020–2023, Total Award $2,399k.

J. Brown (PI), *Extending PETSc's Composable Hierarchical Solvers*, DOE Office of Advanced Scientific Computing Research, DE-SC0016140 (renewal), 2019-07-01 to 2022-06-30, Award $290k.

T. Kolev (Lead PI), P. Fischer, M. Min, J. Dongarra, T. Warburton, J. Brown (CU Boulder PI), M. Shepherd, *Center for Efficient Exascale Discretization*, DOE Exascale Computing Project, 2019–2020, CU Boulder Award $400k.

J. Brown (Lead PI), Tobin Isaac (GaTech), *Collaborative Research: Elements: Software: NSCI: Constitutive Relation Inference Toolkit (CRIKit)*, NSF CSSI (contract pending), 2019-01-01 to 2021-12-31, Total Award $593k (CU Boulder $293k).

G. Bisht (Lead PI, LBNL), J. Brown (CU Boulder PI), N. Collier, J. Frederick, G. Hammond, S. Karra, M. Knepley, *Terrestrial dynamical cores for the ACME to simulate water cycle*, DOE Office of Biological and Environmental Research (SciDAC), 2018-05-01 to 2020-10-31, CU Boulder Award $188k.

K. Jansen (Lead PI), J. Brown, A. Doostan, J. Evans, J. Farnsworth, *Collaborative Research: NSCI SI2-S2I2: Conceptualization of CFDSI: Model, Data, and Analysis Integration for End-to-End Support of Fluid Dynamics Discovery and Innovation*, NSF OAC 1743178, 2018-03-01 to 2019-08-31, Award $257k.

J. Brown (PI), *Extending PETSc's Composable Hierarchical Solvers*, DOE Office of Advanced Scientific Computing Research, DE-SC0016140, 2016-07-01 to 2019-06-30, Award $285k.

T. Kolev (Lead PI), P. Fischer, M. Min, J. Dongarra, T. Warburton, J. Brown (CU Boulder PI), M. Shepherd, *Center for Efficient Exascale Discretization*, DOE Exascale Computing Project, 2016–2018, CU Boulder Award $400k.

M. Adams, M. Knepley, J. Brown (Co-PI), *Intel Parallel Computing Center at Rice University*, Intel, 2016-07-01 to 2017-06-30, Award to Rice University $200k.

M. Adams, M. Knepley, J. Brown (Co-PI), *Intel Parallel Computing Center at University of Chicago*, Intel, 2015-07-01 to 2016-06-30, Award to University of Chicago $200k.

HPC Allocations

K. Jansen (lead), S. Becker, J. Brown, J. Evans, A. Doostan, *Data Analytics and Machine Learning for Exascale CFD*, Aurora Early Science Program, includes funding for an ALCF postdoc that we recruit.

K. Jansen (lead), J. Brown, J. Evans, M. Rasquin, O. Sahni, M. Shepherd, *Adaptive DES of a Vertical Tail/Rudder Assembly with Active Flow Control*, DOE INCITE 2017, 90M ALCF hours.

K. Jansen (lead), J. Brown, M. Rasquin, O. Sahni, M. Shepherd, C. Smith, *Adaptive Detached-Eddy Simulation of a High Lift Wing with Active Flow Control*, DOE INCITE 2016, 70M ALCF hours.

K. Jansen (lead), J. Brown, I. Bolotnov, C. Carothers, J. Evans, B. Matthews, M. Rasquin, O. Sahni, M. Shepherd, C. Smith, *Extreme Scale Unstructured Adaptive CFD: From Multiphase Flow to Aerodynamic Flow Control*, ALCF Theta Early Science Program Tier 2, 5M ALCF hours.

J. Brown (lead), L. Curfman McInnes, *Composable Hierarchically Nested Solvers*, NERSC Allocation 2020, 1.54M NERSC MPP hours, 500 SRUs.

J. Brown (lead), L. Curfman McInnes, *Composable Hierarchically Nested Solvers*, NERSC Allocation 2019, 1.54M NERSC MPP hours, 500 SRUs.

J. Brown (lead), L. Curfman McInnes, *Composable Hierarchically Nested Solvers*, NERSC Allocation 2018, 1.87M NERSC MPP hours, 500 SRUs.

J. Brown (lead), L. Curfman McInnes, *Composable Hierarchically Nested Solvers*, NERSC Allocation

2017, 2.0M NERSC MPP hours, 1000 SRUs.

J. Brown (lead), L. Curfman McInnes, *Composable Hierarchically Nested Solvers*, NERSC Allocation 2018, 1.5M NERSC MPP hours, 1000 SRUs.

Proposals declined (as PI or co-PI)

A. Doostan (PI), S. Becker, J. Brown, J. Evans, K. Jansen, *Scalable Data Reduction Techniques for Extreme-Scale Unstructured PDE Simulations*, DOE PSAAP, 2019.

J. Brown (PI), J. Kay, C. Monteleoni, *What is predictable? Quantifying Internal Model and Natural Variability for Actionable Policy*, Schmidt Futures VESRI, 2019.

J. Brown (PI), *Parallel Multiscale Bundle Adjustment*, Google, 2017.

M. Adams (PI), B. Smith, A. Bhattacharjee, M. Knepley, D. Brennan, B. Griffith, A. Donev, R. Brower, T. Isaac, B. Riviere, J. Brown, *Structure Preserving, Adaptive, Composable methods for Extreme-scale computational science (SPACE)*, DOE, 2017.

J. Brown (PI), *Benchmarks of Realistic Scientific Application Performance of Large-Scale Computing Systems*, NSF, 2015.

K. Jansen (PI), J. Brown, J. Evans, M. Shephard, C. Smith, *Robust and Efficient Unstructured Grid Flow Solvers at Extreme Scale: Extending Existing Success to the Broader Community of Unstructured CFD including FUN3D*, NASA, 2015.

J. Brown (PI), K. Jansen, J. Evans, A. Doostan, *SI2: SSI Modular Software for Model Exploration and Immersive Simulation*, NSF, 2015.

Software

Developer of the Portable Extensible Toolkit for Scientific computing (PETSc) since 2008, `http://mcs.anl.gov/petsc`.

Principal author of libCEED: Code for Efficient Extensible Discretization, `https://github.com/ceed/libceed`.

Principal author of the Parallel Ice Sheet Model (PISM) 2004–2007, `http://pism-docs.org`.

Author of the Dual-Order *hp* finite element library, `https://github.com/jedbrown/dohp`.

I have released and maintained software written in C, C++, Fortran, Python, Haskell, Perl, Ruby, and LaTeX, and have a working knowledge of several other languages including Lisps and x86 and PowerPC assembly.

Selected Presentations

2020

J. Brown, *Libraries, communities, and performance portability*, (invited/plenary), ExCALIBUR: Exascale Computing for System-Level Engineering, UK (virtual), 2020-07-14.

2019

J. Brown, *Developing a terrestrial dynamical core for E3SM*, Multicore-9, NCAR, Boulder, 2019-09-26.

J. Brown, *Algorithms, architectures, and community for high-resolution climate modeling*, (invited/plenary), Latsis Symposium, ETH Zürich, Switzerland, 2019-08-22.

J. Brown, *JOSS: The Journal of Open Source Software*, (invited/plenary), CSDMS Annual Meeting, Boulder, CO, 2019-05-21.

J. Brown, *PETSc Tutorial*, SIAM CSE, Spokane, WA, 2019-02-26.

J. Brown, *Library interface design and performance portability*, SIAM CSE, Spokane, WA, 2019-02-25.

2018

J. Brown, *On performance portability for unstructured high-order finite element computations*, SIAM Annual Meeting, Portland, OR, 2018-07-09.

J. Brown, *Active learning for cost-aware model reduction*, Copper Mountain Conference on Iterative Methods, Colorado, 2018-03-27.

2017

J. Brown, *Practical and Efficient Time Integration and Kronecker Product Solvers*, SIAM Central States Section, Fort Collins, CO, 2017-09-30.

J. Brown, *Center for Efficient Exascale Discretization, Multicore 7 Workshop* (invited/plenary), NCAR, Boulder, CO, 2017-09-28.

J. Brown, *Practical and Efficient Time Integration and Kronecker Product Solvers*, Preconditioning 2017 (invited/plenary), Vancouver, Canada, 2017-08-01.

J. Brown, *PETSc Solvers Tutorial*, PETSc User Meeting, Boulder, CO, 2017-06-14.

J. Brown, *On nonlinear adaptivity with heterogeneity*, Copper Mountain Multigrid Conference, Colorado, 2017-03-30.

J. Brown, *Community building through software design* (invited/plenary), SI2 Meeting, 2017-02-21.

J. Brown, *On nonlinear adaptivity with heterogeneity* (invited/plenary), DD24, Svalbard, 2017-02-09.

2016

J. Brown, *Design Considerations for Latency and Throughput on KNL*, MultiCore 6 Workshop, NCAR, 2016-09-14.

J. Brown, *Higher Standards on the Control of Numerical Accuracy*, AXICCS, Rockville, MD, 2016-09-12.

J. Brown, *Threading Tradeoffs in Domain Decomposition*, SIAM Parallel Processing, Paris, 2016-04-13.

J. Brown, *Building a Community Model for Robustness and Extensibility*, (invited), Melt in the Mantle, Isaac Newton Institute, Cambridge University, 2016-03-03.

J. Brown, *PETSc: Technical and Social Aspects of Library Development*, (invited), Scientific Software Days, UT Austin, 2016-02-25.

J. Brown, *High-Performance Geometric Multigrid (HPGMG) and Quantification of Performance Versatility*, CISL Seminar, NCAR, Boulder, 2016-02-17.

2015

J. Brown, *To Thread or Not To Thread*, Multi-core 5 Workshop, NCAR, Boulder, 2015-09-16.

J. Brown, *Tradeoffs in Data Assimilation and Solver Design*, 14th International Workshop on Modeling of Mantle and Lithosphere Dynamics (invited), Olérons, France, 2015-09-01.

J. Brown, *In Search of Performance Versatility*, PADAL Workshop, Berkeley Lab, 2015-06-24.

J. Brown, *HPGMG: Relevant Benchmarking for Scientific Computing*, HPCSE (invited), Czech Republic, 2015-05-25.

J. Brown, M. Adams, S. Williams, *HPGMG: Benchmarking Computers Using Multigrid*, Copper Mountain Conference on Multigrid Methods, 2015-03-24.

J. Brown, *Time Integration for Atmospheric Physics*, SIAM Conference on Computational Science and Engineering (CSE15), Salt Lake City, 2015-03-16.

J. Brown, *On Adaptive Methods in Heterogeneous Media*, High Performance and Parallel Computing for Materials Defects and Multiphase Flows (invited), National University of Singapore, 2015-02-13.

J. Brown, *Practical Multigrid Methods for Momentum Balance in Ice Sheets*, CESM Land Ice Working Group, NCAR, 2015-02-02.

2014

J. Brown, *How Can We Quantify Performance Versatility?*, JointLab Workshop, Chicago, 2014-11-24.

J. Brown, D. May, L. Le Pourhiet, *pTatin3d: High-performance Methods for Long-Term Lithospheric Dynamics*, SC14, New Orleans, 2014-11-18.

J. Brown, *Software Design and Packaging for Extensibility, Provenance, and Sharing*, CIG Webinar, 2014-11-13.

J. Brown, D. Ghosh, *Can Implicit Integrators Have Less Data Motion Than Explicit?*, $[HPC]^3$ Workshop (invited), KAUST, Saudi Arabia, 2014-11-10.

J. Brown, *Efficient Implicitness: Latency-throughput and cache-vectorization tradeoffs*, Heterogeneous Multi-Core Workshop, NCAR, 2014-09-17.

J. Brown, M. Adams, M. Knepley, D. May, *Towards τ adaptivity for lithospheric dynamics*, SIAM Annual Meeting, Chicago, 2014-07-07.

J. Brown, M. Adams, M. Knepley, *Algorithmic reuse for non-smooth problems in heterogenous media*, Parallel Matrix Algorithms and Applications, Lugano, Switzerland, 2014-07-02.

J. Brown, M. Adams, M. Knepley, *Next-generation multigridding: Adaptivity and communication avoidance*, JointLab Workshop, INRIA Sophia Antipolis, 2014-06-09.

J. Brown, D. May, M. Knepley, *High-performance matrix-free operator application and preconditioning*, Algorithms and Abstractions for Assembly in PDE codes (invited), Sandia National Lab, 2014-05-14.

J. Brown, M. Adams, M. Knepley, *Next-generation multigridding*, SUNY Buffalo, 2014-04-23.

J. Brown, *Numerical libraries and frameworks*, ENES Workshop on Exascale Technologies (invited), Hamburg, 2014-03-18.

J. Brown, *Exploits in implicitness*, SIAM conference on Parallel Processing (SIAG/SC Junior Scientist Prize talk), 2014-02-21.

J. Brown, M. Adams, M. Knepley, *Low-communication multigrid, with applications to time-dependent adjoints, in-situ visualization, and resilience*, SIAM conference on Parallel Processing, 2014-02-19.

J. Brown, *Multigrid on the outside: restructuring time integration and adaptivity*, ANAG seminar, Berkeley National Lab, 2014-01-16.

2013

J. Brown, D. Ghosh, *Fast solvers for implicit Runge-Kutta systems*, JointLab workshop, UIUC, 2013-11-26.

J. Brown, M. Adams, P. Brune, E. Constantinescu, M. Knepley, D. May, B. Smith, *Prospects for next-generation multigridding*, Imperial College London, 2013-09-26 and University of Oxford, 2013-09-27.

J. Brown, *Inverse problems and uncertainty quantification*, Citcom workshop (invited), UC Davis, 2013-09-16.

J. Brown, P. Brune, E. Constantinescu, D. Ghosh, L.C. McInnes, *PETSc and BOUT++*, 2013 BOUT++ workshop (invited), LLNL, 2013-09-04.

J. Brown and S. Dalton, *GPU-accelerated smoothed aggregation algebraic multigrid: Multi-node scalability and versatility*, GPU-SMP13 (invited), Changchun, China, 2013-07-30.

J. Brown, *Vectorization, communication aggregation, and reuse in stochastic and temporal dimensions*, JointLab workshop, Lyon, France, 2013-06-13.

J. Brown and P. Brune, *Low-rank Quasi-Newton Updates for Robust Jacobian Lagging in Newton Methods*, International Conference for Numerical and Mathematics and Computational Methods Applied to Nuclear Science and Engineering (MC2013), Sun Valley, ID, 2013-05-08.

J. Brown, *Discretization, Solvers, and Statistics in Computational Geodynamics*, EarthCube Modeling Workshop (invited), Boulder, CO, 2013-04-23.

J. Brown, S. Abhyankar, B. Smith, *Sharing Thread Pools and Caches for Inter-library Composition and Multicore Performance*, SIAM CSE, Boston, MA, 2013-02-25 to 03-01.

J. Brown, M. Adams, P. Brune, M. Knepley, and B. Smith, *Communication elimination and fault tolerance in multilevel solvers*, Computer Science seminar, UIUC, 2013-02-06.

2012

J. Brown, M. Adams, M. Knepley, and B. Smith, *Multilevel solvers with adaptive coarse space construction for lithosphere dynamics*, 1st International Conference on Frontiers in Computational Physics: Modeling the Earth System, Boulder, CO, 2012-12-16 to 20.

J. Brown, *Pervasive multiscale modeling, analysis, and solvers*, Bridging the Gap Between the Geosciences and Mathematics, Statistics, and Computer Science (invited), Princeton, October 1-2, 2012.

J. Brown, *Multilevel Stokes flow solvers: Adapting to heterogeneity and rheology*, Mantle Convection and Lithospheric Dynamics Workshop (invited), UC Davis, July 30, 2012.

J. Brown, M. Adams, P. Brune, M. Knepley, L.C. McInnes, and B. Smith, *Composable multilevel methods for multiphysics simulation*, SIAM Annual Meeting, Minneapolis, 2012-07-13.

J. Brown, I. Grindeanu, B. Smith, and T. Tautges, *A parallel unstructured implicit 3D polythermal model for outlet glaciers*, International Glaciology Society International Symposium, Fairbanks, AK, 2012-06-28.

J. Brown, P. Brune, E. Constantinescu, M. Knepley, and B. Smith, *Towards high throughput composable multilevel solvers for implicit multiphysics simulation*, National Renewable Energy Laboratory, Golden, CO, 2012-04-27.

J. Brown, M. Knepley, D. May, and B.F. Smith, *Scalable and composable implicit solvers for polythermal ice flow with steep topography*, International Conference on Scientific Computing and Applications, Las Vegas, 2012-04-03.

J. Brown, M. Adams, P. Brune, M. Knepley, D. May, L. C. McInnes, and B.F. Smith, *Commuting block preconditioning with multigrid*, Copper Mountain Conference on Iterative Methods, 2012-03-27.

J. Brown, M. Knepley, D. May, and B.F. Smith, *Towards high throughput composable multilevel solvers for implicit multiphysics simulation*, Center for Computational Engineering Distinguished Speaker Series, MIT, 2012-03-21.

J. Brown, M. Knepley, D. May, and B. Smith, *Towards algorithmic and software composability for implicit multiphysics with high throughput*, ICES/PECOS seminar, UT Austin, 2012-02-23

J. Brown, M. Knepley, D. May, and B. Smith, *Commuting block preconditioned splitting with multigrid within the same code base*, SIAM conference on Parallel Processing, 2012-02-17.

J. Brown, A. Ahmadia, M. Knepley, and B. Smith, *Utilizing emerging multicore and GPU hardware for multiphysics simulation through implicit high-order finite element methods with tensor product structure*, SIAM conference on Parallel Processing, 2012-02-15.

J. Brown, M. Adams, P. Brune, M. Knepley, D. May, and B. Smith, *Toward less synchronous composable multilevel methods for implicit multiphysics simulation*, Workshop on High Performance Computing, and Hybrid Programming Concepts for Hyperbolic PDE Codes $[HPC]^3$ (invited), KAUST, Saudi Arabia, 2012-02-06.

J. Brown, M. Adams, P. Brune, M. Knepley, and B.F. Smith, *Toward less synchronous composable multilevel methods for implicit multiphysics simulation*, Workshop on Synchronization-reducing and Communication-reducing Algorithms and Programming Models for Large-scale Simulations (invited), ICERM, Brown University, 2012-01-10.

2011

D. May, L. Le Pourhiet, and J. Brown, *Tightly coupled geodynamic systems: Software, implicit solvers, and applications*, American Geophysical Union Fall Meeting (invited), 2011-12-05.

J. Brown, A. Ahmadia, M. Knepley, and B.F. Smith, *Utilizing emerging hardware for multiphysics simulation through implicit high-order finite element methods with tensor product structure*, American Geophysical Union Fall Meeting (invited), 2011-12-05.

J. Brown, E. Constantinescu, and B. Smith, *Tightly coupled solvers, loosely coupled software: Multiphysics solvers and time integration in PETSc*, Los Alamos National Laboratory, Center for Nonlinear Studies, 2011-11-02.

J. Brown, I. Grindeanu, D. Karpeev, B.F. Smith, and T.J. Tautges, *Interactive transient and steady-state analysis of regional ice flow*, World Climate Research Programme, Denver, CO, 2011-10-26.

J. Brown, D. May, and B.F. Smith, *Strongly coupled solvers with loosely coupled software*, 7th International Congress on Industrial and Applied Mathematics - ICIAM 2011, Vancouver, Canada, 2011-07-21.

J. Brown, I. Grindeanu, D. Karpeev, B.F. Smith, and T.J. Tautges, *Scalable implicit methods for free surface flows in glaciology*, 7th International Congress on Industrial and Applied Mathematics - ICIAM, Vancouver, Canada, 2011-07-20.

A. Ahmadia, J. Brown, N. Collier, T. Malas, and J. Gunnels, *A software framework in Python for generating optimal isogeometric kernels on the PowerPC 450*, SciPy, Austin, 2011-07-13.

J. Brown, *Strongly coupled solvers with weakly coupled software: Modular linear algebra for multi-physics*, Workshop on High Performance Computing and Hybrid Programming Concepts for Hyperbolic PDE Codes (invited), KAUST, Saudi Arabia, 2011-03-27.

J. Brown, *Implicit solution of free surface flows in glaciology*, SIAM Conference on Computational Science and Engineering, Reno, NV, 2011-03-01.

J. Brown, *Computational methods for several models of ice stream flow*, International Conference on the Diversity of Research on Geophysical Environmental Sciences, ETH Zürich, 2011-02-18.

2010

J. Brown, *Solving free surface flows for steady state without time stepping*, American Geophysical Union Fall Meeting, 2010-12-14.

J. Brown, *Implicit discretizations for grounding line dynamics*, CCSM Annual Meeting, Breckenridge, CO, 2010-06-30.

J. Brown, *PETSc: new developments, memory performance, and algorithmic experimentation*, NOTUR (invited), Bergen, Norway, 2010-05-21.

J. Brown, *Implicit integration of 3D ice sheet flow using hybrid factorization/relaxation block preconditioning*, Copper Mountain Conference on Iterative Methods (invited), CO, 2010-04-08.

J. Brown, *Scalable solvers for the 3D non-Newtonian Stokes problem in ice flow modeling*, CCSM Annual Meeting, Breckenridge, CO, 2010-06-17.

J. Brown and B.F. Smith, *Textbook multigrid efficiency for hydrostatic ice flow*, CCSM Land Ice Working Group, Boulder, CO, 2010-02-17.

Internal Professional Activities

CS Colloquium Chair 2018–

CS Compute Committee 2020-

CS EdTech Committee 2019–

CS Executive Committee 2015–2017

CS Graduate Committee 2015–2017

CS Search Committee 2015–2016, 2016–2017

CS representative on INSTAAR/CSDMS Search Committee, 2018–2019

College Faculty Inclusive Excellence Team 2016–2017

CEAS Transfer Credit Committee 2017–2018

External Professional Activities

Associate Editor, Journal of Open Source Software, 2018–present.

Elected member of the Leadership Council for EarthCube, 2019–2021.

Mentor for Women in HPC, SIAM, SC, Black in AI.

Elected member of the Science Steering Committee for CIG (Computational Infrastructure for Geodynamics), 2011–2014, 2014–2017.

Member of the CIG Computational Science Working Group, 2013–present.

Co-organizer of MultiCore 8 and MultiCore 9 at NCAR, 2018–2019.

Primary organizer of PETSc 2017 User Meeting, Boulder, CO.

Co-organizer of IMA Hot Topics Workshop: Modelling Waves Impacting Coastal Areas, UMN, Oct 2014.

Associate Editor, SISC Special Section for CSE15 - CSE Software and Big Data in CSE.

Selected technical program committees:

SC20 International Conference for High Performance Computing, Networking, Storage and Analysis, Atlanta, GA, 2020-11-17 to 2019-11-23.

EuroPar'20 International European Conference on Parallel and Distributed Computing, Warsaw, Poland, 2020-08-24 to 28.

SIAM PP20 SIAM Parallel Processing Technical Papers Committee, 2020.

PASC20 ACM/SIGHPC Platform for Advanced Scientific Computing (PASC), ETH Zürich, 2020-06-29 to 2019-07-01.

SC19 International Conference for High Performance Computing, Networking, Storage and Analysis, Denver, CO, 2019-11-17 to 23.

Precon19 International Conference On Preconditioning Techniques For Scientific and Industrial Applications , Minneapolis, MN, 2019-07-01 to 03.

PASC19 ACM/SIGHPC Platform for Advanced Scientific Computing (PASC), ETH Zürich, 2019-06-12 to 14.

PETSc-2019 PETSc User Meeting, Atlanta, Georgia, 2019-06-05 to 07.

SC18 International Conference for High Performance Computing, Networking, Storage and Analysis, Dallas, TX, 2018-11-11 to 16.

PETSc-2018 PETSc User Meeting, London, 2018-06-04 to 06.

SIAM PP18 SIAM Parallel Processing, Tokyo, Japan, 2018-03-07 to 10.

IPDPS17 International Conference for Parallel and Distributed Computing, Salt Lake City, UT, 2017-11-13 to 18.

SC16 International Conference for High Performance Computing, Networking, Storage and Analysis, Salt Lake City, UT, 2016-11-13 to 18.

PDESoft2016 PDE Software Frameworks, Warwick, England, 2016-07-04 to 08.

PETSc-2016 PETSc User Meeting, Vienna, 2016-06-28 to 30.

SC15 International Conference for High Performance Computing, Networking, Storage and Analysis, Austin, TX, 2015-11-15 to 20.

PETSc-2015 PETSc User Meeting, Argonne National Lab, 2015-06-15 to 18.

SC14 International Conference for High Performance Computing, Networking, Storage and Analysis, New Orleans, LA, 2014-11-16 to 21.

ISC'14 International Supercomputing Conference, Leipzig, Germany, 2014-06-22 to 26.

VECPAR2014 11th International Meeting on High-Performance Computing for Computational Science, Eugene, OR, 2014-06-30 to 07-03.

EASC2014 Exascale Applications and Software Challenges, Stockholm, Sweden, 2014-04-02 to 04

SC13 International Conference for High Performance Computing, Networking, Storage and Analysis, Denver, CO, 2013-11-17 to 22.

GPU-SMP2013 International Workshop of GPU and MIC Solutions to Multiscale Problems in Science and Engineering, Changchun, China, 2013-07-29 to 08-02.

MC2013 International Conference for Numerical and Mathematics and Computational Methods Applied to Nuclear Science and Engineering, Sun Valley, ID, 2013-05-06 to 10.

HPC^3 **2012** Workshop on High Performance Computing and Hybrid Programming Concepts for Hyperbolic PDE Codes, KAUST, Saudi Arabia, 2012-02-04 to 08.

Session convener at the American Geophysical Union Fall Meeting, 2009–2019.

Session convener at SIAM CSE 2015, SIAM PP 2016, SIAM CSE 2019, SIAM PP 2020.

BoF organizer, SC14, SC15, SC16, SC17.

Contributed to the MPI-3 standard.

Grant reviewer/panelist for DOE and NSF.

Reviewer for ASCR Leadership Computing Challenge (ALCC), Advances in Water Resources, Computational Science and Discovery, EuroMPI, ETH Zürich, Geoscientific Model Development, International Journal of High Performance Computing Applications, IEEE International Parallel and Distributed Processing Symposium, International Conference on Supercomputing, IMUDI, Journal of Computational Physics, Journal of Fluid Mechanics, Journal of Geophysical Research, Journal of Scientific Computing, SIAM Journal on Scientific Computing, SIAM Journal on Numerical Analysis, The Cryosphere, Transactions and Mathematical Software, ACM Transactions on Mathematical Software, SIAM books, Wiley books

Collaborators

Abhyankar, Shrirang (ANL); Adams, Mark (LBNL); Beams, Natalie (UTK); Bisht, Gautam (PNNL); Bueler, Edward (University of Alaska Fairbanks); Calhoun, Donna (Boise State); Constantinescu, Emil (ANL); Dudouit, Yohann (LLNL); Dalcin, Lisandro (KAUST); Fischer, Paul (UIUC/ANL); Ghosh, Debojyoti (LLNL); Dobrev, Veselin (LLNL); Hammond, Glenn (Sandia); Hammond, Jeff (Intel); He, Yunhui (University of Waterloo); Isaac, Tobin (GATech); Jansen, Ken (CU Boulder); Knepley, Matthew (U Buffalo); Kolev, Tzanio (LLNL); MacLachlan, Scott (Memorial University); McInnes, Lois Curfman (ANL); Medina, David (LLNL); Menickelly, Matt (ANL); Mills, Richard (ANL); Min, Misun (ANL); Rupp, Karl (Independent/TU Wien); Samtaney, Ravi (KAUST); Shephard, Mark (RPI); Smith, Barry (ANL); Smith, Cameron (RPI); Terrel, Andy (Fashion Metric, NumFOCUS); Tomov, Stanimire (UTK); Warburton, Tim (Virginia Tech); Wild, Stefan (ANL); Williams, Sam (LBNL); Zampini, Stefano (KAUST); Zhang, Hong (ANL); Zhang, Hong (UIC);

Teaching

CU Boulder CSCI 3656 Numerical Computation (Spring 2020)

CU Boulder CSCI 4576/5576 High-Performance Scientific Computing (Fall 2019)

CU Boulder CSCI 3656 Numerical Computation (Spring 2019)

CU Boulder CSCI 5636 Numerical Solution of Partial Differential Equations (Fall 2018)

CU Boulder CSCI 3656 Numerical Computation (Spring 2018)

CU Boulder CSCI 5636 Numerical Solution of Partial Differential Equations (Fall 2017)

CU Boulder CSCI 4830/7000 High-Performance Linear Algebra (Spring 2017)

CU Boulder CSCI 3656 Numerical Computation (Fall 2016)

CU Boulder CSCI 7000-014 Topics in CS&E (Fall 2015)

CU Boulder CSCI 4830-014/7000-018 HPC Performance Analysis (Spring 2015)

Founding member of `scicomp.stackexchange.com`, profile at `http://scicomp.stackexchange.com/users/119/jed-brown`

Thousands of technical explanations of numerical methods and software design in support of hundreds of scientific and engineering applications (many on PETSc mailing lists and externally).

Mentor for NASA team at GPU Hackathon, Boulder 2018-06-04 to 08

Tutorials and short courses

PETSc Tutorial, tutorial at Memorial University of Newfoundland, Canada, 2017-05-29 to 31.

PETSc Tutorial, tutorial at IT4I, Ostrava, Czech Republic, 2015-05-21 to 22.

Intro to parallel algebraic solvers using PETSc, tutorial at UC Merced, 2014-10-31.

PETSc, tutorial at SUNY Buffalo (with Matt Knepley), 2014-04-22.

PETSc, tutorial at PRACE summer school, Ostrava, Czech Republic, 2013-06-17 to 21.

High performance implicit solvers for geodynamics, CIG Webinar, 2013-01-10.

PETSc, tutorial at National Renewable Energy Laboratory, Golden, CO, 2012-04-27.

Advanced PETSc, tutorial at TACC, Austin, TX, 2012-02-20.

PETSc tutorial at the 2011 ACTS workshop, NERSC, Berkeley, CA, 2011-08-17.

PETSc, 3-day tutorial at the Arctic Region Supercomputing Center, Fairbanks, AK, 2010-08-03 to 05.

PETSc, 2-day tutorial at the Swiss National Supercomputing Center, Manno, Switzerland, 2010-05-10 to 11.

Scalable solvers for nonlinear equations: mini-course on Newton-Krylov methods, 3-week mini-course at the University of Alaska Fairbanks, 2009-01-22 to 02-05, `59A2.org/newton-krylov`.

Two days of hands-on with students at ATPESC, plus panel discussion, 2014-08-08 to 09.

Two days of hands-on with students at ATPESC, plus panel discussion, 2015-08-07 to 2014-08-08.

Software carpentry boot camp, University of Chicago, 2013-01-12 to 13.

Advising

CU Boulder postdocs advised

Valeria Barra, 2018–2020

CU Boulder PhD students advised

Dmitry Duplyakin, CS PhD Spring 2017, postdoc at University of Utah

Tristan Konolige, CS PhD student, 2016–2020

Sarah Gage, CS PhD student, 2017–

Jeremy Thompson, APPM PhD student, 2017–

Reagan Cronin, CS PhD student, SIGHPC/Intel Computational and Data Science Fellow, 2018–

Leila Ghaffari, CS PhD student, 2019–

John Michael McCabe, CS PhD student, 2019–

Rezgar Shakeri, CEAE PhD student, 2020–

Ren Stengel, CS PhD student, 2020–

Arash Mehraban, CS PhD student, 2015–2017

CU Boulder MS students advised

Parth Thakkar, APPM MS student, 2018–

Tiantian Xie, MS Spring 2017

Karthik Handady, MS Spring 2017

CU Boulder BS+MS students advised

Matthew Normile, Aerospace BS+MS, 2017–2019

CU Boulder BS Senior Thesis students advised

Mehmet Karaoglu, 2018–2019

CU Boulder Undergraduate research

Zane Jakobs, APPM, 2019–

Raya Alotaibi, CS, 2019–2020

Olivia Golden, MCEN, 2020–2020

Joe Geisz, APPM, 2019

CU Boulder Thesis Committees

Joseph Pointer, Aerospace PhD

Sebastian Laudenschlager, CS PhD

Arash Mehraban, CS PhD

Fortino Garcia, APPM PhD

Mike Kasper, CS PhD 2020

Hilary Egan, APS PhD 2019

Andrew Glaws, CS PhD 2018, NREL postdoc

James Folberth, APPM PhD 2018

James Balasalle, CS PhD 2018, Digital Globe

Joshua Murphy, CS PhD 2018

Blake Caldwell, CS PhD 2017–2018

Fande Kong, CS PhD 2016, INL staff member

Thomas Nelson, CS PhD 2015

Maxwell Lambek, CS Senior Thesis

H. Nihar Nandan, CS Senior Thesis

Argonne summer students advised/co-advised:

2013

Steven Dalton, UIUC PhD, GPU-accelerated distributed-memory parallel algebraic multigrid. (Also served on Steven's thesis committee.) Now at NVIDIA Research.

Jesse Lopez, CSGF, OHSU PhD, performance optimization, multilevel solvers, and discretization for estuary simulation.

Matthew Otten, IIT, "Scientific Application Web server" for monitoring and steering simulations. Now a PhD student at Cornell.

Patrick Sanan, Caltech PhD, adaptive HMM and FLAVORS multiscale and variational time integrators in PETSc. Now a postdoc at ETH Zürich/USI Lugano.

2012

Lulu Liu, KAUST PhD , nonlinear solution methods for oil extraction problems.

Abraham Taicher, UT Austin PhD, compatible discretizations for Darcy-Stokes melt-migration.

Xuan Zhou, IIT PhD, scalable dense linear support in PETSc using Elemental.

Memberships

SIAM Society of Industrial and Applied Mathematics

AWM Association for Women in Mathematics

NAM National Association of Mathematicians

AGU American Geophysical Union

SIGHPC ACM Special Interest Group on High Performance Computing

CMG++ Consortium for Mathematics in the Geosciences