Contact Information

Institution	Lawrence Berkeley National Laboratory	Old Dominion University
Department	Computational Research Division	Computer Science Department
Email	ewbethel@lbl.gov	ebethel@odu.edu
Web	http://vis.lbl.gov/~wes	http://www.cs.odu.edu/~wbethel
Address	1 Cyclotron Rd, MS 59R-3103, Berkeley CA, 94720, USA	

Research Interests

High performance, parallel and data-intensive computing; data science; computer graphics; scientific and information visualization; computer vision and image analysis; performance optimization; distributed computing; applications of machine learning and deep learning; usability.

Education

- Ph.D. in Computer Science, University of California at Davis, Mar. 2010. Advisor: Kenneth I. Joy.
- M.S. in Computer Science, University of Tulsa, May 1986, Advisor: Samuel P. Uselton.
- B.S. in Information Systems, University of Tulsa, Dec. 1983.

Professional Experience

- 2017–present. Old Dominion University, Norfolk, VA; Adjunct Research Associate Professor, Computer Science Department.
- 1990–present. Lawrence Berkeley National Laboratory, Berkeley, CA
  - Senior Fellow, Berkeley Institute for Data Science, University of California, Berkeley. 2014–present.
  - Senior Computer Scientist Group Lead, 2010–present.
  - Staff Scientist Group Lead, 2001–2010.
  - Staff Scientist, 1990–2001.
- 1997–2010. R3vis Corporation, Novato, CA; Founding Technical Director, Chief Technology Officer, Chief Software Architect.
- 2000–2001. University of California, Berkeley, Institute for Transportation Studies; Principal Development Engineer.
- 1988–1989. Bethel Software, Fairfax CA; Principal.
- 1987–1988. Island Graphics Corporation, San Rafael, CA; Software Engineer.
- 1987. Amoco Research Center, Tulsa, OK; Graphics and Visualization Consultant.
- 1986–1987. Geoscan Inc., Tulsa, OK; Senior Graphics Engineer.
- 1984–1986. University of Tulsa, Tulsa, OK; Graduate Research Assistant.

Awards and Honors

External Awards and Honors

- Interagency Partnership Award, by the Federal Laboratory Consortium. Recognizes laboratory employees, agencies, and private partners who collaboratively accomplished outstanding work in transferring a technology (UV-CDAT climate data analysis software). 2015.
- Berkeley Institute for Data Science, Senior Fellow. 2014.
- ACM Distinguished Scientist. December 2012.
- Best Paper Awards and Nominees:
  - Alexy Agranovsky, David Camp, Christoph Garth, E. Wes Bethel, Kenneth I. Joy, and Hank Childs. Improved Post Hoc Flow Analysis Via Lagrangian Representations. In *Proceedings of the IEEE Symposium on Large Data Analysis and Visualization (LDAV)*, pages 67–75, Paris, France, November 2014. Best Paper Award.

- Mark Howison, E. Wes Bethel, and Hank Childs. MPI-hybrid Parallelism for Volume Rendering on Large, Multi-core Systems. In *Eurographics Symposium on Parallel Graphics and Visualization (EGPGV)*, Norrköping, Sweden, May 2010. Best Paper Award.
- S. Kamil, C. Chan, S. Williams, L. Oliker, J. Shalf, M. Howison, E. W. Bethel, and Prabhat. A Generalized Framework for Auto-tuning Stencil Computations. In *Proceedings of Cray User Group Conference*, Atlanta GA, USA, May 2009. Best Paper Award.
- Luke Gosink, John C. Anderson, E. Wes Bethel, and Kenneth I. Joy. Variable Interactions in Query-Driven Visualization. *IEEE Transactions on Visualization and Computer Graphics (Proceedings of Visualization 2007)*, 13(6):1400–1407, November/December 2007. Nominated for Best Paper Award.
- Oliver Kreylos, Nelson Max, Bernd Hamann, Silvia Crivelli, and E. Wes Bethel. Interactive Protein Manipulation. In *Proceedings of IEEE Visualization 2003*, pages 581–588, Seattle, WA, October 2003. Best Application Paper Award.
- Best Panel Award. IEEE Visualization 2006. T. J. Jankun-Kelly (organizer), Robert Kosara, Gordon Kindlmann, Chris North, Colin Ware, and E. Wes Bethel. Is There Science in Visualization? In *IEEE Visualization 2006*, Baltimore, MD, USA, October 2006.
- R&D 100 Award nominee, ProteinShop, 2004.
- Supercomputing Conference, High Performance Bandwidth Challenge, "Fattest and Fastest Award," 2000, 2001, 2002.
- "Most Innovative Set of AVS Modules Contributed: The Virtual Reality Modules and Libraries," presented by the International AVS Center, 1995.
- Recognition Award for "Outstanding Service and Dedication to the Scientific Visualization Community," presented by the International AVS Center, 1993.
- "Most Valuable Module Contributor," presented by the International AVS Center, 1992.
- "Better World Award," presented by Stardent Computer, 1991.

Internal Awards and Honors

- Outstanding Performance Award, Lawrence Berkeley National Laboratory. 1997, 1999, 2001, 2002, 2003, 2006.
- SPOT Award, Lawrence Berkeley National Laboratory, 2014. For extraordinary efforts in the preparation of the DOE Exascale Preliminary Project Design Document.
- SPOT Award, Lawrence Berkeley National Laboratory, 2014. For extraordinary efforts in organizing the highly successful Scientific Data Management, Analysis, and Visualization PI meeting.

Publications

Peer-Reviewed Journal Articles

1. Talita Perciano, Daniela Ushizima, Harinarayan Krishnan, Dilworth Parkinson, Natalie Larson, Daniël M. Pelt, Wes Bethel, Frank Zok, and James Sethian. Insight into 3D micro-CT data: exploring segmentation algorithms through performance metrics. *Journal of Synchrotron Radiation*, 24(5):1065–1077, September 2017.

2. Daniela M. Ushizima, Hrishikesh A. Bale, E. Wes Bethel, Peter Ercius, Brett A. Helms, Harinarayan Krishnan, Lea T. Grinberg, Maciej Haranczyk, Alastair A. Macdowell, Katarzyna Odziomek, Dilworth Y. Parkinson, Talita Perciano, Robert O. Ritchie, and Chao Yang. IDEAL: Images Across Domains, Experiments, Algorithms and Learning. *Journal Of Materials*, pages 1–10, September 2016.

3. Andrew C. Bauer, Hasan Abbasi, James Ahrens, Hank Childs, Berk Geveci, Scott Klasky, Kenneth Moreland, Patrick O'Leary, Venkatram Vishwanath, Brad Whitlock, and E. Wes Bethel. *In Situ* Methods, Infrastructures, and Applications on High Performance Computing Platforms, a State-of-the-art (STAR) Report. *Computer Graphics Forum, Proceedings of Eurovis 2016*, 35(3), June 2016.

4. O. Rübel, B. Loring, J. L. Vay, D. P. Grote, R. Lehe, S. Bulanov, H. Vincenti, and E. W. Bethel. WarpIV: In Situ Visualization and Analysis of Ion Accelerator Simulations. *IEEE Computer Graphics and Applications*, 36(3):22–35, May 2016.

5. Mark Howison and E.Wes Bethel. GPU-Accelerated Denoising of 3D Magnetic Resonance Images. *Journal of Real-Time Image Processing*, pages 1–12, June 2014.

6. Oliver Rubel, Cameron G.R. Geddes, Min Chen, Estelle Cormier-Michel, and E. Wes Bethel. Feature-Based Analysis of Plasma-Based Particle Acceleration Data. *IEEE Transactions on Visualization and Computer Graphics*, 20(2):196–210, February 2014.

7. Oliver Rübel, Annette Greiner, Shreyas Cholia, Katherine Louie, E. Wes Bethel, Trent R. Northen, and Benjamin P. Bowen. OpenMSI: A High-Performance Web-Based Platform for Mass Spectrometry Imaging. *Analytical Chemistry*, 85(21):10354–10361, 2013.

8. Dean Williams, Charles Doutriaux, John Patchett, Sean Williams, Galen Shipman, Ross Miller, Chad Steed, Harinarayan Krishnan, Claudio Silva, Aashish Chaudhary, Peer-Timo Bremer, David Pugmire, E. Wes Bethel, Hank Childs, Mr Prabhat, Berk Geveci, Andrew Bauer, Alexander Pletzer, Jorge Poco, Tommy Ellqvist, Emanuele Santos, Gerald Potter, Brian Smith, Thomas Maxwell, David Kindig, and David Koop. Ultrascale Visualization of Climate Data. *IEEE Computer*, 46(9):68–76, September 2013.

9. Hank Childs, Berk Geveci, William J. Schroeder, Jeremy S. Meredith, Kenneth Moreland, Christopher Sewell, Torsten Kuhlen, and E. Wes Bethel. Research Challenges for Visualization Software. *IEEE Computer*, 46(5):34–42, May 2013.

10. Joerg Meyer, E. Wes Bethel, Jennifer L. Horsman, Susan S. Hubbard, Harinarayan Krishnan, Alexandru Romosan, Elizabeth H. Keating, Laura Monroe, Richard Strelitz, Phil Moore, Glenn Taylor, Ben Torkian, Timothy C. Johnson, and Ian Gorton. Visual Data Analysis as an Integral Part of Environmental Management. *IEEE Transactions on Visualization and Computer Graphics*, 18(12):2088–2094, December 2012.

11. Daniela M. Ushizima, Dmitriy Morozov, Gunther H. Weber, Andrea G.C. Bianchi, James A. Sethian, and E. Wes Bethel. Augmented topological descriptors of pore networks for material science. *IEEE Transactions on Visualization and Computer Graphics (Proc. IEEE Vis 2012)*, 18(12):2041–2050, 2012.

12. E. Wes Bethel and Mark Howison. Multi-core and Many-core Shared-memory Parallel Raycasting Volume Rendering Optimization and Tuning. *International Journal of High Performance Computing Applications*, 26(4):399–412, November 2012.

13. E. Wes Bethel, David Leinweber, Oliver Rübel, and Kesheng Wu. Federal Market Information Technology in the Post-Flash Crash Era: Roles for Supercomputing. *Journal of Trading*, 7(2), January 2012.

14. Mark Howison, E. Wes Bethel, and Hank Childs. Hybrid Parallelism for Volume Rendering on Large, Multi- and Many-core Systems. *IEEE Transactions on Visualization and Computer Graphics*, Preprints, 2011.

15. Luke J. Gosink, Christoph Garth, John C. Anderson, E. Wes Bethel, and Kenneth I. Joy. An Application of Multivariate Statistical Analysis for Query-Driven Visualization. *IEEE Transactions on Visualization and Computer Graphics*, 17(3):264–275, 2011.

16. Hank Childs, David Pugmire, Sean Ahern, Brad Whitlock, Mark Howison, Prabhat, Gunther Weber, and E. Wes Bethel. Extreme Scaling of Production Visualization Software on Diverse Architectures. *IEEE Computer Graphics and Applications*, 30(3):22–31, May/June 2010.

17. Oliver Rübel, Gunther H. Weber, Min-Yu Huang, E. Wes Bethel, Mark D. Biggin, Charless. C. Fowlkes, C. Luengo Hendriks, Soile. V. E. Keränen, Michael B. Eisen, David W. Knowles, Jitendra Malik, Hans Hagen, and Bernd Hamann. Integrating Data Clustering and Visualization for the Analysis of 3D Gene Expression Data. *IEEE Transactions on Computational Biology and Bioinformatics*, 7(1):64–79, March 2010.

18. Luke J. Gosink, John C. Anderson, E. Wes Bethel, and Kenneth I. Joy. Query-Driven Visualization of Time-Varying Adaptive Mesh Refinement Data. *IEEE Transactions on Visualization and Computer Graphics (Special Issue: Proceedings of IEEE Visualization 2008)*, 14(6):1715–1722, November/December 2008.

19. Brian Paul, Sean Ahern, E. Wes Bethel, Eric Brugger, Rich Cook, Jamison Daniel, Ken Lewis, Jens Owen, and Dale Southard. Chromium Renderserver: Scalable and Open Remote Rendering Infrastructure. *IEEE Transactions on Visualization and Computer Graphics*, 14(3):627–639, May/June 2008.

20. Jerry Chen, Ilmi Yoon, and E. Wes Bethel. Interactive, Internet Delivery of Visualization via Structured, Prerendered Multiresolution Imagery. *IEEE Transactions on Visualization and Computer Graphics*, 14(2):302–312, 2008.

21. Luke Gosink, John C. Anderson, E. Wes Bethel, and Kenneth I. Joy. Variable Interactions in Query-Driven Visualization. *IEEE Transactions on Visualization and Computer Graphics (Proceedings of Visualization 2007)*, 13(6):1400–1407, November/December 2007. Nominated for Best Paper Award.

22. E. Wes Bethel, Chris Johnson, Ken Joy, Sean Ahern, Valerio Pascucci, Hank Childs, Jonathan Cohen, Mark Duchaineau, Bernd Hamann, Charles Hansen, Dan Laney, Peter Lindstrom, Jeremy Meredith, George Ostrouchov, Steven Parker, Claudio Silva, Allen Sanderson, and Xavier Tricoche. SciDAC Visualization and Analytics Center for Enabling Technology. *Journal of Physics Conference Series – SciDAC 2007*, 78:012032, June 2007.

23. Kenneth I. Joy, Mark Miller, Hank Childs, E. Wes Bethel, John Clyne, George Ostrouchov, and Sean Ahern. Frameworks for Visualization at the Extreme Scale. *Journal of Physics Conference Series – SciDAC 2007*, 78:012035, 2007.

24. E. Wes Bethel, Chris Johnson, Charles Hansen, Steven Parker, Allen Sanderson, Claudio Silva, Xavier Tricoche, Valerio Pascucci, Hank Childs, Jonathan Cohen, Mark Duchaineau, Dan Laney, Peter Lindstrom, Sean Ahern, Jeremy Meredith, George Ostrouchov, Ken Joy, and Bernd Hamann. VACET: Proposed SciDAC2 Visualization and Analytics Center for Enabling Technologies. *Journal of Physics Conference Series – SciDAC 2006*, 46:561–569, June 2006.

25. Silvia Crivelli, Oliver Kreylos, Bernd Hamann, Nelson Max, and E. Wes Bethel. ProteinShop: A Tool for Interactive Protein Manipulation and Steering. *Journal of Computer Aided Molecular Design (JCAMD)*, 18(4):271–285, April 2004.

26. Nameeta Shah, Olivier Couronne, Len Pennacchio, Michael Brudno, Serafim Batzoglou, E. Wes Bethel, Edward Rubin, Bernd Hamann, and Inna Dubchak. Phylo-VISTA: Interactive Visualization of Multiple DNA Sequence Alignments. *Bioinformatics*, 20(5):636–643, May 2005.

27. John Shalf and E. Wes Bethel. How the Grid Will Affect the Architecture of Future Visualization Systems. *IEEE Computer Graphics and Applications*, 23(2):6–9, May/June 2003.

28. John Shalf and E. Wes Bethel. Cactus and Visapult: A Case Study of Ultra-High Performance Distributed Visualization Using Connectionless Protocols. *IEEE Computer Graphics and Applications*, 23(2):51–59, March/April 2003.

29. T.J. Jankun-Kelly, Oliver Kreylos, John Shalf, Kwan-Liu Ma, Bernd Hamann, Kenneth I. Joy, and E. Wes Bethel. Deploying Web-based Visual Exploration Tools on the Grid. *IEEE Computer Graphics and Applications*, 23(2):40–49, March/April 2003.

30. Janet Jacobsen, E. Wes Bethel, Akhil Datta-Gupta, and Preston Holland. Virtual Reservoir Development a Reality on Prototype System. *American Oil & Gas Reporter*, 38(12):78–86, 1995.

Books Edited (Textbooks or Proceedings)

31. E. Wes Bethel, Hank Childs, and Charles Hansen, editors. *High Performance Visualization— Enabling Extreme-Scale Scientific Insight*. Chapman & Hall, CRC Computational Science. CRC Press/Francis–Taylor Group, Boca Raton, FL, USA, November 2012. `http://www.crcpress.com/product/isbn/9781439875728`.

32. E. Wes Bethel. *RM/OpenRM Scene Graph Programming Guide*. R3vis Corporation, November 2008.

Peer-Reviewed Book Chapters

33. O. Rübel, S.V.E. Keränen, M.D. Biggin, D.W. Knowles, G.H. Weber, H. Hagen, B. Hamann, and E.W. Bethel. Linking Advanced Visualization and MATLAB for the Analysis of 3D Gene Expression Data. In L. Linsen, B. Hamann, H. Hagen, and H.-C. Hege, editors, *Visualization in Medicine and Life Sciences II, Progress and New Challenges*, Mathematics and Visualization, pages 267–285. Springer Verlag, Heidelberg, Germany, Jan 2012.

34. Daniela Ushizima, Cameron Geddes, Estelle Cormier-Michel, E. Wes Bethel, Janet Jacobsen, Prabhat, Oliver Rübel, Gunther Weber, Bernard Hamann, Peter Messmer, and Hans Hagen. Automated Detection and Analysis of Particle Beams in Laser-plasma Accelerator Simulations. In Yagang Zhang, editor, *Machine Learning*, pages 367–389. In-Tech, Feb 2010. ISBN 978-953-307-033-9.

35. Oliver Rübel, Gunther H. Weber, Min-Yu Huang, E. Wes Bethel, Soile V. E. Keränen, Charless C. Fowlkes, Cris L. Luengo Hendriks, Angela H. DePace, Lisa Simirenko, Michael B. Eisen, Mark D. Biggin, Hans Hagen, Jitendra Malik, David W. Knowles, and Bernd Hamann. Pointcloudxplore 2: Visual exploration of 3d gene expression. In C. Garth, H. Hagen, and M. Hering-Bertram, editors, *Visualization of Large and Unstructured Data Sets*, GI Lecture Notes in Informatics. Gesellschaft fuer Informatik (GI), 2008.

Peer-Reviewed Conference, Symposium, and Workshop Proceedings

36. Colleen Heinemann, Talita Perciano, Daniela Ushizima, and E. Wes Bethel. Distributed Memory Parallel Markov Random Fields using Graph Partitioning. In *Fourth International Workshop on High Performance Big Graph Data Management, Analysis, and Mining (BigGraphs 2017), in conjunction with IEEE BigData 2017*, December 2017.

37. Brenton Lessley, Talita Perciano, Manish Mathai, Hank Childs, and E. Wes Bethel. Maximal Clique Enumeration with Data Parallel Primitives. In *7th IEEE Symposium on Large Data Analysis and Visualization (LDAV)*, Phoenix, AZ, USA, October 2017.

38. Utkarsh Ayachit, Andrew Bauer, Earl P. N. Duque, Greg Eisenhauer, Nicola Ferrier, Junmin Gu, Kenneth Jansen, Burlen Loring, Zarija Lukić, Suresh Menon, Dmitriy Morozov, Patrick O'Leary, Michel Rasquin, Christopher P. Stone, Venkat Vishwanath, Gunther H. Weber, Brad Whitlock, Matthew Wolf, K. John Wu, and E. Wes Bethel. Performance Analysis, Design Considerations, and Applications of Extreme-scale *In Situ* Infrastructures. In *ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis (SC16)*, Salt Lake City, UT, USA, November 2016.

39. Utkarsh Ayachit, Brad Whitlock, Matthew Wolf, Burlen Loring, Berk Geveci, David Lonie, and E. Wes Bethel. The SENSEI Generic In Situ Interface. In *Proceedings of In Situ Infrastructures for Enabling Extreme-scale Analysis and Visualization (ISAV 2016)*, Salt Lake City, UT, USA, November 2016.

40. E. Wes Bethel, Martin Greenwald, Kerstin Kleese van Dam, Manish Parashar, Stefan M. Wild, and H. Steven Wiley. Management, Analysis, and Visualization of Experimental and Observational Data – The Convergence of Data and Computing. In *Proceedings of the 2016 IEEE 12th International Conference on eScience*, Baltimore, MD, USA, October 2016.

41. Talita Perciano, Daniela Ushizima, E. Wes Bethel, Yariv Mizrahi, and James Sethian. Reduced-complexity Image Segmentation Under Parallel Markov Random Field Formulation Using Graph Partitioning. In *IEEE International Conference on Image Processing (ICIP)*, Phoenix, AZ, USA, September 2016.

42. E. Wes Bethel, David Camp, David Donofrio, and Mark Howison. Improving Performance of Structured-memory, Data-Intensive Applications on Multi-core Platforms via a Space-Filling Curve Memory Layout. In *International Workshop on High Performance Data Intensive Computing, an IEEE International Parallel and Distributed Processing Symposium (IPDPS) workshop*, Hyderabad, India, May 2015. (37% acceptance rate).

43. Alexy Agranovsky, David Camp, Christoph Garth, E. Wes Bethel, Kenneth I. Joy, and Hank Childs. Improved Post Hoc Flow Analysis Via Lagrangian Representations. In *Proceedings of the IEEE Symposium on Large Data Analysis and Visualization (LDAV)*, pages 67–75, Paris, France, November 2014. Best Paper Award.

44. David Camp, Hari Krishnan, David Pugmire, Christoph Garth, Ian Johnson, E. Wes Bethel, Kenneth I. Joy, and Hank Childs. GPU Acceleration of Particle AdvectionWorkloads in a Parallel, Distributed Memory Setting. In *Proceedings of EuroGraphics Symposium on Parallel Graphics and Visualization*, pages 1–8, May 2013. DOI: 10.2312/EGPGV/EGPGV13/001-008.

45. E. Wes Bethel, Prabhat, Suren Byna, Oliver Rübel, K. John Wu, and Michael Wehner. Why High Performance Visual Data Analytics is Both Relevant and Difficult. In *Visualization and Data Analysis, IS&T/SPIE Electronic Imaging 2013*, San Francisco, CA, USA, February 2013.

46. Surendra Byna, Jerry Chou, Oliver Rübel, Prabhat, Homa Karimabadi, William S. Daughton, Vadim Roytershteyn, E. Wes Bethel, Mark Howison, Ke-Jou Hsu, Kuan-Wu Lin, Arie Shoshani, Andrew Uselton, and Kesheng Wu. Parallel I/O, Analysis, and Visualization of a Trillion Particle Simulation. In *Proceedings of SuperComputing 2012*, Nov 2012.

47. E. Wes Bethel, Surendra Byna, Jerry Chou, Estelle Cormier-Michel, Cameron G. R. Geddes, Mark Howison, Fuyu Li, Prabhat, Ji Qiang, Oliver Rübel, Robert D. Ryne, Michael Wehner, and Kesheng Wu. Big Data Analysis and Visualization: What Do LINACS and Tropical Storms Have In Common? In *11th International Computational Accelerator Physics Conference, ICAP 2012*, Rostock-Warnemünde, Germany, August 2012.

48. Mehmet Balman, Eric Pouyoul, Yushu Yao, E. Wes Bethel, Burlen Loring, Prabhat, John Shalf, Alex Sim, and Brian L. Tierney. Experiences with 100G Network Applications. In *Proceedings of the 5th International Workshop on Data Intensive and Distributed Computing (DIDC 2012)*, Delft, Netherlands, June 2012.

49. Prabhat, Oliver Rübel, Surendra Byna, Kesheng Wu, Fuyu Li, Michael Wehner, and E. Wes Bethel. TECA: A Parallel Toolkit for Extreme Climate Analysis. In *Third Worskhop on Data Mining in Earth System Science (DMESS 2012) at the International Conference on Computational Science (ICCS 2012)*, Omaha, Nebraska, June 2012.

50. Wei Zhuo, Prabhat, Chris Paciorek, Cari Kaufman, and E. Wes Bethel. Parallel Kriging Analysis for Large Spatial Datasets. In *2012 IEEE 12th International Conference on Data Mining Workshops*, pages 38–44, Vancouver, BC, Canada, December 2011.

51. Jerry Chou, Mark Howison, Brian Austin, Kesheng Wu, Ji Qiang E. Wes Bethel, Arie Shoshani, Oliver Rübel, Prabhat, and Rob D. Ryne. Parallel Index and Query for Large Scale Data Analysis. In *Proceedings of 2011 International Conference for High Performance Computing, Networking, Storage and Analysis*, SC '11, pages 30:1–30:11, Seattle, WA, USA, November 2011.

52. E. Wes Bethel, D. Leinweber, O. Rübel, and K. Wu. Federal Market Information Technology in the Post Flash Crash Era: Roles of Supercomputing. In *Workshop on High Performance Computational Finance at SC11*, Seattle, WA, USA, Nov 2011. (authors in alphabetical order).

53. D. Ushizima, D. Parkinson, P. Nico, J. Ajo-Franklin, A. Macdowell, B. Kocar, E. Wes Bethel, and J. Sethian. Statistical Segmentation and Porosity Quantification of 3D X-Ray Microtomorgraphy. In *XXXIV Applications of Digital Image Processing: Proceedings of SPIE 2011*, San Diego, CA, USA, August 2011.

54. Mark Howison, Andreas Adelmann, E. Wes Bethel, Achim Gsell, Benedikt Oswald, and Prabhat. H5hut: A High-Performance I/O Library for Particle-Based Simulations. In *Proceedings of 2010 Workshop on Interfaces and Abstractions for Scientific Data Storage (IASDS10)*, Heraklion, Crete, Greece, September 2010.

55. Oliver Rübel, Sean Ahern, E. Wes Bethel, Mark. D Biggin, Hank Childs, Estelle Cormier-Michel, Angela DePace, Michael B. Eisen, Charless C. Fowlkes, Cameron G. R. Geddes, Hans Hagen, Bernd Hamann, Min-Yu Huang, Soile V. E. Keränen, David W. Knowles, Cris L. Luengo Hendriks, Jitendra Malik, Jeremy Meredith, Peter Messmer, Prabhat, Daniela Ushizima, Gunther H. Weber, and Kesheng Wu. Coupling Visualization and Data Analysis for Knowledge Discovery from Multi-dimensional. In *Procedia Computer Science, Proceedings of International Conference on Computational Science, ICCS 2010*, May 2010.

56. Mark Howison, E. Wes Bethel, and Hank Childs. MPI-hybrid Parallelism for Volume Rendering on Large, Multi-core Systems. In *Eurographics Symposium on Parallel Graphics and Visualization (EGPGV)*, Norrköping, Sweden, May 2010. Best Paper Award.

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58. Luke Gosink, Kesheng Wu, E. Wes Bethel, John D. Owens, and Ken I. Joy. Data Parallel Bin-based Indexing for Answering Queries on Multi-core Architectures. In *21st International Conference on Scientific and Statistical Database Management (SSDBM)*, volume 5566, pages 110–129, June 2009.

59. E. Wes Bethel, Oliver Rübel, Prabhat, Kesheng Wu, Gunther H. Weber, Valerio Pascucci, Hank Childs, Ajith Mascarenhas, Jeremy Meredith, and Sean Ahern. Modern Scientific Visualization is More than Just Pretty Pictures. In *Numerical Modeling of Space Plasma Flows: Astronum-2008 (Astronomical Society of the Pacific Conference Series)*, pages 301–317, St. Thomas, USVI, June 2008.

60. Daniela Ushizima, Oliver Rübel, Prabhat, Gunther Weber, E. Wes Bethel, Cecilia Aragon, Cameron Geddes, Estelle Cormier-Michel, Bernd Hamann, Peter Messmer, and Hans Hagen. Automated Analysis for Detecting Beams in Laser Wakefield Simulations. In *2008 Seventh International Conference on Machine Learning and Applications, Proceedings of IEEE ICMLA'08*, pages 382–387, December 2008.

61. Oliver Rübel, Prabhat, Kesheng Wu, Hank Childs, Jeremy Meredith, Cameraon G. R. Geddes, Estelle Cormier-Michel, Sean Ahern, Gunther H. Weber, Peter Messmer, Hans Hagen, Bernd Hamann, and E. Wes Bethel. High Performance Multivariate Visual Data Exploration for Extemely Large Data. In *Proceeedings of Supercomputing 2008*, Austin, TX, USA, November 2008.

62. William T.C. Kramer, John M. Shalf, E. Wes Bethel, D. Agarwal, Michael Banda, John Hules, Juan C. Meza, Leonid Oliker, Horst Simon, David Skinner, Francesca Verdier, Howard Walter, Michael Wehner, and Katherine Yelick. HPC in 2016: A View Point from NERSC. In *Proceedings of Cray User Group Conference*, Helsinki, Finland, 2008.

63. Janet S. Jacobsen, Dominique C. Joyner, Sharon E. Borglin, Terry C. Hazen, Adam P. Arkin, and E. Wes Bethel. Visualization of Growth Curve Data from Phenotype Microarray Experiments.

In *Information Visualization, 2007. IV '07. 11th International Conference*, pages 535–544. IEEE Computer Society Press, July 2007.

64. Gunther H. Weber, Vincent E. Beckner, Hank Childs, Terry J. Ligocki, Mark Miller, Brian van Straalen, and E. Wes Bethel. Visualization tools for adaptive mesh refinement data. In Werner Benger, Rene Heinzel, Wolfgang Kapferer, Wolfram Schoor, Mayank Tyagi, Shalini Venkataraman, and Gunther H. Weber, editors, *Proceedings of the 4th High End Visualization Workshop*, pages 12–25, Berlin, Germany, 2007. Lehmans Media.

65. Andreas Adelmann, Achim Gsell, B. Oswald, T. Schietinger, E. Wes Bethel, John Shalf, Cristina Siegerist, and Kurt Stockinger. Progress on H5Part: A Portable High Performance Parallel Data Interface for Electromagnetic Simulations. In *Particle Accelerator Conference PAC07 25–29 June 2007, Albuquerque NM*, 2007.

66. R. D. Ryne, J. Qiang, E. W. Bethel, I. Pogorelov, J. Shalf, C. Siegerist, M. Venturini, A. J. Dragt, A. Adelmann, D. Abell, J. Amundson, P. Spentzouris, F. Neri, P. Walstrom, C. T. Mottershead, and R. Samulyak. Recent Progress on the Marylie/Impact Beam Dynamics Code. In *International Computational Accelerator Physics Conference*, Chamonix, France, October 2006.

67. Kurt Stockinger, E. Wes Bethel, Scott Campbell, Eli Dart, , and Kesheng Wu. Detecting Distributed Scans Using High-Performance Query-Driven Visualization. In *SC '06: Proceedings of the 2006 ACM/IEEE Conference on High Performance Computing, Networking, Storage and Analysis*. IEEE Computer Society Press, November 2006.

68. E. Wes Bethel, Scott Campbell, Eli Dart, Kurt Stockinger, and Kesheng Wu. Accelerating Network Traffic Analysis Using Query-Driven Visualization. In *Proceedings of 2006 IEEE Symposium on Visual Analytics Science and Technology*, pages 115–122. IEEE Computer Society Press, October 2006.

69. Luke Gosink, John Shalf, Kurt Stockinger, Kesheng Wu, and E. Wes Bethel. HDF5-FastQuery: Accelerating Complex Queries on HDF Datasets using Fast Bitmap Indices. In *Proceedings of the 18th International Conference on Scientific and Statistical Database Management*, pages 149–158. IEEE Computer Society Press, July 2006.

70. Jerry Chen, E. Wes Bethel, and Ilmi Yoon. Interactive, Internet Delivery of Scientific Visualization via Structured, Prerendered Imagery. In Simone Santini, Raimondo Schettini, and Theo Gevers, editors, *Proceedings of 2006 SPIE/IS&T Conference on Electronic Imaging, Volume 6061, A 1-10*, January 2006.

71. Kurt Stockinger, John Shalf, Kesheng Wu, and E. Wes Bethel. Query-Driven Visualization of Large Data Sets. In *Proceedings of IEEE Visualization 2005*, pages 167–174. IEEE Computer Society Press, October 2005.

72. Kurt Stockinger, John Shalf, E. Wes Bethel, and Kesheng Wu. DEX: Increasing the Capability of Scientific Data Analysis Pipelines by Using Efficient Bitmap Indices to Accelerate Scientific Visualization. In *Proceedings of Scientific and Statistical Database Management Conference (SSDBM)*, pages 35–44, Santa Barbara, CA, USA, June 2005.

73. Christopher Co, Alex Friedman, David Grote, Jean-Luc Vay, E. Wes Bethel, and Kenneth I. Joy. Interactive Methods for Exploring Particle Simulation Data. In *Proceedings of EuroVis 2005*, pages 279–286, Leeds, UK, June 2005.

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176. E. Wes Bethel. Applications Development with OpenRM and CAVElib. Technical report, R3vis Corporation, Novato, CA, USA, September 2000.

177. E. Wes Bethel. What is a Scene Graph and Why Should You Care? In *Tom's Hardware (online)*, January 2000. http://www.tomshardware.co.uk/primer,review-2462.html.

178. E. Wes Bethel. RM Scene Graph Technical White Paper. Technical report, R3vis Corporation, Novato, CA, USA, December 1999.

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181. E. Wes Bethel. Interpolating Gridded Data from Scattered Data in AVS. In *AVS Network News*, pages 13–16, 1992.

Press Releases/Articles

182. L. Vu (ed.). NERSC's Deep Sky Project Provides a Portal into Data Universe. Berkeley Lab Computing Sciences News, http://www.lbl.gov/cs/Archive/news032709a.html, March 2009.

183. L. Vu (ed.). VisIt Now Available on Franklin. Berkeley Lab Computing Sciences News, http://www.lbl.gov/cs/CSnews/CSnews052609b.html, May 2009.

184. L. Vu (ed.). NERSC and CRD Help Decipher Science from Compact Accelerator Simulations. Berkeley Lab Computing Sciences News, http://www.lbl.gov/cs/Archive/news052609a.html, May 2009.

185. Krell Institute (ed.). Scientists Open Their Eyes to Visualization's Potential. ASCR Discovery Website, http://ascr-discovery.science.doe.gov/feature/viz1.shtml, June 2009.

186. L. Vu (ed.). Visualizing the Future of Scientific Discovery. Berkeley Lab Computing Sciences News, http://www.lbl.gov/cs/Archive/news061109.html, June 2009.

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Intellectual Property: Copyrights, Trademarks, and Patents

1. SENSEI Framework: Scalable Environments for Scientific Explorations In Situ Framework. 2017-017, Lawrence Berkeley National Laboratory. November 2016. Utkarsh Ayachit, Andrew Bauer, E. Wes Bethel, Earl Duque, Nicola Ferrier, Burlen Loring, Dmitriy Morozov, Patrick O'Leary, Venkat Vishwanath, Gunther H. Weber, Brad Whitlock, Matthew Wolf, Kesheng (John) Wu.

2. GD3C: GPU-Accelerated Denoising in 3D. Lawrence Berkeley National Laboratory, 2014-002. November 2013. Mark Howison and E. Wes Bethel.

3. QuantCT: software suite for segmentation and analysis of Computed Tomography image data. Lawrence Berkeley National Laboratory, 2013-094_CR, May 2013. Daniela Ushizima and E. Wes Bethel.

4. wesBench: an OpenGL graphics benchmark. Lawrence Berkeley National Laboratory, CR-2826, December 2009. E. Wes Bethel.

5. svPerfGL : a Scientific Visualization OpenGL Graphics Benchmark. Lawrence Berkeley National Laboratory, CR-2410, April 2007. E. Wes Bethel.

6. semMeasure: Software application for obtaining angular and distance measurements via a virtual reality interface and stereo image pairs (obtained from stereo electron microscopy). Lawrence Berkeley National Laboratory, CR-2236, November 2005. E. Wes Bethel.

7. ProteinShop Open Source software license and release. Lawrence Berkeley National Laboratory, CR-2030, 2004. Silvia Crivelli, E. Wes Bethel, Oliver Kreylos.

8. Visapult Open Source software license and release. Lawrence Berkeley National Laboratory, CR-1883, 2004. E. Wes Bethel.

9. "RM" and "RM Scene Graph," trademarks registered with the U. S. Patent and Trademark Office 2000, renewed 2005. R3vis Corporation.

Presentations

Invited Speaker at Conferences/Workshops/Events

I1. E. Wes Bethel. Overcoming I/O Limitations on HPC Platforms with In Situ Methods and Infrastructure for Analysis and Visualization. In *Future Trends in Nuclear Physics Computing*, Jefferson Laboratory, Newport News, VA, USA, May 2017.

I2. E. Wes Bethel. In Situ Methods, Infrastructures, and Applications on HPC Platforms: Knowledge Discovery with Minimal I/O. In *HPC 2017 Symposium, co-located with Spring Simulation Multi-Conference*, Virginia Beach, VA, USA, April 2017.

I3. E. Wes Bethel. In Situ Processing Overview and Relevance to the HPC Community. In *SIAM Conference on Computational Science and Engineering, MS74: In Situ Methods and Infrastructures: Faster Insight Through Smarter Computing*, Atlanta, GA, USA, February 2017.

I4. E. Wes Bethel. Performance Analysis, Design Considerations, and Applications of Extreme-scale *In Situ* Infrastructures. In *ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis (SC16)*, Salt Lake City, UT, USA, November 2016.

I5. E. Wes Bethel. Towards Adoption and Deployment of In Situ Methods and Infrastructure. In *ISAV 2016: In Situ Infrastructures for Enabling Extreme-scale Analysis and Visualization, a SC16 workshop*, Salt Lake City, UT, USA, November 2016. Invited panel presentation.

I6. E. Wes Bethel. The SENSEI Generic In Situ Interface. In *IEEE Symposium on Large Data Analysis and Visualization (LDAV)*, Baltimore, MD, USA, October 2016. Invited panel presentation.

I7. E. Wes Bethel. *In Situ* Methods, Infrastructures, and Applications on High Performance Computing Platforms, a State-of-the-art (STAR) Report. In *Eurovis 2016*, Gröningen, Netherlands, June 2016.

I8. E. Wes Bethel. *In Situ* Methods and Infrastructure: Answers Without All the I/O. In *SIAM Parallel Processing 2016 (PP16)*, Paris, France, April 2016.

I9. E. Wes Bethel. In Situ Methods: Hype or Necessity? In *IEEE International Conference for High Performance Computing, Networking, Storage and Analysis (SC15)*, Austin, TX, USA, November 2015.

I10. E. Wes Bethel. Visualization, Analysis, and Exascale: Trouble or Triumph? In *The Ultrascale Visualization Workshop, IEEE International Conference for High Performance Computing, Networking, Storage and Analysis (SC15)*, Austin, TX, USA, November 2015.

I11. E. Wes Bethel. HPC Visualization and Analysis at the Exascale: Big Headaches, Big Opportunities. In *Siggraph Asia Symposium on Visualization in High Performance Computing*, Kobe, Japan, November 2015.

I12. E. Wes Bethel. In Situ 2020: Back to the Future, Again. In *IEEE Symposium on Large Data Analysis and Visualization Symposium, co-located with IEEE Visualization 2015*, Chicago, IL, USA, October 2015.

I13. E. Wes Bethel, David Camp, David Donofrio, and Mark Howison. Improving Performance of Structured-memory, Data-Intensive Applications on Multi-core Platforms via a Space-Filling Curve Memory Layout. In *International Workshop on High Performance Data Intensive Computing, an IEEE International Parallel and Distributed Processing Symposium (IPDPS) workshop*, Hyderabad, India, May 2015. (37% acceptance rate).

I14. E. Wes Bethel, David Camp, David Donofrio, and Mark Howison. Improving Performance of Structured-memory, Data-Intensive Applications on Multi-core Platforms via a Space-Filling Curve Memory Layout. In *Computational Research Division Seminar*, Berkeley, CA, USA, May 2015.

I15. E. Wes Bethel. Brook No Delay: In Situ Visualization and Analytics on HPC Platforms. In *BIS 2015, Inria@SiliconValley, Panel on Big Data Science: Data Analytics Meets High Performance Computing*, Berkeley, CA, USA, May 2015.

I16. E. Wes Bethel et al. Scalable Analysis Methods and In Situ Infrastructure for Extreme Scale Knowledge Discovery. In *Scientific Data Management, Analysis, and Visualization (SMDAV) Program-wide PI Meeting*, Walnut Creek, CA, USA, January 2015.

I17. E. Wes Bethel et al. Towards Exascale: High Performance Visualization and Analytics. In *Scientific Data Management, Analysis, and Visualization (SMDAV) Program-wide PI Meeting*, Walnut Creek, CA, USA, January 2015.

I18. Oliver Rübel, James P. Ahrens, and E. Wes Bethel. Data Analytics and Visualization – Overview and SSIO Cross-cutting Chalenges. In *U. S. Department of Energy Software Stack and I/O Crosscutting Workshop*, Rockville, MD, USA, December 2014.

I19. E. Wes Bethel. The Future of Large-scale Visual Data Analysis. In *Joint Facilities User Forum on Data Intensive Computing*, Oakland, CA, USA, June 2014.

I20. E. Wes Bethel. Scalable Data Management, Analysis, and Visualization Institute: Visualization Area Accomplishments. In *DOE Review of SciDAC Institutes*, Washington DC, USA, May 2014.

I21. E. Wes Bethel. Scalable Data Management, Analysis, and Visualization Institute: Visualization Area Accomplishments. In *2014 DOE Computer Graphics Forum*, Chicago, IL, USA, April 2014.

I22. E. Wes Bethel. Berkeley Lab Site Report: Visualization and Analytics. In *2014 DOE Computer Graphics Forum*, Chicago, IL, USA, April 2014.

I23. E. Wes Bethel. SciDAC Scalable Data Management, Analysis, and Visualization Institute Overview, Accomplishments Overview, and Collaboration Opportunities. In *Fall 2013 Meeting of the SciDAC Institute for Sustained Performance, Energy, and Resilience*, Oakland, CA, USA, September 2013.

I24. E. Wes Bethel. Scalable Analysis and Visualization. In *For Representatives from the Research and Economic Development Program, Mississippi State University*, Berkeley, CA, USA, May 2013.

I25. E. Wes Bethel. Visual Data Exploration and Analysis of Ultra-large Climate Data. In *Climate 2013*, Berkeley, CA, USA, March 2013.

I26. E. Wes Bethel. Why High Performance Visual Data Analytics is Both Relevant and Difficult. In *Visualization and Data Analysis, IS&T/SPIE Electronic Imaging 2013*, San Francisco, CA, USA, February 2013. Invited Keynote.

I27. E. Wes Bethel. Big Data Challenges and Approaches in Energy Science Programs. In *Big Data Symposium: Applications & Analytics for Defense, Intelligence, and Homeland Security*, Las Vegas, NV, USA, December 2012.

I28. E. Wes Bethel. Big Data Analysis and Visualization: What Do LINACS and Tropical Storms Have In Common? In *11th International Computational Accelerator Physics Conference, ICAP 2012*, Rostock-Warnemünde, Germany, August 2012.

I29. E. Wes Bethel. How High Performance Visualization (David) Might Tame Exascale (Goliath). In *DOE Germantown Headquarters Technical Briefing*, Germantown, MD, USA, June 2012.

I30. E. Wes Bethel. The SciDAC Scalable Data Management, Analysis, and Visualization (SDAV) Institute – Overview and science Applications. In *DOE Office of Science Data Working Group*, Germantown, MD, USA, June 2012.

I31. E. Wes Bethel. The SciDAC Scalable Data Management, Analysis, and Visualization (SDAV) Institute – Overview and science Applications. In *Korean Institute of Science and Technology Briefing*, Berkeley, CA, USA, June 2012.

I32. E. Wes Bethel, Mark Howison, and Hank Childs. Hybrid Parallelism for Volume Rendering on Large Multi- and Many-Core Systems. In *15th SIAM Conference on Parallel Processing for Scientific Computing*, Savannah GA, USA, February 2012.

I33. E. Wes Bethel, Mark Howison, Andreas Adelmann, Achim Gsell, and Prabhat. H5hut: The HDF5 Utility Toolkit. In *15th SIAM Conference on Parallel Processing for Scientific Computing*, Savannah GA, USA, February 2012.

I34. E. Wes Bethel. Visualization and Visualization-driven Analytics. In *LBNL Integrated Bioimaging Workshop*, Emeryville, CA, USA, February 2012.

I35. E. Wes Bethel and David Leinweber. Modern Financial Markets and Data-Intensive Science: Leveraging 35 Years of Federal Research. In *Commodities and Futures Trading Commission (CFTC) Technical Advisory Committee Meeting*, Washington, DC, USA, December 2011.

I36. E. Wes Bethel. Visualization Tools for Scientific Data Understanding. In *DOE/ASCR Workshop on Data Tools for Scientific Research*, Bethesda, MD, USA, October 2011.

I37. E. Wes Bethel. Secrets of the Elusive "Super-Mega" X/Y Chart: Snapshot of High Performance Scientific Visualization Research. In *Advanced Light Source User's Workshop*, Berkeley CA, USA, October 2011.

I38. E. Wes Bethel. Visual Data Exploration and Analysis of Ultra-Large Climate Data. In *Climate and Earth System Modeling (CESM) Principal Investigators' Meeting, U. S Department of Energy, Office of Biological and Environmental Research*, Washington, DC, USA, September 2011.

I39. E. Wes Bethel. ASCEM Visualization Task: Year 1 Accomplishments, Year 2 Objectives. In *Attenuation-Based Remedies in the Subsurface Applied Field Research Center – 2011 Technical Meeting*, Aiken, SC, USA, March 2011.

I40. E. Wes Bethel. Visual Data Analysis Computational Requirements. In *Large Scale Computing and Storage Requirements for Advanced Scientific Computing Research*, Oakland, CA, USA, January 2011.

I41. E. Wes Bethel. Berkeley Lab Visualization Program. In *Intelligence Advanced Research Projects Agency*, Berkeley, CA, USA, December 2010.

I42. E. Wes Bethel. Hybrid Parallelism for Volume Rendering on Large, Multi-core Systems. In *Astronum 2010 – Fifth International Conferece on Numerical Modeling of Space Plasma Flows*, San Diego, CA, USA, June 2010.

I43. E. Wes Bethel. MPI-hybrid Parallelism for Volume Rendering on Large, Multi-core Systems. In *DOE Computer Graphics Forum*, Park City UT, USA, April 2010.

I44. E. Wes Bethel. 3D Bilateral Filtering on the GPU. In *DOE Computer Graphics Forum*, Park City UT, USA, April 2010.

I45. E. Wes Bethel. Foghorns, Lighthouses and the Circuitous, Hazard-laden Path Towards Extreme Scale Data Analysis. In *ICAP '09 – 10th International Computational Accelerator Physics Conference*, San Francisco, CA, September 2009.

I46. E. Wes Bethel. Occam's Razor and Petascale Visual Data Analysis. In *SciDAC 2009 Program Conference*, San Diego, CA, June 2009. Featured presentation.

I47. E. Wes Bethel. Meet the SciDAC Visualization and Analytic Center for Enabling Technologies. In *DOE Computer Graphics Forum*, Monterey CA, USA, April 2009.

I48. E. Wes Bethel. Meet the SciDAC Visualization and Analytics Center for Enabling Technologies. In *SciDAC Community Petascale Project for Accelerator Science and Simulation (ComPASS) Collaboration Meeting*, Los Angeles, CA, December 2008.

I49. E. Wes Bethel. Meet the SciDAC Visualization and Analytics Center for Enabling Technologies. In *CS and Visualization PI Presentations*, U. S. Department of Energy, Office of Advanced Scientific Computing Research, Germantown, MD, October 2008.

I50. E. Wes Bethel. Accelerating Visual Knowledge Discovery with Query-Driven Visualization. In *SIAM Conference on Imaging Science (IS08), Visualization and Analytics for Science Discovery*, San Diego, CA, USA, July 2008.

I51. E. Wes Bethel. Modern Scientific Visualization is More Than Just Pretty Pictures. In *Numerical Modeling of Space Plasma Flows: Astronum-2008 (Astronomical Society of the Pacific Conference Series)*, St. John, USVI, June 2008.

I52. E. Wes Bethel. Visual Data Analysis and Data Exploration at the Extreme Scale. In *DOE Office of Science, Advanced Scientific Computing Research Principal Investigator Meeting*, Denver, CO, USA, April 2008.

I53. E. Wes Bethel. Analysis of 3D Gene Expression Data. In *DOE Office of Science, Office of Biological and Environmental Research, Joint Genomics: GTL Awardee Workshop and Metabolic Engineering*, Bethesda, MD, USA, February 2008.

I54. E. Wes Bethel. Query-Driven Visualization Accelerates Scientific Insight. In *National Science Foundation (NSF) and Cyber-enabled Discovery and Innovation (CDI) Workshop*, Mathematical Sciences Research Institute, Berkeley CA, USA, October 2007.

I55. E. Wes Bethel. Occam's Razor and Petascale Visual Data Analysis. In *2007 Falls Creek Falls Conference*, Nashville, TN, USA, October 2007.

I56. E. Wes Bethel. Visualization, VACET and the SciDAC Compass Accelerator Project. In *Community Petascale Project for Accelerator Science and Simulation (COMPASS) All-Hands Meeting*, Fermi National Laboratory, Batavia IL, USA, September 2007.

I57. E. Wes Bethel. Top Issues in Visualization and Analytics. In *Visualization and Knowledge Discovery: Report from the DOE/ASCR Workshop on Visual Analysis and Data Exploration at the Extreme Scale*, Salt Lake City UT, USA, June 2007.

I58. E. Wes Bethel. Query-Driven Visualization Accelerates Scientific Insight. In *SC06 Workshop on Ultra-Scale Visualization*, Tampa FL, USA, November 2006.

I59. E. Wes Bethel. Is there Science in Visualization? In *IEEE Visualization*, Baltimore MD, USA, October 2006.

I60. E. Wes Bethel, Scott Campbell, Eli Dart, Kurt Stockinger, and Kesheng Wu. Accelerating Network Traffic Analysis Using Query-Driven Visualization. In *Proceedings of 2006 IEEE Symposium on Visual Analytics Science and Technology*, pages 115–122. IEEE Computer Society Press, October 2006.

I61. E. Wes Bethel. Accelerating Network Traffic Analysis with Query-Driven Visualization. In *DOE Computer Graphics Forum*, Monterey CA, USA, April 2006.

I62. E. Wes Bethel. NERSC Science Driven Analytics. In *DOE Computer Graphics Forum*, Monterey CA, USA, April 2006.

I63. E. Wes Bethel. Issue: Virtual Reality is No Longer Relevant. In *DOE Computer Graphics Forum*, Monterey CA, USA, April 2006.

I64. E. Wes Bethel. Query-Driven Visualization. In *SIAM Conference on Parallel Processing for Scientific Computing*, San Francisco CA, USA, February 2006.

I65. E. Wes Bethel. Query-Driven Visualization. In *LBNL Booth Presentation*, Seattle WA, USA, November 2005.

I66. E. Wes Bethel. Network Traffic Analysis with Query-Driven Visualization – SC05 HPC Analytics Challenge Results. In *SC '05: Proceedings of the 2005 ACM/IEEE Conference on High Performance Computing, Networking, Storage and Analysis*, Seattle WA, USA, November 2005. IEEE Computer Society Press.

I67. E. Wes Bethel. NERSC Science Driven Analytics. In *NERSC User Group Meeting*, Seattle WA, USA, November 2005.

I68. E. Wes Bethel. Query-Driven Visualization. In *IEEE Visualization*, Minneapolis MN, USA, October 2005.

I69. E. Wes Bethel. NERSC Visualization Update. In *NERSC User Group Meeting*, Pittsburgh PA, USA, November 2004.

I70. E. Wes Bethel. Notional Objectives for an ASCR/MISC Visualization Program. In *SciDAC Math ISIC AHM*, Bodega Bay CA, USA, October 2004.

I71. E. Wes Bethel. Summary of and Musings About the 1998 DOE Workshop on Interoperability. In *PNNL/National Visual Analytics Center*, Richland WA, USA, October 2004.

I72. E. Wes Bethel and Cristina Siegerist. Visualization Tools and Techiques on Seaborg and Escher. In *NERSC User Group Meeting*, 2004.

I73. E. Wes Bethel. Experiences using SGI's Vizserver for Remote Image Delivery. In *DOE Computer Graphics Forum*, Santa Fe NM, USA, April 2004.

I74. E. Wes Bethel, Greg Abram, John Shalf, Randall Frank, Jim Ahrens, Steve Parker, Nagiza Smatova, and Mark Miller. Interoperability of Visualization Software and Data Models is Not an Achievable Goal. In *IEEE Visualization 2003*, pages 607–610, Seattle, WA. USA, 2003.

I75. E. Wes Bethel. Diva – Distributed Visualization Architecture Workshop Report. In *DOE Computer Graphics Forum*, April 2003.

I76. E. Wes Bethel. Visapult and the SCXX Bandwidth Challenge Hat Trick. In *DOE Computer Graphics Forum*, April 2003.

I77. E. Wes Bethel. Visualization Activities and Challenges in the DOE Office of Science. In *DOE CIO Meeting*, April 2003.

I78. E. Wes Bethel. Interactive Stereo Electron Microscopy Enhanced with Virtual Reality. In *Proceedings of SPIE Vol. 4660: Stereoscopic Displays and Virtual Reality Systems IX*, San Jose CA, USA, January 2002.

I79. E. Wes Bethel. Combining a Multithreaded Scene Graph System with a Tiled Display Environment. In *Proceedings of SPIE Vol. 4660: Stereoscopic Displays and Virtual Reality Systems IX*, San Jose CA, USA, January 2002.

I80. E. Wes Bethel. Emerging Technologies for Remote Parallel Visualization. In *First SIAM Conference on Computational Science and Engineering*, Washington DC, USA, September 2000.

I81. E. Wes Bethel. Emerging Technologies for Remote Parallel Visualization. In *DOE Computer Graphics Forum*, Santa Fe NM, USA, April 2000.

I82. E. Wes Bethel. Challenges and Solutions in Large-Data Visualization. In *DOE Computer Graphics Forum*, Santa Fe NM, USA, April 2000.

I83. Samuel P. Uselton, Lloyd Treinish, James P. Ahrens, E. Wes Bethel, and Andrei State. Multi-source Data Analysis Challenges. In *IEEE Visualization 1998*, pages 501–504, Research Triangle Park, NC, USA, 1998.

I84. E. Wes Bethel. Modular Virtual Reality Visualization Tools. In *Proceedings of the International Advanced Visual Systems User and Developer Conference (AVS95)*, pages 245–254, Boston, MA, USA, April 1995.

I85. E. Wes Bethel. Virtual Reality and Visualization. In *DOE Computer Graphics Forum*, Estes Park CO, USA, April 1994.

I86. E. Wes Bethel. Chemical Flooding in a Virtual Environment – A Survivor's Guide to VR Development. In *Proceedings of the International Advanced Visual Systems User and Developer Conference (AVS94)*, pages 299–309, Boston MA, USA, May 1994.

I87. E. Wes Bethel, Janet Jacobsen, and Preston Holland. Site Remediation in a Virtual Environment. In Robert J. Moorhead, Deborah E. Silver, and Samuel P. Uselton, editors, *Visual Data Exploration and Analysis, Proceedings of SPIE 2178*, pages 78–87, San Jose CA, USA, January 1994.

I88. E. Wes Bethel. The Visualization Revolution. In *Proceedings of the First International Advanced Visual Systems User and Developer Conference*, Research Triangle Park, North Carolina, USA, February 1992.

I89. E. Wes Bethel. Berkeley Lab's Visualization Program and Laboratory. In *DOE Computer Graphics Forum*, Bodega Bay CA, USA, April 1991.

I90. E. Wes Bethel. Case Study: Application of Visualization Techniques to Multi-dimensional Seismic Data. In *First annual IEEE Visualization*, San Francisco CA, USA, October 1990.

Invited Presentations at Institutions/Colloquia

I91. E. Wes Bethel. What Science Goes Undiscovered When You Can't Save but a Tiny Portion of Simulation Data for Analysis? In *CAS Seminar Series, Old Dominion University*, Norfolk, VA, USA, May 2017.

I92. E. Wes Bethel. Towards Exascale: High Performance Visualization and Analytics. In *2017 ASCR Computer Science Principal Investigators Meeting (CS PI Meeting)*, Bethesda, MD, USA, March 2017.

I93. E. Wes Bethel. Scalable Analysis Methods and In Situ Infrastructure for Extreme Scale Knowledge Discovery. In *2017 ASCR Computer Science Principal Investigators Meeting (CS PI Meeting)*, Bethesda, MD, USA, March 2017.

I94. E. Wes Bethel. Management, Analysis, and Visualization of Experimental and Observational Data: The Convergence of Data and Computing. In *2017 ASCR Computer Science Principal Investigators Meeting (CS PI Meeting)*, Bethesda, MD, USA, March 2017.

I95. E. Wes Bethel. Navigating the Landscape of Scientific Data Challenges and Opportunities. In *Office of Science Data Working Group and Facilities Working Group Seminar*, Germantown, MD, USA, January 2017.

I96. E. Wes Bethel. Convergence of Computing and Data: An Opportunity for Long-term Impact on SC Science Programs, and Beyond. In *Office of Advanced Scientific Computing Research Seminar*, Germantown, MD, USA, January 2017.

I97. E. Wes Bethel. Management, Analysis, and Visualization of Experimental and Observational Data – The Convergence of Data and Computing. In *National Institute of Standards and Technology, Applied and Computational Mathematics Division Seminar Series*, Gaithersburg, MD, USA, October 2016.

I98. E. Wes Bethel. Management, Analysis, and Visualization of Experimental and Observational Data – The Convergence of Data and Computing. In *U.S. Department of Energy Advanced Scientific Computing Advisory Committee (ASCAC) Meeting*, Washington, DC, USA, September 2016.

I99. E. Wes Bethel. Management, Analysis, and Visualization of Experimental and Observational Data – The Convergence of Data and Computing. In *Thomas Jefferson National Laboratory Colloquium*, Newport News, VA, USA, August 2016.

I100. E. Wes Bethel. Exascale Computing Challenges and Volume Rendering Optimizations for Advanced Architectures. In *Computer Science Department Colloqium Series, Old Dominion University*, Norfolk, VA, USA, April 2016.

I101. E. Wes Bethel. Berkeley Lab Visualization and Analytics. In *For Visiting Representatives from the Natural Science Foundation of China and East China Normal University*, Berkeley, CA, USA, November 2013.

I102. E. Wes Bethel. Why High Performance Visual Data Analytics is Both Relevant and Difficult. In *LBNL Summer Students Brown Bag Series*, Berkeley, CA, USA, July 2013.

I103. E. Wes Bethel. Hybrid Parallelism, Performance Optimization, and Auto-tuning for Visual Data Exploration on Large Multi- and Many-core Systems. In *University of Tulsa Research Seminar*, Tulsa, OK, USA, March 2012.

I104. Hank Childs and E. Wes Bethel. Challenges and Solutions for Visual Data Analysis on Current and Emerging HPC Platforms. In *SEG Workshop on High Performance Computing in the Geosciences*, Berkeley, CA, USA, July 2011.

I105. E. Wes Bethel. Exascale Visualization – Get Ready for a Whole New World. In *Discovery 2015: HPC and Cloud Computing Workshop*, Berkeley, CA, USA, June 2011.

I106. E. Wes Bethel. The Art and Science of Scientific Visualization. In *LBNL Computer Sciences Summer Student Seminar Series*, Berkeley, CA, July 2009.

I107. E. Wes Bethel. High Performance, Query-Driven Scientific Visualization: Finding Smaller Needles in Larger Haystacks. In *University of Tulsa Research Seminar*, Tulsa, OK, USA, September 2008.

I108. E. Wes Bethel. Scientific Visualization: The Modern Oscilloscope for Seeing the Unseeable. In *LBNL Summer Lecture Series*, Berkeley, CA, USA, June 2008.

I109. E. Wes Bethel. Query-Driven Visualization Accelerates Scientific Insight. In *Computation and Complex Systems, Mathematical Sciences Research Institute*, Berkeley CA, USA, October 2007.

I110. E. Wes Bethel. Query-Driven Visualization. In *CS and Visualization PI Presentations*, Germantown MD, USA, May 2005.

I111. E. Wes Bethel. SDM Needs of the Visualization Research and Development Community. In *SciDAC Scientific Data Management Center All-Hands Meeting*, Salt Lake City UT, USA, March 2005.

I112. E. Wes Bethel. Finding the Unknown in a Sea of Data: Leveraging Human Intuition with Scientific Data Analysis. In *CS and Visualization PI Presentations*, Germantown MD, USA, February 2005.

I113. E. Wes Bethel. Benefits of Martial Arts Training. In *Berkeley Lab Wellness Fair*, Berkeley CA, USA, November 2004.

I114. E. Wes Bethel. Science-Driven Visualization Research Challenges. In *Berkeley Lab Booth Lectures, Supercomputing 2004*, Pittsburgh PA, USA, November 2004.

I115. E. Wes Bethel. Terabytes to Insights: Remote and Distributed Visualization. In *CS and Visualization PI Presentations*, Germantown MD, USA, September 2004.

I116. E. Wes Bethel. Scientific Visualization at NERSC. In *NERSC User Group Business Meeting*, May 2003.

I117. E. Wes Bethel. NERSC Visualization Greenbook Workshop Report. In *DOE Computer Graphics Forum*, April 2003.

I118. E. Wes Bethel. Virtual Reality and Scientific Visualization. In *EPA Visualization Conference*, Research Triangle Park NC, USA, September 1995.

I119. E. Wes Bethel. AVS Introduction and Tutorial. In *Courant Institute, New York University*, New York NY, USA, October 1991.

I120. E. Wes Bethel. Interactive Scientific Visualization. In *Courant Institute, New York University*, New York NY, USA, October 1991.

Invited Guest Lecturer

I121. E. Wes Bethel. Scientific Visualization. In *Invited lecture, MSIM 742, Synthetic Environments and Advanced Visualization*, Old Dominion University, Norfolk, VA, USA, February 2015.

I122. E. Wes Bethel. Big Data Challenges and Approaches in Energy Sciences. Skytree, Inc., San Jose, CA, USA, May 2014.

I123. E. Wes Bethel. Scientific Visualization. In *Invited lecture, MSIM 742/842, Advanced Visualization*, Old Dominion University, Norfolk, VA, USA, February 2014.

I124. E. Wes Bethel. Performance Optimization and Scene Graph Concepts. In *University of Tulsa, CS3023 Guest Lecture*, Tulsa, OK, USA, March 2012.

I125. E. Wes Bethel. Parallelism in Graphics and Visualization. In *University of Tulsa, CS6813 Guest Lecture*, Tulsa, OK, USA, September 2008.

I126. E. Wes Bethel. Parallelism in Graphics and Visualization. In *UC Berkeley, CS 267, Applications of Parallel Computers*, Berkeley CA, USA, April 2008.

I127. E. Wes Bethel. Parallelism in Graphics and Visualization. In *UC Berkeley, CS 267, Applications of Parallel Computers*, Berkeley CA, USA, April 2006.

I128. E. Wes Bethel. Parallelism in Graphics and Visualization. In *UC Berkeley, CS 267, Applications of Parallel Computers*, Berkeley CA, USA, May 2005.

Research Grants and Contracts

Current Funding

F1. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "Scalable Data-Computing Convergence and Scientific Knowledge Discovery." $900K/yr FY2018–FY2020. E. Wes Bethel (PI).

F2. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "Scalable Analysis Methods and *In Situ* Infrastructure for Extreme Scale Knowledge Discovery." $1.4M/yr FY2018–FY2020. E. Wes Bethel (PI).

F3. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "A SciDAC Institute for Computer Science and Data." $6M/yr FY2018–FY2020. R. Ross (PI); E. Wes Bethel (Senior Personnel).

Previous Funding

F4. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "Towards Exascale: High Performance Visualization and Analytics." $750K/yr FY2015–2017. E. Wes Bethel (PI).

F5. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "Scalable Analysis Methods and *In Situ* Infrastructure for Extreme Scale Knowledge Discovery." $1.5M/yr FY2015–FY2017. E. Wes Bethel (PI).

F6. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "SciDAC Scalable Data Analysis and Visualization Institute." $5M/yr FY2012–2017. A. Shoshani (PI), E. Wes Bethel (co-PI), along with co-PIs from 12 other institutions.

F7. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "Towards Exascale: High Performance Visualization and Analytics." $725K/yr FY2012–2014. E. Wes Bethel (PI).

F8. U. S. Department of Energy, Office of Biological and Environmental Research. "Visual Data Exploration and Analysis of Ultra-large Climate Data." $1.7M/yr, FY2010–2013. E. Wes Bethel (PI), William D. Collins (co-I), Dean N. Williams (co-I).

F9. National Science Foundation. "TeraGrid Phase III: eXtreme Digital Resources for Sciences and Engineering (XD)." $958K, FY2009–2012. S. Ahern (PI), E. Wes Bethel (co-PI).

F10. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "Visualization and Analysis for Nanoscale Control of Geologic CO2." $427K, FY2010–2014. E. Wes Bethel (PI), Gunther H. Weber (co-I), Daniela Ushizima (co-I), Janet S. Jacobsen (co-I).

F11. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "Accelerating Discovery of New Materials for Energy-related Gas Separations through PDE-based Mathematical and Geomtrical Algorithms and Advanced Visualization Tools." $383K, FY2010–2014. E. Wes Bethel (PI), Maciej Haranczyk (co-I), Prabhat (co-I), James A. Sethian (co-I).

F12. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "SciDAC Visualization and Analytics Center for Enabling Technologies." $2.2M/yr FY2007–2012. E. Wes Bethel (Coordinating PI) and Chris Johnson (co-PI).

F13. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "High Performance Visualization." $575K/yr FY2008–2011. E. Wes Bethel (PI).

F14. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. "High Performance Visualization." $500K/yr FY2005–2007. E. Wes Bethel (PI), J. Shalf (co-PI).

F15. U.S. Department of Energy Office of Science. Scientific Application Pilot Program for Visualization on the "Advanced Computing for 21st Century Accelerator Science and Technology." $75K FY2005. R. Ryne and K. Ko (PIs), E. Wes Bethel (co-PI), and J. Shalf (co-PI) (Bethel and Shalf are co-PI's on a Strategic Application Partnership project).

F16. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research, SBIR/STTR Program. "Chromium Renderserver: Remote Rendering and Visualization Servers Using Distributed Memory Parallel Clusters." $100K, FY 2004; $750K FY2005–2006. B. Paul (PI), E. Wes Bethel (co-PI), S. Ahern (co-PI), J. Owen (co-PI).

F17. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research, Office of Mathematics, Information and Computational Sciences. "Adaptive Mesh Refinement Visualization." $360K/yr FY2002–2005. E. Wes Bethel (PI), with J. Shalf (co-PI) and B. Hamann (co-PI).

F18. Department of Homeland Security via National Visualization and Analytics Center. "Query-Driven Network Flow Data Analysis and Visualization." $131K. FY2005–2006. E. Wes Bethel (PI).

F19. U.S. Department of Energy Office of Science, Office of Mathematics, Information and Computational Sciences. "DiVA (Distributed Visualization Architecture) Workshops." FY2003, $40K. E. Wes Bethel (PI).

F20. Lawrence Berkeley National Laboratory, LDRD. "Interactive Visualization Methods for Exploration and Comparison of Multi-billion Base Pair Sequence Data." $150K, FY 2003; $100K, FY2004; $80K, FY2005. B. Hamann (PI), E. Rubin (co-PI), E. Wes Bethel, I. Dubchak, K. Joy, K. Schwartz.

F21. U.S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research, SBIR/STTR Program. "Scalable, Open Source Scene Graph Software for High Performance Graphics and Visualization." $100K, FY2003. E. Wes Bethel (PI).

F22. Lawrence Berkeley National Laboratory, LDRD. "Infrastructure for Improving Protein Structure Prediction in Computational Biology." $150K, FY2002–2004. S. Crivelli (PI), E. Wes Bethel (co-PI), B. Hamann, K. Joy, O. Kreylos, N. Max, J. Shalf.

F23. Lawrence Berkeley National Laboratory, LDRD. "Interactive Electron Microscopy Enhanced with Virtual Reality." $130K, FY2001. E. Wes Bethel (PI) and S. J. Bastacky (co-PI). FY2001.

F24. U. S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research, SBIR/STTR Program. "Scene Graph Middleware for Remote and High Performance Visualization." $100K, FY 2001. E. Wes Bethel (PI).

F25. Lawrence Berkeley National Laboratory, LDRD. "An Agenda for Combustion Visualization." $100K, FY1999. E. Wes Bethel (PI) and Terry Ligocki (co-PI).

F26. Lawrence Berkeley National Laboratory, LDRD. "Parametric Visualization and Computation of Large Geochemical Datasets." $60K, FY1998. E. Wes Bethel (PI), George Brimhall (co-PI).

F27. U. S. Department of Energy, Office of Science, Office of Basic Energy Sciences, Advanced Computational Technology Initiative (ACTI). "Advanced Flux Visualization and Virtual Reality for Reservoir Engineering." $210K FY1995–1996. E. Wes Bethel (PI), J. Jacobsen (co-PI).

Mentoring

Current Staff

S1. Dr. David Camp (2010–present), Computer Systems Engineer.

S2. Dr. Bernd Hamann (2002–present), Faculty Scientist, Professor, Computer Science, University of California, Davis.

S3. Dr. Hari Krishnan (2010–present), Computer Systems Engineer.

S4. Mr. Burlen Loring (2011–present), Computer Systems Engineer.

S5. Dr. John Michael MacNeil (2017–present), Postdoctoral Researcher.

S6. Dr. Dmitriy Morozov (2010–present), Research Scientist.

S7. Dr. Sang-Yun Oh (2015–present), Faculty Scientist, Asst. Professor, Statistics and Applied Probability, University of California, Santa Barbara.

S8. Dr. Talita Perciano (2013–present), Research Scientist.

S9. Dr. Oliver Rübel (2011–present), Research Scientist.

S10. Dr. Daniela Ushizima (2007–present), Staff Scientist.

S11. Dr. Gunther Weber (2006–present), Staff Scientist.

Current Students

S12. Ms. Colleen Heinemann (2015–present). Bradley University, University of Illinois.

S13. Mr. Brent Lessley (2016–present). University of Oregon.

Previous Staff

S14. Dr. Cecilia Aragon (2006–2008), Associate Professor, Department of Human Centered Design & Engineering, University of Washington.

S15. Dr. Jacob Bastacky (2000–2002), Research Physician, Children's Hospital Oakland Research Institute.

S16. Dr. Hank Childs (2009–2016), Associate Professor, Computer Science, University of Oregon.

S17. Dr. Silvia Crivelli (2003–2016). Staff Scientist, Lawrence Berkeley National Laboratory.

S18. Ms. Janet Jacobsen (2007–2010).

S19. Dr. Kenneth I. Joy (2002–2016), Faculty Scientist, Professor, Computer Science, University of California, Davis.

S20. Ms. Mary Hester (2012–2013), Outreach Coordinator, Energy Sciences Network, Lawrence Berkeley National Laboratory.

S21. Ms. Jennifer Horsman (2010–2012), Geologist/GIS Analyst, Research Planning, Inc.

S22. Mr. Mark Howison (2009–2014). Director, Brown University Center for Computation and Visualization.

S23. Mr. Jason Novotny (2004–2005).

S24. Dr. Jörg Meyer (2011–2014). Magic Leap.

S25. Dr. Pardeep Pall (2012–2013), Research Scientist, Scientific Computing Group, Lawrence Berkeley National Laboratory.

S26. Mr. Prabhat (2007–2014), Computational Manager, National Energy Research Scientific Computing Facility, Lawrence Berkeley National Laboratory.

S27. Dr. Raquel Romano (2002–2004), Senior Software Engineer, Google, Inc.

S28. Mr. Ken Schwartz (2001–2003).

S29. Mr. John Shalf (2001–2006). Staff Scientist, Lawrence Berkeley National Laboratory.

S30. Ms. Cristina Siegerist (2001–2007).

S31. Mr. Steven A. Smith (2005), emeritus Technical Staff, Los Alamos National Laboratory.

S32. Dr. Kurt Stockinger (2003–2006), Associate Professor of Computer Science, Zurich University of Applied Sciences.

S33. Dr. Ilmi Yoon (2004–2008), Associate Professor, San Francisco State University.

Previous Students, Graduate and Undergraduate

S34. Mr. Martin Adams (2017). San Mateo Community College, UC Berkeley.

S35. Dr. Kenes Beketayev (2009–2013).

S36. Dr. Carlos Bazan (2006).

S37. Ms. Christina de Bianchi (2012–2013).

S38. Mr. Ian Bowman (2004–2005).

S39. Dr. Carson Brownlee (summer 2011).

S40. Ms. Elena Caraba (2006–2007).

S41. Mr. James Chen (2004–2006).

S42. Mr. Dogan Demir (summers 2010, 2011).

S43. Mr. Jerry Chi-Li Chen (2004-2009), Software Engineer, Google, Inc.

S44. Mr. Clark Crawford (2005–2006).

S45. Mr. Fernano Fuentes (2012–2013).

S46. Dr. Virgil Griffith (summer 2010).

S47. Dr. Luke Gosink (2005–2009), Scientist, Pacific Northwest National Laboratory.

S48. Mr. Bryce Hathaway (2005).

S49. Dr. Chengcheng Hu (2006–2009).

S50. Mr. Ian Johnson (summer 2011).

S51. Mr. Eugene Kadish (2012–2013).

S52. Dr. T.J. Jankun-Kelly (2002–2003), Associate Professor, Computer Science Department, Mississippi State University.

S53. Dr. Oliver Kreylos (2001–2009), Research Staff, University of California, Davis.

S54. Ms. Xia Liu (summer 2002).

S55. Dr. James Lu (2004–2006).

S56. Dr. Hoa Nguyen (2015–2016). University of Utah.

S57. Mr. Iuri Prilepov (summer 2011).

S58. Dr. Nameeta Shah (2004–2006).

S59. Mr. Praveen Shetty (2001-2003).

S60. Dr. Zhi Xing (Louis) Feng (2007–2009).

S61. Mr. Thomas Yopes (summer 2011)

S62. Ms. Wei (Tina) Zhuo (summers 2010, 2011)

Teaching Experience

Courses Taught

T1. Scientific Visualization with AVS. A two-day course taught to Berkeley Lab, Ph.D.-level scientists, consisting of lecture and hands-on use of the AVS oftware to solve scientific visualization problems using data the students brought to class. Curriculum included basics of scientific visualization: use of color/color spaces, methods for scalar and vector fields, methods for temporal data, coding to extend the system with user-written modules. Taught this course approximately four times per year during the period 1990–1994 at Lawrence Berkeley National Laboratory.

Tutorials

T2. SC17 Tutorial: SENSEI Cross-Platform View of In Situ Analytics, November 2017. This day-long tutorial is a combination of lecture and hands-on instruction on *in situ* methods and infrastructure. Participants will gain an understanding of the fundamentals of *in situ* analytics and visualization, while being exposed to advanced analysis like as time-dependent autocorrelation and interactive monitoring and steering, as well as code coupling between a miniapplication and three different *in situ* infrastructures. Co-organized with Andrew Bauer (Kitware, Inc.), Brad Whitlock (Intelligent Light), Matthew Wolf (Oak Ridge National Laboratory) and Venkat Vishwanath (Argonne National Laboratory).

Invited Guest Lecturer

T3. E. Wes Bethel. Scientific Visualization. In *Invited lecture, MSIM 742, Synthetic Environments and Advanced Visualization*, Old Dominion University, Norfolk, VA, USA, February 2015.

T4. E. Wes Bethel. Big Data Challenges and Approaches in Energy Sciences. Skytree, Inc., San Jose, CA, USA, May 2014.

T5. E. Wes Bethel. Scientific Visualization. In *Invited lecture, MSIM 742/842, Advanced Visualization*, Old Dominion University, Norfolk, VA, USA, February 2014.

T6. E. Wes Bethel. Performance Optimization and Scene Graph Concepts. In *University of Tulsa, CS3023 Guest Lecture*, Tulsa, OK, USA, March 2012.

T7. E. Wes Bethel. Parallelism in Graphics and Visualization. In *University of Tulsa, CS6813 Guest Lecture*, Tulsa, OK, USA, September 2008.

T8. E. Wes Bethel. Parallelism in Graphics and Visualization. In *UC Berkeley, CS 267, Applications of Parallel Computers*, Berkeley CA, USA, April 2008.

T9. E. Wes Bethel. Parallelism in Graphics and Visualization. In *UC Berkeley, CS 267, Applications of Parallel Computers*, Berkeley CA, USA, April 2006.

T10. E. Wes Bethel. Parallelism in Graphics and Visualization. In *UC Berkeley, CS 267, Applications of Parallel Computers*, Berkeley CA, USA, May 2005.

Other Teaching Experience

T11. Taekwondo/Martial Arts. Head instructor at United Black Belts of America, San Anselmo, CA, during the period 1994–1999. Responsible for developing curriculum and teaching classes to all levels, from beginners to advanced, black-belt level competitors. Organized and carried out numerous public martial arts demonstrations for outreach and education purposes. Curriculum included fundamentals, poomse (forms), kyuckpa (breaking), self defense, kyoroogi (free sparring), breath, citizenship, scholarship, and related martial philosophy. Taught approximately 10 classes per week for five years.

Service

Conference/Workshop Chair or co-Chair

1. ISAV: In Situ Infrastructures for Enabling Extreme Scale Analysis and Visualization. Supercomputing Conference Series Workshop. General chair: 2015, 2016; Program chair: 2017.

2. Eurographics Symposium on Parallel Graphics and Visualization. June 6–7, 2016, Gröningen, Netherlands.

3. High Performance Data Analysis and Visualization (HPDAV), an International Parallel and Distributed Processing Symposium Workshop (IPDPS), May 23, 2016. Chicago, IL, USA.

4. SIAM PP16 Minisymposium MS66: *In Situ* Methods and Infrastructure: Answers Without All the I/O. April 15, 2016, Paris, France.

5. Data Management, Visualization, and Analysis of Experimental and Observational Data. DOE/ASCR Workshop on Data Management, Visualization, and Analysis of Experimental Data. September 29 – October 1, 2015. Bethesda, MD, USA.

6. High Performance Data Analysis and Visualization (HPDAV), an International Parallel and Distributed Processing Symposium Workshop (IPDPS) 2015. Hyderabad, India.

7. Visualization and Data Analysis (VDA) Conference (sponsor: IS&T/SPIE). Conference co-chair, February 2015. San Francisco, CA, USA.

8. U. S. Department of Energy, Office of Science, Advanced Scientific Computing Research. Scientific Data Management, Analysis, and Visualization, Program-wide PI Meeting. Jan 13-15, 2015, Walnut Creek, CA. (Primary organizer.)

International Program Committee

9. Siggraph Asia 2017 Symposium on Visualization.

10. SC17 Visualization Showcase.

11. International Parallel and Distributed Processing Symposium (IPDPS) 2015.

12. IEEE Visualization Large Scale Data Analysis and Visualization Symposium, International Program Committee: 2011, 2012, 2015, 2016.

13. DOE Computer Graphics Forum, Chair: 1993, 1997, 2005, 2009, 2016.

14. EuroVis/EnvrVis: Visualization in Environmental Sciences: 2015, 2016, 2017.

15. IEEE Visualization Technical Program Committee: 2005, 2006, 2007, 2015.

16. ACM Supercomputing Annual Conference Series: 2002, 2004.

17. ACM Siggraph, Panels Committee: 1996.

18. ACM Siggraph Asia, Visualization in High Performance Computing Technical Program Committee: 2015.

19. AVS Users Group Meeting: 1994, 1995.

20. University of California, Digital Media Initiative Executive Committee, 2001.

Organizing Committee

21. ISAV: In Situ Infrastructures for Enabling Extreme Scale Analysis and Visualization. Supercomputing Conference Series Workshop. 2015, 2016, 2017.

22. American Geophysical Union, Fall 2012 Meeting. Session co-organizers: Robert Jacob, Dean Williams, E. Wes Bethel. Session title: "Challenges in Analysis and Visualization of Large Earth Science Data Sets."

23. American Geophysical Union, Fall 2011 Meeting. Session co-organizers: Robert Jacob, Dean Williams, E. Wes Bethel. Session title: "Challenges in Analysis and Visualization of Large Earth Science Data Sets."

24. U. S. Department of Energy, Office of Science, Office of Nuclear Physics. Future Trends in Nuclear Physics Computing Symposium and Workshop. May 3–5 2017, Newport News, VA.

25. U. S. Department of Energy, Office of Science, Office of Fusion Energy Sciences. Integrated Fusion Modeling Workshop. June 2–4 2015, Rockville, MD.

26. U. S. Department of Energy, Office of Science, Advanced Scientific Computing Research. Scientific Discovery through Advanced Computing (SciDAC) Annual Program Meeting, 2007.

27. U. S. Department of Energy , Office of Science, Advanced Scientific Computing Research. Visualization and Knowledge Discovery: Report from the DOE/ASCR Workshop on Visual Analysis and Data Exploration at the Extreme Scale. June 7-8 2007, Salt Lake City, UT.

28. U. S. Department of Energy, Office of Science, Advanced Scientific Computing Research. Office of Science Scientific Data Management Challenge Workshop Series, 2004.

29. U. S. Department of Energy. Computer Graphics Forum Steering Committee: 1995–present.

30. U. S. Department of Energy, Office of Science. Science Case for Large-scale Simulation (SCaLeS) Workshop, 2003.

31. U. S. Department of Energy, Office of Science, Advanced Scientific Computing Research. "NERSC Visualization Greenbook Workshop," Berkeley CA, June 2002.

32. U. S. Department of Energy, Office of Science, Advanced Scientific Computing Research. "MICS Workshop on Visualization Program Interoperability," Berkeley CA, March 1998.

Service to Professional Organizations – Technical Reviewer

33. ACM Computing Surveys: 2010.

34. ACM Siggraph Technical Program: 2005, 2011.

35. ACM Siggraph Asia: 2015, 2016.

36. ACM Supercomputing Annual Conference Series, Technical Program: 2001, 2002, 2004.

37. ACM Supercomputing – Visualization Showcase: 2013, 2017.

38. Astronum – Numerical Modeling of Space Plasma Flows: 2008, 2010.

39. EuroGraphics Technical Program: 2005, 2017.

40. EuroGraphics Computer Graphics Forum: 2011, 2012.

41. IEEE Computational Science and Engineering: 1997.

42. IEEE Computer Graphics and Applications: 2002, 2004, 2005, 2006.

43. IEEE Pacific Visualization: 2011.

44. IEEE Transactions on Visualization and Computer Graphics: 2001, 2002, 2005, 2008, 2009, 2013.

45. IEEE Visualization Technical Program: 1992, 2003, 2004, 2005, 2006, 2007, 2010, 2011, 2012, 2013, 2015.

46. IEEE International Parallel and Distributed Processing Symposium (IPDPS): 2015.

47. IEEE Visualization Symposium on Large Scale Data Analysis and Visualization: 2011, 2015, 2016.

48. IEEE Symposium on Visual Analytics Science and Technology: 2006.

49. IEEE Visualization: Information Visualization Technical Program: 2005.

50. Transportation Research Board – Intelligent Transportation Systems: 2007.

Technical Proposal/Grant Reviewer

51. Agency for Science, Research, & Technology (A*STAR), Singapore. 2014.

52. Austrian Science Fund. 2014, 2016.

53. U. S. Department of Energy, SBIR/STTR Technical Reviewer: 2003, 2004, 2005, 2006, 2007, 2011, 2012, 2013.

54. National Science Foundation. 2012, 2017.

55. U. S. Department of Energy, Office of Science, Advanced Scientific Computing Research, Mathematical, Information and Computational Sciences research proposal reviewer: 2002, 2003, 2004, 2006, 2008, 2009, 2010.

56. U. S. Department of Energy, Early Career Principal Investigator Program: 2003, 2004, 2005, 2009.

57. Louisiana Board of Regents, Office of Sponsored Programs: grant proposal reviewer, 2007.

58. U. S Department of Energy, Office of Science, Office of Fusion Energy Science research proposal reviewer: 2004.

59. U. S Department of Energy, Office of Science, Office of High Energy Physics, research proposal reviewer: 1996.

60. U. S. Department of Energy, Office of Basic Energy Sciences: 1996.

Other Service to Professional Organizations

61. President, Bay Area AVS Users Group: 1992–1995.

Editor

62. IEEE Computer Graphics and Applications, Special Issue on High Performance Visualization and Analysis. 2016. E. Wes Bethel and Kelly Gaither, editors.

External Review Committee and Advisory Panel

63. U.S. Department of Energy, Office of Science, Office of Biological and Environmental Research. Earth System Grid Federation program review, June 2017.

64. U.S. Department of Energy, Office of Science, Office of Advanced Scientific Computing Research. Visualization/Analytics Nexus co-lead. 2013–2016.

65. National Center for Supercomputing Applications. Blue Waters Visualization Advisory Panel, 2010.

66. Pacific Northwest National Laboratory/National Visual Analytics Center: Architectural Review Board (Chair), 2004.

Service to LBNL

67. Lawrence Berkeley Laboratory Lab Staffing Committee, 2014–2017.

68. Computing Sciences Area Staffing Committee, 2011–present.

69. Computational Research Division (CRD) Safety Committee, 2007–present.

70. Building Emergency Team member, 2007–present.

71. Computational Theory Center Building committee, 2008–2013.

72. Employee Activities Association Board Member, 2004–2005.

73. Martial Arts Instructor, EAA Martial Arts Club, 2003–2007.

74. CRD and NERSC staff search/hiring committee member: numerous.

75. LBNL Open House. 1995, 1999.

Student Thesis/Dissertation Committee

76. Ms. Hoa Nguyen, PhD Qualifying Examination Committee, Computer Science, University of Utah, April 2016; PhD Dissertation Defense Committee, January 2017.

77. Mr. Alexy Agronovsky, PhD Qualifying Examination Committee, Computer Science, U.C. Davis, May 2013.

78. Mr. Kenes Bekatayev, PhD Qualifying Examination Committee, Computer Science, U.C. Davis, June 2011 and April 2013.

79. Mr. David Camp, PhD Qualifying Examination Committee, Computer Science, U.C. Davis, September 2011.

80. Mr. Ian Bowman, MS Committee, Department of Computer Science, UC Davis. Graduated 2004.

Professional Affiliations

- ACM Distinguished Scientist member, SIGGRAPH, SIGHPC.
- IEEE, associate member.

Other Certifications

- Martial Arts. Kukkiwon certified fourth-degree black belt in Taekwondo, certificate number 5904313, 24 September 1999. United States Taekwondo Union (USTU) certified referee, level D-2.

- General aviation. FAA Instrument-rated private pilot, certificate number 2791855, with complex and high performance aircraft endorsements.

- U.S. Air Force Auxiliary, Civil Air Patrol. Transport Mission pilot, search and rescue pilot trainee, Inspector General, webmaster, 1st Lt. 2005–2013.