

Jennifer L. Mueller

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Appointments

2016– Professor of Electrical and Computer Engineering, Colorado State University
(joint appointment)
2011– Professor of Mathematics, Colorado State University
2011– Professor of Biomedical Engineering, Colorado State University
2013– : Associate Chair, Dept. of Mathematics, Colorado State University
2010– : Graduate Director, Colorado State University
2007–2011: Associate Professor of Biomedical Engineering, Colorado State University
2005–2011: Associate Professor of Mathematics, Colorado State University
2000–2005: Assistant Professor of Mathematics, Colorado State University
1997–2000: NSF Mathematical Sciences Postdoctoral Fellow, Rensselaer Polytechnic Institute
1998–2000: Research Fellow, Rensselaer Polytechnic Institute

Laboratories:

2011– Director and founder of Electrical Impedance Tomography Laboratory

Education

1997– Ph.D. in Mathematics, University of Nebraska
1993– M.S. in Mathematics, University of Nebraska
1991– B.S. in Mathematics and Statistics, University of Nebraska,
magna cum laude, Phi Beta Kappa

Editorships

Associate editor: Inverse Problems in Science and Engineering, Oct. 2016 - present
Associate editor: IEEE Transactions on Medical Imaging, Nov. 2015 - present
Associate editor: SIAM Journal of Applied Mathematics, Jan. 2014 - present

Advisory Boards

2012– School of Biomedical Engineering, Milwaukee School of Engineering (MSOE)
2005– Invited participant, Respironics Medical Advisory Board Meeting, Cleveland, OH

Visiting Positions:

Spring 2010: University of São Paulo, Brazil
Spring 2007: University of São Paulo, Brazil

Honors and Awards:

- 2016: Co-chair of SIAM Annual Meeting 2017
04/2016: Invited Plenary Speaker: NIH Human Placenta Project Workshop
05/2014: Invited Plenary Speaker At "Progres recents dans l'analyse mathematique et numerique des problemes inverses", CIRM, Marseilles, France
2010 - 2012: Program Director of SIAM Activity Group on Imaging (elected)
2008 - 2010: Vice Chair of SIAM Activity Group on Imaging (elected)
1997–2000: NSF Mathematical Sciences Postdoctoral Fellowship
1995 – 1997: EPA Graduate Fellowship

Books and Book Chapters

J. L. Mueller and S. Siltanen, *Linear and Nonlinear Inverse Problems with Practical Applications*, SIAM, Computational Science & Engineering, **10**, 2012

Book Chapter: Direct Methods for EIT, co-authored with David Isaacson and Samuli Siltanen for the text *Electrical Impedance Tomography: Methods, History, and Applications*, edited by David Holder, in press.

Journal Publications

1. M. Alsaker and J. L. Mueller, 2016 Use of a priori spatial information in D-bar reconstructions of EIT tank data, in review.
2. P. A. Muller, J. L. Mueller, and M. Mellenthin, 2016 Calderón's Method on General Domains, in review.
3. M. Mellenthin, J. L. Mueller, E. de Camargo, F. de Moura, T. Santos, R. Lima, S. J. Hamilton, P. A. Muller, and M. Alsaker 2016 The ACE1 Electrical Impedance Tomography System for Thoracic Imaging, in review.
4. S. J. Hamilton, J. L. Mueller and M. Alsaker, 2016 Incorporating a Spatial Prior into Nonlinear D-Bar EIT imaging for Complex Admittivities, *IEEE Transactions on Medical Imaging*, Vol. PP, Issue 99, DOI: 10.1109/TMI.2016.2613511 (early access article)
5. M. Alsaker and J. L. Mueller, 2016 A D-bar algorithm with a priori information for 2-D electrical impedance tomography, *SIAM Journal on Imaging Science*, Vol.9 No. 4, 1619–1654.
6. R. Croke, J. L. Mueller, M. Music, P. Perry, S. Siltanen and A. Stahel, 2015 The Novikov-Veselov equation: Theory and Computation, *Contemporary Mathematics*, Vol. 635, 25–70.

7. R. Croke, J. L. Mueller and A. Stahel, 2015 Transverse instability of plane wave soliton solutions of the Novikov-Veselov equation, *Contemporary Mathematics*, Vol. 635, 71–89. Arxiv link: <http://arxiv.org/abs/1304.1489>
8. C.N.L. Herrera, M.F.M. Vallejo, J.L.Mueller, R. Lima 2015 Direct 2-D reconstructions of conductivity and permittivity from EIT data on a human chest, *IEEE Transactions on Medical Imaging*, Vol. 34, No. 1, pp. 267-274.
9. M. Dodd and J. L. Mueller 2014 A Real-time D-bar Algorithm for 2-D Electrical Impedance Tomography Data, *Inverse Problems and Imaging*, Vol. 8, No. 4, pp.1013-1031.
10. S. J. Hamilton and J. L. Mueller, 2013 Direct EIT reconstructions of complex conductivities on a chest-shaped domain in 2-D, *IEEE Transactions on Medical Imaging*, Vol. 32, No. 4, pp. 757—769. PMID: 25203984
11. S. J. Hamilton, C. N. L. Herrera, J. L. Mueller, and A. Von Herrmann, 2012 A direct D-bar reconstruction algorithm for recovering a complex conductivity in 2-D, *Inverse Problems*, Vol. 28, 095005. Arxiv link: <http://arxiv.org/abs/1202.1785>
12. M. Lassas, J. L. Mueller, S. Siltanen, and A. Stahel, 2012 The Novikov-Veselov Equation and the Inverse Scattering Method, Part I: Analysis, *Physica D*, Vol. 241, pp. 1322–1335. Arxiv link: <http://arxiv.org/abs/1105.3903>
13. M. Lassas, J. L. Mueller, S. Siltanen, and A. Stahel, 2012 The Novikov-Veselov Equation and the Inverse Scattering Method, Part II: Computation, *Nonlinearity*, Vol. 25, pp. 1799–1818.
14. K. Knudsen and J. L. Mueller, 2011 The Born approximation and Calderón’s method for reconstruction of conductivities in 3-D, *Discrete and Continuous Dynamical Systems*, Special Issue, pp. 844–853.
15. J. Bikowski, K. Knudsen, J. L. Mueller, 2011 Direct numerical reconstruction of conductivities in three dimensions, *Inverse Problems*, Vol. 27
16. K. Astala, J. L. Mueller, A. Perämäki, L. Päivärinta, S. Siltanen, 2010 Direct electrical impedance tomography for nonsmooth conductivities, *Inverse Problems and Imaging*, Vol. 3, No. 3, pp. 531–549
17. K. Astala, J. L. Mueller, L. Päivärinta, S. Siltanen, 2010 Numerical computation of complex geometrical optics solutions to the conductivity equation, *Applied and Computational Harmonic Analysis*, Vol. 29, No. 1, pp. 2-17.
18. M. DeAngelo and J. L. Mueller 2010 D-bar reconstructions of human chest and tank data using an improved approximation to the scattering transform, *Physiological Measurement*, Vol. 31, No. 2, pp. 221-232. PMID: 20057005

19. K. Knudsen, M. Lassas, J. Mueller, S.Siltanen 2009 Regularized D-bar method for the inverse conductivity problem, *Inverse Problems and Imaging*, Vol. 3, No. 4, pp. 599–624.
20. E.K. Murphy and J. L. Mueller, 2009 Effect of domain-shape modeling and measurement errors on the 2-D D-bar method for electrical impedance tomography, *IEEE Trans. Med. Imaging*, Vol. 28, No. 10, pp. 1576–1584.
21. K. Knudsen, M. Lassas, J. Mueller, S.Siltanen 2008 Reconstructions of piecewise constant conductivities by the D-bar method for electrical impedance tomography, Proceedings of the 4th AIP International Conference and the 1st Congress of the IPIA, Vancouver, 2007, *Journal of Physics: Conference Series*, Vol. 124, 2008.
22. J. Bikowski and J. L. Mueller, 2008 2D EIT reconstructions using Calderón’s method, *Inverse Problems and Imaging*, Vol. 2, No. 1, 43–61.
23. M. Lassas, J. Mueller, and S. Siltanen 2007 Mapping properties of the nonlinear Fourier transform in dimension two, *Comm. PDE’s.*, Vol. 32, No. 4 591–610.
24. E.K. Murphy, J. L. Mueller, J. C. Newell, 2007 Reconstructions of conductive and insulating targets using the D-bar method on an elliptical domain, *Physiological Measurement*, Vol. 28, No. 7 S101–S144. PMID: 17664628
25. K. Knudsen, M. Lassas, J. Mueller, S.Siltanen 2006 D-bar method for electrical impedance tomography with discontinuous conductivities, *SIAM J. on Applied Math.*, Vol. 67, No. 3 893–913.
26. D. Isaacson, J. Mueller, J. Newell, and S. Siltanen 2006 Imaging Cardiac Activity by the D-bar Method for Electrical impedance tomography, *Physiol Meas.* Vol. 27, S43-S50. PMID: 16636419
27. K. Knudsen, J. Mueller, and S. Siltanen 2004 Numerical solution method for the dbar-equation in the plane, *J. Comp. Phys*, Vol. 198, No. 2, 500–517.
28. D. Isaacson, J. Mueller, J. Newell, and S. Siltanen 2004 Reconstructions of Chest Phantoms by the D-Bar Method for Electrical Impedance Tomography, *IEEE Trans. on Med. Imaging*, Vol. 23, No. 7, 821–828. PMID: 15250634
29. J. Mueller and T.Shores, 2004 A New Sinc-Galerkin Method for the Solution of Convection- Diffusion Equations with Mixed Boundary Conditions, *Computers and Mathematics with Applications*, Vol. 47 803–822.
30. J. Mueller and S. Siltanen 2003 Direct Reconstructions of Conductivities from Boundary Measurements, *SIAM Journal on Scientific Computation*, Vol. 24, No. 4, 1232–1266.

31. J. Mueller, S. Siltanen, and D. Isaacson 2002 A Direct Reconstruction Algorithm for Electrical Impedance Tomography, *IEEE Transactions of Medical Imaging*, Vol. 21, No. 6, 555–559.
32. S. Siltanen, J. Mueller, and D. Isaacson 2001 Reconstruction of High Contrast 2-D Conductivities by the Algorithm of A. Nachman. In *AMS proceedings of the 2000 conference on Radon Transforms and Tomography*, E. Quinto, editor, pp.241-254.
33. J. Mueller, D. Isaacson, and J. Newell 2001 Reconstruction of Conductivity Changes Due to Ventilation and Perfusion from EIT Data Collected on a Rectangular Electrode Array, *Physiol. Meas.*, Vol. 22, No. 1, 97–106. PMID: 11236896
34. A. Hasanov and J. Mueller 2001 A Numerical Method for Backward Parabolic Problems with Non-Selfadjoint Elliptic Operators. *Appl. Num. Math.*, Vol. 37, pp. 55-78.
35. S. Siltanen, J. Mueller, and D. Isaacson 2000 An Implementation of the Reconstruction Algorithm of A. Nachman for the 2-D Inverse Conductivity Problem. *Inverse Problems*, **16** , 681–699.
36. A. Hasanov, J. Mueller, S. Cohn, and J. Redepenning 2000 Numerical Solution of a Nonlocal Identification Problem for Nonlinear Ion Transport. *Computers Math. Applic.*, Vol. 39, No. 7/8, 225–235.
37. J. Mueller, D. Isaacson, and J. Newell 1999 A Reconstruction Algorithm for Electrical Impedance Tomography Data Collected on Rectangular Electrode Arrays, *IEEE Trans. Biomed. Engr.*, Vol. 46, No. 11, 1379–1386. PMID: 10582423
38. J. Mueller and T. Shores 1997 Uniqueness and Numerical Recovery of a Potential on the Real Line. *Inverse Problems* **13**, 781–800.

Referred Proceedings Publications

1. J. L. Mueller, M. M. Mellenthin, P. Muller, R. R. Deterding, and S. D. Sagel, 2015, *Electrical Imaging of Patients with Cystic Fibrosis*. In: Proceedings of the NIH-IEEE 2015 Strategic Conference on Healthcare Innovation and Point-of-Care Technologies for Precision Medicine, in press.
2. M. Mellenthin, J. Mueller, E. D. L. B. Camargo, F. S. de Moura, S. J. Hamilton, R. Gonzalez Lima, 2015, *The ACE1 Thoracic Electrical Impedance Tomography System for Ventilation and Perfusion*. In: Proceedings of the 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, pp. 4073-4076.
3. E. Murphy and J. Mueller, 2008, *Effect of errors in domain shape modeling in 2-D reconstructions by the D-bar method*, In: Proceedings of the Conference on Electrical Impedance Tomography, Dartmouth University.

4. J. Mueller, 2004, *EIT Reconstructions and Faddeev Solutions for a Numerically Simulated Phantom Chest*, In: Biomedical Sciences Instrumentation, Vol. 40, ISA Volume 449, (S. James and H. Valenta, editors) pp. 213-218
5. J. Mueller and D. Isaacson, 2004, *Regularization of the computed scattering transform for the D-bar method for electrical impedance tomography*, In: Proceedings of the 2004 SPIE Annual Meeting Vol. 5562, (Bones, Fiddy, and Millane, editors) pp. 121-128
6. J. Bikowski and J. Mueller, 2004, *Electrical impedance tomography and the fast multipole method*, In: Proceedings of the 2004 SPIE Annual Meeting Vol. 5562, (Bones, Fiddy, and Millane, editors) pp. 129-140.

Postdocs Directed

- Peter Muller, Department of Mathematics, Colorado State University, 2014-2015
- Miguel Montoya Vallejo, Department of Mathematics, Colorado State University, 2013
- Natalia Lara Herrera, Department of Mathematics, Colorado State University, 2013

Doctoral Students

- Ethan Murphy, Department of Mathematics, Colorado State University, 2007, Thesis: *2-D D-bar conductivity reconstructions on non-circular domains*
- Jutta Bikowski, Department of Mathematics, Colorado State University, 2009, Thesis: *Electrical impedance tomography reconstructions in two and three dimensions: from Calderon to direct methods*
- Alan Von Hermann, Department of Mathematics, Colorado State University, 2009, Thesis: *Properties of the reconstruction algorithm and associated scattering transform for admittivities in the plane*
- Ryan Croke, Department of Mathematics, Colorado State University, 2012, Thesis: *The Novikov-Veselov equation, stability of solitary-wave solutions and a numerical solution*
- Sarah Hamilton, Department of Mathematics, Colorado State University, 2012, Thesis: *A direct D-bar reconstruction algorithm for complex admittivities in $W^{2,\infty}(\Omega)$ for the 2-D EIT problem*
- Miguel Montoya Vallejo, University of São Paulo, Brazil, (co-advisor), 2012, Thesis: *Full Nonlinear 2D Reconstructions of Images for Electrical Impedance Tomography Using the D-bar Method*
- Natalia Lara Herrera, University of São Paulo, Brazil, (co-advisor), 2012, Thesis: *A D-bar Method for Computing the Admittivity in 2-D EIT*
- Michelle Mellenthin, School of Biomedical Engineering, CSU, 2016, Thesis: *The Active Complex Electrode (ACE1) Electrical Impedance Tomography System*
- Melody Alsaker (Dodd), Department of Mathematics, Colorado State University, 2016, Thesis: *Computational Advancements in the D-bar Reconstruction Method for 2-D Electrical Impedance Tomography*

- Rashmi Murthy, Department of Mathematics, Colorado State University, in progress
- Michael Capps, Department of Mathematics, Colorado State University, in progress
- Kwancheol Shin, Department of Mathematics, Colorado State University, in progress
- Talles Santos, University of São Paulo, Brazil, (co-advisor), in progress

Master's Students

Jutta Bikowski, 2004, Elena Jakubikova, 2005, Jennifer Maple, 2006, Ashley Swannack, 2008, Sarah Hamilton, 2009, Shelby Stanhope, 2010, Ryan Price, 2012

Undergraduate Research

Chase Ashby, 2015-present, Lucas Martins Rocha, 2015, Jessyca Fonesca Araujo, 2015, Chris Dean, 2013-2014, Connor Watkins, 2013-2014, Katherine O'Dell, funded by HP, 2013-2014, Michael DeAngelo, funded through the Undergraduate Research Institute, CSU, Summer 2007 - Spring 2008. Publication in *Physiological Measurement*, Marian Allen, 2003, Emily Turner, Honors thesis, 2004

Recent Invited Conference Presentations (since 2010)

- Electrical impedance tomography: A novel method for imaging, NIH Human Placenta Project Workshop, April 14-15, 2016, NIH, Bethesda, MD, Invited
- Direct Reconstruction Algorithms for Real-Time Patient Imaging with Electrical Impedance Tomography, Computational and Analytical Aspects of Image Reconstruction, ICERM, Brown University, July 15, 2015, Invited
- Electrical Imaging of Patients with Cystic Fibrosis, Poster Presentation, NIH-IEEE POC Conference, Bethesda Maryland, Nov. 9-10, 2015
- D-bar Methods for Electrical Impedance Tomography, May 22, 2014, At "Progres recents dans l'analyse mathematique et numerique des problemes inverses", CIRM, Marseilles, France , Plenary Lecture
- Numerical Solution of the Novikov-Veselov Equation by the ISM and Transverse Instability of Plane-wave Soliton Solutions, April 13, 2013, AMS Sectional Meeting (1089th Meeting of the AMS), Boulder CO, presented in Special Session on Nonlinear Waves and Integrable Systems
- Reconstructions of Lung Pathologies by a D-Bar Method for 2-D Electrical Impedance Tomography, July 12, 2012, SIAM Annual Meeting, San Diego, CA, presented in mini symposium "Methods, Applications, and Innovations in Electromagnetic Imaging"
- A Direct D-bar Reconstruction Algorithm for Recovering a Complex Conductivity in 2-D, SIAM Annual Meeting, San Diego, CA July 12, 2013
- Numerical solution of the Novikov-Veselov equation by the ISM and transverse instability of plane-wave soliton solutions, Spring Western Sectional Meeting of the AMS, Boulder, CO April 13, 2013
- A Direct D-bar Reconstruction Algorithm for Recovering a Complex Conductivity in 2-D, Conference in honor of Gunther Uhlmann's Birthday, Irvine, CA, June, 2012
- Regularization of a D-bar Method for Electrical Impedance Tomography, SIAM Conference on Imaging Science, Philadelphia, May, 2012

- Electrical Impedance Tomography, in session on Applications of Math and Statistics to Physics, CSU Research Colloquium Physics at CSU: Neutrinos to Nano Science, March 28-29, 2012, Hilton Hotel, Fort Collins, CO
- Direct Electrical Impedance Tomography for Nonsmooth Conductivities, Fields-MITACS Conference on Mathematics of Medical Imaging, Toronto, CA, June 20, 2011
- A Direct D-bar Reconstruction Algorithm for Recovering Complex Conductivities, ICIAM, Vancouver, BC, July 19, 2011
- Direct Electrical Impedance Tomography for Nonsmooth Conductivities, ICIAM, Vancouver, BC, July 20, 2011
- Advantages of the D-bar method, The First Virtual Imaging Workshop, University of São Paulo Medical School (LIM), March 26, 2010

Recent Invited Colloquia and Seminars (since 2011)

- Electrical impedance tomography for functional pulmonary imaging: Methods and clinical results, Colloquium, Rensselaer Polytechnic Institute, Oct. 17, 2016
- Electrical Impedance Tomography for Functional Pulmonary Imaging, Institute for Engineering in Medicine Seminar Series, University of Minnesota, Oct. 26, 2015
- Real-time Direct Electrical Impedance Imaging for Clinical Applications, Colloquium, Marquette University, Nov. 14, 2014
- Direct Electrical Impedance Imaging Using Complex Geometrical Optics and the D-bar Method, Applied Math Seminar, CU-Boulder, Sept. 21, 2012
- Electrical Impedance Tomography, COSI Seminar, CU-Boulder, April 2, 2012
- Electrical Impedance Tomography for Assessing Ventilation and Perfusion, The Children's Hospital (Cystic Fibrosis Group seminar), April 26, 2011
- CSU Animal Cancer Center "Electrical Impedance Tomography" March 7, 2011