

CURRICULUM VITAE

YEKATERINA EPSHTEYN

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PERSONAL INFORMATION

- Citizenship: United States

CURRENT POSITION:

- Postdoctoral Associate, Department of Mathematical Sciences and Center for Nonlinear Analysis, Carnegie Mellon University (2007-present).
- Contact Information: Department of Mathematical Sciences, Carnegie Mellon University, Pittsburgh, PA, 15213, U.S.A
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EDUCATION:

- Ph.D. Applied Mathematics, University of Pittsburgh, GPA 4.0, 2002-2007.
Thesis Advisor : Prof. Beatrice Rivière.
Thesis Area: Multiphase Flow: Theory and Implementation.
Thesis Title: HP Primal High Order Discontinuous Finite Element Methods for Two-Phase Flow in Porous Media.
- BS summa cum laude in Applied Mathematics and Physics, Moscow Institute of Physics and Technology (Moscow Physico-Technical Institute), June 2000.
Thesis Advisor: Prof. Viktor S. Ryaben'kii.
Thesis Area: Difference Potentials Method (DPM).
Thesis Title: Decomposition of Numerical Algorithms in Compound Domains.

RESEARCH INTERESTS:

- Numerical Analysis, Scientific Computing, Applied Mathematics
- Finite Element Methods, Finite Volume Methods, Finite Difference Methods, Difference Potentials Method
- Biomedical Applications: cells signaling, chemotaxis models, reaction-diffusion systems in developmental biology
- Computational Fluid Dynamics
- Flow in Porous Media, Multiphase Flow
- Shallow Water Models
- Material Science Applications: grain growth modeling

GRANTS AND AWARDS:

1. Travel Award from US National Congress on Computational Mechanics (USNCCM 10) to attend and participate in the congress, July 2009.
2. Full Scholarship and Travel Award from the Executive Board of the Berlin Mathematical School to attend and participate in the summer school "Mathematics of Multiscale Phenomena", Berlin, September 2008.
3. Travel Award from New Jersey Institute of Technology, to participate in the conference "Frontiers in Applied and Computational Mathematics", May 2008.
4. Travel Grant from the University of Pittsburgh Medical School (UPMC) and Center for Inflammation and Regenerative Modeling to participate in Conference "6th International Conference on Complexity in Acute Illness", October 2007.

5. Travel Award from Oregon State University to participate in Workshop "Modeling, Analysis and Simulation of Multiscale Nonlinear Systems", June 2007.
6. AWM Travel Award to participate in the AWM Workshop at the Joint Mathematical Meetings (JMM) in New Orleans in January 2007.
7. SIAM Student Travel Award to participate in SIAM Annual Meeting, Boston, 2006.
8. MSRI Travel Award to participate in MSRI Conference "The Legacy of Ladyzhenskaya and Oleinik", University of California at Berkeley, 2006.
9. Summer-Fall 2006 Research Fellowship, Department of Mathematics, University of Pittsburgh.
10. 4th IMACS most successful papers award, 2007
11. Mellon Fellowship, 2004-2005.
12. NSF Graduate Fellowship, Honorable Mention, 2004.
13. Summer 2003 Research Fellowship, Department of Mathematics, University of Pittsburgh.
14. Research Assistantship, Keldysh Institute for Applied Mathematics, Moscow, 1999-2001.
15. Russian Government Scholarship for high GPA, 1996-2000.
16. Silver Medal for outstanding achievements in study, 1996.
17. Diplomas, Russian National Olympiad, 1994-1996.

LIST OF PUBLICATIONS:

1. Y. Epshteyn, V.S. Ryaben'kii and V. Turchaninov
The numerical example of algorithms composition for solution of the

- boundary-value problems on compound domain based on difference potential method, No.3, Moscow, Keldysh Institute for Applied Mathematics, Russia Academy of Sciences, 2003.
2. Y. Epshteyn, V.S. Ryaben'kii and V. Turchaninov
Algorithm composition scheme for problems in composite domains based on the Difference potential method, Journal of Computational Mathematics and Mathematical Physics, Volume 10, p 1768-1784, 2006.
 3. A. Dunca and Y.Epshteyn
On the Stolz-Adams deconvolution Model for the large-eddy simulation of turbulent flows, SIAM Journal on Mathematical Analysis, Volume 37, Issue 6, p 1890-1902, 2006.
 4. Y. Epshteyn and B. Rivière
On the solution of incompressible two-phase flow by a p-version discontinuous Galerkin method, Communications in Numerical Methods in Engineering, Volume 22, Issue 7, p 741-751, 2006.
 5. Y. Epshteyn and B. Rivière
Fully implicit discontinuous finite element methods for two-phase flow, Applied Numerical Mathematics, 57, p.383-401, 2007. *This paper was the fourth most successful IMACS 2007 paper published in Applied Numerical Mathematics.*
 6. Y. Epshteyn and B. Rivière
Estimation of penalty parameters for symmetric interior penalty Galerkin methods, Journal of Computational and Applied Mathematics, 206, p.843-872, 2007
 7. Y.Epshteyn and B.Rivière
Convergence of High Order Methods for Miscible Displacement, International Journal on Numerical Analysis and Modeling, 5 (2008), suppl., 47-63, also CNA report, 07-CNA-007.pdf.
 8. Y.Epshteyn
Discontinuous Galerkin Methods for the Chemotaxis and Haptotaxis

- Models, *Journal of Computational and Applied Mathematics*, 224 (2009), no. 1, 168–181.
9. Y. Epshteyn, T. Khan and B. Rivière
Inverse problem in optical tomography using discontinuous Galerkin method, *Mathematics and Computers in Simulation*, 79 (2009), no. 7, 1989–2000.
 10. Y. Epshteyn, and B. Rivière
Analysis of hp Discontinuous Galerkin Methods for Incompressible Two-Phase Flow, *Journal of Computational and Applied Mathematics*, 225 (2009), no. 2, 487–509.
 11. Y. Epshteyn and A. Kurganov
New Interior Penalty Discontinuous Galerkin Methods for the Keller-Segel Chemotaxis Model, *SIAM Journal on Numerical Analysis*, 47 (2008/09), no. 1, 386–408.
 12. B. Riviere, Y. Epshteyn, D. Swigon, Y. Vodovotz, A Simple Mathematical Model of Signaling Resulting from the Binding of Lipopolysaccharide with Toll-like Receptor 4 Demonstrates Inherent Preconditioning Behavior, *Mathematical Biosciences*, 217 (2009), no. 1, 19–26.
 13. K. Barmak, E. Eggeling, M. Emelianenko, Y. Epshteyn, D. Kinderlehrer and S. Ta’asan, Geometric growth and character development in large metastable networks, *Rendiconti di Matematica, Serie VII, Volume 29, Roma 2009*, 65–81.
 14. Y. Epshteyn and A. Izmirliglu, Fully Discrete Analysis of a Discontinuous Finite Element Method for the Keller-Segel Chemotaxis Model, *Journal of Scientific Computing*, Volume 40, Issue 1–3, 211–256, 2009.
 15. S. Bryson, Y. Epshteyn, A. Kurganov and G. Petrova, Well-Balanced Positivity Preserving Central-Upwind Scheme on Triangular Grids for the Saint-Venant System, under review *M2AN Math. Model. Numer. Anal.*, 2009.

CONFERENCE PROCEEDINGS:

- Y.Epshteyn and B.Rivière
Fully Implicit Discontinuous Galerkin Scheme for Two-Phase Flow, in the proceedings of MSRI Conference “The Legacy of Ladyzhenskaya and Oleinik”, p.125-128, 2006.
- Y.Epshteyn, B. Rivière, D. Swigon, Y. Vodovotz
A Simple Mathematical Model of Lipopolysaccharide Signaling Through Toll-Like Receptor 4 Results in Complex Insights on Preconditioning, Journal of Critical Care, Volume 22, Issue 4, 2007, in the proceedings of Conference ”6th International Conference on Complexity in Acute Illness”

IN PREPARATION:

- K. Barmak, E. Eggeling, M. Emelianenko, Y. Epshteyn, D. Kinderlehrer, S. Ta’asan and R. Sharp, A theory of microstructural texture evolution, 2009
- Y. Epshteyn, D.Kinderlehrer and M. Kowalczyk, Hybrid variational principle for the Keller-Segel-Patlak system, 2009
- Y. Epshteyn, D. Slepcev and S. Ta’asan, Efficient Numerical Algorithm based on optimal mass transportation theory for large data sets, 2009
- A. Chertock, Y. Epshteyn and A. Kurganov, High-order finite-difference methods for the chemotaxis systems, 2009
- A. Chertock, Y. Epshteyn and A. Kurganov, Hybrid Central-Upwind - Difference Potentials Method for chemotaxis-fluid coupling system, 2009
- Y. Epshteyn, Efficient Difference Potentials Method for the Reaction-Diffusion Systems in Developmental Biology, 2009

CONFERENCE TALKS :

1. "Fully Implicit Scheme for the Two-Phase Flow", Conference "Finite Element Circus", University of Delaware, April 2005.
2. "Adams-Stolz Deconvolution LES Models", Conference "Frontiers of Applied Analysis", Carnegie Mellon University, September 2005, contributed talk.
3. "Stable Interior Penalty Galerkin Methods for elliptic problems" , Conference "Finite Element Circus", UMBC, March 2006.
4. "Fully Implicit Discontinuous Finite Element Method for Two-Phase Flow" , MSRI Conference "The Legacy of Ladyzhenskaya and Oleinik " , University of California, Berkeley, May 2006, invited poster presentation.
5. "On The Choice Of The Penalty Parameters For Symmetric Interior Penalty Galerkin Method", Conference MAFELAP, Brunel University, UK, June 2006, invited talk.
6. "Application Of Interior Penalty Galerkin Method to Inverse Problem", Conference " SIAM Annual Meeting", Boston, July 2006, invited talk.
7. "Adaptive and implicit high order methods for two-phase flow", Conference "SIAM Annual Meeting", Boston, July 2006, invited talk
8. "High Order Fully Implicit Method For Two-Phase Flow", Conference "Seventh World Congress on Computational Mechanics", Los Angeles, July 2006, invited talk.
9. "hp Discontinuous Galerkin FEM for Incompressible Two-Phase Flow Problems in Porous Media " , Conference "Finite Element Circus", Penn State, November 2006.
10. "High Order Fully Coupled Discontinuous Finite Element Methods for Two-Phase Flow " , Conference "AWM Workshop at the Joint Mathematical Meetings (JMM)", New Orleans, January 2007, invited poster presentation.

11. "hp Primal Discontinuous Galerkin Methods For Two-Phase Flow ", Conference " 14th International Conference on Finite Element Methods for Flow Problem", Santa Fe, March 2007, invited talk.
12. " hp Primal Discontinuous Galerkin Methods For Two-Phase Flow in Porous Media ", Conference " Modeling, Analysis and Simulation of Multiscale Nonlinear Systems", Oregon State University, June 2007, invited talk.
13. "A Simple Mathematical Model of Lipopolysaccharide Signaling Through Toll-Like Receptor 4 Results in Complex Insights on Preconditioning ", Conference "6th International Conference on Complexity in Acute Illness", Los Angeles, October 2007, invited poster presentation.
14. "DG Methods for Chemotaxis and Haptotaxis Models", Conference "Finite Element Circus", Cornell University, October 2007.
15. "Discontinuous Galerkin Methods for the Chemotaxis Model and Closely Related Biomedical Problems", conference "Frontiers in Applied and Computational Mathematics", New Jersey Institute of Technology, May 19-21, 2008, contributed talk.
16. "Discontinuous Galerkin Methods for the Chemotaxis Model and Closely Related Biomedical Problems", World Congress on Computational Mechanics (WCCM 8 - ECCOMAS 5), Venice, Italy, June 30 - July 4, 2008, invited talk.
17. "Discontinuous Galerkin Methods for the Chemotaxis Model and Closely Related Biomedical Problems", SIAM Annual Meeting, San Diego, July 7-11, 2008, invited talk.
18. "Chemotaxis and Numerical Methods for Chemotaxis Models", MAFE-LAP, Brunel University, UK, June 8-12, 2009, invited talk.
19. "Chemotaxis and Numerical Methods for Chemotaxis Models", Multi-scale Analysis of Self-Organization in Biology workshop organized by

Benoit Perthame and Thomas Hillen, Banff International Research Station, Canada, July 12-17,2009, invited participation and poster presentation

20. “Well-Balanced Positivity Preserving Central-Upwind Scheme on Triangular Grids for the Saint-Venant System of Shallow Water”, USNCCM 10, July 16-July 19, Columbus, 2009, invited talk and poster presentation.

OTHER CONFERENCES ATTENDED:

1. Conference ” Finite Element Circus”, Penn State, October 2002.
2. Conference ”Finite Element Circus”, University of Pittsburgh, May 2004.
3. Center for Nonlinear Analysis 2008 Summer School - Contemporary Topics in Nonlinear PDEs.
4. “Mathematics of Multiscale Phenomena”, 2008 Summer School, Free University of Berlin, Berlin, September 2008, invited participant

INVITED SEMINARS AND COLLOQUIUM TALKS :

- “ hp Discontinuous Galerkin Finite Element Methods for Two-Phase Flow Models in Porous Media”, Dept. of Mathematics, Michigan State University, December 2006.
- “ hp Discontinuous Galerkin Finite Element Methods for Two-Phase Flow Models in Porous Media”, Lawrence Berkeley National Laboratory, January 2007.
- “ hp Discontinuous Galerkin Finite Element Methods for Two-Phase Flow Models in Porous Media”, Dept. of Mathematics, University of Tennessee, January 2007.
- “ hp Discontinuous Galerkin Finite Element Methods for Two-Phase Flow Models in Porous Media”, Dept. of Mathematics, University of Arizona, January 2007.

- “ hp Discontinuous Galerkin Finite Element Methods for Two-Phase Flow Models in Porous Media”, Dept. of Applied Mathematics and Physics, Columbia University, January 2007.
- ”New Discontinuous Galerkin Methods for Chemotaxis and Haptotaxis Models ”, Department of Mathematics, University of Pittsburgh, October 2007.
- ” Discontinuous Galerkin Methods for Chemotaxis and Haptotaxis Models”, CNA seminar, Department of Mathematical Sciences, Carnegie Mellon University, November 2007.
- ” New Discontinuous Galerkin Methods for the Chemotaxis Model and Related Biomedical Problems”, Department of Mathematics, George Mason University, February 2008.
- ”Mathematical modeling and simulations with applications to flow in porous media, biomedical problems and grain growth in complex materials”, Material Science Seminar, Carnegie Mellon University, April 2008.
- ”The Method of Difference Potentials and Application to the Domain Decomposition Problem”, Dept. of Mathematics, Tulane University, March 2009.
- “Well-Balanced Positivity Preserving Central-Upwind Scheme on Triangular Grids for the Saint-Venant System”, Dept. of Mathematics, University of Pittsburgh, April 2009.
- “Chemotaxis and Numerical Methods for Chemotaxis Models”, Dept. of Mathematics, Iowa State University, October 2009.
- “Chemotaxis and Numerical Methods for Chemotaxis Models”, Dept. of Mathematics, University of Maryland College Park, October 2009.
- “Chemotaxis and Numerical Methods for Chemotaxis Models”, Dept. of Applied Mathematics, University of Colorado Boulder, November 2009.

SEMINARS TALKS :

1. “Difference Potentials Method for domain decomposition”, Dept. of Mathematics, University of Pittsburgh, November 2002.
2. “High Order Discretization of the Multiphase Flow”, Dept. of Mathematics, University of Pittsburgh, April 2005.
3. “Symmetric Interior Penalty Galerkin methods for elliptic problems” , Dept. of Mathematics, University of Pittsburgh, February 2006.
4. “hp-DG Finite Element Methods for Incompressible Two-Phase Flow Models in Porous Media”, Dept. of Mathematics, University of Pittsburgh, October 2006.

TEACHING EXPERIENCE:

- Instructor: Calculus 1 (Summer 2005)
- Teaching Assistant: Calculus 1, 2 (Spring 2004, 2005-2006)
- Instructor: Calculus for Humanities Students I (Fall 2007)
- Instructor: Integration and Differential Equations (Spring 2008 - Fall 2008)
- Instructor: Numerical Methods (Spring 2009 - Fall 2009)
- Instructor: Numerical Methods for PDE: Finite Difference Schemes (Spring 2010)

COMPUTER SKILLS:

- Languages: Fortran, C.
- Software: L^AT_EX, Matlab, Mathematica, Tecplot, Word, Excel.
- Operating Systems: UNIX, Linux, Windows

PROFESSIONAL ACTIVITIES:

- Mini-symposium co-organizer “Theoretical and Computational Aspects of Discontinuous Galerkin Methods’ ’, MAFELAP June 8-12, 2009
- CNA working group co-organizer ”Recent Advances in Analysis and Approximation of Fluids”, Carnegie Mellon University, Fall 2009
- Refereeing for: SIAM Journal on Numerical Analysis, SIAM Journal on Scientific Computing, Mathematics of Computation, Journal of Computational and Applied Mathematics, Journal of Computational Mathematics, Computer Methods in Applied Mechanics and Engineering

PROFESSIONAL AND SOCIETY MEMBERSHIPS:

- Member of the American Mathematical Society
- Member of the Association of Women in Mathematics
- Member Society for Industrial and Applied Mathematics