

# Roman Shvydkoy

## Curriculum Vitae

University of Illinois  
at Chicago  
MSCS (M/C 249)  
851 S Morgan St.  
Chicago, IL 60607  
☎ (312) 413-2967  
☎ (312) 996-1491  
✉ shvyd-  
koy@math.uic.edu

[www.math.uic.edu/~shvydkoy](http://www.math.uic.edu/~shvydkoy)

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### Interests

Partial differential equations, Euler and Navier-Stokes equations, stability, turbulence;  
Dynamical systems; Operator semigroups, harmonic analysis, spectral theory.

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### Appointments

- 2009 – present **Associate Professor**, *University of Illinois, Chicago*.  
Dec 2008, **Short-term Member**, *Nečas Center for Mathematical Modeling, Prague*.  
May, June 2009  
2006 – 2009 **Assistant Professor**, *University of Illinois, Chicago*.  
2003 – 2006 **Research Assistant Professor**, *University of Illinois, Chicago*.  
March 2005 **Short-term Visiting Member**, *IAS, Princeton*.  
2002 – 2003 **Lectureship**, *University of Texas, Austin*.  
2001 – 2002 **Postdoc**, *University of Missouri, Columbia*.

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### Education

- 1998 – 2001 **Ph.D. in Mathematics**, *University of Missouri, Columbia, MO*.  
1993 – 1998 **M.S.**, *Kharkov State University, Kharkov, Ukraine*.  
1991 – 1993 **B.S. in Computer Programming**, *Computer College of Fund "Professional", Kharkov, Ukraine*.

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### Ph.D. Thesis (2001)

- title *Operators and Integrals on Banach spaces*  
supervisors N. Kalton, Y. Latushkin  
reference <http://www.math.uic.edu/~shvydkoy/publications.html>

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### Master Thesis (1998)

- title *Banach spaces with the Daugavet property*  
supervisor V. M. Kadets  
reference *J. Funct. Anal.*, V.176 (2000) 2, 198–212

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## Grants and Awards

- 2009–2012 **NSF**, grant DMS-0907812.  
2007 – 2010 **CRDF**, grant RUM1-2842-RO-06, (U.S. Civilian Research & Development Foundation.).  
2006 – 2009 **NSF**, grant DMS-0604050.  
2001 **student research NSF**, grant DMS-98700027.  
2000 **student research NSF**, grant DMS-98700027.  
2000 **Mathematics Distinguished Teaching Award**, *University of Missouri*, Columbia.  
1998 **Honor Diploma**, *Kharkov State University*, Ukraine.  
1997 **"Soros student"**, GSU071158.

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## Publications

most recent

- 31 Lectures on the Onsager conjecture, preprint, 29 pages  
30 with A. Cheskidov, Ill-posedness of the basic equations of fluid dynamics in Besov spaces, to appear in *Proceedings of AMS*, 11 pages  
29 with Y. Latushkin, Operator algebras and the Fredholm spectrum of advective equations of linear hydrodynamics, to appear in *Journal of Functional Analysis*  
28 On the energy of inviscid singular flow, *Journal of Mathematical Analysis and Applications*, 349 (2009), 583–595  
27 A geometric condition implying energy equality for solutions of 3D Navier-Stokes equation, *Journal of Dynamics and Differential Equations*, 21 (2009), no. 1, 117–125  
26 with A. Cheskidov, On the regularity of weak solutions of the 3D Navier-Stokes equations in  $B_{\infty, \infty}^{-1}$ , to appear in *Archive for Rational Mechanics and Analysis*, 11 pages  
25 with P. Constantin, A. Cheskidov, S. Friedlander, Energy conservation and Onsager's conjecture for the Euler equations, *Nonlinearity* 21 No 6, (2008) 1233–1252  
24 with A. Cheskidov, S. Friedlander, On the energy equality for weak solutions of the 3D Navier-Stokes equations, to appear in *Galdi Fest volume*, 7 pages  
23 with S. Friedlander, The unstable spectrum of the Navier-Stokes operator in the limit of vanishing viscosity, *Annales de l'Institut Henri Poincaré / Analyse non lineaire*, 25 (2008), 713–724

postdoctoral

- 22 Cocycles and Mañé sequences with an application to ideal fluids, *J. Diff. Eq.*, 229/1 (2006), 49–62  
21 The essential spectrum of advective equations, *Comm. Math. Phys.*, 265/2 (2006), 507–545  
20 with S. Friedlander and N. Pavlović, Nonlinear instability for the Navier-Stokes equations, *Comm. Math. Phys.* 264/2 (2006), 335–347  
19 with S. Friedlander, On recent developments in the spectral problem for the linearized Euler equation, *Contemp. Math.*, 371 (2005), 271–295

- 18 with S. Friedlander, The unstable spectrum of the surface quasi-geostrophic equation, *J. Math. Fluid Mech.*, 7 suppl. 1 (2005), S81–S93
- 17 with Y. Latushkin, Essential spectrum of the linearized 2D Euler equation and Lyapunov-Oseledets exponents, *J. Math. Fluid Mech.*, 7/2 (2005), 164–178
- 16 with D. Bilik, V. Kadets and D. Werner, Narrow operators and the Daugavet property for ultraproducts, *Positivity*, 9/1 (2005), 45–62
- 15 with M. M. Vishik, On spectrum of the linearized 3D Euler equation, *Dynamics of PDE*, 1/1 (2004), 49–63
- 14 with Y. Latushkin, The essential spectrum of the linearized 2D Euler operator is a vertical band, *Contemp. Math.*, 327 (2003), 299–304

#### graduate

- 13 with M. Matolcsi, Counterexample to the Trotter-Lie product formula for projections, *Archiv der Mathematik*, 81/3 (2003), 309–317
- 12 with B. Cascales, On Krein-Šmulian theorem for weaker topologies, *Illinois J. Math.*, 47/4 (2003), 957–976
- 11 with A. Batkai and E. Fasanga, Hyperbolicity of delay equations via Fourier multipliers, *Acta Sci. Math. (Szeged)* 69 (2003), 131–145
- 10 A dimension-dependent maximal inequality, *Proc. Roy. Soc. Edinburgh Sect. A*, 45 (2002), 547–548
- 9 with D. Bilik, V. Kadets, G. Sirotkin and D. Werner, Narrow operators on vector-valued sup-normed spaces, *Illinois J. Math.*, 45 (2002), 120–143
- 8 The largest linear space of operators satisfying the Daugavet Equation in  $L_1$ , *Proc. Amer. Math. Soc.*, 130 (2002), no. 3, 773–777
- 7 with V. Kadets, B. Shumyatskiy, L. Tseytlin and K. Zheltukhin, Some remarks on vector-valued integration, *Mat. Fiz. Anal. Geom.*, 9 (2002), no.1, 48–65
- 6 with Y. Latushkin, Hyperbolicity of semigroups and Fourier multipliers, in "Systems, Approximation, Singular Integral Operators, and Related Topics, International Workshop on Operator Theory and Applications, IWOTA 2000", 341–363, Birkhäuser Verlag, 2001

#### undergraduate

- 5 with V. Kadets and D. Werner, Narrow operators and rich subspaces of Banach spaces with the Daugavet property, *Studia Math.* 147 (2001), no. 3, 269–298
- 4 with V. Kadets, G. Sirotkin and D. Werner, Banach spaces with the Daugavet property, *Trans. Amer. Math. Soc.*, V.352 (2000) 2, 855–873
- 3 Geometric aspects of the Daugavet property, *J. Funct. Anal.*, V.176 (2000) 2, 198–212
- 2 with V. Kadets, The Daugavet property for pairs of Banach spaces, *Mat. Fiz. Anal. Geom.*, V.6 (1999) N.3-4, 253–263
- 1 with V. Kadets, G. Sirotkin and D. Werner, Banach spaces with the Daugavet property (French) *C. R. Acad. Sci., Paris, Sér. I, Math.* 325 (1997), no. 12, 1291–1294

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#### Invitations

lecture series

- May 2009 11th School "Mathematical theory in Fluid mechanics", Kacov, Czech Republic
- June 2009 "Analysis of Fluid Stability", ICMS, Edinburgh

colloquia and plenary talks

- February 2009 CAMP colloquium at University of South California.
- December 2008 Charles University, Prague.
- October 2007 University of Illinois at Chicago joint SIAM Chapter – MSCS
- June 2006 International Conference "Mathematical Hydrodynamics", Moscow Russia

conferences, meetings, workshops

- July 2009 Workshop "Mathematical Aspects of Hydrodynamics", Mathematisches Forschungsinstitut Oberwolfach, Germany.
- March 2009 AMS sectional #1047, University of Illinois at Urbana-Champaign.
- December 2008 Workshop: "Mathematical analysis on fluid models", Nečas Center for Mathematical Modeling, Prague.
- October 2008 Workshop: "Dynamics of interfaces and structures in fluid flows", Vanderbilt University.
- June 2008 "Topology and Analysis" International conference, Lviv, Ukraine.
- May 2008 The 7th AIMS International conference on Dynamical Systems, Differential Equations and Applications, University of Texas at Arlington
- April 2008 AMS sectional #1038, Indiana University, Bloomington
- November 2007 The 60th Midwest PDE Seminar, Northwestern University
- October 2007 AMS sectional #1030, DePaul University, Chicago
- June 2007 The 7th conference "Symmetry in Nonlinear Mathematical Physics", Kiev, Ukraine
- June 2007 "Mathematical hydrodynamics: Euler equations and related topics EEC-300", St. Petersburg, Russia
- March 2007 AMS sectional #1025, Miami University, Oxford, OH
- April 2006 C. Chicone's 60th birthday conference, Columbia MO
- April 2006 AMS sectional #1016, University of Notre Dame, Notre Dame, IN
- March 2006 Differential Equations Weekend, University of Memphis
- November 2005 Midwest PDE meeting at Notre Dame, IN
- May 2005 MSRI workshop "Analytical and Stochastic Fluid Dynamics"
- July 2005 "Dynamical System Methods in Fluid Dynamics" workshop at Mathematisches Forschungsinstitut Oberwolfach
- 2004 AMS sectional #1001, Northwestern University, IL
- 2001 Functional Analysis Day, University of Missouri, Columbia
- 1999 AMS sectional #948, University of Texas, Austin

## seminars

- 2002–2008 University of Illinois at Chicago
- July 2007 University of Granada, Spain
- April 2007 University of Minnesota
- March 2006 Duke University
- February 2006 University of Colorado, Boulder
- January 2006 University of Illinois, Urbana-Champaign
- January 2006 Concordia University, Montreal
- January 2006 University of Chicago
- January 2006 Northwestern University
- April 2005 University of Minnesota
- April 2005 University of Kansas - Lawrence
- December 2005 Purdue University
- December 2005 Concordia University, Montreal
- July 2005 Rostov State University, Russia
- March 2005 Princeton University
- April 2003 University of California - Santa Barbara
- 2002–2003 University of Texas - Austin
- June 2001 TULKA Seminar at Blaubeuren, Germany
- June 2001 Workshop on Positive Semigroups, Blaubeuren, Germany
- June 2001 University of Tübingen, Germany
- June 2001 University of Ulm, Germany
- 1998–2004 University of Missouri-Columbia
- 1997–2001 Kharkov State University

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## Service and Experience

### service to the department

- 2008 Administration of Twersky Award for students in applied mathematics
- 2007–2008 Chair of the Mathematics and Applications Seminar
- 2007–2008 RAP search (also assisted tenure-track search), undergraduate studies (USC), admissions – fellowships – assistantships (AFA), master's examination committee
- 2007 Redesign of the sequence Math576 – Math577 "Applied PDE I, II"
- 2006–2007 tenure-track search, preliminary examination committee
- 2004 preliminary examination committee

### teaching

- fall 2007 Math 417 – Complex Analysis with Applications; Math 541 – Partial Differential Equations (taught under newly redesigned syllabus)

- spring 2007 Math 410 – Advanced Calculus; Math 596 – Independent Study "Harmonic analysis and Littlewood-Paley theory" with Carlo Fazioli and Sean Lynch
- fall 2006 Math 533 – Real Analysis I
- spring 2006 Math 581 – Special Topics in Fluid Mechanics
- fall 2005 Math 480 – Applied Differential Equations; Math 596 – Independent Study "Advanced Topics of Fluid Dynamics" with Maria Kakleas
- spring 2005 Math 580 – Mathematical Fluids (enrollment for this course included students from Engineering Department)
- 1998 – 2004 Standard undergraduate curriculum including Precalculus, Calculus I–III with the use of *Mathematica*, Finite Mathematics, Probability, honors sections

referee work

- Proceedings of AMS
- Journal of Mathematical Analysis and Applications
- Journal of Fluid Mechanics
- Nonlinear Analysis Series A: Theory, Methods and Applications
- Journal of Mathematical Fluid Mechanics
- SIAM Journal on Applied Mathematics
- Journal of Statistical Physics
- Nonlinearity

synergetic

- Co-organized a section in AMS meeting #1030, DePaul University
- Co-organized a section in AMS meeting #1001, Northwestern University
- Organized a working seminar on fluid mechanics at University of Texas - Austin, and a graduate study seminar on applications of functional analysis to PDE at University of Illinois - Chicago

Ph.D. students

Velin Troshanov

first year mentoring

- M.S. Velin Troshanov
- M.S. Jo Lynn Sedgwick
- Ph.D. Genady Yoffe

membership

2006–present American Mathematical Society