

SPYROS ALEXAKIS

Contact Information:

Department of Mathematics
University of Toronto
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- Degrees** **Princeton University**, Princeton, NJ
Ph.D. in Mathematics, May 2005
Thesis advisor: Prof. Charles Fefferman
Dissertation title: Local and Global Aspects of Conformal Geometry
University of Athens, Greece
B.A. summa cum laude in Mathematics, 1996-1999
(completed undergraduate studies in three rather than the regular four years)
- Employment** Professor, Mathematics department,
University of Toronto, (July 2016–)

Associate Professor, Mathematics department,
University of Toronto, (2014–2016).

Assistant Professor, Mathematics department,
University of Toronto (Appointed Fall 2008; on leave until Fall 2010–2014).

Clay Research Fellow, Clay Mathematics Institute, (2008-2010).

Instructor, Mathematics Department, Princeton University (2005-2008).

Lecturer, Mathematics Department, Princeton University (2004-2005).
- Visiting positions.** Imperial College, London, Visiting Professor, 2015–2016.
ETH Zürich, Clay Postdoctoral fellow, fall 2009.
MIT, Clay Postdoctoral Fellow, academic year 2008-2009.
University of Tokyo, Japan, July-August 2008.
Mathematical Sciences Research Institute, postdoctoral fellow,
Berkeley, Spring 2007
- Honours** **Andre-Aisenstadt prize:**
CRM Montreal, 2012.
Sloan Fellowship:
Fall 2010–Fall 2012.
Plenary Address, AMS Southeastern Sectional Meeting:
Florida Atlantic University, November 2009.
Clay Research Fellowship:
Clay Mathematics Institute, 2008-2010.
Clay Liftoff Fellowship
Clay Mathematics Institute, summer 2005.
Finalist, AIM Five-year fellowship:
American Institute of Mathematics, 2005.
Charlotte E. Procter Honorary Fellowship:
Princeton University, 2003-2004
International Mathematical Olympiad (1996)
Bronze Medal

Research Endeavours Geometric Analysis, General Relativity, Geometric PDE.

Research Awards: NSERC Discovery Grant, awarded April 2015, duration 2015-2020.
Total award 155K.

Early Researcher Award, Ontario M.of Research and Innovation,
duration 2014-2019, Total Award: 150K.

Foreign Consultant, NSF FRG Grant on General Relativity, duration 2011-2014.
Total award approx. 1,3M USD.

NSERC Accelerator Grant, awarded April 2010, duration 2010-2014.
Total award 120K

NSERC Discovery Grant, awarded April 2010, duration 2010-2015.
Total award 150K.

Sloan Research Fellowship, awarded February 2010,
duration 2010-2012 (+2 year extension) Total award 50K USD.

Scholarly and Professional Work.

Refereed Publications S. Alexakis, V. Schlue *Non-existence of time-periodic vacuum space-times*, (50 pages), accepted, J. Differential Geom. arXiv:1504.04592.

S. Alexakis, A. Shao, *On the profile of energy concentration at blow-up points for sub-conformal focusing nonlinear waves*, (17 pages), accepted, Trans. Amer. Math. Soc. arXiv:1412.6844.

S. Alexakis, A. Shao, *Global uniqueness theorems for linear and nonlinear waves*, Jour. Funct. Anal., **269** (2015), no. 11, 3458–3499.

S. Alexakis, A. Shao, V. Schlue *Unique Continuation from Infinity for linear waves* Advances in Math. **286**, (2016), 481-544.

S. Alexakis, A. Shao *Bounds on the Bondi energy by a flux of curvature* (51 pages), to appear, Jour. European Math. Soc., arXiv:1308.4170.

S. Alexakis, D. Chen, G. Fournodavlos *Singular Ricci solitons and their stability under the Ricci flow* Comm. Partial Differential Equations **40** (2015), no. 12, 2123–2172.

S. Alexakis, A. Shao *On the Geometry of Null Cones to Infinity under curvature flux bounds* (50 pages), Class. Quantum Grav. **31** (2014) 195012 62 pp.

S. Alexakis, A. Ionescu, S. Klainerman *Rigidity of stationary black holes with small angular momentum on the horizon*, Duke Math Journal **163**, No. 14 (2014), 2603–2615.

S. Alexakis, R. Mazzeo *Complete Willmore surfaces in H^3 with bounded energy: boundary regularity and bubbling*, J. Differential Geom. **101** (2015), no. 3, 369–422.

S. Alexakis, *The decomposition of Global Conformal Invariants: Some technical proofs II*, Pacific Jour. of Math. **260**, No.1 (2012), 1–88.

S. Alexakis, *The decomposition of Global Conformal Invariants (Research monograph*, 464 pages), Annals of Math. Studies, **182**, April 2012. Princeton University Press.

S. Alexakis, *The decomposition of global conformal invariants IV: A proposition on local Riemannian invariants*, Advances in Mathematics, **225** (2011), 515–597.

S. Alexakis, *The decomposition of global conformal invariants: Some Technical Proofs I*, SIGMA **7** (2011), 41 pages.

S. Alexakis, A. Ionescu, S. Klainerman *Uniqueness of smooth stationary black holes in vacuum: Small perturbations of the Kerr spaces*, Comm. Math. Phys. **299**, (No. 1), (2010), 89–127.

S. Alexakis, A. Ionescu, S. Klainerman *Hawking’s local rigidity theorem*

without analyticity, *Geom. Funct. Anal.* **20**, No. 4, (2010), 845–869.

S. Alexakis, R. Mazzeo *Renormalized area and properly embedded minimal surfaces in hyperbolic 3-manifolds*, *Comm. Math. Phys.*, **297**, No. 3, (2010), (621–651).

S. Alexakis, *On the Decomposition of Global conformal invariants I*, *Annals of Math.*, **170**, No.3, (2009), 1241–2306.

S. Alexakis, *On the Decomposition of Global conformal invariants II*, *Advances in Mathematics*, **206**, (2006), 466–502.

S. Alexakis, *On Conformally Invariant Differential Operators in Odd Dimensions*, *Proc. Natl. Acad. Sci.* **100**, 4409-4410, 2003

Non-Refereed Publications S. Alexakis, *Unique continuation for the vacuum Einstein equations*, (20 pages), arXiv:0902.1131.

S. Alexakis, *On Conformally Invariant differential operators*, math.DG/0608771, (50 pages).

Submitted Articles S. Alexakis *The Penrose inequality on perturbations of the Schwarzschild exterior*, (50 pages), arXiv:1506.06400.

S. Alexakis, K. Hirachi *Integral Kahler Invariants and the Bergman kernel asymptotics for line bundles*, (44 pages), arXiv:1501.02463.

Invited Lectures Hellenic Society on Relativity, Gravitation and Cosmology
Mykonos, September 2016.

Rutgers University, Colloquium
September 2016.

16th Canadian Conference on General Relativity and Relativistic Astrophysics
Vancouver, July 2016.

Tübingen University
Geometric Analysis Seminar, June 2016.

University of Warwick
Analysis Seminar, June 2016.

Conference on Spectral Theory and Mathematical Physics
Université Cergy-Pontoise, June 2016.

Shanks Conference on evolutionary PDE
Vanderbilt University, May 2016.

End of Year London Geometry Conference
King's College, London, December 2015.

Imperial College, London
Geometry Seminar, October 2015.

Midwest PDE conference
Michigan State, November 2015.

University of Edinburgh, Analysis Seminar, November 2015

Paris-London Analysis Seminar, October 2015

Cambridge University, Geometric Analysis and PDE Seminar
October 2015.

Recent Advances in Mathematical General Relativity
Institut Henri Poincare, September 2015.

Workshop on the AdS-CFT correspondence and cosmology
Centre de Recherches Mathematiques, Montreal, July 2015

Courant Institute (NYU),
Geometry Seminar, April 2015.

University of Helsinki, Colloquium, March 2015

General Relativity Workshop,
Simons Center, Stony Brook: January 2015

Stanford University, Analysis Seminar
January 2015.

Canadian Institute of Theoretical Astrophysics
General Relativity working Seminar, January 2015.

Workshop on Geometric scattering theory,
Banff International Research Station, November 2014

Workshop on Variational problems in geometry
Fields Institute, November 2014.

Princeton University:
Geometric Analysis Seminar, April 2014.

New York General Relativity Seminar:
Stony Brook, March 2013.

Workshop on Geometric Variational Problems:
BIRS, Banff, December 2013.

Johns Hopkins University:
Colloquium, November 2013

University of Toronto:
Colloquium, October 2013

Workshop on Inverse problems:
BIRS, Banff, September 2013.

Conference on Topics in Conformal Geometry and Geometric Analysis:
CRM Barcelona, July 2013.

Centre de Recherche Mathematique:
Andre-Aisenstadt Colloquium, Montreal, April 2013.

University of Waterloo:
Colloquium, February 2013.

University of Miami, General Relativity Meeting
December 2012.

McGill University:
Analysis Seminar, November 2012.

University of Nantes, France:
Recent results in conformal geometry,
October 2012

Johns Hopkins University:
Analysis seminar, October 2012.

Erwin Schrodinger Institute, Vienna:
The Interaction of Geometry and Representation Theory,
September 2012

Workshop on Spectral Invariants on Non-compact and Singular Spaces:
CRM Montreal, July 2012.

Panhellenic Congress on Mathematical Analysis:
Plenary lecture, University of Patras, May 2012.

Conference on Geometric Singularities:
MFO Oberwolfach, Germany, May 2012.

Southern California PDE meeting:
UCSD May 2012.

Conference on Geometric Analysis:
Goethe-Universität, Frankfurt, Germany, March 2012.

Princeton University:
Geometric Analysis Seminar, March 2012.

University of Miami, General Relativity Meeting:
January 2012

CMS Annual Meeting, Geometry section:
January 2012

University of North Carolina, Chapel Hill:
Analysis Seminar, December 2011.

University of Michigan, Ann Arbor:
Analysis seminar, November 2011.

Conference on “The Geometry of differential equations”,
Australian National University, September 2011.

University of Athens, Greece:
Analysis Seminar, June 2011

University of Athens, Greece:
Colloquium, June 2011.

Centre International de Rencontres Mathematiques, Luminy, France:
Geometric Analysis Conference, January 2011.

XVIIth Southeastern Geometry Seminar:
University of Tennessee, December 2010.

York University:
Analysis Seminar, December 2010.

University of Crete:
Analysis seminar, July 2010.

Banff International Research Station:
Workshop on Geometric Analysis and General Relativity, June 2010.

Perimeter Institute, Waterloo Canada:
Workshop on “Connections in Geometry and Physics”, May 2010.

Michigan State University:
Colloquium, April 2010.

Banff International Research Station:
Workshop on Geometric Scattering Theory and Applications, March 2010.

Stanford University: Geometry Seminar, February 2010.

University of Alabama, Birmingham: Colloquium, February 2010.

Simons Center for Geometry and Physics, Stony Brook, NY:
Workshop in General Relativity, November 2009 (unable to attend).

Plenary Address, AMS Southeastern Sectional Meeting:
Florida Atlantic University, November 2009.

ETH Zürich, Switzerland:
Analysis Seminar, November 2009.

University of Warwick, UK:
Analysis Seminar, October 2009.

Mini-Symposium on Nonlinear PDE, Maxwell Institute,
Centre for Analysis and Nonlinear PDEs, Edinburgh, October 2009.

Conference on Mathematical Aspects of General Relativity:
Mathematisches Forschungsinstitut Oberwolfach, Germany, October 2009.

“Hot topics” Workshop, Mathematical Sciences Research Institute,
Berkeley California, September 2009.

Workshop on the Geometry of Einstein manifolds:
University of Nantes, July 2009.

Cambridge University: Geometric Analysis and
Nonlinear PDEs seminar, June 2009.

Oxford University: General Relativity Seminar, June 2009.

International Conference on Complex analysis and Dynamical Systems IV:
General Relativity section, Nahariya, Israel, May 2009.

Johns Hopkins University: Complex Geometry Seminar, February 2009.

Harvard University: Differential Geometry Seminar, February 2009.

Princeton University: Analysis Seminar, October 2008.

University of Rochester: Analysis Seminar, October 2008.

USTC, Hefei, China:
International Conference on PDEs in Conformal and Kähler Geometry, July 2008

Hayama Symposium on Complex Analysis in Several Variables:
Hayama, Japan July 2008.

AMS Eastern Sectional Meeting, NY:
Workshop on Isoperimetric problems and PDE, March 2008.

McMaster University:
Geometry and Topology Seminar, March 2008.

MIT: Geometry Seminar, February 2008.

University of California, San Diego: Colloquium, January 2008.

Northwestern University: Colloquium, January 2008.

University of Toronto: Colloquium, January 2008.

Vanderbilt University: Special Lecture, January 2008.

University of Wisconsin, Madison: Geometric Analysis Seminar, December 2007.

Rice University: Special Lecture, December 2007.

University of Minnesota: Differential Geometry Seminar, December 2007.

University of Minnesota: Special Colloquium, December 2007.

Princeton University:
Geometric Analysis Seminar, September 2007.

University of Nice, France:
Conference in Geometric Analysis: Conformal, CR, microlocal, June 2007.

Midwest Geometry Conference, University of Iowa, May 2007 (plenary lecture).

Stanford University:
Workshop on Asymptotic structures in geometric analysis, March 2007.

Mathematical Sciences Research Institute:
Postdoctoral Seminar, March 2007.

University of Athens, Greece:
Geometry and Analysis Seminar, December 2006.

Trinity College Dublin, Ireland: PDE Seminar, May 2006.

MIT: Differential Geometry Seminar, May 2006.

Isaac Newton Institute, Cambridge:
Workshop on the Einstein Constraint equations, December 2005

Banff International Research Station:
Workshop on Conformal Geometry, August 2004

National University of Singapore:
Workshop on Geometric Partial Differential Equations, June 2004

CUNY: Differential Geometry and Analysis Seminar, February 2004
 AMS Annual Meeting, Phoenix:
 Workshop on Nonlinear PDEs and Conformal Geometry, January 2004
 American Institute of Mathematics:
 Workshop on Conformal structures in Geometry, Analysis and Physics, August 2003
 University of Washington, Seattle:
 Differential Geometry and PDE Seminar, May 2003
 Princeton University: Geometric Analysis Seminar, November 2002

List of Courses.

Undergraduate courses	<p>APM426H1S/MAT1700HS (Univ. of Toronto): General Relativity Spring 2012, Spring 2014. Course Designer and Instructor.</p> <p>MAT257Y (Univ. of Toronto): Analysis II Fall-Spring 2012-2013. Course Designer and Instructor.</p> <p>MAT136 (Univ. of Toronto): Calculus B Spring 2013; Instructor.</p> <p>MAT195 (EngSci, Univ. of Toronto): Calculus II. Spring 2011, Instructor.</p> <p>MAT458/MAT1001 (Univ. of Toronto): Real Analysis II Spring 2011, Spring 2012; course Designer and Instructor.</p> <p>MAT457/MAT1000 (Univ. of Toronto): Real Analysis I Fall 2010; course Designer and Instructor.</p> <p>MAT104: Introduction to Calculus (Princeton) Instructor, Spring 2008, Fall 2007, Fall 2005, Fall 2004. Reviewer, Spring 2008, Fall 2007, Fall 2006, Fall 2005.</p> <p>MAT303: Ordinary Differential Equations (Princeton). Fall 2006, Course Designer and Instructor.</p> <p>MAT202: Introduction to Linear Algebra (Princeton) Instructor, Spring 2006.</p> <p>MAT 201: Multi-variable Calculus (Princeton) Instructor, Spring 2005.</p>
Graduate Courses	<p>MAT 1508HF (Univ. of Toronto): Topics in Applied Mathematics: Wave propagation. Fall 2013. Course designer and Instructor.</p> <p>APM426H1S/MAT1700HS (Univ. of Toronto): General Relativity Spring 2012. Course Designer and Instructor.</p> <p>MAT1001/MAT458 (Univ. of Toronto): Real Analysis II Spring 2011, Spring 2012; course Designer and Instructor.</p> <p>MAT1000/MAT457 (Univ. of Toronto): Real Analysis I Fall 2010; course Designer and Instructor.</p>

Student and Postdoc supervision

Masters' and Undergraduate Theses	<p>Pratyush Sarkar, USRA Summer Research project, May 2015-August 2015.</p> <p>Andrew Ross USRA Summer Research Project, May 2014-August 2014.</p> <p>Greg Fournodavlos: Master's Thesis. Singular Ricci solitons. May-August 2012.</p> <p>Yan Mary He: Master's Thesis. Minimal and Willmore surfaces in hyperbolic space, May-August 2012.</p>
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Alec Hughes
USRA Summer Research, May 2010–August 2010.

PhD students Greg Fournodavlos
September 2012–present.

Tracey Balehowsky
May 2012–present.

Ali Feizmohammadi
May 2013–present.

Postdoctoral supervision Xinliang An: Postdoctoral Fellow, General Relativity, September 2015–May 2016.
Volker Schlue: Postdoctoral Fellow, General Relativity, September 2012–May 2015.
Arick Shao: Postdoctoral Fellow, General Relativity September 2011–May 2014.
Jesse Gell-Redman: Postdoctoral Fellow, Geometric analysis and Scattering, September 2012–May 2014.
Dezhong Chen: NSERC-funded Postdoctoral Fellow, Ricci flow with Singular initial data, September 2010–May 2012.

Educational Lectures. Classroom Adventure in Mathematics: Summer Institute
Educational Lecture in Summer Teacher Camp, University of Toronto.
“Minimal surfaces: Mathematical Research accessible to high-school students.”
August 2011
Fields Undergraduate Network: Workshop in Geometry.
Educational Lecture on minimal surfaces and renormalized area for undergraduates from Ontario Universities, October 2010.

Administrative Positions

Service, University of Toronto Geometric Analysis Seminar (joint with Fields Institute):
Organizer, September 2013–present.
Analysis and Applied Math seminar:
Organizer, September 2012–present.
Appointments Committee: Member, 2011-2012.
Department Council: Member, 2011-2012.
Undergraduate Committee: Member, 2012-2013.
Graduate Committee:
member, 2010-2011, 2012-2013, 2013-2014, 2014-2015.

Workshop organization Fields Institute, Semester on Differential Geometry (Fall 2017).
Joint with W. Craig (McMaster), S. Karigiannis (Waterloo), A. Naber, M. Wang (McMaster).
Fields Institute, 2-month Thematic Program on the centenary of Einstein’s equations. (May-June 2015).
joint with M.Dafermos (Princeton), Luis Lehner (Perimeter), H. Pfeiffer (CITA, Toronto), E. Poisson (Guelph).
Banff International Research station:
coorganizer, 5-day workshop on Conformal and CR geometry, August 2012.
Workshop on General Relativity and related PDEs,
AMS Southeastern Sectional Meeting, Boca Raton FL,
November 2009, co-organizer.
NSF Research Training Group in Analysis and Geometry,
Princeton University:
Coorganizer, summer 2008,
Scientific Coordinator, summer 2006 and summer 2007.