

# Sergiu MOROIANU

---

## Contact

IMAR, P.O.Box 1-764, RO-014700 Bucharest, Romania

e-mail: moroianu@alum.mit.edu

WWW: alum.mit.edu/www/moroianu

---

## Research interests

Index theory on singular spaces, hyperbolic manifolds, spectral functions, algebras of pseudodifferential operators.

---

## Education

2010 Qualification à la fonction de Professeur des universités (France);

2004 Habilitation à diriger des recherches, Université Paul Sabatier, Toulouse, France;

1999 PhD in Mathematics, dissertation: *Residue functionals on the algebra of adiabatic pseudo-differential operators*, MIT, USA;

1996 Licențiat în matematică, Universitatea București, România;

1994 DEA de Mathématiques, École Polytechnique, Palaiseau, France;

1991 Bacalaureat, Liceul de Informatică, București, România.

---

## Work experience

- Since July 2005: Associate professor, IMAR, Bucharest, Romania.
  - Apr.–Jun. 2011: Directeur de Recherche invité, Ecole Polytechnique, France.
  - Sep.–Nov. 2010: Directeur de Recherche invité, Ecole Normale Supérieure, France.
  - Apr. 2006 – Oct. 2008: Director, SNSB Mathematics department.
  - Oct. 2007 Visiting Assistant Professor, Université Paul Sabatier, Toulouse, France.
  - Sep. 2004 – July 2005: Assistant professor, IMAR.
  - Oct. 2002 – Sep. 2004: Post-doc, Université Paul Sabatier, Toulouse.
  - Oct. 2001 – Sep. 2002: Post-doc, Universität Hamburg, Germany.
  - Aug. 1999 – Sep. 2001: Researcher, IMAR.
  - Sep. 1994 – Jul. 1999: Teaching Assistant, MIT, USA.
- 

## Publications

- (1) *Hochschild Homology of algebras of pseudodifferential operators*, 4<sup>th</sup> International Workshop on Differential Geometry and its Applications, Transilvania University Press, Braşov (2000), 189–197.
- (2) *Fredholm Theory for degenerate pseudodifferential operators on manifolds with fibered boundaries*, (with Robert Lauter), *Comm. Partial Diff. Equat.* **26** (2001), 233–285.
- (3) *Adiabatic limits of eta and zeta functions: a pseudo-differential approach*, *Anal. Univ. Timisoara, ser. Mat. – Info.*, vol. XXXIX (2001), fasc. spec. Mat., 303–312.
- (4) *Homology of pseudo-differential operators on manifolds with fibered boundaries*, (with Robert Lauter), *J. Reine Angew. Math.* **547** (2002), 207–234.
- (5) *The index of cusp operators on manifolds with corners*, (with Robert Lauter), *Ann. Global Anal. Geom.* **21** (2002), 31–49.
- (6) *Sur la limite adiabatique des fonctions  $\eta$  et  $\zeta$* , *Comptes Rendus Math.* **334** (2002), 131–134.
- (7) *K-Theory of suspended pseudo-differential operators*, *K-Theory* **28** (2003), 167–181.

- (8) *Homology of pseudodifferential operators on manifolds with fibered cusps*, (with Robert Lauter), T. Am. Mat. Soc. **355** (2003), 3009–3046.
- (9) *Heat Kernel Asymptotics for Roots of Generalized Laplacians*, (with Christian Bär), Int. J. Math. **14** (2003), 397–412.
- (10) *Adiabatic limits of eta and zeta functions of elliptic operators*, Math. Z. **246** (2004), 441–471.
- (11) *Homology of adiabatic pseudo-differential operators*, Nagoya Math. J. **175** (2004), 171–221.
- (12) *An index formula on manifolds with fibered cusp ends*, (with Robert Lauter), J. Geom. Analysis **15** (2005), 261–283.
- (13) *Cusp geometry and the cobordism invariance of the index*, Adv. Math. **194** (2005), 504–519.
- (14) *Gravitational and axial anomalies for generalized Euclidean Taub-NUT metrics* (with Ion Cotăescu and Mihai Vişinescu), J. Phys. A – Math. Gen. **38** (2005), 7005–7019.
- (15) *On the  $L^p$  index of spin Dirac operators on conical manifolds*, (with André Legrand), Studia Math. **177** (2006), 97–112.
- (16) *On Carvalho’s  $K$ -theoretic formulation of the cobordism invariance of the index*, P. Am. Math. Soc. **134** (2006), 3395–3404.
- (17)  *$L^2$ -index of the Dirac operator of generalized Euclidean Taub-NUT metrics* (with Mihai Vişinescu), J. Phys. A - Math. Gen. **39** (2006), 6575–6581.
- (18) *On the structure of quantum permutation groups* (with Teodor Banica), P. Am. Mat. Soc. **135** (2007), 21–29.
- (19) *Fibered cusp versus  $d$ -index theory*, Rendiconti Semin. Math. Padova. **117** (2007), 193–203.
- (20) *The Dirac spectrum on manifolds with gradient conformal vector fields*, (with Andrei Moroianu), J. Funct. Analysis. **253** nr. 1 (2007), 207–219.
- (21) *Weyl laws on open manifolds*, Math. Annalen **340**, nr. 1 (2008), 1–21.
- (22) *Index and homology of pseudodifferential operators on manifolds with boundary* (with Victor Nistor), Perspect. Operat. Algebras Math. Phys. (2008), 123–148.
- (23) *Spectral analysis of magnetic Laplacians on conformally cusp manifolds* (with Sylvain Golénia), Ann. H. Poincaré **9** (2008), 131–179.
- (24) *Adiabatic limit of the eta invariant over cofinite quotients of  $PSL(2, R)$*  (with Paul Loya and Jinsung Park), Compositio Mat. **144** (2008), 1593–1616.
- (25) *Quasi-fuchsian manifolds with particles* (with Jean-Marc Schlenker), J. Differ. Geom. **83** (2009), 75–129.
- (26) *The spectrum of  $k$ -form Schrödinger Laplacians on conformally cusp manifolds* (with Sylvain Golénia), to appear in Trans. Amer. Math. Soc.
- (27) *Regularity of the eta function on manifolds with cusps*, (with Paul Loya and Jinsung Park), to appear in Mathematische Zeitschrift.
- (28) *Eta invariant and Selberg Zeta function of odd type over convex co-compact hyperbolic manifolds*, (with Colin Guillarmou and Jinsung Park), to appear in Advances in Math. **225** (2010), 2464–2516.
- (29) *The Dirac operator on generalized Taub-NUT spaces*, (with Andrei Moroianu), to appear in Commun. Math. Phys.
- (30) *Uniformization of  $S^2$  and flat singular surfaces*, preprint arXiv:1101.2355

---

## Courses and talks

- *Courses*:
  - “Riemann surfaces”, Şcoala Normală Superioară Bucharest, 2009.

- Mini-course "Spectral asymptotics for Dirac operators", Korea Institute of Advanced Studies summer school, 2007.
- "Hyperbolic manifolds in dimensions 2 and 3", Școala Normală Superioară Bucharest, 2007 (with Jean-Marc Schlenker);
- "K-theory and differential operators", Școala Normală Superioară, 2005;
- "Algebraic Topology", University of Bucharest, 2005;
- Mini-course "Introduction to Global Analysis", Instituto Superior Tecnico, Lisbon, Feb. 2002;
- "Differential geometry", University of Pitești, 2001;
- "Mathematical methods for engineers", MIT, 1999;
- "Differential equations", MIT, 1998;
- "Linear Algebra", MIT, 1997.
- *Conference talks:*
  - *Analysis, Geometry and Surfaces*, Autrans, Mar. 2011.
  - *Lectures on Spectral invariants and Moduli spaces*, Seoul, Jun. 2010.
  - *IMAR 60 International Conference*, Jun. 2009.
  - *Geometric Applications of Microlocal Analysis*, Luminy, Jun. 2008.
  - *Workshop on Analysis and Geometry*, Hannover, Sep. 2007.
  - *Spectral problems for Dirac and Laplace operators*, Paris, Jan. 2007.
  - *Spectral theory and Global Analysis*, Oldenburg, Aug. 2006.
  - *PDE's on noncompact and singular manifolds*, Potsdam, Aug. 2006.
  - *KIAS Workshop on Spectral Invariants and Related Topics*, Seoul, May 2006.
  - *7<sup>th</sup> Intl. Workshop on Differential Geometry and its Applications*, Deva, Sept. 2005;
  - *Analysis and Geometric Singularities*, Oberwolfach, Aug. 2005;
  - *Second joint meeting of AMS, DMV, ÖMV*, Mainz, Jun. 2005;
  - *Degenerate PDE's and Singular Geometries*, Potsdam, Aug. 2004;
  - *Analyse Géométrique*, CIRM Marseille, March 2004;
  - *Operator Algebras, Singularities, Deformation Quantisation*, Potsdam, March 2004;
  - *Operator algebras on manifolds with singularities*, Potsdam, March 2003;
  - *Journées Nancéiennes de Géométrie*, Nancy, Jan. 2003;
  - *Geometric analysis and singular spaces*, Oberwolfach, June 2002;
  - *5<sup>th</sup> Intl. Workshop on Differential Geometry and its Applications*, Timișoara, Sept. 2001;
  - *Ellipticity and Parabolicity in Analysis and Geometry*, Potsdam, Aug. 2001;
  - *Geometric Analysis*, Potsdam, Oct. 2000;
  - *L<sup>2</sup>-Methods in Geometry*, Sarasota, Jan. 2000;
  - *4<sup>th</sup> Intl. Workshop on Differential Geometry and its Applications*, Brașov, Sept. 1999;
  - *Operator Algebras and Asymptotics on Manifolds with Singularities*, Warsaw, April 1999.
- *Seminar invited talks*
  - 2011: Regensburg; Nantes.
  - 2010: Toulouse; IHP Paris.
  - 2009: Bucharest.
  - 2007: Chișinău; Toulouse.
  - 2006: Toulouse.
  - 2005: Potsdam.

- 2004: Bucharest.
- 2003: Ecole Polytechnique; HU Berlin; Ecole Normale Lyon; Clermont-Ferrand.
- 2002: IST Lisbon; Paris 6.
- 2001: Paris 11; Mainz.

---

**Honors and awards**

- Romanian Academy prize "Simion Stoilow", 2003 (awarded in 2005).
- National Foundation for Science and Arts prize, 2004.
- International Mathematical Olympiads
  - 1991: first prize (42 pts.);
  - 1990: second prize.

---

**Community work**

- 2009 Organizer of the Exploratory Workshop on Differential Geometry and its applications, Iași, Sept 2-4 2009.
- 2006–2008 Director of the Mathematics department of Școala Normală Superioară Bucharest.
- Co-organizer of the 8th International Workshop on Differential Geometry and its applications, Cluj-Napoca 2007.
- Co-editor of the proceedings volume for the 7th International Workshop on Differential Geometry and its applications, Deva 2005.

---

**Languages**

- Romanian: native;
- English, French: fluent;
- German: advanced;
- Italian, Portuguese, Spanish: beginner.