

## Luca Capogna

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### Education

- B. S. (Laurea)** Mathematics, Second University of Rome, February 1990.
- Ph.D.** Mathematics, Purdue University, May 1996.
- Postdoc** Courant Institute 1996-1998, University of Pennsylvania 1998-1999.

### Research interests

Partial differential equations, harmonic analysis and differential geometry.

### Academic positions

- 2003- : Associate professor, University of Arkansas.
- 1999-2003 : Assistant professor, University of Arkansas.
- 1998-1999 : Lecturer, University of Pennsylvania.
- 1996-1998 : Courant Instructor, New York University.
- 1991-1996 : Graduate teaching assistant, Purdue University.

### Visiting positions

- Fall 2005: Visiting Associate Professor, University of Michigan.
- Summer 2002, 2003, 2004: Visiting Professor, University of NSW, Sydney.
- Summer 2002, Fall 2003: Visiting fellow, University of Michigan.
- Summer 2001, Spring 2004: Visiting fellow, Princeton University.
- Summer 2000: Visiting fellow, University of Kentucky, Lexington.

### Grants and awards

- NSF Early Career Award Grant: 2002-2008
- PI or CoPI for the NSF grants: DMS 0548644, DMS 0503695, DMS 0139011, DMS 0100599, DMS 0070592.
- First Alternate for the AMS Centennial Fellowship 2005.
- Fulbright College full-time research semester assignment: Fall 2003.
- SILO SURF grant (in relation with Diana Dunn's research project), Spring 2002, Fall 2003.
- Arkansas Science and Technology grant, 2001-2002.
- NSF grant DMS 9800794: 1998-2001.
- Alfred P. Sloan doctoral dissertation fellowship: 1995-1996.
- Purdue Research Foundation: 1993-1995. CNR grant (Italy): 1990-1992.

### Students

Undergraduates: Diana Dunn, April Gentry.  
Graduate: Emily Shores (PhD 2005), Erin Haller (PhD 2008), Heather Griffin-Rowe and Garret Rea (current).

### Invited lectures.

- 2008 Geometry and Analysis, Bern (Switzerland), Summer School at Jyväskylä (Finland). Oberwolfach (Nonlinear Evolution Equations), AMS meeting LSU.

- 2007, UIUC, New Mexico State (colloquium), Geometric Analysis and PDE (Bedlewo, Poland), Analysis in Metric spaces (Trento, Italy), Georgia Tech (CDSNS seminar), Washington University St. Louis (colloquium).
- 2006, ICM satellite meeting Naples, Midwest PDE seminar (U. of Illinois, Chicago), Meeting on Subelliptic PDE's and Applications to Geometry and Finance Cortona (Italy), AMS meeting Orlando (FL). University of Rome I "La Sapienza" (analysis seminar).
- 2005, UCLA, University of Michigan, Oberwolfach (Nonlinear Evolution Equations). AMS meeting Bowling Green (KY). Riviere-Fabes symposium (1hr lecture). "4th School on Analysis and Geometry in Metric Spaces" (Trento). Università di Bologna (Italy), Analysis Seminar University of Western Ontario.
- 2004, New Mexico Analysis seminar (keynote speaker), AMS meeting Albuquerque, AMS meeting Pittsburgh, University of Toronto (Analysis seminar).
- 2004, Centro De Giorgi, Pisa (Italy), University of Illinois (analysis seminar), University of New South Wales, University of Missouri Columbia, show-me seminar.
- 2003, University of Michigan, Michigan State University. Oberwolfach (Nonlinear Evolution Equations), ETH, Università di Trento, Cortona (Second Order Subelliptic Equations), University of New South Wales. Vanderbilt.
- 2002, University of Wisconsin, Wright State University, University of Kentucky, AMS meeting Orlando (FL). Purdue, University of New South Wales.
- 2001, AMS meeting U. of Tennessee, Praire Analysis (Kansas), U. of Minnesota. U. of Memphis, AMS meeting U. of Kansas, AMS-SIAM conference Mt. Holyoke.
- 2000: U. of Massachusetts, Johns Hopkins U., AMS meeting at Notre Dame U. of Kentucky, Rice, Notre Dame (Analysis seminar);
- 1999: Courant Institute (NYU), U. of Texas at Austin, Conference in Honor of Yu G. Reshetnyak, Novosibirsk, Russia. AMS meeting in Melbourne, Australia.
- 1998: Princeton, UPenn Johns Hopkins University, Temple;
- 1997: Minnesota, Purdue;
- 1996: MIT, Courant Institute;

#### Other activities

- Co-organizer (with Scott Pauls and Jeremy Tyson) Conference on Geometric Analysis and applications, UIUC Summer 2006.
- Co-organizer (with Scott Pauls and Jeremy Tyson) Conference on minimal surfaces, subelliptic pde's and geometric function theory, Dartmouth College, March 2005.
- Co-organizer (with Robert Smits) AMS special session in Albuquerque, NM (October 2004). Co-organizer (with Scott Pauls and Jeremy Tyson) AMS special session in Fayetteville, AR (November 2006).
- Organizer of the Workshop in Analysis and Geometry in Carnot-Caratheodory spaces, Fayetteville, March 2003.
- Co-Organizer (with Loredana Lanzani) of the University of Arkansas Spring Lecture Series for the years: 2009 (Main speaker Michael Lacey), 2008

(Main Speaker Alice Chang), 2002 (Main speaker Professor M. Christ), 2001 (Main speakers Professors Caffarelli and de la Llave), and 2000 (Main speaker Professor Kenig).

- Editor of the proceedings of the SLS2000, *Boundary value problems and harmonic analysis*, University Lecture Series AMS (2001).
- Advisor of two honors undergraduate students dissertations: Diana Dunn (winner of SILO SURF award and Fulbright scholar, graduated in May 2004), and April Gentry (Sturgis fellow 2003, graduated in December 2004).
- Faculty advisor of the (Pi Mu Epsilon) Mathematics Club at the University of Arkansas 2002, 2004, 2006, 2007, 2008

## Books

- (1) *An introduction to the Heisenberg group and the sub-Riemannian Isoperimetric problem*, Progress in Mathematics Vol. 259, 2007, XVI, 223 p., Hardcover ISBN: 978-3-7643-8132-5, Birkhauser (with D. Danielli, S. Pauls and J. Tyson).
- (2) *Harmonic measure, geometric and analytic point of view* (with Carlos Kenig and Loredana Lanzani). University Lectures Series 35, 2005, ISBN 0-8218-2728-6.

## In preparation

- (1) *Horizontal Mean Curvature Flow in the Heisenberg group*, (with M. Bonk).
- (2) *Boundary regularity of biholomorphic maps via geometric function theory*, (with M. Cowling and L. Lanzani).
- (3) *Regularity of intrinsic graphs evolving by horizontal mean curvature in Heisenberg groups*. (with G. Citti and M. Manfredini)
- (4) *Generalized mean curvature flow in Carnot groups*, (with G. Citti).

## Publications and preprints

- (1) *Smoothness of intrinsic minimal graphs in the Heisenberg group  $\mathbb{H}^n$ ,  $n > 1$* , submitted 2007 (with Giovanna Citti and Maria Manfredini).
- (2) *Isoperimetric inequalities in the Heisenberg group and in the plane*. Lecture Notes of Seminario Interdisciplinare di Matematica, Vol. 6 (2007), 93-106
- (3) *On the Mixed Boundary Value Problem for Laplace's Operator on Lipschitz Planar Domains*, To appear in Math. Annalen (with Russell Brown and Loredana Lanzani).
- (4) *Ill-posedness of the Cauchy problem for Heisenberg wave maps*, to appear in Proc. Amer. Math. Soc. (with Jalal Shatah).
- (5) *Convexity and horizontal second fundamental forms for hypersurfaces in Carnot groups*, To appear in Trans. American Math. Soc. (with S. D. Pauls and J. Tyson)
- (6) *A note on the engulfing property and the  $\Gamma^{1+\alpha}$ -regularity of convex functions in Carnot Groups*, Proc. Amer. Math. Soc, 134 (2006) 3191-3199. (with D. Maldonado).
- (7) *The Aronsson-Euler equation for Absolutely minimizing Lipschitz extensions with respect to Carnot-Carathéodory metrics*, Trans. Amer. Math. Soc. 357 (2005), 795-823., (with Thomas Bieske).
- (8) *Ahlfors regularity in Carnot-Carathéodory spaces*, Journal of Geometric Analysis, Vol. 16 (3) (2006) 455-497 (with N. Garofalo).
- (9) *1-quasiconformal maps in Carnot groups*, Duke Math. Journal, Vol. 135, No. 3 (2006) (with Michael Cowling).

- (10) *Pointwise Schauder estimates for subelliptic operators in Carnot groups*, Proceedings of the AMS-SIAM Mt. Holyoke conference in Harmonic Analysis. American Mathematical Society 2003. ( with Qing Han).
- (11) *Legendrian Energy Minimizers I: Heisenberg group target* Calc. Var. and PDE 12 (2001), 145-171. (with Fang Hua Lin).
- (12) *Examples of Uniform and NTA domains in Carnot groups* Proceedings of a conference in honor of Y. G. Reshetnyak. Sobolev Institute of Mathematics (2001), 103-121. (with N. Garofalo and D-M Nhieu).
- (13) *Properties of harmonic measures in the Dirichlet problem for certain nilpotent Lie groups*, American Journal of Mathematics, 124 (2002), no. 2, 273–306. (with N. Garofalo and D-M Nhieu).
- (14) *Regularity for quasilinear equations and 1–quasiconformal maps in Carnot groups*, Math. Ann., 313, (1999) 263-295.
- (15) *A version of a theorem of Dahlberg for the subelliptic Dirichlet problem*. Math. Res. Lett. 5 ( 1998), no. 4, 541–549. (with N. Garofalo and D-M Nhieu).
- (16) *Regularity of minimizers of the calculus of variations in Carnot groups via hypoellipticity of systems of Hörmander type* , Journal of the European Mathematical Society, (2003) 5, 1-40. (Joint with N. Garofalo).
- (17) *Boundary behavior of nonnegative solutions of subelliptic equations in NTA domains for Carnot-Carathodory metrics*, Jour. of Fourier an. and appl. 4,4 (1998) 403-432. (with N. Garofalo).
- (18) *Nontangentially accessible domains for Carnot-Carathodory metrics and a Fatou type theorem*. C. R. Acad. Sci. Paris Ser. I Math. 321 (1995), no. 12, 1565–1570. (with N. Garofalo)
- (19) *Regularity for quasilinear equations in the Heisenberg group*, Comm. in pure and appl. Math, vol. L, (1997), pages 867–889
- (20) *Optimal regularity for quasilinear equations in stratified nilpotent Lie groups and applications*. Electron. Res. Announc. Amer. Math. Soc. 2 (1996), no. 1, 60–68.
- (21) *Capacitary estimates and the local behavior of solutions of nonlinear subelliptic equations*, American Journal of Mathematics, vol. 118, no. 6 (1996), pages 1153-1196 (with D. Danielli and N. Garofalo).
- (22) *Uniform domains and quasiconformal mappings on the Heisenberg group*, Man. Math., 86 (1995), pages 267-281 (with P. Tang)
- (23) *Subelliptic mollifiers and a basic pointwise estimate of Poincaré type*, Math. Z. (1997) (with D. Danielli and N. Garofalo)

- (24) *The geometric Sobolev embedding for vector fields and the isoperimetric inequality*, Comm. in Analysis and Geometry 2(2) (1994), pages 203–215 (with D. Danielli and N. Garofalo)
- (25) *An isoperimetric inequality and the geometric Sobolev embedding for vector fields*. Math. Res. Lett. 1 (1994), no. 2, 263–268.
- (26) *Subelliptic mollifiers and a characterization of Rellich and Poincaré domains*, Rend. Sem. Mat. Univ. Pol. Torino, 51 (4) (1993) pages 361–386 (with D. Danielli and N. Garofalo)
- (27) *An embedding theorem and the Harnack inequality for nonlinear subelliptic equations*, Comm. Partial Diff. Eq., 18 (1993), pages 1765–1794 (with D. Danielli and N. Garofalo)
- (28) *Embedding theorems and the Harnack inequality for solutions of nonlinear subelliptic equations*. C. R. Acad. Sci. Paris Sr. I Math. 316 (1993), no. 8, 809–814 (with D. Danielli and N. Garofalo)