# Curriculum vitae of Giovanni Leoni
## (January 3, 2015)
## Personal data

- born in Sassuolo (Modena), Italy on March 10, 1967;

## Education

- March 31, 1995, *Ph.D. in Mathematics,* University of Minnesota, Minneapolis, U.S.A., advisor: James Serrin;
- June 30, 1993, *Master in Mathematical Sciences*, University of Minnesota, Minneapolis, U.S.A., advisor: James Serrin;
- June 27 1990 *laurea in Mathematics*, Magna Cum Laude, University of Modena, Modena, Italy, advisor: Patrizia Pucci;

## Academic positions

- January 1997- April 1997 post–doctoral associate*, Center for Nonlinear Analysis, Carnegie Mellon University;
- July1,1995–October 31, 1998 Assistant Professor, Department of Mathematics, University of Perugia, Perugia, Italy;
- November 1, 1998–August 31, 2002 Associate Professor, Department of Advanced Sciences and Technologies, University of Piemonte Orientale, Alessandria, Italy;
- January 2002 won a competition for full-professor in Analysis;
- September 1, 2002–June 30, 2005 Associate Professor with Tenure, Department of Mathematical Sciences, Carnegie Mellon University, Pittsburgh;
- July 1, 2005-present Full Professor, Department of Mathematical Sciences, Carnegie Mellon University, Pittsburgh;
- January 1, 2011-present Associate Director of the Center for Nonlinear Analysis, Carnegie Mellon University, Pittsburgh.

## Honors and awards

- *scholarship for undergraduate students,* National Council of Research, 1990;
- *scholarship to study abroad,* National Institute of High Mathematics F. Severi, 1990 (renewed for three years);
- *scholarship to study abroad,* National Council of Research, 1995;
- *selected communication for young mathematicians under 33* at the XVI meeting of the Italian Mathematical Society, Naples, 9-13/9-18–1999;
- award *Premio Giuseppe Bartolozzi* of the Italian Mathematical Society for best Italian mathematician under 34, 2001;
- award *Julius Ashkin Teaching Award* of the Mellon College of Science, Carnegie Mellon University, 2013;

## Grants

- NSF "Singularly Perturbed and Multiscale Problems" 2004-2007;
- NSF "U.S.-Chile Workshop: PDEs-Preparatory Workshops; Pittsburgh, Pennsylvania; March 2006; Santiago, Chile; January 2007," PI's Irene Fonseca, David Kinderlehrer, Giovanni Leoni.
- NSF "Center for Nonlinear Analysis: Research and Training in Applied Mathematics" PI's Irene Fonseca, Co-PIs: Giovanni Leoni, Robert Pego, Noel Walkington, David Kinderlehrer; 2007-2012.

- NSF "Modern methods in the Calculus of Variations with applications to materials science and hydrodynamics" 2007-2011.
- FCT "Fine structures, homogenization, and multi-phase transitions", CMU-Portugal, 2011-2013, Co-PI.
- NSF "Modern methods in the Calculus of Variations with applications to materials science, mechanics, and imaging" 2010-2014.
- NSF "PIRE: Science at the Triple Point Between Mathematics, Mechanics and Materials Science", Associate Director; 2011-2016.
- NSF "Contemporary methods in calculus of variations and differential equations with applications to materials science" 2014-2017.

## Teaching activity

- fall quarter 1994-95, teaching assistant *College Algebra and Probability*, School of Mathematics, *University of Minnesota*;
- winter quarter 1994-95, teaching assistant *Differential equations with linear algebra,* School of Mathematics, *University of Minnesota*;
- spring quarter 1994-95, teaching assistant *Multivariable calculus*, School of Mathematics, *University of Minnesota*;
- 1995-96, *Analisi Matematica I*, Department of Mathematics, University of Perugia;
- 1996-97, *Analisi Matematica II,* Department of Mathematics, University of Perugia;
- 1997-98, *Analisi Matematica II,* Department of Mathematics, University of Perugia;
- 1998-99, *Analisi Matematica II*, Department of Advanced Sciences and Technologies, University of Piemonte Orientale;
- 1999-2000, *Analisi Matematica II,* Department of Advanced Sciences and Technologies, University of Piemonte Orientale;
- 1999-2000, *Istituzioni di Analisi Superiore,* Department of Advanced Sciences and Technologies, University of Piemonte Orientale;
- 2000-2001, *Analisi Matematica II,* Department of Advanced Sciences and Technologies, University of Piemonte Orientale;
- 2000-2001, *Istituzioni di Matematica II,* Politecnico of Torino;
- 2001-2002, *Analisi Matematica II,* Department of Advanced Sciences and Technologies, University of Piemonte Orientale;
- 2001-2002, *Calcolo II and III,* Department of Advanced Sciences and Technologies, University of Piemonte Orientale;
- Fall Semester 2002, *Partial Differential Equations (graduate level),* Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2003, *Introduction to Functional Analysis (graduate level), Partial Differential Equations (graduate level),* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2003, *Mathematical studies I,* Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2004, *Mathematical studies II, Measure and Integration* (graduate level)*,* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2004, *Sequences and series of functions,* and *Advanced topics in Analysis: Singular Integrals* (graduate level) Department of Mathematical Sciences, Carnegie Mellon University;

- Spring Semester 2005, *Principles of Real Analysis I,* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2005, *Sequences and series of functions*; Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2006, *Introduction to Functional Analysis (graduate level), Principles of Real Analysis II,* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2006, *Sequences and series of functions, Sobolev Spaces (graduate level)*; Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2007, *Principles of Real Analysis I,* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2007, *Principles of Real Analysis I, Measure and Integration (graduate level)* Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2008, *Advanced topics in Analysis: Convex Analysis (graduate level)* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2008, *Measure and Integration (graduate level), Sobolev Spaces (graduate level)* Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2009, sabbatical.
- Fall Semester 2009, *General Topology (graduate level)* Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2010, *Introduction to Functional Analysis (graduate level), Principles of Real Analysis I,* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2010, *Measure and Integration (graduate level), Sobolev Spaces (graduate level)* Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2011, *Principles of Real Analysis II,* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2011, *Measure and Integration (graduate level), Principles of Real Analysis I,* Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2012, *Mathematical studies II: Analysis,* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2012, *Sobolev Spaces (graduate level), Principles of Real Analysis I,* Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2013, *Vector Analysis,* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2013, *Partial Differential Equations I (graduate level),* Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2014, *Partial Differential Equations II (graduate level),* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2014, *Sobolev Spaces (graduate level),* Department of Mathematical Sciences, Carnegie Mellon University;
- Spring Semester 2015, *Vector Analysis, Advanced topics in Analysis: Singular Integrals (graduate level)* Department of Mathematical Sciences, Carnegie Mellon University;
- Fall Semester 2015, *Calculus of Variations (graduate level), Mathematical studies I: Analysis,* Department of Mathematical Sciences, Carnegie Mellon University;

## Thesis students

- Calcagno Cinzia, thesis title *Sul metodo dei piani paralleli di Alexandrov-Serrin,* University of Piemonte Orientale, Italy, Fall 2001;
- Michela Magrin, thesis title *Unicitá delle soluzioni positive dell'equazione* $\Delta u + f(u) = 0$ *in* $\mathbb{R}^n$, University of Piemonte Orientale, Italy, Summer 2002;
- Eric Baer, (undergraduate) Master, thesis title *Some properties of fractional Sobolev spaces*, May 2006;
- Graca Carita (co-advisor with Irene Fonseca), Ph.D., thesis title *Relaxation in SBV for Constrained-Valued Fields,* June 2007;
- Danut Arama, Ph.D., thesis title *On a variational approach for Stokes conjectures in water waves*, June 2008;
- Bernardo Sousa (co-advisor with Irene Fonseca), Ph.D., thesis title *Variational Methods for Phase Transitions,* June 2008;
- Daniel Spector, Ph.D., thesis title *Characterizing Sobolev and BV functions*, May 2011;
- Paolo Piovano (co-advisor with Irene Fonseca), Ph.D., thesis title *Evolution and regularity results for epitaxially strained thin films and material voids*, June 2012.
- Current students. Ph.D.: Giovanni Gravina; Ryan Murray (co-advisor with Robert Pego), Matteo Rinaldi (co-advisor with Irene Fonseca).

## Postdoctoral Associates

- Massimiliano Morini, 2002-2004; CNA; co-mentored with I. Fonseca; University of Parma, Italy.
- Vincent Millot, 2005-2007; CNA; co-mentored with I. Fonseca; currently: University of Paris 7, France.
- Marco Barchiesi, 2007-2009; CNA; co-mentored with I. Fonseca; currently: University of Naples, Italy.
- Filippo Cagnetti, 2008-2010, funded by the ICTI CMU|Portugal Program in Applied Mathematics; co-mentored with I. Fonseca; currently: University of Sussex, England.
- Milena Chermisi, 2008-2010, funded by the ICTI CMU|Portugal Program in Applied Mathematics; co-mentored with I. Fonseca; currently: private industry.
- Michael Goldman, 2011, CNA, co-mentored with I. Fonseca; currently: University of Paris 7, France.
- Timothy Blass, 2011-2014, funded by the PIRE NSF award; co-mentored with D. Kinderlehrer and I. Fonseca; currently: private industry.
- Gurgen Hayrapetyan, 2011-2014, funded by the RTG NSF award, co-mentored with I. Fonseca; currently: currently: Ohio University.
- Marco Morandotti, 2011-2013, funded by the ICTI CMU|Portugal Program in Applied Mathematics; co-mentored with I. Fonseca; currently: SISSA, Italy.
- Xinyang Lu, 2012-2015, funded by the ICTI CMU|Portugal Program in Applied Mathematics; co-mentored with I. Fonseca and Dejan Slepčev; currently McGills University, Canada;
- Emanuel Indrei, 2013-2016, funded by the PIRE NSF award; co-mentored with I. Fonseca;
- Marco Carroccia, 2015-2018, funded by the ICTI CMU|Portugal Program in Applied Mathematics; co-mentored with I. Fonseca;

- Riccardo Cristoferi, 2015-2018, funded by the Fonseca's NSF personal grant; co-mentored with I. Fonseca;
- Laurent Dietrich, 2015-2018, funded by PIRE NSF award; co-mentored with I. Fonseca;

## Department Committees

- member of the Graduate students' core requirements committee;
- member of the Graduate student' retention committee;
- member of the Colloquia committee;
- chair of the Undergraduate curriculum committee, Sept. 2010-present;

## Visiting positions

- 6-15/7-10-96 *School of Mathematics, University of Minnesota*, Minneapolis;
- 1-15/5-15-97 *Postdoctoral Associate, Center for Nonlinear Analysis, Carnegie Mellon University*;
- 10-26/11-30-1997, *School of Mathematics, University of Minnesota*, Minneapolis;
- 5-16/5-30-1998 *Max Planck Institute*, Leipzig, Germany;
- 6-29/7-19-1998, *School of Mathematics, University of Minnesota*, Minneapolis;
- 3-1/3-27-1999 *Center for Nonlinear Analysis, Carnegie Mellon University*;
- 5-16/5-20-1999 *S.I.S.S.A.*, Trieste, Italy;
- 1-4/1-13-2000 *C.M.A.F.*, Lisbon, Portugal;
- 3-5/4-15-2000 *Center for Nonlinear Analysis, Carnegie Mellon University*;
- 6-8/6-19 2000 *C.M.A.F.*, Lisbon, Portugal;
- 9-3/9-13-2000 *Department of Mathematical Analysis, Charles University*, Prague, Czech Republic;
- 4-17/5-18-2001 *Center for Nonlinear Analysis, Carnegie Mellon University*;
- 5-27/5-31-2001 *Mathematical Institute, University of Oxford*, Oxford, UK;
- 3-5/4-15-2002 *Center for Nonlinear Analysis, Carnegie Mellon University*;
- 5-5/5-25-2002 Research in Pairs *Mathematisches Forschungsinstitut Oberwolfach,* Oberwolfach, Germany;
- 6-8/6-20-2003 *Institute for Advanced Studies,* Princeton;
- 6-29/7-7-2003 *Département de Mathématiques*, Université de Toulon et du Var, La Garde Cedex, France;
- 7-13/7-16-2003 *Department of Mathematics*, University of Rome "la Sapienza", Italy;
- 8-10/8-15-2003, *Fachbereich Mathematik*, Universität Dortmund, Dortmund, Germany;
- 7-3/7-19-2004 *Département de Mathématiques*, Université de Toulon et du Var, La Garde Cedex, France;
- 7-19/8-9-2004 *Center for Mathematical Analysis, Geometry, and Dynamical Systems* at Instituto Superior Técnico, Lisbon, Portugal;
- 8-20/8-23-2004 *Department of Mathematics*, University of Naples, Italy;
- 1-2/1-6-2005 *Department of Mathematics*, University of Rome "la Sapienza", Italy;
- 1-2/1-8-2006 *Department of Mathematics*, University of Rome "la Sapienza", Italy;
- 7-18/7-31-2006 *Department of Mathematics*, University of Florence, Italy;
- 7-3/7-16-2007 S.I.S.S.A, Trieste, Italy.
- 7-13/7-21-2008 S.I.S.S.A, Trieste, Italy.
- 7-21/7-23-2008 *Department of Mathematics*, University of Naples, Italy;

- 2-28/3-28-2009 *Centre for Mathematics and its Applications*, The Australian National University, Canberra, Australia;
- 7-4/7-18-2009 *S.I.S.S.A*, Trieste, Italy;
- 7-20/7-27-2010 *S.I.S.S.A*, Trieste, Italy;
- 12-12/12-17-2010 *Department of Mathematics*, University of Parma, Italy.
- 7-15/7-27-2012 *Universidade Nova de Lisboa*, Lisbon, Portugal;
- 6-21/6-30-2013 *University of Pavia,* Pavia, Italy;
- 6-14/6-19-2015 *University of Pavia,* Pavia, Italy.

## Invited lectures

- January 1992 four lectures, *School of Mathematics, University of Minnesota*, Minneapolis;
- 6-3-1996 conference, *Department of Pure Mathematics, Delft University of Technology*, Delft, Holland;
- 2-14-1997 conference, *Center for Nonlinear Analysis, Carnegie Mellon University*;
- 11-9-1997 conference, *School of Mathematics, University of Minnesota*; Minneapolis;
- 3-9-1999 conference, *Center for Nonlinear Analysis , Carnegie Mellon University*;
- 5-4-1999 conference *Department of Mathematics, University of Rome Tor Vergata,* Rome, Italy;
- 5-19-1999 conference, *S.I.S.S.A.*, Trieste, Italy;
- 3-22-2000 conference, *Center for Nonlinear Analysis, Carnegie Mellon University*;
- 5-24-2000 conference *Department of Mathematics, University of Pavia,* Pavia, Italy;
- 6-5-2000 conference *C.M.A.F. University Lisbon, Lisbon, Portugal*;
- 9-13-2000 conference *Department of Mathematical Analysis, Charles University*, Prague, Czech Republic;
- 3-21-2001 conference *Dipartimento di Metodi e Modelli Matematici per le Scienze Applicate, University of Roma "La Sapienza",* Rome;
- 3-22-2001 conference *Department of Mathematics and Computer Sciences, University of Perugia,* Perugia, Italy;
- 4-19-2001 conference, *Center for Nonlinear Analysis, Carnegie Mellon University*;
- 5- 28-2001 conference, *Mathematical Institute, University of Oxford*, Oxford, UK;
- 7-11-2001 conference, *Department of Mathematics, Politecnico di Milano,* Milan, Italy;
- 11-7-2001 colloquium, *Center for Nonlinear Analysis* of *Carnegie Mellon University*;
- 3-6-2002 conference *Department of Mathematics "U. Dini", University of Florence,* Florence, Italy;
- 3-12-2002 conference, *Department of Mathematics,* University of Milan*, Milan*, Italy;
- 4-16-2002 conference, *Carnegie Mellon University*;
- 7-3-2003 conference *Département de Mathématiques*, Université de Toulon et du Var, La Garde Cedex, France;
- 7-8-2003 conference *Department of Mathematics, University of Pavia,* Pavia, Italy;
- 7-14-2003 conference *Department of Mathematics*, University of Rome "la Sapienza";
- 6-6/6-18-2004 Ph. D. Course in Calculus of Variations, *Department of Mathematics, University of Pavia,* Pavia, Italy;
- 7-15-2004 conference *Département de Mathématiques*, Université de Toulon et du Var, La Garde Cedex, France;

- 7-20-2004 conference, *Center for Mathematical Analysis, Geometry, and Dynamical Systems* at Instituto Superior Técnico, Lisbon, Portugal;
- 3-31-2005 conference *Mathematics Department*, University of Maryland;
- 4-1-2005 colloquium, *Department of Mathematics*, University of Pittsburgh;
- 8-19-2008 conference *School of Mathematics*, Georgia Institute of Technology;
- 7-8-2009 conference, *S.I.S.S.A*, Trieste, Italy;
- 10-30-2009 colloquium, *Department of Mathematics*, University of Pittsburgh;
- 10-20-2011 seminar, *Department of Mathematics*, University of Puerto Rico;
- 3-08-2012 seminar, *Department of Mathematics*, University of Texas, Austin;
- 7-25-2012 seminar, *C.M.A.F.*, Lisbon, Portugal;
- 10-24-2012 applied mathematics seminar, *Department of Mathematics*, University of Pittsburgh;
- 04-01-2014 colloquium, *School of Mathematics*, University of Minnesota;
- 03-11-2015 applied mathematics seminar, *Department of Mathematics*, University of California, Riverside;
- 06-16-2015 seminar, *Department of Mathematics*, University of Pavia, Italy.

### Plenary speaker at conferences, workshops, and summer schools

- *Symposium on Partial Differential Equations to celebrate the Seventy-Fifth Birthday of James Serrin*, University of Perugia, Italy, 6-28-2002;
- *International Workshop on New Developments in Nonlinear Partial Differential Equations*, University of Minnesota, Minneapolis, 23-25 june 2004;
- Symposium *Principles, Methods, and Taste in Continuum Mechanics, Physics, and Mathematical Analysis* in honor of Mort Gurtin's 70th birthday, Carnegie Mellon University, Pittsburgh, 26-28 June, 2004;
- Conference *Calculus of Variations and PDE: challenges and applications,* Toledo (Spain) August 16-19, 2006;
- Workshop *New Trends in Partial Differential Equations and Calculus of Variations*, Cortona, Italy, May 6-12, 2007;
- Workshop *CNA-Chile New Developments in Partial Differential Equations I,* Carnegie Mellon University, Pittsburgh, May 21-24, 2007;
- Workshop *CNA-Chile New Developments in Partial Differential Equations II*, Santiago, Chile, January 7-10, 2008;
- *Workshop on Nonlinear Analysis*, Centre for Mathematics and its Applications, The Australian National University, Canberra, Australia, March 18-19, 2009;
- *Workshop on Calculus of Variations*, Ancona, Italy, June 6-8, 2011;
- Workshop *Variational Views in Mechanics and Materials,* Pavia, Italy, June 24-26, 2013.
- 2013 CNA Summer School *Topics in Nonlinear PDEs and Calculus of Variations, and Applications in Materials Science*, Center for Nonlinear Analysis, Carnegie Mellon University, Pittsburgh, PA, May 30–June 7, 2013.
- International Workshop "*Advances in Nonlinear Analysis*", University of Pittsburgh, March 13-15, 2014.
- ERC Workshop on *Existence and Regularity for Nonlinear Systems of Partial Differential Equations*, De Giorgi Center, Pisa, Italy, June 30–July 4, 2014.
- ERC School on *Free Discontinuity Problems*, De Giorgi Center, Pisa, Italy, July 7–July 11, 2014.

- Workshop *Multiscale Modeling and Emergence*, February 7 - 8 , 2015, Center for Philosophy of Science, University of Pittsburgh, Pittsburgh.
- Conference "*Recent Developments in Continuum mechanics and PDEs*" University of Nebraska, Lincoln, April 18 - 19, 2015.
- One week minicourse at the intensive period *Variational Methods for Plasticity and Dislocations,* SISSA, Trieste, Italy, June 11-15, 2015.
- Conference on *Calculus of Variations, PDE, and Geometric Measure Theory*, University of Sussex 7-8 September 2015.

### Communications at congresses

- communication at the meeting *Sistemi Hamiltoniani, equazioni alle derivate parziali, fluidodinamica, processi diffusivi*, L'Aquila, 4-28 / 4-30–1994;
- communication at the meeting XV Congresso UMI, Padova, 9-11 / 9-16–1995;
- communication at the meeting *Fifth Colloquium on the Qualitative theory of Differential Equations*, Szeged, Hungary 7-29 / 8-2–1996;
- conference at the meeting *Giornata sulle equazioni differenziali*, Trieste, Italy, 4-2–1996;
- communication at the meeting Convegno *40 %*, Montecatini, 2-19 / 2-21–1998;
- communication at the meeting Convegno 40 % *Giornate di Analisi Nolineare*, S.I.S.S.A., Trieste, 6-1 / 6-4–1999;
- communication at the meeting XVI Congresso UMI, Naples, 9-13 / 9-18–1999;
- conference at the meeting Convegno 40 % *Analisi Nolineare*, Perugia, 11-9 / 11–11–2000;
- 6-13-2002 conference, AMS-UMI First Joint Meeting, Session "Contemporary Developments in Partial Differential Equations and in the Calculus of Variations", Pisa, Italy;
- conference, Canadian Mathematical Society's Annual Winter Meeting, minisymposium "Nonlinear Partial Differential Equations" 12-6 /12- 8-2003, Vancouver, Canada;
- communication, Fourth SIAM Conference on Mathematical Aspects of Materials Science, minisymposium on *Contemporary Calculus of Variations for Advanced Materials*, 24-25 May 2004, Hyatt Regency, Macy Plaza, Downtown Los Angeles;
- lecture, *The second Summer School of the Center for Nonlinear Analysis* (CNA), Carnegie Mellon University, May 27, 2004 -June 5, 2004;
- communication, SIAM Conference on Analysis of Partial Differential Equations, minisymposium *Calculus of Variations, PDE and Mass Transport*, December 6-8, 2004, Houston, Texas;
- communication, SIAM Conference on Analysis of Partial Differential Equations, minisymposium *Analysis of Front Propagation and Its Applications*, July 10-12, 2006, Boston, Massachusetts;
- communication, AMS Special Session on *Nonconvex Variational Problems: Recent Advances and Applications*, October 7-8, 2006, University of Utah, Salt Lake City, Utah;
- communication, SIAM Conference on Mathematical Aspects of Materials Science, minisymposium on *Dislocations - from Atomistic to Continuum Models*, 23-26 May 2010, Los Angeles, California;
- communication, ICIAM 2011, minisymposium on *Multiscale Phenomena in Calculus of Variations and Inverse Problems,* July 18 – 22, 2011, Vancouver, BC, Canada;

- communication, ICIAM 2011, minisymposium on *Modern Methods and Applications of the Calculus of Variations,* July 18 – 22, 2011, Vancouver, BC, Canada;
- communication, SIAM Conference on Analysis of Partial Differential Equations, minisymposium *Singularities in Physical systems and the Calculus of Variations,* November 14-17, 2011, San Diego, California;
- communication, 2013 Joint Mathematics Meetings, AMS Special Session on *Recent Advances and New Challenges in Applied Analysis*, January 9-12, 2013, San Diego, California;
- communication, SIAM Conference on Mathematical Aspects of Materials Science, minisymposium *Mathematical Methods for Epitaxial Grow*, June 8-12, 2013, Philadelphia.
- 50 minutes talk, 2015 International meeting, AMS-EMS-SPM, June 10-13, 2015, Porto, Portugal, Special session *Mathematical Models for Materials.*

### Participation at congresses

- 5-17/5-18-1991 meeting, *Degenerate Diffusions, Institute for Mathematics and its Applications* dell' *University of Minnesota*, Minneapolis, U.S.A., 65th birthday of Prof. J. Serrin;
- 1-2/1-6-1995 Seconda Conferenza Internazionale, *Nonlinear Evolution Problems*, Roma, Italy;
- 9-30/10-4-1996 meeting *Conferenze in onore di Calogero Vinti*, Perugia, Italy;
- 4-18/4-20-1997 meeting *Future Directions in Mathematical Sciences, Institute for Mathematics and its Applications , University of Minnesota*, Minneapolis, U.S.A.
- 5-23/5-28-1997 meeting *The conjecture of Mumford-Shah and related problems, Palazzone*, Cortona, Italy;
- 10-14/10-17-1997 meeting *Equazioni Differenziali e Calcolo delle Variazioni, Hotel Le Picchiae*, Picchiae, Isola d'Elba, Italy;
- 10–20/10-23-1997 *Convegno in memoria di Ennio de Giorgi, Scuola Normale Superiore* di Pisa, Italy;
- 6-21/6-25-1999 meeting *Shape Optimization and Related Topics, CIRM* Lumini (Marsiglia), France;
- 7-2/7-8-2000 workshop *Calculus of Variations, Mathematisches Forschungsinstitut Oberwolfach,* Oberwolfach, Germany;
- 7-4/7-6-2001 meeting *Variational methods for discontinuous structures, Villa Erba,* Cernobbio, Italy;
- 10-24/10-27-2001 workshop *The Mathematics of Ennio De Giorgi,* Scuola Normale Superiore of Pisa from October 24 to October 27, 2001;
- 11-8/11-11-2001 *Symposium to celebrate 75th birthday of James Serrin, School of Mathematics* of the *University of Minnesota*, Minneapolis, U.S.A.;
- 12-13/12-15-2001 meeting *Mathematical Models in Material Sciences,* December 1 Bressanone, Italy.
- 2-17/2-22-2002 *Geometric Measure Theory and Calculus of Variations*, Levico Terme (Trento) Italy;
- 6-30/7–6-2002 workshop *Calculus of Variations, Mathematisches Forschungsinstitut Oberwolfach,* Oberwolfach, Germany;
- 11-12/11-16-2002, workshop *Quasiconvexity and its applications,* Princeton University, Princeton, NJ, USA;

- 4-11/4-12-2003 *US/EU Meeting on Phase Transitions in Crystals and TMR Annual Meeting*, University of Minnesota, Minneapolis;
- 8-6/8-13-2011 workshop *Partial differential equations*, Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach, Germany;
- 9-26-/9-28-2011 workshop *Pattern Formation and Multiscale Phenomena in Materials*, University of Oxford, England;

### Reviews of Publications and Research Proposals

- referee for the journals *Advances in Calculus of Variations*; *Annali di Matematica Pura ed Applicata*; *Annali Scuola Normale Superiore di Pisa; Applied Mathematics and Optimization; Atti Sem. Mat. Fis. Univ. Modena; Calculus of Variations and Partial Differential Equations; Communications in Contemporary Mathematics; Communications in Partial differential Equations*; *Communications on Pure and Applied Mathematics*; *Comptes rendus -Mathematics journal; Differential Integral Equations; ESAIM: Control, Optimization and Calculus of Variations; Forum Mathematicum; Interfaces and Free Boundaries; International Journal of Mathematics and Mathematical Sciences; Journal of Differential Equations; Journal of the European Mathematical Society (JEMS)*; *Journal of Fixed Point Theory and Applications*; *Journal of Functional Analysis; Journal of Mathematical Analysis and Applications; Journal of Nonlinear Analysis; Journal of Nonlinear Science; Multiscale Modeling and Simulation, Proceedings Royal Society Edinburgh; Rendiconti del Circolo Matematico di Palermo; SIAM Journal Applied Mathematics; SIAM Journal on Control and Optimization; SIAM Journal of Mathematical Analysis; SIAM Multiscale Modeling and Simulation; Transactions American Mathematical Society*;
- reviewer for *Mathematical Reviews.*
- Reviewer of NSF and NSERC Research Proposals;

### Other scientific activities

- 1999-2002 coordinator of the research project (ex 60 %) *Mathematical models ad methods and their applications*, local unit with 11 members;
- Organizer, together with M. Morini and M. Rieger, of the workshop *Advances in Nonlinear Analysis*, Carnegie Mellon University, May 30-June 1, 2003;
- Organizer, together with I. Fonseca, D. Kinderlehrer and S. Ta'asan of a minisymposium on *Contemporary Calculus of Variations for Advanced Materials*, Fourth SIAM Conference on Mathematical Aspects of Materials Science, 24-25 May 2004, Hyatt Regency, Macy Plaza, Downtown Los Angeles;
- Organizer, together with I. Fonseca, D. Kinderlehrer and S. Ta'asan of *The second Summer School of the Center for Nonlinear Analysis* (CNA), Carnegie Mellon University, May 27, 2004 -June 5, 2004;
- Organizer, together with D. Kinderlehrer of the minisymposium *Calculus of Variations, PDE and Mass Transport*, SIAM Conference on Analysis of Partial Differential Equations, December 6-8, 2004, Houston, Texas;
- Organizer, together with I. Fonseca of the workshop *Workshop on the Calculus of Variations in 2005,* Carnegie Mellon University, October 17-19, 2005;
- Organizer, together with M. Foss of the *Special Session on Calculus of Variations*, 2005 Fall AMS Central Sectional Meeting, 21-23 October 2005, University of Nebraska-Lincoln.

- Organizer, together with I. Fonseca, R. Pego and K. Ramanan of *The third Summer School of the Center for Nonlinear Analysis* (CNA), Carnegie Mellon University, May 29–June 6, 2006;
- Organizer, together with I. Fonseca and M. Morini of the minisymposium *Contemporary Developments in Calculus of Variations and PDE*, SIAM Conference on Analysis of Partial Differential Equations, July 10-12, 2006, Boston, Massachusetts;
- Organizer, together with I. Fonseca, S. Hastings, S. Ta'asan and N. Walkington of *A conference on Applied Analysis on the occasion of the 65th birthday of David Kinderlehrer* (CNA), Carnegie Mellon University, October 19-21, 2006;
- Organizer, together with I. Fonseca and D. Kinderlehrer of the workshop *US-Chile Workshops: new Developments in Partial Differential Equations I*, Carnegie Mellon University, May 21-24, 2007.
- Organizer, together with I. Fonseca and D. Slepcev of the minisymposium *Energy Based Approaches to Nonlinear PDEs*, SIAM Conference on Analysis of Partial Differential Equations, December 10-12, 2007, Mesa, Arizona.
- Organizer, together with N. Fusco, of the Workshop " *New Trends in Calculus of Variations and Mass Transport*" Carnegie Mellon University, March 13-15, 2008.
- Organizer, together with I. Fonseca and D. Slepcev of the minisymposium *Variational Models for Advanced Materials*, SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, May 11-14, 2008.
- Organizer, together with I. Fonseca, D. Kinderlehrer, B. Pego, D. Slepcev, S. Ta'asan, N. Walkington of *The fourth Summer School of the Center for Nonlinear Analysis* (CNA), Carnegie Mellon University, May 29–June 6, 2008.
- Co-Chair, together with I. Gamba, of the SIAM conference on Analysis of Partial Differential Equations 09, Miami, Florida, December 7-9, 2009.
- Organizer, together with I. Fonseca of the minisymposium *New Frontiers in Calculus of Variations and Applications to Materials Science*, SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, May 23-26, 2010.
- Organizer, together with I. Fonseca and D. Slepcev of *The fifth Summer School of the Center for Nonlinear Analysis* (CNA), Carnegie Mellon University, June 07–June 12, 2010.
- Organizing committee, 2010 SIAM Annual Meeting, Pittsburgh, July 12-16, 2010.
- Organizer, together with I. Fonseca of the minisymposium *Recent Advances in Calculus of Variations and Partial Differential Equations*, 2010 SIAM Annual Meeting, Pittsburgh, July 12-16, 2010.
- Organizer, together with I. Fonseca and I. Tice of *The sixth Summer School of the Center for Nonlinear Analysis* (CNA), Carnegie Mellon University, May 30–June 7, 2013.
- Organizer, together with I. Fonseca of the minisymposium *Mathematical Methods for Epitaxial Grow*, SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, June 8-12, 2013.
- Organizer, together with Christoph Ortner and Florian Theil of the PIRE Workshop: Atomistic and Multi-Scale Models of Materials, University of Warwick, 15-18 September 2014.
- Organizer, together with John Ball, Robert Kohn, and Peter Palffy-Muhoray of the PIRE-Oxford Workshop, University of New York, January 2016.

- Organizer, together with Christoph Ortner, Irene Fonseca, and Stefan Mueller of 2016 PIRE-CNA Summer School New Frontiers in Nonlinear Analysis for Materials June 2-10, 2016. Center for Nonlinear Analysis, Carnegie Mellon University, Pittsburgh, PA.
- Organizer, together with Irene Fonseca, of the special session *New Trends in Calculus of Variations and Partial Differential Equations* at the AIMS conference in Orlando (Florida), July 1-5, 2016
- Management committee, Admissions Committee, and Program Committee for The CMU-Portugal ICTI Program in Applied Mathematics.
- Associate Director of the PIRE "PIRE: Science at the Triple Point Between Mathematics, Mechanics and Materials Science", 2011–2016.
- Associate Director of the Center for Nonlinear Analysis, January 2011–present.

## Current research interests

My current research interests lie in calculus of variations, partial differential equations and geometric measure theory with special emphasis on applications to problems in continuum mechanics, in materials science, and in imaging. Recent areas of focus have been: variational problems involving material defects, such as dislocations; the epitaxial growth of a thin film over a crystalline substrate; phase field models for anisotropic crystalline energies.

## Theses

- *Stabilità asintotica globale per sistemi variazionali della forma*

$$(g(r)\nabla_p G(u, u'))' + g(r)\{f(r, u) - \nabla_u G(u, u')\} = 0,$$

  Bachelor thesis, University of Modena (1990);
- *Existence and Asymptotic stability for perturbed Lagrangian and Hamiltonian systems*, Ph.D. thesis, University of Minnesota (1995);

## List of publications

(1) G. Leoni, M. Manfredini, and P. Pucci, *Stability properties for solutions of general Euler-Lagrange systems*, Differential and Integral Equations **5** (1992) 537–552;

(2) G. Leoni, *A note on a theorem of Pucci & Serrin*, J. Diff. Equations **113** (1994) 535–542;

(3) G. Leoni, *Asymptotic stability for perturbed Hamiltonian systems*, Archive Rational Mech. Anal. **128** (1994) 105–125;

(4) G. Leoni, *Existence of solutions for holonomic dynamical systems with homogeneous boundary conditions*, J. Nonlinear Analysis **23** (1994) 427–445;

(5) G. Leoni, *Asymptotic stability for the differential system* $u'' + \sigma(t)|u|^\alpha |u'|^\beta u' + f(u) = 0$, Advances in Differential Equations **1** (1996) 111–132;

(6) G. Leoni, *Asymptotic stability for perturbed Hamiltonian systems, II*, Annali Scuola Norm. Sup. Pisa Scien. Fis. Mat. Serie IV **XXIII** (1996) 531–549;

(7) G. Leoni, *A very singular solution for the porous media equation* $u_t = \Delta(u^m) - u^p$ *when* $0 < m < 1$, J. Diff. Equations **132** (1996) 353–376;

(8) G. Leoni, *Existence of solutions for strongly degenerate differential systems*, Calc. Var. Partial Differential Equations **5** (1997) 435–462;

(9) G. Leoni, *On very singular selfsimilar solutions for the porous media equation with absorption*, Differential and Integral Equations **10** (1997) 1123–1140;

(10) G. Leoni, *Classification of positive solutions for the elliptic equation* $\operatorname{div}(|\nabla u|^{p-2}\nabla u) + x \cdot \nabla(u^q) + \alpha\, u^q = 0$ *in* $\mathbb{R}^N$ Differential Equations **34** (1998) 1172-1180;

(11) I. Fonseca and G. Leoni, *Bulk and contact energies: relaxation and nucleation*, SIAM Journ. Math. Anal. **30** (1999) 190–219;

(12) P. Cermelli, M. Gurtin, and G. Leoni, *Energies for incoherent interfaces: an analytical approach*, Interfaces and Free Boundaries **1** (1999) 81–105;

(13) I. Fonseca and G. Leoni, *Some remarks on lower semicontinuity*, Indiana Univ. Math. J. **49** (2000) 617–635;

(14) A. Braides, I. Fonseca, and G. Leoni, *A-quasiconvexity: relaxation and homogenization*, ESAIM: Control, Optimization and Calculus of Variations, **5** (2000) 539–577;

(15) I. Fonseca and G. Leoni, *On lower semicontinuity and relaxation*, Proceedings Royal Society Edinburgh **131A** (2001) 519–565;

(16) P. Cermelli and G. Leoni, *Interfacial energies for incoherent inclusions*, Archive Rational Mech. Anal. **159** (2001) 335–361;

(17) I. Fonseca, G. Leoni, J. Malỳ and R. Paroni, *A note on Meyers' Theorem in* $W^{k,1}$, Trans. Amer. Math. Soc. **354** (2002) 3723–3741;

(18) S. Conti, I. Fonseca, and G. Leoni, *A Γ-convergence result for the two-gradient theory of phase transitions*, Comm. Pure Appl. Math. **55** (2002) 857–936;

(19) G. Bouchitté, I. Fonseca, G. Leoni, and L. Mascharenhas, *A global method for relaxation in* $W^{1,p}$ *and in* $SBV_p$, Arch. Ration. Mech. Anal. **165** (2002) 187–242;

(20) G. Leoni and M. Morini, *Some remarks on the analyticity of minimizers of free discontinuity problems*, J. Math. Pures Appl. **82** (2003) 533–551;

(21) I. Fonseca, G. Leoni, and R. Paroni, *On lower semicontinuity in* $BH$ *and 2-quasiconvexification*, Calc. Var. Partial Differential Equations **17** (2003) 283–309;

(22) V. De Cicco and G. Leoni, *A chain rule in* $L^1(\operatorname{div};\Omega)$ *and its applications to lower semicontinuity*, Calc. Var. Partial Differential Equations **19** (2004) 23–51;

(23) G. Dal maso, I. Fonseca, G. Leoni, and M. Morini, *Higher Order Quasiconvexity Reduces to Quasiconvexity*, Archive Rational Mech. Anal. **171** (2004) 55–81;

(24) I. Fonseca, G. Leoni, and S. Müller, *A-quasiconvexity: the gap problem*, Ann. Inst. H. Poincaré Anal. Non Linéaire **21** (2004) 209–236;

(25) I. Fonseca, G. Leoni, and R. Paroni, *On Hessian matrices in the space* $BH$, Commun. Contemp. Math. **7** (2005) 401–420;

(26) H. Koch, G. Leoni, and M. Morini, *On optimal regularity of free boundary problems and a conjecture of De Giorgi*, Comm. Pure Appl. Math. **58** (2005) 1051–1076;

(27) I. Fonseca, G. Leoni, and J. Malỳ *Weak continuity and lower semicontinuity results for determinants*, Archive Rational Mech. Anal. **178** (2005) 411–448;

(28) P. Cermelli and G. Leoni, *Renormalized Energy and Forces on Dislocations*, SIAM Journ. Math. Anal. **37** (2005) 1131–1160;

(29) G. Leoni and M. Morini, *Necessary and sufficient conditions for the chain rule in* $W^{1,1}_{\mathrm{loc}}\left(\mathbb{R}^N;\mathbb{R}^d\right)$ *and* $BV_{\mathrm{loc}}\left(\mathbb{R}^N;\mathbb{R}^d\right)$, J. Eur. Math. Soc. (JEMS) **9** (2007) 219–252;

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(31) I. Fonseca, N. Fusco, G. Leoni, and M. Morini, *Equilibrium configurations of epitaxially strained crystalline films: existence and regularity results*, Arch. Rational Mech. Anal. **186** (2007) 477–537;

(32) G. Dal Maso, I. Fonseca, G. Leoni, and M. Morini, *A higher order model for image restoration: the one dimensional case*, SIAM Journ. Math. Anal. **40** (2009) 2351–2391;

(33) A. Garroni, G. Leoni, and M. Ponsiglione, *Gradient theory for plasticity via homogenization of discrete dislocations*, J. Eur. Math. Soc. (JEMS) **12** (2010) 1231–1266;

(34) G. Dal maso, I. Fonseca, and G. Leoni, *Nonlocal character of the reduced theory of thin films with higher order perturbations*, Adv. Cal. Var. **3** (2010) 287–319;

(35) I. Fonseca, F. Maggi, G. Leoni, and M. Morini, *Exact reconstruction of damaged color images using a total variation model*, Ann. Inst. H. Poincaré Anal. Non Linéaire **27** (2010), no. 5, 1291–1331;

(36) G. Carita, I. Fonseca, and G. Leoni, *Relaxation in $SBV_p\left(\Omega; S^{d-1}\right)$*, Calc. Var. Partial Differential Equations **42** (2011) 211–255;

(37) N. Fusco, I. Fonseca, G. Leoni, and V. Millot, *Material voids in elastic solids with anisotropic surface energies*, J. Math. Pures Appl. **96** (2011) 591-639;

(38) G. Leoni and D. Spector, *Characterization of Sobolev and BV Spaces*, Journal of Functional Analysis **261** (2011) 2926-2958;

(39) M. Chermisi, G. Dal Maso, and I. Fonseca, and G. Leoni, *Singular perturbation models in phase transitions for second order materials*, Indiana Univ. Math. J. **60** (2011), 367-410;

(40) D. Arama and G. Leoni, *On a variational approach for water waves*, Comm. Partial Differential Equations **37** (2012), 833–874;

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(43) G. Leoni, *A remark on the compactness for the Cahn-Hilliard functional*, ESAIM: Control, Optimization and Calculus of Variations **20** (2014) 517–523.

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(45) I. Fonseca, N. Fusco, G. Leoni, and M. Morini, *Motion of three-dimensional elastic films by anisotropic surface diffusion with curvature regularization*. Anal. PDE 8 (2015), no. 2, 373–423.

(46) I. Fonseca and G. Leoni, *Calculus of variations*, ", 2015The Princeton Companion to Applied Mathematics", Princeton University Press.

(47) G. Dal Maso, I. Fonseca, G. Leoni, *Second order asymptotic development for the anisotropic Cahn-Hilliard functional*. To appear in Calc. Var. Partial Differential Equations.

(48) I. Fonseca, G. Leoni, X. Y. Lu, *Regularity for weak solutions of a continuum model for epitaxial growth with elasticity on vicinal surfaces*. To appear in Comm. Partial Differential Equations.

(49) G. Leoni and R. Murray, *Second-order Γ-limit for the Cahn–Hilliard functional*. To appear in Arch. Rational Mech. Anal.

(50) I. Fonseca, G. Hayrapetyan, G. Leoni, and B. Zwicknagl, *Domain formation in membranes near the onset of instability*. Submitted for publication.

(51) I. Fonseca, N. Fusco, G. Leoni, and M. Morini, In preparation.
(52) G. Dal Maso, I. Fonseca, G. Leoni, In preparation.
(53) I. Fonseca, G.Leoni, M.G. Mora, In preparation.
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(1) G. Leoni, *On the existence of fast-decay solutions for a quasilinear elliptic equation with a gradient term*, Atti Sem. Mat. Fis. Univ. Modena, Supplement to Vol. XLVI dedicated to Prof. Vinti (1998) 827–846;

(2) I. Fonseca and G. Leoni, *Relaxation in Micromagnetics*, Ricerche di Matematica, **XLIX** (2000), Supplement in memory of Ennio De Giorgi, 269-304;

(3) G. Leoni, *On lower semicontinuity in the Calculus of Variations*, Atti del Sedicesimo Congresso dell'Unione Matematica Italiana, Naples 13-18 September 1999, (2000) 537-556;

(4) I. Fonseca and G. Leoni, *Higher Order Variational Problems and Phase Transitions in Nonlinear Elasticity*, Progress in Nonlinear differentail Equations and Their Applications, Vol. 51, 117-140, 2002 Birkhauser;

## Books

- I. Fonseca and G. Leoni, *Modern Methods in the Calculus of Variations: $L^p$ Spaces*, Springer Monographs in Mathematics. Springer, New York, 2007.
- G. Leoni, *A First Course in Sobolev Spaces*, Graduate Studies in Mathematics. 105. Providence, RI: American Mathematical Society (AMS), 2009.
- I. Fonseca and G. Leoni, *Modern Methods in the Calculus of Variations: Sobolev Spaces*, in preparation, accepted for publication by Springer.