

## CV of Pietro Baldi

(update 25/07/2019)

### Personal information

Pietro Baldi

born 27/07/1977

Italian citizenship

married, two daughters

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### Current position

Associate professor (“professore di II fascia”) in Mathematical Analysis at the University of Naples Federico II, Naples, Italy, since 30/10/2015

Italian habilitation (ASN) to full professor position (“professore di I fascia”) in Mathematical Analysis, Probability and Mathematical Statistics since 27/07/2018

### Previous positions

Researcher (“ricercatore”) at the University of Naples Federico II since 1/11/2009 to 29/10/2015

Post-doc (“assegno di ricerca Forgiare”) at the same university since 1/10/2008 to 31/10/2009

Research Officer at the University of Bath, Bath, UK, since 1/10/2007 to 30/09/2008

### Education

PhD in Functional Analysis and Applications at SISSA, Trieste, under the supervision of Antonio Ambrosetti and Massimiliano Berti, 25/10/2007

Degree in Mathematics (cum laude) at the University of Padova under the supervision of Rosanna Bressan Villella, 27/03/2002

### Research interests

Dynamics of evolution PDEs, KAM theory for PDEs, Hamiltonian and dispersive PDEs, Hydrodynamics, Reducibility, Normal forms, Control of PDEs, Nash-Moser methods, Pseudo-differential and paradifferential calculus, Differential equations from geometric evolution problems

### Papers

25 papers, some of which published in high level journals: Invent. Math. · J. Europ. Math. Soc. (JEMS) · Arch. Ration. Mech. Anal. · Ann. Inst. H. Poincaré (C) Anal. Non Linéaire · Anal. PDE · Commun. Partial Diff. Eq. · J. Diff. Eq. · J. Funct. Anal. · etc. (see below for the complete list)

### Grants

1) *Principal Investigator* of a “STAR Junior Principal Investigator Grant 2013”, a local competition of University of Naples, with external evaluation procedure done by the ESF – European Science Foundation. Project title: *Water waves, PDEs and dynamical systems with small divisors*. Funding source: Fondazione San Paolo and University of Naples Federico II. Amount: 107.000 euro. Period: 31/1/2014 – 30/04/2016. The two referees put my project in the “top priority” list (the best five projects).

2) *Coordinator* of an Italian INdAM-GNAMPA 2019 project. Project title: *Hamiltonian dynamics and evolution PDEs*. Period: 11/3/2019 – 11/3/2020.

3) ERC Starting Grant 2012. Project title: *Hamiltonian PDEs and small divisor problems: a dynamical system approach* (proposal 306414). My role: *coordinator of the local unit* of Naples

(since November 2013), team member (until October 2013). Amount: 678.000 euro. Period: 1/11/2012 – 31/10/2018. PI of the project: Michela Procesi (University of Roma Tre).

4) Italian national PRIN grant 2012. Project title: *Variational and perturbative aspects of nonlinear differential problems*. Funding source: MIUR (Italian Ministry of University School and Research). Period: 8/3/2014 – 8/3/2017. PI of the project: Susanna Terracini (University of Torino). My role: team member.

5) Italian national PRIN grant 2009. Project title: *Critical Point Theory and Perturbative Methods for Nonlinear Differential Equations*. Period: 17/10/2011 – 17/11/2013. PI of the project: Susanna Terracini. My role: team member.

6) ERC Starting Grant 2008. Project title: *Hamiltonian PDEs: new connections between dynamical systems and PDEs with small divisors phenomena*. Period: 1/07/2008 – 30/06/2012. PI of the project: Massimiliano Berti (SISSA). My role: team member.

## Invited talks

- Erice, International School of Mathematics “G. Stampacchia”, September 2019. Workshop “New trends in propagation of linear and nonlinear wave phenomena”. My talk: *Size of data in implicit function problems and singular perturbations for nonlinear Schrödinger systems*.
- University of Roma Tor Vergata, February 2019. Invited by Riccardo Molle and Alfonso Sorrentino. My talk: *Control of water waves and quasilinear evolution PDEs*.
- University of Naples Federico II, November 2018. Conference “Analysis, Control and Inverse Problems for PDEs”. My talk: *Control of water waves and quasilinear evolution PDEs*.
- Isaac Newton Institute, Cambridge, UK, October 2017. Programme “Mathematics of sea-ice phenomena”, week “Ice-fluid interaction”. My talk: *Time quasi-periodic gravity water waves in finite depth*.
- University of Nice, France, January 2016. Conference “Seventh itinerant meeting in PDEs”. My talk: *Exact controllability for quasi-linear perturbations of KdV*.
- SISSA, Trieste, November 2015. Invited by Massimiliano Berti. My talk: *Exact controllability for quasi-linear perturbations of KdV*.
- University of Zurich, Switzerland, February 2015. Invited by Thomas Kappeler. My talk: *Gravity capillary standing water waves*.
- Pienza (Siena), October 2014. Conference “Asymptotic analysis of dispersive partial differential equations”. My talk: *Gravity capillary standing water waves*.
- Roma, September 2014. School and Workshop “KAM Theory and Dispersive PDEs”. My talk: *Water waves: an introduction*.
- St-Etienne de Tinée (University of Nice, France), February 2014. Winter school “Dynamics and PDEs”. My talk: *Gravity capillary standing water waves (a work in progress)*.
- Institut H. Poincaré, Paris, June 2013. “Analyse non-linéaire et EDP”, joint seminar ENS - Paris 6 - Paris 7. Invited by Thomas Alazard. My talk: *Quasi-periodic solutions for quasi-linear KdV*.
- CIRM, Luminy, Marseille (France), June 2013. Conference “HANDDY: Hamiltonian and Dispersive Equations”. My talk: *Quasi-periodic solutions of forced quasi-linear and fully nonlinear perturbations of Airy equations*.
- ENS - Ecole Normale Supérieure, Paris, June 2013. Workshop “Recent advances on water waves equations”. My talk: *Small divisors in the water waves equations*.
- St-Etienne de Tinée, February 2013. Winter school “Dynamics and PDEs”. My talk: *KAM for quasi-linear and fully nonlinear forced KdV*.
- Roma, September 2012. Conference “New perspectives in nonlinear PDEs”. My talk: *A KAM result for quasi-linear and fully nonlinear KdV*.
- Anacapri, June 2012. Conference “Hamiltonian PDEs”. My talk: *Toward quasi-periodic water waves*.

- Università di Milano, April 2012. Invited by Dario Bambusi. My talk: *Periodic solutions of fully nonlinear autonomous equations of Benjamin-Ono type*.
- St-Etienne de Tinée, February 2012. Winter school “Dynamics and PDEs”. My talk: *Periodic solutions of quasi-linear and fully nonlinear equations of Benjamin-Ono type*.
- Bologna, September 2011. “XIX Congresso dell'Unione Matematica Italiana”. My talk: *Soluzioni periodiche di equazioni di Benjamin-Ono (in Italian)*.
- Napoli, May 2011. Spring school “KAM and Cauchy theory for PDEs”. My talk: *Periodic solutions of quasilinear and fully nonlinear Benjamin-Ono equations*.
- St-Etienne de Tinée, February 2011. Winter school “Dynamics and PDEs”. My talk: *Toward periodic and quasi-periodic standing water waves*.
- Capri, October 2010. “Workshop on Hamiltonian PDEs”. My talk: *Toward periodic and quasi-periodic standing water waves*.
- Napoli, April 2009. Indam-ERC intensive period “New connections between dynamical systems and Hamiltonian PDEs”. My talk: *An introduction to water waves*.
- University of Oxford, December 2008. “South West Regional PDE Winter School”. My talk: *Periodic travelling water waves under thin ice*.
- EPFL - Ecole Polytechnique Fédérale de Lausanne, November 2008. Invited by Boris Buffoni. My talk: *Periodic travelling water waves under nonlinear elastic membranes*.
- Università di Napoli Federico II, November 2008. Invited by M. Berti. My talk: *Periodic travelling water waves under thin ice*.
- Capri, September 2008. Summer school “Hamiltonian PDEs and Variational Methods”. My talk: *Periodic travelling water waves under nonlinear elastic membranes*.
- Università di Parma, January 2008. Invited by Stefano Panizzi and Alberto Arosio. My talk: *Periodic solutions of forced Kirchhoff equations*.
- Università di Milano, September 2007. Invited by D. Bambusi. My talk: *Periodic solutions of forced Kirchhoff equations*.
- University of Loughborough, UK, July 2007. Conference “Dynamics Days Europe”. My talk: *Periodic solutions of forced Kirchhoff equations*.
- SISSA, Trieste, May 2007. My talk: *Periodic solutions of forced Kirchhoff equations*.
- SISSA, Trieste, April 2007. My talk: *An application of a Nash-Moser theorem to nonlinear wave equations*.
- Università di Napoli Federico II, May 2006. *Forced vibration of a string via Nash-Moser iterations*.
- SISSA, Trieste, April 2005. *Quasi-periodic solutions of nonlinear wave equations*.

### **Organization of scientific meetings**

- 2017, 2 March: one-day conference “A day in Nonlinear Analysis”, Napoli, as a member of the Scientific and Organizing Committee
- 2016, 5-10 September: International conference “Hamiltonian Dynamics, PDEs and Waves on the Amalfi coast”, Maiori, as a member of the Scientific and Organizing Committee
- 2013, 16-20 September: School and Workshop “Multiscale methods in small divisor problems”, Maiori
- 2012, 4-7 June: Conference “Hamiltonian PDEs”, Capri
- 2011, 14 October: Conference “Dynamics of PDEs”, Roma, Accademia dei Lincei
- 2011, 16-21 May: School on “KAM and Cauchy theory for PDEs”, Napoli
- 2011, 23-27 May: Conference on “KAM and Cauchy theory for PDEs”, Ravello
- 2010, 15-16 October: Workshop on “New connections between dynamical systems and Hamiltonian PDEs”, Capri
- 2009, 1 April–6 June: Indam intensive period “New connections between dynamical systems and Hamiltonian PDEs”, Napoli, Accademia Pontaniana.

- 2008, 8-12 September: Summer school on “Hamiltonian PDEs and Variational Methods”, Capri.

### Visiting periods

One-month visit in 2018 as an *invited professor* at Université Paris-Dauphine CEREMADE, invited by Eric Séré and Ivar Ekeland.

Short visits at the Ecole Polytechnique Fédérale de Lausanne EPFL (four days in November 2008, invited by Boris Buffoni) and Universität Zürich UZH (three days in February 2015, invited by Thomas Kappeler).

Several visits at the Ecole Normale Supérieure ENS of Paris (two-week visit in March 2011; one-week visit in July 2011; one-week visit in February 2012; two-week visit in June 2013; two-week visit in June 2014), invited by Thomas Alazard.

Two-month visit at the University of Bath, UK, in 2007, during my PhD course, invited by John Toland.

### Supervision of post-docs

Scientific supervisor of two post-doc positions (“assegno di ricerca”) at the University of Naples Federico II, cofunded by the grants STAR and ERC (see above), in the period 2014-2016: one 2-year position, held by Emanuele Haus, and one 1-year position, held by Giuseppe Florida.

### Supervision of theses

Supervisor of two theses for the Master Degree in Mathematics, one thesis for the Degree in Mathematics, and one thesis (on topics in Mathematical Analysis) for the Degree in Biomedical Engineering.

### Teaching

Several courses (mainly two courses per year) of “Mathematical Analysis I”, “Mathematical Analysis II”, “Mathematical Methods for Engineering”, and “Dynamical Systems”, for students of the degree courses in Mathematics and in Engineering, at the University of Naples, since academic year 2009-2010.

### List of papers

#### *Research papers*

- [1] P. Baldi, E. Haus, *Size of data in implicit function problems and singular perturbations for nonlinear Schrödinger systems*, preprint 2019 (arxiv:1906.12290).
- [2] P. Baldi, E. Haus, C. Mantegazza, *Existence of a lens-shaped cluster of surfaces self-shrinking by mean curvature*, preprint 2018 (arxiv:1811.07822).
- [3] P. Baldi, E. Haus, *On the existence time for the Kirchhoff equation with periodic boundary conditions*, preprint 2018 (arxiv:1805.01189).
- [4] P. Baldi, M. Berti, E. Haus, R. Montalto, *Time quasi-periodic gravity water waves in finite depth*, Invent. Math. 214 (2018), no. 2, 739-911.
- [5] P. Baldi, E. Haus, C. Mantegazza, *Non-existence of theta-shaped self-similarly shrinking networks moving by curvature*, Comm. Partial Differential Equations 43 (2018), no. 3, 403-427.
- [6] T. Alazard, P. Baldi, D. Han-Kwan, *Control of water waves*, J. Eur. Math. Soc. (JEMS) 20 (2018), no. 3, 657-745.
- [7] P. Baldi, E. Haus, R. Montalto, *Controllability of quasi-linear Hamiltonian NLS equations*, J. Differential Equations 264 (2018), no. 3, 1786-1840.
- [8] P. Baldi, E. Haus, *A Nash-Moser-Hörmander implicit function theorem with applications to control and Cauchy problems for PDEs*, J. Funct. Anal. 273 (2017), no. 12, 3875-3900.
- [9] P. Baldi, G. Florida, E. Haus, *Exact controllability for quasi-linear perturbations of KdV*, Anal. PDE 10 (2017), no. 2, 281-322.

- [10] P. Baldi, M. Berti, R. Montalto, *KAM for autonomous quasi-linear perturbations of KdV*, Ann. Inst. H. Poincaré (C) Anal. Non Linéaire 33 (2016), no. 6, 1589-1638.
- [11] P. Baldi, M. Berti, R. Montalto, *KAM for autonomous quasi-linear perturbations of mKdV*, Boll. Unione Mat. Ital. 9 (2016), no. 2, 143-188.
- [12] T. Alazard, P. Baldi, *Gravity capillary standing water waves*, Arch. Ration. Mech. Anal. 217 (2015), no. 3, 741-830.
- [13] P. Baldi, M. Berti, R. Montalto, *KAM for quasi-linear and fully nonlinear forced perturbations of Airy equation*, Math. Annalen 359 (2014), no. 1-2, 471-536.
- [14] P. Baldi, *Periodic solutions of fully nonlinear autonomous equations of Benjamin-Ono type*, Ann. Inst. H. Poincaré (C) Anal. Non Linéaire 30 (2013), no. 1, 33-77.
- [15] P. Baldi, J. Toland, *Steady periodic water waves under nonlinear elastic membranes*, J. Reine Angew. Math. 652 (2011), 67-112.
- [16] P. Baldi, J. Toland, *Bifurcation and secondary bifurcation of heavy periodic hydroelastic travelling waves*, Interfaces Free Bound. 12 (2010), no. 1, 1-22.
- [17] P. Baldi, *Periodic solutions of forced Kirchhoff equations*, Ann. Sc. Norm. Sup. Pisa, Cl. Sci. (5), Vol. VIII (2009), no. 1, 117-141.
- [18] P. Baldi, M. Berti, *Forced vibrations of a nonhomogeneous string*, SIAM J. Math. Anal. 40 (2008), no. 1, 382-412.
- [19] P. Baldi, M. Berti, *Periodic solutions of nonlinear wave equations for asymptotically full measure sets of frequencies*, Rend. Lincei Mat. Appl. 17 (2006), no. 3, 257-277.
- [20] P. Baldi, *Quasi-periodic solutions of the equation  $v_{tt} - v_{xx} + v^3 = f(v)$* , Discr. Cont. Dynam. Systems 15 (2006), no. 3, 883-903.

### ***Expository papers***

- [21] P. Baldi, M. Berti, E. Haus, R. Montalto, *KAM for gravity water waves in finite depth*, Rend. Lincei Mat. Appl. 29 (2018), no. 2, 215-236.
- [22] P. Baldi, E. Haus, C. Mantegazza, *On the Classification of Networks Self-Similarly Moving by Curvature*, Geometric Flows 2 (2017), no. 1, 125-137.
- [23] P. Baldi, E. Haus, C. Mantegazza, *Networks self-similarly moving by curvature with two triple junctions*, Rend. Lincei Mat. Appl. 28 (2017), no. 2, 323-338.
- [24] P. Baldi, M. Berti, R. Montalto, *KAM for quasi-linear KdV*, C. R. Acad. Sci. Paris, Ser. I 352 (2014), no. 7-8, 603-607.
- [25] P. Baldi, M. Berti, R. Montalto, *A note on KAM theory for quasi-linear and fully nonlinear forced KdV*, Rend. Lincei Mat. Appl. 24 (2013), no. 3, 437-450.