Scientific curriculum of Emanuele Haus

October 30, 2019

Personal data

- Date of birth: 31st July 1983
- Place of birth: Milan (ITALY)
- Citizenship: Italian
- Gender: male

Present position

- **(February 2019 - present)**: Tenure-track Assistant Professor (RTD-B) at the University of Roma Tre.

Previous positions

- **(December 2016 - January 2019)**: Fixed-term Assistant Professor (RTD-A) at the University of Naples "Federico II".
- **(November 2016 - December 2016)**: Research collaborator ("co.co.co.") at the University of Roma Tre, within the ERC project "HamPDEs – Hamiltonian PDEs and small divisor problems: a dynamical systems approach" (principal investigator: Michela Procesi).
- **(August 2014 - July 2016)**: "assegno di ricerca" (post-doc position) at the University of Naples "Federico II", within the STAR project "Water waves, PDEs and dynamical systems with small divisors" (principal investigator: Pietro Baldi) and the ERC project "HamPDEs – Hamiltonian PDEs and small divisor problems: a dynamical systems approach" (principal investigator: Michela Procesi, local coordinator: Pietro Baldi).
- **(March 2013 - July 2014)**: "assegno di ricerca" (post-doc position) at the University of Rome "La Sapienza", within the ERC project "HamPDEs – Hamiltonian PDEs and small divisor problems: a dynamical systems approach" (principal investigator: Michela Procesi).
- **(January 2012 - December 2012)**: post-doc position at the Laboratoire de Mathématiques "Jean Leray" (Nantes), within the ANR project "HANDDY – Hamiltonian and Dispersive equations: Dynamics" (principal investigator: Benoît Grébert).

Abilitazione Scientifica Nazionale **(National Scientific Qualification)**

- In 2018, I have obtained the Italian *Abilitazione Scientifica Nazionale* for the rôle of Associate Professor in the sector 01/A3 (Mathematical Analysis, Probability and Mathematical Statistics).

Qualification aux fonctions de Maître de Conférences

- In 2013, I have obtained the French *Qualification aux fonctions de Maître de Conférences* in Mathematics (section 25 of CNRS).

Education

- **(January 2009 - December 2011)**: *Ph.D. in Mathematics*, Università degli Studi di Milano, thesis defended in March 2012.
    - Title: "Dynamics of an elastic satellite with internal friction. Asymptotic stability vs collision or expulsion".
    - Advisor: prof. Dario Bambusi.
- **October 2008**: *Master's Degree in Mathematics and Applications*, Università degli Studi di Milano, 110/110 cum laude.
    - Title: "Perché la Luna mostra sempre la stessa faccia alla Terra?" ("Why does the Moon always show the same face to the Earth?").
    - Advisor: prof. Dario Bambusi.

Main research interests

- Nonlinear Hamiltonian and dispersive PDEs:
    - growth of Sobolev norms, beatings and energy cascade;
    - periodic and quasi-periodic solutions, KAM theory;
    - dynamical systems techniques, normal form.
- Dynamics of water waves.
- Control and Cauchy problems for PDEs.
- Nash-Moser type schemes.
- Dynamics of networks moving by mean curvature flow.
- Dynamics of a viscoelastic satellite in a gravitational field.

Publications and preprints

BH19 P. Baldi, E. Haus, "Size of data in implicit function problems and singular perturbations for nonlinear Schrödinger systems", preprint 2019 (arXiv:1906.12290).

HM19 E. Haus, A. Maspero, "Growth of Sobolev norms in time dependent semi-classical anharmonic oscillators", published online in *Journal of Functional Analysis*.

GHHMP19 M. Guardia, Z. Hani, E. Haus, A. Maspero, M. Procesi, "A note on growth of Sobolev norms near quasiperiodic finite-gap tori for the 2d cubic NLS equation", *Rendiconti Lincei - Matematica e Applicazioni*, Volume 30, Issue 4, pp. 865-880, 2019.

BHMa19 P. Baldi, E. Haus, C. Mantegazza, "Existence of a lens-shaped cluster of surfaces self-shrinking by mean curvature", *Mathematische Annalen*, Volume 375, Issue 3, pp. 1857-1881, 2019.

GHHMP18 M. Guardia, Z. Hani, E. Haus, A. Maspero, M. Procesi, "Strong nonlinear instability and growth of Sobolev norms near quasiperiodic finite-gap tori for the 2D cubic NLS equation", preprint 2018 (arXiv:1810.03694).

BH18 P. Baldi, E. Haus, "On the existence time for the Kirchhoff equation with periodic boundary conditions", to appear in *Nonlinearity*.

BBHM18a P. Baldi, M. Berti, E. Haus, R. Montalto, "Time quasi-periodic gravity water waves in finite depth", *Inventiones Mathematicae*, Volume 214, Issue 2, pp. 739-911, 2018.

BBHM18b P. Baldi, M. Berti, E. Haus, R. Montalto, "KAM for gravity water waves in finite depth", *Rendiconti Lincei - Matematica e Applicazioni*, Volume 29, Issue 2, pp. 215-236, 2018.

BHMo18 P. Baldi, E. Haus, R. Montalto, "Controllability of quasi-linear Hamiltonian NLS equations", *Journal of Differential Equations*, Volume 264, Issue 3, pp. 1786-1840, 2018.

BHMa18 P. Baldi, E. Haus, C. Mantegazza, "Non-existence of Theta-shaped self-similarly shrinking networks moving by curvature", *Communications in Partial Differential Equations*, Volume 43, Issue 3, pp. 403-427, 2018.

BH17 P. Baldi, E. Haus, "A Nash-Moser-Hörmander implicit function theorem with applications to control and Cauchy problems for PDEs", *Journal of Functional Analysis*, Volume 273, Issue 12, pp. 3875-3900, 2017.

BHMa17b P. Baldi, E. Haus, C. Mantegazza, "On the classification of networks self-similarly moving by curvature", *Geometric Flows*, Volume 2, pp. 125-137, 2017.

HP17 E. Haus, M. Procesi, "KAM for beating solutions of the quintic NLS", *Communications in Mathematical Physics*, Volume 354, Issue 3, pp. 1101-1132, 2017.

BHMa17a P. Baldi, E. Haus, C. Mantegazza, "Networks self-similarly moving by curvature with two triple junctions", *Rendiconti Lincei - Matematica e Applicazioni*, Volume 28, Issue 2, pp. 323-338, 2017.

BFH17 P. Baldi, G. Floridia, E. Haus, "Exact controllability for quasi-linear perturbations of KdV", *Analysis and Partial Differential Equations*, Volume 10, Issue 2, pp. 281-322, 2017.

GHP16 M. Guardia, E. Haus, M. Procesi, "Growth of Sobolev norms for the defocusing analytic NLS on $\mathbb{T}^2$", *Advances in Mathematics*, Volume 301, pp. 615-692, 2016.

HP15 E. Haus, M. Procesi, "Growth of Sobolev norms for the quintic NLS on $\mathbb{T}^2$", *Analysis and Partial Differential Equations*, Volume 8, Issue 4, pp. 883-922, 2015.

CHP15 L. Corsi, E. Haus, M. Procesi, "A KAM result on compact Lie groups", *Acta Applicandae Mathematicae*, Volume 137, pp. 41-59, 2015.

HB15 E. Haus, D. Bambusi, "Asymptotic behavior of an elastic satellite with internal friction", *Mathematical physics, Analysis and Geometry*, Volume 18, Issue 1, Article 14, 2015.

HT13 E. Haus, L. Thomann, "Dynamics on resonant clusters for the quintic non linear Schrödinger equation", *Dynamics of Partial Differential Equations*, Volume 10, Issue 2, pp. 157-169, 2013.

BH12 D. Bambusi, E. Haus, "Asymptotic stability of synchronous orbits for a gravitating viscoelastic sphere", *Celestial Mechanics and Dynamical Astronomy*, Volume 114, Issue 3, pp. 255-277, 2012.

Hau12 E. Haus, "Dynamics of an elastic satellite with internal friction. Asymptotic stability vs collision or expulsion", Ph.D. thesis, published by Ledizioni LediPublishing, 2013.

Condensed overview of my scientific production

- *Quasiperiodic solutions for PDEs*
  In [BBHM18a] we prove existence and linear stability of time-quasiperiodic solutions of the pure-gravity *water waves* equations in finite depth. To obtain such a result, we overcome several technical difficulties, due to the fully-nonlinear nature of the equations and to the fact that the linear frequencies grow sublinearly. The sublinear growth forces us to impose very weak Melnikov conditions, losing space derivatives. We compensate such a loss of

regularity by reducing the linearized operators obtained at each approximate quasi-periodic solution along the Nash-Moser iteration to constant coefficients up to sufficiently smoothing operators, using pseudo-differential changes of variables that are quasiperiodic in time. This result is also summarized in the note [BBHM18b].

In [CHP14] we give a linear stability result for time-quasiperiodic solutions of the nonlinear Schrödinger equation (NLS) on some compact Lie groups. The existence of such solutions had already been proved by Berti-Corsi-Procesi.

- *Normal forms, energy transfer and growth of Sobolev norms*

  I have devoted a substantial part of my research activity to the study of questions related to energy transfer in hyperbolic PDEs. In [HT13] we used Birkhoff normal form in order to prove long-time existence of "close-to-quasiperiodic" solutions of the quintic NLS on the circle, with energy exchange between the Fourier modes belonging to some "clusters" (the result for the single-cluster case had already been obtained by Grébert-Thomann). In [HP17], KAM theory is applied to prove infinite-time existence of quasiperiodic solutions with beatings for solutions essentially supported on a single cluster.

  We have also studied the phenomenon of energy cascade (which is closely related to weak turbulence and analogous to Arnold diffusion): one of the few mathematically precise ways of catching this phenomenon is to measure the growth of Sobolev norms. In [HP15] we proved growth of Sobolev norms for the quintic NLS on the two dimensional torus, while in [GHP16] we extended the result to analytic nonlinearities of any degree, also giving estimates of the time needed for such a growth. These two papers generalize the previous work by Colliander-Keel-Staffilani-Takaoka-Tao and by Guardia-Kaloshin on the cubic NLS. More recently, in the paper [GHHMP18], which deals with the 2D cubic NLS, we studied the long-time stability of the invariant finite-gap tori inherited from the 1D equation and showed that, under certain assumptions and over sufficiently long timescales, they exhibit a strong form of transverse instability in Sobolev spaces. The work [GHHMP18] is also motivated by an ambitious program, which aims at proving infinite energy cascade for the 2D cubic NLS. The result of [GHHMP18] is also summarized in the note [GHHMP19].

  In the paper [BH18], we perform a step of quasilinear normal form on the Kirchhoff equation on the n-dimensional torus and obtain that the cubic resonant terms do not contribute to the energy estimate in Sobolev spaces. This enables us to obtain a longer existence time for small amplitude solutions of the Cauchy problem with respect to the time given by the classical local theory.

  In the paper [HM19], we exhibit some solutions whose Sobolev norms grow over long times for some time dependent anharmonic quantum oscillators. The main idea is to construct an unbounded solution for classical time dependent unbounded oscillator, and to exploit the theory of semiclassical approximation via coherent states.

- *Control and Cauchy theory for PDEs*

  In [BFH17] we proved local internal controllability for quasi-linear perturbations of the KdV equation on the circle. The proof is based on a Nash-Moser approach and the inversion of the linearized operator is obtained via the techniques developed by Baldi-Berti-Montalto in the setting of KAM theory, combined by classical HUM method and Ingham inequality. This

result contained a small loss of regularity, which can be avoided by applying the Nash-Moser theorem that we proved in [BH17]; this result is a slight improvement of a classical theorem by Hörmander. In [BHMo18] we apply this new theorem, together with the reduction techniques developed by Feola-Procesi, and we prove local internal controllability for the quasi-linear Hamiltonian NLS on the circle.

In [BH19] we compare the size and regularity of data in different Nash-Moser type schemes: we show that, in the application to the Cauchy problem for a nonlinear Schrödinger system with singular (concentrating or fast oscillating) data as introduced by Texier and Zumbrun, we are able to improve a recent result by Ekeland and Séré in terms both of size of data and of regularity of the solution.

- *Networks evolving by mean curvature*
  In [BHMa18] we completed the classification of self-shrinking planar networks of curves with two triple junctions (a problem related to blow-up limits of networks moving by curvature), by proving non-existence of theta-shaped self-shrinkers. The result is also summarized in the note [BHMa17a]. In the proceeding [BHMa17b] the result is set in a broader context, with more emphasis given to the classification of self-shrinking networks, and with an introduction to the ongoing work on the higher-dimensional case. In [BHMa19], for clusters of surfaces moving by mean curvature in three-dimensions, we proved the existence of a lens-shaped self-shrinker.

- *Dynamics of a deformable satellite*
  My Ph.D. thesis [Hau12] dealt with a problem in celestial mechanics: I studied the dynamics of a deformable body with dissipation interacting with a Newtonian field, with particular attention to the question of the stability of the *synchronous* spin orbit interaction 1:1. In [BH12] we proved local asymptotic stability of the synchronous resonance in the case of a spherical body, while in [HB15] we gave a global result on the asymptotic dynamics, for bodies of any shape, stating that the satellite must collide with the source of the Newtonian field, be expelled to infinity, or be captured in synchronous resonance.

Member of the Ph.D. committee

- Since November 2019, I am member of the Ph.D. committee for the Ph.D. program in Mathematics at the Università degli Studi Roma Tre.

Research grant

- Grant winner as Principal Investigator of the research project *Stable and unstable dynamics in evolution PDEs* at Sapienza Università di Roma, within the program "Progetti di avvio alla ricerca 2014".

Teaching

- "Titolare del corso" (Main teacher of the class, together with L. Battaglia) of Functional Analysis for students of Mathematics, Università degli Studi Roma Tre, academic year 2019-2020.

- "Titolare del corso" (Main teacher of the class) of Analisi Matematica 2 for students of Mathematics, Università degli Studi Roma Tre, academic year 2019-2020.
- "Titolare del corso" (Main teacher of the class) of Analisi Matematica 2 for students of Mathematics, Università degli Studi Roma Tre, academic year 2018-2019.
- "Titolare del corso" (Main teacher of the class) of Analisi Matematica 2 for students of Automation, Biomedical, Computer, Electronic and Telecommunication Engineering, Università Federico II, Napoli, academic year 2017-2018.
- "Titolare del corso" (Main teacher of the class) of Analisi Matematica 2 for students of Civil, Environmental and Gestional Engineering, Università Federico II, Napoli, academic year 2016-2017.
- "Esercitazioni" (practical classes) of Analisi Matematica 1 for students of Biomedical Engineering, Università Federico II, Napoli, academic year 2015-2016.
- "Esercitazioni" (practical classes) of Analisi Matematica 2 for students of Biomedical Engineering, Università Federico II, Napoli, academic year 2015-2016.
- Tutor of Analisi Matematica 1 for students of Mathematics, Università Federico II, Napoli, academic year 2015-2016.

Research mini-courses

- In May 2019 I held a 5-hour course titled "Nonlinear dynamics of the Schrödinger equation with periodic boundary conditions", upon invitation, at the "Summer School on Recent Advances in Mathematical Fluid Dynamics", University of Southern California, Los Angeles.
- In April-May 2013, I held a mini-course (12 hourse) about current research on the topic "Growth of Sobolev norms for the nonlinear Schrödinger equation" at the University of Rome Sapienza. The course was oriented towards researchers and Ph.D. students.

Scientific organization

- Member of the scientific and organizing committees (with P. Baldi, N. Fusco and A. Verde) of the workshop "A day in nonlinear analysis" (Napoli, 2 March 2017).
- Member of the scientific and organizing committees (with P. Baldi, D. Bambusi, L. Biasco, V. Coti Zelati, W. Craig, R. Feola, B. Grébert, A. Maspero and M. Procesi) of the school and workshop "Hamiltonian dynamics, PDEs and Waves on the Amalfi coast" (Maiori, 5-10 September 2016).
- Member of the organizing committee (with L. Biasco, L. Corsi, R. Feola, P. Magrone and M. Procesi) of the "Roman summer school and workshop: KAM theory and dispersive PDEs" (Rome, 1-11 September 2014).

Refereeing activity

I have peer-reviewed papers for several mathematical journals, including:
- *Journal of the European Mathematical Society (JEMS)*
- *Communications in Partial Differential Equations*

- *Journal of Differential Equations*
- *Transactions of the American Mathematical Society*
- *Discrete and Continuous Dynamical Systems - Series A*
- *Journal of Mathematical Physics*
- *Nonlinearity*
- *Journal of Dynamics and Differential Equations*
- *Nonlinear Differential Equations and Applications (NoDEA)*
- *Mathematical Physics, Analysis and Geometry*
- *Bollettino dell'Unione Matematica Italiana*

Talks and seminars

- **June 2019**: "Strong Sobolev instability of quasi-periodic solutions of the 2D cubic Schrödinger equation", Workshop "Hamiltonian PDEs: KAM, Reducibility, Normal Forms and Applications", Casa Matemática Oaxaca, Mexico.
- **May 2019**: "Quasi-periodic gravity water waves in finite depth", PDE and Applied Math Seminar, UC Davis.
- **March 2019**: "Strong Sobolev instability of finite-gap solutions of the 2D cubic Schrödinger equation", Séminaire Géométrie EDP et Physique Mathématique, Université de Cergy-Pontoise.
- **December 2018**: "Quasi-periodic gravity water waves in finite depth", SISSA, Trieste.
- **June 2018**: "Time quasi-periodic gravity water waves in finite depth", Conference SPT2018 "Symmetry and Perturbation Theory", Santa Margherita di Pula (Sardinia).
- **April 2018**: "Growth of Sobolev norms and dynamics of the nonlinear Schrödinger equation on the torus", SISSA, Trieste.
- **February 2018**: "Time quasi-periodic gravity water waves in finite depth", School of Mathematics, Georgia Tech, Atlanta.
- **January 2018**: "Time quasi-periodic gravity water waves in finite depth", Università di Roma Tor Vergata.
- **November 2017**: "On the classification of networks self-similarly shrinking by curvature", Graduiertenkolleg Kolloquium, University of Regensburg (Germany).
- **September 2017**: "Growth of Sobolev norms for the nonlinear Schrödinger equation", seminar of the Math Workgroup, Università Federico II, Naples.
- **September 2017**: "Time quasi-periodic gravity water waves in finite depth", Conference IperPV2017 "XVII Italian Meeting on Hyperbolic Equations", Pavia.
- **June 2017**: "Non-existence of Theta-shaped self-similarly shrinking networks moving by curvature", Workshop "Curves and Networks in Geometric Analysis", Centro di Ricerca Matematica Ennio De Giorgi, Pisa.
- **April 2017**: "Oscillations and resonance: a universal phenomenon", Università Federico II, Naples.
- **February 2017**: "A Nash-Moser-Hörmander implicit function theorem with applications to control and Cauchy problems for PDEs", SISSA, Trieste.
- **February 2017**: "KAM for beating solutions of the quintic NLS", Séminaire d'Analyse, Laboratoire de Mathématiques Jean Leray, Nantes.
- **January 2017**: "KAM for beating solutions of the quintic NLS", Winter School "Dynamics and PDEs", Saint Étienne de Tinée (France).

- **December 2016**: "Dynamics of Hamiltonian PDEs on tori", Dipartimento di Matematica e Applicazioni, Università Federico II, Naples.
- **September 2016**: "Exact controllability for some quasi-linear PDEs", Dipartimento di Matematica, Università degli Studi di Milano.
- **September 2016**: "Exact controllability for quasi-linear perturbations of KdV", SIMAI2016, Milan.
- **July 2016**: "Growth of Sobolev norms for the NLS on $\mathbb{T}^2$", 11th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, Florida.
- **May 2016**: "Growth of Sobolev norms and beating effects for the NLS on tori", Università degli Studi Roma Tre.
- **February 2016**: "Growth of Sobolev norms for the NLS on $\mathbb{T}^2$", Analysis Seminar, School of Mathematics, Edinburgh.
- **October 2015**: "Exact controllability for quasi-linear perturbations of KdV", UPC, Barcelona.
- **September 2015**: "Growth of Sobolev norms for the NLS on $\mathbb{T}^2$", XX Congresso UMI (Italian Mathematical Union), Siena.
- **July 2015**: "Growth of Sobolev norms for the NLS on $\mathbb{T}^2$", Workshop "Trails in Quantum Mechanics and Surroundings", Como.
- **March 2015**: "Growth of Sobolev norms for the NLS on $\mathbb{T}^2$", Séminaire Analyse non-linéaire et EDP, Institut Henri Poincaré, Paris.
- **December 2014**: "Growth of Sobolev norms for the NLS on $\mathbb{T}^2$", Workshop "KAM and dispersive methods in Hamiltonian PDEs", Milan.
- **September 2014**: "Growth of Sobolev norms for the quintic NLS on $\mathbb{T}^2$", School "KAM theory and dispersive PDEs", Rome.
- **May 2014**: "Growth of Sobolev norms for the quintic NLS on $\mathbb{T}^2$", Conference SPT2014 "Symmetry and Perturbation Theory", Cala Gonone (Sardinia).
- **November 2013**: "Dynamics of the quintic non-linear Schrödinger equation on the n-dimensional torus", Dipartimento di Matematica, Università degli Studi di Milano.
- **September 2013**: "Growth of Sobolev norms for the quintic nonlinear Schrödinger equation", workshop "Multiscale methods in small divisor problems", Maiori (Amalfi coast).
- **September 2013**: "Asymptotic behavior of an elastic satellite with internal friction", International Meeting on Celestial Mechanics CELMEC VI, San Martino al Cimino - Viterbo.
- **May 2013**: "Dynamics on resonant clusters for the quintic non linear Schrödinger equation", Dipartimento di Matematica e Applicazioni, Università Federico II, Naples.
- **January 2013**: "Dynamics on resonant clusters for the quintic non linear Schrödinger equation", Dipartimento di Matematica, Università La Sapienza, Rome.
- **October 2012**: "Dynamics on resonant clusters for the quintic non linear Schrödinger equation", HANDDY workshop, Station Biologique de Roscoff.
- **April 2012**: "Asymptotic behavior of an elastic satellite with internal friction", Séminaire d'Analyse, Laboratoire de Mathématiques Jean Leray, Nantes.
- **February 2012**: "Asymptotic dynamics of an elastic satellite with internal friction", Dipartimento di Fisica, Università La Sapienza, Rome.

- **September 2011**: "Asymptotic stability of the synchronous resonance for an elastic satellite with internal friction", HANDDY workshop, Île Berder (Bretagne).
- **September 2011**: "Asymptotic stability of the synchronous resonance for an elastic satellite with internal friction", Laboratoire de Mathématiques Jean Leray, Nantes.
- **May 2011**: "Numbers and notes: from Pythagoras to Debussy", City hall, Treviglio (BG), Italy.
- **March 2011**: "Asymptotic stability of the synchronous resonance for a viscoelastic satellite", meeting of the Gruppo Nazionale di Fisica Matematica, Montecatini Terme.
- **February 2011**: "Asymptotic stability of the synchronous resonance for a viscoelastic satellite", Centro di Ricerca Matematica Ennio De Giorgi, Pisa.
- **April 2010**: "Taming infinity", School "Anna Frank", Varese (VA), Italy.
- **December 2009**: "Asymptotic stability of the 1:1 spin-orbit resonance. A dynamical model", seminar of the research group in Mathematical Physics, Università degli Studi di Milano.
- **October 2009**: "A viscoelastic dynamical model for the study of the asymptotic stability of the 1:1 spin-orbit resonance", meeting of the Gruppo Nazionale di Fisica Matematica, Montecatini Terme.

Conferences

I took part in the following conferences:

- **June 2019**: Workshop "Hamiltonian PDEs: KAM, Reducibility, Normal Forms and Applications", Casa Matemática Oaxaca, Mexico, **invited speaker**.
- **May 2019**: "Summer School on Recent Advances in Mathematical Fluid Dynamics", USC, Los Angeles, **invited lecturer** (5-hour course).
- **June 2018**: School JISD2018 "Jornades d'Interacció entre Sistemes Dinàmics i Equacions en Derivades Parcials", UAB, Barcelona.
- **June 2018**: Conference SPT2018 "Symmetry and Perturbation Theory", Santa Margherita di Pula (Sardinia).
- **May 2018**: "BeKAM International Meeting 2018", Institut d'Études Scientifiques Cargèse (Corsica).
- **February 2018**: "Variational Methods in Analysis, Geometry and Physics", Centro di Ricerca Matematica Ennio De Giorgi, Pisa.
- **October 2017**: "Conference on Hamiltonian Systems (a tribute to the memory of John N. Mather)", Ascona (Switzerland).
- **October 2017**: "Analysis and Dynamics", Congress in honour of Luigi Chierchia's 60th Birthday, Marina di San Gregorio (LE), Italy.
- **September 2017**: Conference IperPV2017 "XVII Italian Meeting on Hyperbolic Equations", Pavia.
- **June 2017**: Workshop "Curves and Networks in Geometric Analysis", Centro di Ricerca Matematica Ennio De Giorgi, Pisa, **invited speaker**.
- **March 2017**: Workshop "A day in nonlinear analysis", **member of the scientific and organizing committee**.
- **January 2017**: Winter School "Dynamics and PDEs", Saint Étienne de Tinée (France), **invited speaker**.
- **September 2016**: SIMAI2016, congress of the Italian Society of Industrial and Applied Mathematics, Milan, **invited speaker**.

- **September 2016**: "Hamiltonian dynamics, PDEs and Waves on the Amalfi coast" Maiori (SA), Italy, **member of the scientific and organizing committee**.
- **July 2016**: 11th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando (Florida), **invited speaker**.
- **September 2015**: XX Congresso UMI (Italian Mathematical Union), Siena, **invited speaker**.
- **July 2015**: Workshop "Trails in Quantum Mechanics and Surroundings", Como, **invited speaker**.
- **June 2015**: Summer School "Normal forms and large time behavior for nonlinear PDE", University of Nantes.
- **February 2015**: Winter School "Dynamics and PDEs", Saint Étienne de Tinée (France).
- **December 2014**: Workshop "KAM and dispersive methods in Hamiltonian PDEs", University of Milan, **invited speaker**.
- **November 2014**: Workshop "Dynamics and PDEs", Institut d'Études Scientifiques Cargèse (Corsica).
- **September 2014**: School and Workshop "KAM theory and dispersive PDEs", University of Rome La Sapienza, **member of the organizing committee**.
- **June 2014**: School JISD2014 "Jornades d'Interacció entre Sistemes Dinàmics i Equacions en Derivades Parcials", UPC, Barcelona.
- **May 2014**: Conference SPT2014 "Symmetry and Perturbation Theory", Cala Gonone (Sardinia).
- **January 2014**: "Conference on Hamiltonian PDEs: Analysis, Computations and Applications", Fields Institute, Toronto.
- **September 2013**: Workshop "Multiscale methods in small divisor problems", Maiori (Amalfi coast), **invited speaker**.
- **September 2013**: International Meeting on Celestial Mechanics CELMEC VI, San Martino al Cimino - Viterbo.
- **June 2013**: HANDDY conference "Equations Hamiltoniennes et dispersives", CIRM, Marseille.
- **October 2012**: HANDDY (Hamiltonian and Dispersive equations: Dynamics) workshop, Station Biologique de Roscoff, **invited speaker**.
- **July 2012**: "Nonlinear Hamiltonian PDEs", Ascona (Switzerland).
- **September 2011**: HANDDY (Hamiltonian and Dispersive equations: Dynamics) workshop, Île Berder (Bretagne), **invited speaker**.
- **May 2011**: School and Workshop "KAM and Cauchy theory for PDEs", Napoli-Ravello.
- **February 2011**: "Nonlinear dynamical systems and applications", CRM Ennio De Giorgi, Pisa, **invited speaker**.
- **September 2010**: Riemann International School of Mathematics "Nonlinear Differential Equations", Verbania (Italy).
- **April 2010**: 'Topological and Variational Methods in Nonlinear Analysis", Brescia (BS), Italy.
- **January 2010**: Winter School "Dynamics and PDEs", Saint Étienne de Tinée (France).
- **November 2009**: "Three dispersive days", University of Milan.
- **October 2009**: "Asymptotics in dynamics, geometry and PDEs, generalized Borel summation", Pisa.
- **September 2009**: International Meeting on Celestial Mechanics CELMEC V, San Martino al Cimino - Viterbo.

- **May 2009**: School and Workshop "New connections between dynamical systems and PDEs", Napoli-Maiori.

Youth mathematical competitions

- Trainer of the local contestants in Naples for the Mathematical Olympiad, 2016-2019.
- Member of the Italian team at the 42nd International Mathematical Olympiad, held in Washington DC, 2001.
- Gold medal at the 2001 Italian Mathematical Olympiad.
- Winner (1st classified) of the mathematical competition "Kangourou Italia", category Student, 2001.