

UNIVERSITÀ DEGLI STUDI DI MILANO

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[Roberto Feola] CURRICULUM VITAE

INFORMAZIONI PERSONALI (NON INSERIRE INDIRIZZO PRIVATO E TELEFONO FISSO O CELLULARE)

COGNOME	FEOLA
NOME	ROBERTO
DATA DI NASCITA	24 FEBBRAIO 1987

INSERIRE IL PROPRIO CURRICULUM (non eccedente le 30 pagine)

EDUCATION.

1. July 2006: "L.S.S. Stanislao Cannizzaro": High school diploma.
2. July 2009: University of "Roma Tre": Bachelor degree in Mathematics. Final mark: 110/110 cum laude. Date: 09/07/2009.
3. May 2012: University of "Roma Tre": Master degree in Mathematics. Title of the thesis: "Resonant tori and one-dimensional systems with quasi-periodic forcing". Advisor: Prof. G. Gentile. Final mark: 110/110 cum laude. Date: 17/05/2012.
4. February 2016: PHD at University of Roma "La Sapienza": Advisor: M. Procesi Title of the thesis: "Quasi-periodic solutions for fully nonlinear NLS". Date: 23/02/2016
5. November 2015/ October 2018: Post-DOC at SISSA - Trieste.

Current Position: Post-DOC at University of NANTES.

Research Interests. Differential equations and dynamical systems, small divisor problems, periodic and quasi-periodic solutions, Hamiltonian Pde's, KAM Theory, Nash-Moser Implicit Function Theorem. Para-differential calculus.

PUBLICATIONS.

1. L. Corsi, R. Feola, G. Gentile,
Lower-dimensional invariant tori for perturbations of a class of non-convex Hamiltonian functions,
Journal of Statistical Physics 150, No. 1, 156-180 (2013). DOI: 10.1007/s10955-012-0682-8,
arXiv:1209.2893
2. L. Corsi, R. Feola, G. Gentile,
Domains of analyticity for response solutions in strongly dissipative forced systems, J. Math Phys.
54 (2013), no. 12.
DOI: 10.1063/1.4836777, arXiv:1210.3998
3. L. Corsi, R. Feola, G. Gentile,
Convergent series for quasi-periodically forced strongly dissipative systems, Communications in
Contemporary Mathematics 16 (2014).
DOI: 10.1142/S0219199713500223, arXiv:1211.2125
4. R. Feola, M. Procesi,
Quasi-periodic solutions for fully nonlinear forced reversible Schrödinger equations, Journal of
Differential equations, 259(7): 3389–3447 (2015),
DOI: 10.1016/j.jde.2015.04.025, arXiv:1412.5786
5. L. Corsi, R. Feola, M. Procesi,
Finite dimensional invariant KAM tori for tame vector fields, Amer. Math. Soc. 372 : 1913-1983
(2019), DOI: <https://doi.org/10.1090/tran/7699>, arXiv:1611.01641
6. R. Feola, F. Iandoli,
Local well-posedness for quasi-linear NLS with large Cauchy data on the circle, Annales de l'Institut
Henri Poincaré C, Analyse non linéaire, 36(1) : 119-164 (2019), DOI: 10.1016/j.anihpc.2018.04.003,
arXiv:1711.02388
7. R. Feola, F. Giuliani, S. Pasquali,
On the integrability of Degasperis-Procesi equation: Birkhoff resonances and strong stability, Journal
of differential Equations, 266(6): 3390–3437 (2018),
DOI: 10.1016/j.jde.2018.09.003, arXiv:1802.00035
8. R. Feola, F. Giuliani, M. Procesi, Reducibility for a class of weakly dispersive linear operators
arising from the Degasperis Procesi equation, Dynamics of partial differential equations, 16(1): 25–
94 (2019), DOI: 10.4310/DPDE.2019.v16.n1.a2, arXiv:1806.06604
9. R. Feola, F. Giuliani, R. Montalto, M. Procesi
Reducibility of first order linear operators on tori via Moser's theorem, Journal of Functional
Analysis, 276(3) : 932-970 (2019), DOI: 10.1016/j.jfa.2018.10.009, arXiv:1801.04224

10. R. Feola, F. Iandoli, Long time existence for quasi-linear NLS with small Cauchy data on the circle, *Annali della Scuola normale superiore di Pisa, Classe di scienze*, DOI: 10.2422/2036-2145.201811003, arXiv:1806.03437
11. R. Feola, B. Grebért, Reducibility of Schrödinger equation on the Sphere, accepted on *International Mathematics Research Notices*, arXiv: 1905.11964
12. M. Berti, R. Feola, F. Pusateri, Birkhoff normal form for Gravity Water Waves, *Water Waves*. Springer Nature Switzerland AG (2020). DOI: 10.1007/s42286-020-00024-y

PREPRINT.

13. R. Feola, M. Procesi, KAM for quasi-linear autonomous NLS, preprint, arXiv:1705.07287
14. M. Berti, R. Feola, F. Pusateri, Birkhoff normal form and long time existence for pure gravity water waves in infinite depth. arXiv:1810.11549
15. R. Feola, F. Giuliani, M. Procesi, Reducible KAM tori for Degasperis-Procesi equation, arXiv:1812.08498
16. M. Berti, R. Feola, L. Franzoi, Quadratic life span of periodic gravity-capillary water waves. arXiv: 1905.05424
17. R. Feola, B. Grebért, T. Nyungen Reducibility of Schrödinger equation on a Zoll manifold with unbounded potential. arXiv:1910.10657

IN PREPARATION

- R. Feola, F. Giuliani, KAM theory for Water Waves.
- R. Feola, F. Iandoli, A Nonlinear Egorov Theorem and Normal forms theory for quasi-linear Schrödinger equation.
- R. Feola, F. Iandoli, On the well-posedness for quasilinear Schrödinger equation on tori.

RESEARCH ACTIVITIES.

Dynamical systems: I studied KAM theory for finite dimensional Hamiltonian systems. In particular (in [1]) I proved the persistence of “lower dimensional tori” by using a multi-scale analysis and resummation procedures of divergent series. In [2] and [3] I proved the existence of response solutions for mechanical systems in presence of large dissipative forces.

Reducibility: The general problem of reducibility for linear differential systems with time quasi periodic coefficients is to prove that they reduces, using “regular” changes of coordinates, to some autonomous system for most values of the frequency vector. In particular I studied “weakly” dispersive linear operators arising from the Degasperis-Procesi equation ([8]), first order linear operators on tori ([9]), linear, unbounded, Schrödinger operators on Zoll manifolds ([11], [17]).

KAM theory, quasi-linear PDEs: I proved the existence of quasi periodic solutions for some quasi-linear PDEs. In [4] I consider a “forced” Schrödinger equation with unbounded non linearity. More recently I consider the Degasperis-Procesi equation (a model for non linear shallow water dynamics). The strategy of the proofs are based on a combination of a Nash- Moser Implicit function theorem (to overcome the issue of small divisors) and reducibility of unbounded, non constant coefficients operators. Pseudo-differential calculus play a fundamental role in the latter argument. In [5] I proved an abstract theorem for the construction of invariant tori for “tame” vector field.

Integrable PDEs: I studied a dispersive equation which possesses infinitely many constants of motion: the Degasperis-Procesi. In particular I showed that such constants of motion control the Sobolev norms of the solution near the origin. This implies that the solutions, evolving from small initial data, are defined globally in time. I also studied the algebraic properties of the constants of motions proving that the formal Birkhoff normal form of the Degasperis-Procesi at any order is action-preserving.

Well-posedness, Dispersive equations, energy method: I considered quasi-linear Schrödinger type equations (in [6], [10]). I studied the associated Cauchy problem proving existence of solutions (in Sobolev spaces) evolving from both small and large initial data. For small data, under some assumptions on the nonlinearity, I proved that actually such solutions exists for very long time scales.

Birkhoff normal form: I proved long time existence results for periodic, gravity or gravity- capillary, water waves equations ([12], [14], [16]). I used techniques of Birkhoff normal forms techniques combined with tools of para-differential calculus. These results also required the study of conjugations of para-differential operators under flows, and a novel normal form identification arguments to handle resonances. The result [14] proves a conjecture of the integrability, at order four, of gravity water waves in infinite depth.

TEACHING.

1. A.A. 2008-09: Tutor for the course “Differential Equations and Mechanics” (Prof. G. Gentile), at the Mathematics department, University of “Roma Tre”.
2. A.A. 2009-10: Tutor for the course “Differential Equations and Mechanics” (Prof. G. Gentile), at the Mathematics department, University of “Roma Tre”.
3. A.A. 2010-11: Tutor for the courses “Differential Equations and Mechanics” (Prof. G. Gentile) and “Preparation for the Final Exam” (Prof. G. Gentile and Prof. A. Bruno), at the Mathematics department, University of “Roma Tre”.

4. A.A. 2011-12: Tutor for the course “Differential Equations and Mechanics” (Prof. A. Giuliani), at the Mathematics department, University of “Roma Tre”.
5. A.A. 2013/2014: Assistant for the course “Partial Differential Equations” (Prof. A. Pellegrinotti), at the Mathematics department, University of “Roma Tre”
6. A.A. 2014/2015: Assistant for the course “Istituzioni di Analisi Superiore” (Prof. U. Bessi), at the Mathematics department, University of “Roma Tre”
7. 2016/2017 Mentoring of PhD student Filippo Giuliani, with Prof. M. Berti. Title of the thesis: “KAM for quasi-linear PDE’s”.
8. 2017/2018 PhD advisor for Felice Iandoli, with Prof. M. Berti.
Title of the thesis: “Local and almost global solutions for fully-nonlinear Schrödinger equations on the circle”.

Conferences.

1. September 2012: conference “PDE’s in Rome: School and Conference” in Rome;
2. February 2013: winter School: “Dynamics and Pde’s” in Saint-Etienne de Tinnée
3. June 2013: HANDDY Conference: “Hamiltonians and Dispersive Equations: Dynamics”, CIRM-Marseille;
4. January 2014: conference in Toronto “Hamiltonian PDEs: Analysis Computations and Applications”;
5. February 2014: Winter school: Dynamics and PDEs, Saint- Etienne de Tinée;
6. June 2014: Workshop on interactions between Dynamical Systems and Partial Differential Equations in Barcellona;
7. September 2014: conference “KAM Theory and Dispersive PDE’s” in Rome; talk about “Quasi-Periodic solutions for quasilinear forced NLS”;
8. July 2016: summer schools “Nonlinear Waves 2016” in Paris ; 4
9. September 2016: conference “Hamiltonian Dynamics, PDEs and Waves on the Amalfi coast”;
10. February 2017: winter school “Dynamics and PDEs” in Saint-Etienne de Tinnée, France;
11. May 2018: School and Conference on Nonlinear Waves in Atlanta (US);

12. July 2018: EMS Lectures Summer School, Roma “Tor Vergata”;
13. September 2018: XLIII Summer School On Mathematical Physics in Ravello ;
14. May 2019: “Leaning tori” An Hamiltonian Event under the Tower, Pisa Centro “De Giorgi”;
15. June 2019: Hamiltonian PDEs: KAM, Reducibility, Normal Forms and Applications, Oaxaca BIRS-CMO;

Talks and seminars.

1. September 2013: conference “Multiscale Methods in small divisors problem” Maiori. Talk about “Quasi-Periodic Solutions for quasi-linear forced NLS”;
2. November 2016: invited speaker to Nantes by Prof. Benoit Grébert. Talk: “KAM theory for quasi-linear NLS”;
3. March 2017: invited speaker to RomaTre by Prof. Michela Procesi. Talk about almost global existence for quasi-linear NLS on the circle;
4. December 2017: invited speaker to Naples by Prof. Pietro Baldi. Talk: “ Local well-posedness for quasi-linear NLS with large Cauchy data on the circle”;
5. July 2018: invited speaker to RomaTre by Prof. Michela Procesi. Talk about long time existence for periodic gravity water waves;
6. September 2018: seminar at “XLIII Summer School On Mathematical Physics - Ravello 2018: “BNF for Water waves”;
7. November 2018: seminar at l’University of Nantes”: Birkhoff normal form and long time existence for periodic gravity water waves;
8. June 2019: seminar at “Hamiltonian PDEs: KAM, Reducibility, Normal Forms and Applications” - Oaxaca 2019: “ Birkhoff normal form for periodic water waves”;
9. July 2019: invited speaker at “University of Toronto” by Prof. Fabio Pusateri. Title: “Reducible KAM tori for Degasperis-Procesi equation”;
10. October 2019: invited speaker at “University Paris13”-LAGA by Prof. Jean-Marc Delort. Title: “Birkhoff normal form for periodic water waves”;

VARIA.

1. 2012 First certificate at British Council
2. 2003 European Computer Driving License

LANGUAGES SKILLS.

1. Italian: mother language
2. English: Upper intermediate (written and spoken)
3. French: Basic knowledge.

Data

28/02/2020

Luogo

Nantes