Procedura di valutazione comparativa per trasferimento per n. 2 posti di Ricercatore Universitario per la Macro-area A Settore Scientifico-Disciplinare MAT 05

MICHELA PROCESI Curriculum Vitae

Roma 6-11-2011

Part I – General Information

Full Name	Michela Procesi
Date of birth	21-03-1973
Place of Birth	Roma
Citizenship	Italian
Permanent Adress	Via delle Mimose 9, Roma IT
Mobile Phone Number	3489261880
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Spoken Languages	italian, english, french

Part II – Education

University Graduation: YEAR 1998 Università di Roma La Sapienza, Degree in Physics on 27/5/97, grade 110/110 e Lode, discussing the thesis:

Onde non-lineari, metodo multiscala ed integrabilità (Non linear waves, multiscale methods and integrability)
Advisor: prof. A. Degasperis

Ph. D. (YEAR 2002) in Mathematics at the Università degli Studi di Roma La Sapienza, on 07/02/2002

Estimates on Hamiltonian splittings: Tree techniques in the theory of homoclinic splitting and Arnold diffusion for a-priori stable systems
Advisor: prof. L. Chierchia.

Part III – Academic Appointments

Start	End	Institution	Position
2002	2004	S.I.S.S.A. Trieste	assegno di ricerca
2005	2006	Universita' Roma 3	assegno di ricerca
2006	2007	IndAM- Universita' Roma 3	borsa post-doc Francesco Severi
2007	_	Universita' di Napoli Federico II	ricercatore S.D. MAT05 facolta' Scienze M.F.N.

during the assegno di ricerca at SISSA I have been on maternity leave from jan 2002 to may 2003.

Part IV – Teaching experience

as a PH. D. Student

Esercitazioni di Analisi II University of Roma 3 (2000-2002)
Esercitazioni di Metodi Matematici della Fisica University of Roma La Sapienza (2000)

In the University of NAPLES
A.A. 2007-2008

Esercitazioni del corso di ``Fondamenti di Analisi superiore I'' corso di laurea triennale in Matematica prof. Coti Zelati

Esercitazioni del corso di ``Istituzioni di Matematiche I '' corso di Laurea Triennale in Chimica industriale prof. Giarrusso

Esercitazioni del corso di ``Fondamenti di Analisi superiore II'' corso di laurea specialistica in Matematica prof. Coti Zelati

A.A. 2008-2009

Corso ed esercitazioni di `` Istituzioni di Matematica e Laboratorio'' corso di laurea triennale in Scienze Biologiche, gruppo 7.

Esercitazioni di ``Ìstituzioni di Matematica e Laboratorio'' corso di laurea triennale in Scienze Biologiche, gruppo 3. prof. Biacino

A.A. 2009-2010

Corso ed esercitazioni di ``Ìstituzioni di Matematica e Laboratorio'' corso di laurea triennale in Scienze Biologiche, gruppo 3.

Esercitazioni di ``Analisi Matematica I'' corso di Laurea triennale in Matematica prof. Stroffolini.

A.A. 2010-2011

Ottobre-Gennaio:

Esercitazioni di ``Ìstituzioni di Matematica e Laboratorio" corso di laurea triennale in Scienze Biologiche, gruppo 3. prof. Sbordone.

Esercitazioni di ``Analisi Matematica I" corso di Laurea triennale in Matematica prof. Sbordone

I have also been actively involved in the formation of (young) researchers, both in Napoli (where I have co-supervised the Ph.D. student Magistrelli and the post-docs Xu e Pinzari) and in Roma (Livia Corsi), in the organization of international events in the field of Hamiltonian PDEs (Capri, Napoli, Maiori, Ravello) as well as in the organization of cycles of seminars in the university of Naples.

Part V -- Society memberberships, Awards and Honors

Member of Indam Group GNAFA

Part V - Funding Information [grants as PI-principal investigators or I-investigator]

participant in the Ideas-ERC grant "Hamiltonian Partial Differential Equations: New Connections between Dynamical systems and PDEs with small divisors phenomena" PI: Massimiliano Berti, the grant expires july 2012.

participant in the Prin 2009 grant "Teoria dei punti critici e metodi perturbativi per equazioni differenziali nonlineari". National coordinator: S. Terracini, local coordinator: M. Berti. We have a funding of 2500 euro each covering two years.

Part VI – Research Activities

KEYWORDS: **Integrable equations, Dynamical Systems, Hamiltonian PDEs, Nash-Moser theory, Normal forms, KAM theory.**

BRIEF DESCRIPTION

Integrable equations: In my undergraduate thesis I have developed a test (based on asymptotic expansions) to check integrability for PDEs in 1+1 dimensions. This test was used successfully to discover a new integrable equation -the Degasperis-Procesi equation- which is widely studied for its applications to hydrodynamics.

Dynamical Systems: In my Ph.D. thesis I have worked on the problem of **homoclinic splitting and Arnold diffusion**. I have mostly used the diagrammatic techniques developed by Gallavotti and his group. One of my main contribution in this field has been the finding a new conserved quantity, which enabled me to prove a long standing conjecture by Gallavotti on the dominance of the analytic part of the splitting matrix in a-priori stable multi time-scale systems.

Hamiltonian PDEs: As a post-doc at SISSA I have been able to get into contact with a different approach to the dynamics of Hamiltonian PDEs, the one more closely related to calculus of variations. In this period I had the opportunity to combine freely this approach together with the renormalization theory one. In collaboration with Gentile and Mastropietro we introduced the **Lindstedt series approach to PDEs.** My first results were on the existence of periodic solutions for the completely resonant wave equation in one dimension [GMP]. These were (contemporarily

with the work by Berti--Bolle) the first breakthrough results of this kind, when the frequency is in a positive measure set, which requires dealing with the very complicated interactions between the bifurcation and small--divisor problems. This paper put the basis for the application of Lindstedt series to PDEs. I have then worked on periodic solutions in high dimensional systems, where the second Melnikov condition does not hold. In collaboration with Gentile I have proved the existence of wave packet solutions for the completely resonant NLS and Beam equations with Dirichlet b.c. using combinatorial methods to solve the bifurcation equation.
In the paper [P] I considered the case of a completely resonant wave equation in 1d and 2d and proved the existence of quasi-periodic solutions with two frequencies. The main idea is to introduce an invariant subspace, on which the equation simplifies significantly. This was the first result on quasi-periodic solutions for this equation, it inspired a paper by P. Baldi and was generalized in [BP], where variational methods play a fundamental role. Successively Yuan studied the case d=1 any number of frequencies (via KAM methods). In higher dimension there is now a preprint by Wang.

Nash-Moser theory: With Berti and Bolle I have proposed an abstract Nash-Moser algorithm which has proved of considerable use for small divisor problems in PDEs. I have proved, with M. Berti, the existence of periodic solutions for NLS and NLW on a compact homogeneous manifold. This groundbreaking result is at the moment the only work on such general manifolds (and we believe that it is just a starting point of a larger program), since the other literature studies only the case of tori or Zoll manifolds (the rank 1 case) which are considerably simpler.

Normal forms: In collaboration with C. Procesi I have proved the existence of approximate integrable normal forms for the completely resonant NLS on the torus. The construction requires a subtle interplay between combinatorics, algebra, algebraic geometry and dynamics. This algebro-combinatoric approach is a very innovative way of studying *the geometry of the set of singular site*s which allowed us to give a very accurate analysis of the structure of the NLS and thus prove a reducibility result without the use of the second Melnikov condition.

KAM theory: together with X. Xu (post.doc in Naples) I have studied the NLS on a torus. In this context I have introduced the set of quasi-Töplitz functions which simplifies and generalizes the notion of Töplitz-Lipschitz matrices of Eliasson-Kuksin.

Part VII – Summary of Scientific Achievements

PRODUCT TYPE	NUMBER	DATA-BASE	start	end
papers(international)	15	math. Rev.	1999	2011

Total Impact Factor	18.63
Total Citations	152
Average Citations per product	10.9
Hirsch (H) index	5
Normalized H index	0.63

The total impact factor is the sum of the impact factors of the journals (in the respective years) taken from ISI. The citations are taken from Math. Rev. Normalized index 0.63= 5/ 8 (9 years form Ph. D. minus one year maternity)

Part IX – Publications

[1] A. Degasperis, M. Procesi: Asymptotic Integrability, in Proceedings of the International Workshop on Symmetry and Perturbation Theory SPT98, A. Degasperis, G. Gaeta ed. World Scientic Press pp. 23-37.

This paper has 100 citations on MR, 144 on ISI Web of Science

[2] M. Procesi: Exponentially small splitting and Arnold diffusion for multiple time scale systems Rev. Math. Phys. 15, 4 (2003), pp. 339-386 (1 citation)

[3] G. Gentile, V. Mastropietro, M. Procesi: Periodic solutions of completely resonant nonlinear wave equations Comm. Math. Phys. 256, 2 (2005), pp. 437-490 (21 citations)

[4] M. Procesi: Quasi-periodic solutions for completely resonant nonlinear wave equations in 1D and 2D. Discr. Cont. Dyn. Syst. A 13, 3 (2005) pp. 541-552 (10 citations)

[5] G. Gentile, M. Procesi: Conservation of resonant periodic solutions for the one dimensional nonlinear Schrödinger equation, Comm. Math. Phys. 262, 3 (2006), pp. 533-553. (5 citation)

[6] M. Berti, M. Procesi: Quasi-periodic solutions of completely resonant forced wave Comm. in PDEs 31 , 6 (2006), pp.959-985. (8 citations)

[7] Berti, M. Procesi: Quasi-periodic oscillations for wave equations under periodic forcing Rendiconti Mat. Acc. Naz. Lincei. s.9 16 (2005) pp. 109-116.

[8] V. Mastropietro, M. Procesi: Lindstedt series for periodic solutions of beam equations under quadratic and velocity dependent nonlinearities Comm. Pure Appl. Anal. 5, 1, (2006) pp. 1-28

[9] G. Gentile, M. Procesi: Periodic solutions for the Schrödinger equation with non-local smoothing nonlinearities in higher dimension. J. Diff. Eq. Vol. 245, (2008) pp. 3253-3326 (4 citations)

[10] G. Gentile, M. Procesi: Periodic solutions for a class of nonlinear partial differential equations in higher dimension. Comm. Math. Phys. vol. 289; pp. 863-906 (2009) (3 citations)

[11] M. Berti, P. Bolle, M. Procesi: An abstract Nash Moser theorem with applications to non linear PDEs Annales Inst. Poincaré vol. 27; (2010) pp. 377-399.

[12] M. Berti, M. Procesi: Nonlinear wave equations on Compact Lie groups and homogeneous manifolds. Duke Math. J. Vol. 159, n. 3 (2011), p. 479-538.

[13] L. Corsi, G. Gentile, M. Procesi: KAM theory in configuration space and cancellations in the Lindstedt series Communications in Mathematical Physics 302 (2011), no. 2, 359-402.

[14] M. Procesi: A normal form for beam and non-local nonlinear Schrödinger equations J. Phys. A: Math. Theor. Vol: 43 (2010) n. 434028

[15] C. Procesi, M. Procesi: A Normal Form for the Schrödinger equation with analytic non—linearities Comm. Math. Phys. To appear

preprints:

[16] Procesi M. and Xu X.: Quasi-Töplitz Functions in the KAM Theorem, arxiv: 1102.1066

[17] Berti M., Biasco L., Procesi M.: KAM theory for the Hamiltonian derivative wave equation arXiv: 1111.3905

Roma, 7-11-2011

Michela Procesi