

# CURRICULUM VITÆ ET STUDIORUM

## GIANLUCA PANATI

### Personal Data

**Birth:** born in Verona (Italy) in 1974

**Nationality:** Italian

**Address:** Dipartimento di Matematica  
Università di Roma “La Sapienza”  
Piazzale Aldo Moro 2  
00185 ROMA (ITALY)

**Telephone:**

**E-mail:**

### Professional Status

2015-today Associate Professor of Mathematical Physics, Department of Mathematics,  
University of Rome “La Sapienza”, Rome, Italy.

2007-2012 Visiting Professor (during the summer semester),  
SISSA International School for Advanced Studies, Trieste, Italy.

2006-2015 Researcher (*Ricercatore*) in Mathematical Physics (**tenured** academic position),  
University of Rome “La Sapienza”, Rome, Italy.

2002-2006 Post-doc Researcher, Technische Universität München, Munich, Germany.

### Education, Degrees and Habilitations

**Habilitations:** French system: *Qualification de Professeur des Universités* (2010), Section 25  
(Mathematics).  
Italian system: *Abilitazione Scientifica Nazionale*, National Habilitation to the  
rôle of University Professor, Section 01/A4 (Mathematical Physics).

**Ph. D.:** *Doctor Philosophiae (Ph.D.) in Mathematical Physics*,  
SISSA International School for Advanced Studies, Trieste, Italy (17.10.2002).  
Thesis: “Space-adiabatic decoupling of Quantum Dynamics”.  
Supervisors: G. Dell'Antonio and H. Spohn.

**Master:** *Master in Physics*, University of Milan, Milan, Italy (7.7.1998).  
Grade: 110/110 cum laude (maximal grade in the Italian system).  
Thesis: “A mathematical problem in Quantum Scattering Theory: the Flux-  
across-surfaces theorem in the case of point interaction”.  
Supervisors: G. Dell'Antonio and A. Teta.

**Languages:** **Italian:** mother tongue. **French:** good, oral and written.  
**English:** fluent, oral and written. **German:** good, oral and written.

## Awards and honours

- 2021 Organizer of the thematic session "Quantum Mechanics and Spectral Theory" at the *XX International Congress on Mathematical Physics*, Geneve, August 2021.
- 2019 Recipient of the **Friedrich Wilhelm Bessel Research Prize** awarded by the Alexander von Humboldt Foundation (Germany).
- 2017 Invited Lecturer at the "*Tosio Kato Centennial conference*", University of Tokyo, Japan. September 4-9, 2017. [Only under-50 invited speaker].
- 2014 Invited session speaker at the *XVIII International Congress on Mathematical Physics*, Santiago de Chile, July 2015.
- 2011 Selected among the "*Best Young Researchers*" by Atomium Culture (an initiative of the EU Commission, see [www.atomiumculture.eu](http://www.atomiumculture.eu))



**Alexander von Humboldt**  
Stiftung/Foundation

## Distinguished visiting positions

2003	Mathematical Sciences Research Institute	Berkeley, USA	visiting researcher	3 months
2010	CMAP, École Polytechnique	Paris, France	visiting researcher	1 month
2012	CMAP, École Polytechnique	Paris, France	senior researcher	1 month
2013	Institut H. Poincaré & Univ. Paris XI	Paris, France	visiting professor	2 months
2015	Newton Institute	Cambridge, UK	visiting scientist	1 month
2019	Institut Mittag Leffler	Stockholm	visiting scientist	1 month
2020	Tübingen University	Tübingen, D	visiting scientist	8 months

## Services for the mathematical community

**Member** of the Board of Graduate Studies in Mathematics, "Sapienza" University of Rome.

**Referee** for the following scientific journals:

Annales Henri Poincaré	Archive for Rational Mechanics and Analysis
Annales Institut Fourier	Discrete and Continuous Dynamical Systems
Communications in Mathematical Physics	Journal of Physics A
Journal of Geometry and Physics	Journal of Statistical Physics
Journal of Mathematical Physics	Kinetic and Related Models
Journal of Spectral Theory	Mathematical Control and Related Fields
Letters in Mathematical Physics	Mathematical Physics Electronic Journal
Mathematical Modelling and Num. Analysis	

**Organizer** of the following conferences:

2007	<a href="#">"Mathematical Methods in Quantum Mechanics II"</a> Brixen, Italy	– February 2007
	<a href="#">"Multiscale Analysis for Quantum Systems and Applications"</a> Rome, Italy	– October 2007
2009	<a href="#">"Mathematical Methods in Quantum Mechanics III"</a> Brixen, Italy	– February 2009
2011	<a href="#">"Mathematical Methods in Quantum Mechanics IV"</a> Brixen, Italy	– February 2011
2013	<a href="#">"Trails in Quantum Mechanics and Surroundings"</a> Frascati, Italy	– February 2013
	<a href="#">"Conical Intersections in Mathematical Physics"</a> Inst. H. Poincaré, Paris	– May 2013
2014	<a href="#">"Solid Math 2014 // Mathematics of solid-state physics"</a> Trieste, Italy	– June 2014
2016	<a href="#">"Solid Math 2016 // Mathematics of solid-state physics"</a> Aalborg, Denmark	– May 2016
	<a href="#">"Kinetic Theory and its neighbours"</a> GSSI, L'Aquila, Italy	– October 2016
2018	<a href="#">"Mathematical Challenges in Quantum Mechanics 2018"</a> Rome, Italy	– February 2018
	<a href="#">"Solid Math 2018 // Mathematics of solid-state physics"</a> Montreal, Canada	– August 2018
2019	Organizer of the "Condensed Matter" Session at the <a href="#">"QMath14: Mathematical Results in Quantum Physics"</a> Aarhus, Denmark	– August 2019
2021	<a href="#">"Mathematical Challenges in Quantum Mechanics 2021"</a> Como, Italy	– June 2021
	<a href="#">"Solid Math 2020+1 // Mathematics of solid-state physics"</a> Paris, France	– July 2021
	Organizer of the "Quantum Mechanics and Spectral Theory" session at the <a href="#">"XX International Congress on Mathematical Physics"</a> , Geneve, CH	– August 2021

More than **70 scientific communications** in the framework of international workshops and conferences, or as Colloquia or Seminar talks in international scientific institutions, including (in alphabetic order):

- École Normale Supérieure de Lyon, Lyon, France
- École Polytechnique, Paris, France
- Erwin Schrödinger Institute, Vienna, Austria
- ETH, Zurich, Switzerland
- IHP - Institut Henri Poincaré, Paris, France
- Isaac Newton Institute, Cambridge, UK
- MSRI, Berkeley, California, USA
- MFO, Oberwolfach, Germany

The detailed **complete list** is attached at the end of the CV.

### **Supervision of Ph.D. thesis**

- Giuseppe De Nittis, *A geometric derivation of the TKNN equations*. SISSA, Trieste, October 2010.
- D. Monaco, *Geometric phases in graphene and topological insulators*. SISSA, Trieste, September 2015.
- L. Pinna, *On the controllability of the quantum dynamics of closed and open systems*. "La Sapienza" University of Rome, January 2018.

- G. Marcelli, *A Mathematical Analysis of Spin and Charge Transport in Topological Insulators*.  
“La Sapienza” University of Rome, February 2018.
- M. Moscolari, *The Localization Dichotomy for disordered gapped periodic systems*.  
“La Sapienza” University of Rome, February 2019.

## List of publications

### Scientific publications

Publications are listed in chronological order. The not-peer-reviewed papers are denoted by star (\*).

1. G. Panati, A. Teta. *The flux-across-surfaces theorem for a point interaction Hamiltonian*, in *Stochastic processes, physics and geometry: new interplays, II* (Leipzig, 1999), 547-557, CMS Conf. Proc. 29, Amer. Math. Soc., 2000.
2. G. Panati, H. Spohn, S. Teufel. *Space-adiabatic perturbation theory in quantum dynamics*, Phys. Rev. Lett. **88**, 250405 (2002).
3. G. Panati, H. Spohn, S. Teufel. *Space-adiabatic perturbation theory*, Adv. Theor. Math. Phys. **7**, 145-204 (2003).
4. G. Panati, H. Spohn, S. Teufel. *Effective dynamics for Bloch electrons: Peierls substitution and beyond*, Commun. Math. Phys. **242**, 547-578 (2003).
- 5.\* S. Teufel, G. Panati. *Propagation of Wigner functions for the Schrödinger equation with a perturbed periodic potential*, appeared in the volume: Ph. Blanchard and G. Dell'Antonio (editors), *Multiscale methods in Quantum Mechanics*, Birkhäuser, Boston, 2004.
6. G. Dell'Antonio, G. Panati. *The flux-across-surfaces theorem and zero-energy resonances*, J. Stat. Phys. **116**, 1161-1179 (2004).
7. G. Panati, S. Teufel. *Semiclassical dynamics of an electron moving in a slowly perturbed periodic potential*, invited and refereed contribution in: J.C. Zambrini (ed.), *XIV International Congress in Mathematical Physics*, World Scientific, 2005.
- 8.\* G. Panati, H. Spohn, S. Teufel. *Motions of electrons in adiabatically perturbed periodic structures*, in: A. Mielke (editor), *Analysis, Modeling and Simulation of Multiscale Problems*, Springer (2006).
9. G. Panati, H. Spohn, S. Teufel. *The time-dependent Born-Oppenheimer approximation*, Mathematical Modelling and Numerical Analysis **41**, 297-314 (2007).
10. G. Panati. *Triviality of Bloch and Bloch-Dirac bundles*, Annales Henri Poincaré **8**, 995-1011 (2007).
11. Ch. Brouder, G. Panati, M. Calandra, Ch. Mourougane, N. Marzari. *Exponential localization of Wannier functions in insulators*, Phys. Rev. Lett. **98**, 046402 (2007).
12. Ch. Brouder, G. Stoltz, G. Panati. *Adiabatic approximation, Gell-Mann and Low theorem, and degeneracies: A pedagogical example*, Phys. Rev. A **78**, 042102 (2008).
13. G. Panati, Ch. Sparber, S. Teufel. *Geometric currents in piezoelectricity*, Arch. Rat. Mech. Analysis **191**, 387-422 (2009).
14. G. Panati. *Perturbation theory and molecular dynamics*, appeared in Encyclopaedia of Complexity and Systems Science, Springer, Part 16, 6689-6697 (2009).
15. Ch. Brouder, G. Panati, G. Stoltz. *Many-body Green function of degenerate systems*, Phys.

Rev. Lett. **103**, 230401 (2009).

16. Ch. Brouder, G. Panati, G. Stoltz. ***Gell-Mann and Low formula for degenerate unperturbed states***, Annales Henri Poincaré **10**, 1285-1309 (2010).
17. G. De Nittis and G. Panati, ***The topological Bloch-Floquet transform and some applications***, appeared as a chapter in: R. Benguria, E. Friedman and M. Mantoiu (editors), *Spectral Analysis of Quantum Hamiltonians*, Operator Theory: Advances and Applications, Birkhäuser (2012).
18. G. Panati, ***Dynamics of electrons in crystalline solids: Wannier functions, Berry curvature and related issues***, appeared in: Encyclopedia of Applied and Computational Mathematics, Springer (2013).
19. G. Panati, ***Microlocal analysis and adiabatic problems: The case of perturbed periodic Schrödinger operators***, appeared as a chapter in: D. Grieser, S. Teufel, A. Vasy (editors), *Microlocal Methods in Mathematical Physics and Global Analysis*, Trends in Mathematics, Birkhäuser (2013).
20. G. Panati, A. Pisante. ***Bloch bundles, Marzari-Vanderbilt functional and maximally localized Wannier functions***, Commun. Math. Phys. **322**, 835-875 (2013).
21. U. Boscain, P. Mason, G. Panati, M. Sigalotti, ***On the control of spin-boson systems***, Proceedings of the 12<sup>th</sup> European Control Conference (ECC '13), 2110-2115 (2013).
22. D. Monaco, G. Panati. ***Topological invariants of eigenvalue intersections and decrease of Wannier functions in graphene***, J. Stat. Phys. **155**, 1027–1071 (2014).
23. D. Monaco, G. Panati. ***Symmetry and localization in periodic crystals: triviality of Bloch bundles with a fermionic time-reversal symmetry***, Acta Appl. Math. **137**, 185–203 (2015).
24. D. Fiorenza, D. Monaco, G. Panati. ***Construction of real-valued localized composite Wannier functions for insulators***, Ann. Henri Poincaré **17**, 63-97 (2016).
25. U. Boscain, P. Mason, G. Panati, M. Sigalotti, ***On the control of spin-boson systems***, J. Math. Phys. **56**, 092101 (2015).
- 26\*. U. Boscain, P. Mason, G. Panati, M. Sigalotti. ***Controllability properties of spin-boson systems***, to appear in the proceedings of the 21<sup>st</sup> International Symposium on Mathematical Theory of Networks and Systems. July 7-11, 2014. Groningen, The Netherlands.
27. D. Fiorenza, D. Monaco, G. Panati.  ***$Z_2$  invariants of topological insulators as geometric obstructions***, Commun. Math. Phys. **343**, 1115-1157 (2016).
28. É. Cancès, A. Levitt, G. Panati, G. Stoltz. ***Robust determination of maximally localized Wannier functions***. Phys. Rev. B **95**, 075114 (2017).
29. D. Monaco, G. Panati, A. Pisante, S. Teufel. ***Optimal decay of Wannier functions in Chern and Quantum Hall insulators***, Commun. Math. Phys. **359**, 61–100 (2018).
- 30.\* G. Panati. ***Exponentially localized Wannier functions and minimizers of the Marzari-Vanderbilt functional***. Invited contribution to the proceedings of the XVIII International Congress in Mathematical Physics (Santiago, Chile, July 27 - August 1, 2015), in press.

31. G. Panati. *The localization dichotomy for gapped periodic systems and its relevance for macroscopic transport*, to appear in the Springer Proceedings in Mathematics and Statistics “*Macroscopic Limits of Quantum Systems*” (Eds: D. Cadamuro, M. Duell, W. Dybalski, S. Simonella), Springer, 2018. [DOI 10.1007/978-3-030-01602-9]
32. L. Pinna, G. Panati. *Approximate controllability of the Jaynes-Cummings dynamics*. J. Math. Physics **59**, 072101 (2018).
33. G. Marcelli, G. Panati, C. Tauber. *Spin Conductance and Spin Conductivity in Topological Insulators: Analysis of Kubo-like terms*. Ann. H. Poincaré **20**, 2071-2099 (2019).
34. G. Marcelli, D. Monaco, M. Moscolari, G. Panati. *The Haldane model and its localization dichotomy*. Rend. Mat. Appl. **39**, 307 – 327 (2018).
35. G. Moscolari, G. Panati. *Symmetry and localization for magnetic Schrödinger operators: Landau levels, Gabor frames, and all that*. Acta App. Mathematicae **162**, 105-120 (2019).
36. G. Marcelli, G. Panati, S. Teufel. *A New Approach to Transport Coefficients in the Quantum Spin Hall Effect*. Ann. H. Poincaré **22**, 1069–1111 (2021).

## Popularization of science

The following papers appeared in *Ulisse*, an Italian magazine of science popularization, in *Atomium*, a popularization initiative sponsored by the EU Commission, and in a well-known German newspaper:

- P1. G. Panati, *La nuvola elettronica e l'energia dell'elettrone*. Ulisse, February 2002.
- P2. G. Panati, *Magnetismo e frattali*. Ulisse, December 2005.
- P3. G. Panati, *The Poetry of Butterflies: Using Geometric Ideas to solve Problems in Quantum Mechanics*. Atomium Project ([www.atomiumproject.eu](http://www.atomiumproject.eu)), 2012.
- P4. G. Panati, *Die Dichtkunst der Schmetterlinge*. Frankfurter Allgemeine, 15.05.2012.  
Newspaper heading: Die Schönheit von Naturgesetzen ist für jeden Mathematiker eine Versuchung.  
Forscher aus Rom zeigen, warum Schmetterlinge grundlegend für das Verständnis und die Beschreibung der Wissenschaftswelt sind.

## Interviews

- I1. Amanda Crain (interview with G. Panati), *Das subtile Zusammenspiel von Mathematik und Physik*. Newsletter Uni Tübingen, n. 1/2020.

## Distinguished achievements (comments on the key publications)

During the last twelve years, the candidate contributed to the solution of four long-standing conjectures in the field of Mathematical Physics, namely<sup>1</sup>:

- i) the **mathematical justification of the semiclassical model of solid-state physics** [4,5,7]: the goal was to prove that the quantum dynamics in a periodic potential, under the influence of perturbing slowly-varying electromagnetic potentials, can be approximated by a suitable Hamiltonian system of ODEs, provided the initial state is concentrated on an isolated Bloch band. According to a famous textbook<sup>2</sup>, "**Justifying the semiclassical model in detail is a formidable task**". Such a task has been performed by the candidate and his coauthors in [4], where also the next-order corrections (in the semiclassical parameter) to the semiclassical model are exhibited .
- ii) the proof of the **existence of exponentially localized composite Wannier functions**, in dimension  $d = 2$  and  $d = 3$  [10,11]. This long-standing conjecture was raised in 1959 by the Nobel Prize winner W. Kohn, who also solved it for a simple Bloch band,  $d = 1$ , and a centrosymmetric potential. The latter condition has been later removed by J. des Cloizeaux (1964). In higher dimension, the problem has been solved, always in the case of a simple isolated Bloch band, by J. des Cloizeaux (1964) for centrosymmetric potentials and finally by G. Nenciu (1983) under general hypotheses. However, in dimension  $d > 1$  the Bloch bands of crystalline solids are not, in general, isolated. Thus the interesting problem, in view of real applications, concerns the case of **multiband systems**. For example, in insulators and semiconductors one considers all the Bloch bands below the Fermi energy as a *composite family of bands*. In this context, the more general notion of **composite Wannier functions** is relevant (de Cloizeaux 1964). The existence of exponentially localized composite Wannier functions has been proved by G. Nenciu (1991) in dimension  $d = 1$ . As for  $d > 1$ , this problem remained unsolved until recently, when an existence result was obtained, by using bundle-theoretic methods, by the candidate and his coworkers, see publications [10][11], and [24] for a new constructive proof.
- iii) the proof of the **Gell-Mann and Low formula for degenerate unperturbed states**, with important consequences on the structure of the **many-body Green function of degenerate systems**. Mathematically, the convergence of the Gell-Mann and Low procedure in the **non-degenerate** case has been proved in 1989 by G. Nenciu and G. Rashe, elaborating on the adiabatic theorem of T. Kato. The degenerate case has been solved by the candidate and his coauthors in a sequence of papers [12, 15, 16].
- iv) the proof that the **minimizers of the Marzari-Vanderbilt localization functional are exponentially localized**: the long-standing controversy about the existence of exponentially localized composite Wannier functions in insulators, solved in the papers [10, 11], and – more crucially – the need for an explicit algorithm to numerically compute well-localized Wannier functions, forced the solid-state physics community to adhere to a variational viewpoint. Marzari and Vanderbilt (1997) introduced a suitable localization functional and investigated the properties of its minimizers (in a suitable space of Wannier functions), which are nowadays called **maximally localized Wannier functions (MLWF)** (see the recent review: *Rev. Mod. Phys.* 84, 1419 (2012) and references therein). Despite the numerical evidence that MLWFs are exponentially localized, a mathematical proof of this fact is highly challenging. This problem has been solved by the candidate and his coauthor, for dimension  $d < 4$ , in reference [20].

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<sup>1</sup> Numbers in colour refer to the previous list of publications.

<sup>2</sup> N. W. Ashcroft, N. D. Mermin : *Solid State Physics*, Saunders College, 1976. The cited sentence is on page 215.



# Teaching activity

## University courses

- 2006/2007      **Analytic and Relativistic Mechanics** (60 hours, Italian).  
Bachelor in Physics, University of Rome "La Sapienza".
- Introduction to Quantum Dynamics** (60 hours, English).  
Ph. D. in Mathematical Physics and Excellence Master in Mathematics  
SISSA International School for Advanced Studies, Trieste.
- 2007/2008      **Analytic and Relativistic Mechanics** (60 hours, Italian).  
Bachelor in Physics, University of Rome "La Sapienza".
- Introduction to Quantum Dynamics** (60 hours, English).  
Ph. D. in Mathematical Physics and Excellence Master in Mathematics,  
SISSA International School for Advanced Studies, Trieste.
- 2008/2009      **Advanced Mathematical Physics** (72 hours, Italian).  
Master in Mathematics, University of Rome "La Sapienza".
- Introduction to Quantum Dynamics** (60 hours, English).  
Ph. D. in Mathematical Physics and Excellence Master in Mathematics,  
SISSA International School for Advanced Studies, Trieste.
- 2009/2010      **Advanced Mathematical Physics** (72 hours, Italian).  
Master in Mathematics, University of Rome "La Sapienza".
- Calculus and Biostatistics** (45 hours = half course, Italian).  
Bachelor in Biological Sciences, University of Rome "La Sapienza".
- Introduction to Quantum Dynamics** (60 hours, English).  
Ph. D. in Mathematical Physics and Excellence Master in Mathematics,  
SISSA International School for Advanced Studies, Trieste.
- 2010/2011      On partial leave of absence from University of Rome "La Sapienza".
- Introduction to Quantum Dynamics** (60 hours, English).  
Ph. D. in Mathematical Physics and Excellence Master in Mathematics,  
SISSA International School for Advanced Studies, Trieste.
- 2011/2012      **Advanced Mathematical Physics** (48 hours, Italian).  
Master in Mathematics, University of Rome "La Sapienza".
- Calculus and Biostatistics** (45 hours = half course, Italian).  
Bachelor in Biological Sciences, University of Rome "La Sapienza".
- Perturbations of periodic Schrödinger operators** (20 hours, English).  
Ph. D. in Mathematical Physics,  
SISSA International School for Advanced Studies, Trieste.
- 2012/2013      **Calculus and Biostatistics** (60 hours =  $\frac{2}{3}$  course, Italian).

Bachelor in Biological Sciences, University of Rome "La Sapienza".

2013/2014

**Advanced Mathematical Physics** (48 hours, Italian).  
Master in Mathematics, University of Rome "La Sapienza".

**Topological and Variational Methods for periodic Schrödinger operators**  
(36 hours, Italian or English according to the audience).  
Ph. D. in Mathematics, University of Rome "La Sapienza".

2014/2015

**Calculus and Biostatistics** (76 hours, Italian).  
Bachelor in Biological Sciences, University of Rome "La Sapienza".

2015/2016

**Advanced Mathematical Physics** (48 hours, Italian).  
Master in Mathematics, University of Rome "La Sapienza".

**Fundamentals of Mathematical Physics** (48 hours =  $\frac{2}{3}$  course, Italian)  
Master in Mathematics, University of Rome "La Sapienza".

2016/2017

**Advanced Mathematical Physics** (48 hours, Italian).  
Master in Mathematics, University of Rome "La Sapienza".

**Fundamentals of Mathematical Physics** (72 hours, Italian)  
Master in Mathematics, University of Rome "La Sapienza".

2017/2018

**Calculus and Biostatistics** (78 hours, Italian).  
Bachelor in Biological Sciences, University of Rome "La Sapienza".

**Mathematical Physics** (48 hours, English).  
Master in Physics, University of Rome "La Sapienza".

2018/2019

**Calculus and Biostatistics** (78 hours, Italian).  
Bachelor in Biological Sciences, University of Rome "La Sapienza".

**Advanced Mathematical Physics** (48 hours, Italian).  
Master in Mathematics, University of Rome "La Sapienza".

2019/2020

On partial leave of absence from University of Rome "La Sapienza" (sabbatical).

2020/2021

**Calculus and Biostatistics** (84 hours, Italian).  
Bachelor in Biological Sciences, University of Rome "La Sapienza".

**Mathematical Physics** (48 hours, English).  
Master in Physics, University of Rome "La Sapienza".

### Supervision of Master and Bachelor theses

In the framework of the teaching activity at University of Rome "La Sapienza" I supervised *more than 40 Master or Bachelor theses*.

Among them, the following students got the maximal grade (110/110 cum laude):

- Antonella Marchesiello    Master thesis in Mathematics                      July 2009  
now **Assistant Professor** at the Czech Technical University in Prague (Czech Republic)
- Daniele Tantari                      Bachelor thesis in Physics                      October 2009  
now **Associate Professor** at University of Bologna (Italy)
- Alessia Nota                      Master thesis in Mathematics                      March 2011  
now **Assistant Professor** at the University of L'Aquila (Italy)
- Domenico Monaco                      Master thesis in Mathematics                      July 2011
- Giancarlo Cicconofri                      Master thesis in Mathematics                      July 2011
- Giovanna Marcelli                      Bachelor thesis in Mathematics                      October 2012
- Lorenzo Pinna                      Master thesis in Mathematics                      July 2014
- Marco Costa                      Master thesis in Mathematics                      July 2014
- Emanuela Giacomelli                      Master thesis in Mathematics                      October 2014
- Giovanna Marcelli                      Master thesis in Mathematics                      October 2014
- Francesco Spadaro                      Master thesis in Mathematics                      July 2016
- Stefano D'Alesio                      Master thesis in Mathematics                      July 2017
- Paolo Tommasini                      Master thesis in Physics                      September 2019

Roma, 29/09/2021

## Annex: Scientific Communications

Scientific communications in the framework of international workshops and conferences, or as Colloquia or Seminar talks in scientific institutions, starting from the year 2007.

**Colloquia** and **invited plenary lectures at international conferences** are emphasized in bold.

2021 **One World Seminar in Mathematical Physics**,  
global seminar organized by the International Association of Mathematical Physics.  
March 16, 2021.

2020 Munich Aarhus Santiago (MAS) - Mathematical Physics virtual seminar.  
December 8, 2020.

2019 **Invited talk at workshop "Mathematical Physics of Anyons and Topological States of Matter"**. Nordita Institute, Stockholm, Sweden. March 11-16, 2019.

**Invited talk at the workshop "Many-body theory, random operators & matrices"**  
Institut Mittag-Leffler, Stockholm, Sweden. April 8-12, 2019.

**Invited talk at the workshop "Topological Phases of Interacting Quantum Systems"**  
Casa de Matematicas de Oaxaca (CMO), Oaxaca, Mexico. June 2-9, 2019.

**Plenary talk at the international conference "Quantissima in the Serenissima III"**  
Palazzo Pesaro-Papafava, Venice, Italy. August 19-23, 2019.

**Invited talk at the workshop "Quantum Transport and Universality"**  
Accademia Nazionale dei Lincei, Rome, Italy. September 23-25, 2019.

Plenary talk at the national conference "Meccanica Quantistica e dintorni"  
Rome, Italy. November 7-9, 2019.

Mathematical Physics Seminar, Tübingen Universität.  
Tübingen, Germany. November 28, 2019.

2018 Invited talk at conference "Trails in Quantum Mechanics and Surroundings"  
SISSA, Trieste, Italy. January 29-31, 2018.

**Invited plenary talk at the workshop "Mathematical Methods in Quantum Chemistry"**  
Mathematisches Forschungsinstitut Oberwolfach (MFO).  
Oberwolfach, Germany. March 18-24, 2018.

**Invited plenary talk at the conference "Symmetry and Perturbation Theory - SPT 2018"**  
Pula (Cagliari), Italy. June 3-10, 2018.

**Invited plenary talk at "Analytical and Numerical Methods in Quantum Transport"**  
Aalborg, Denmark. May 28-30, 2018.

***Invited plenary talk at “Recent Progress in Mathematics of Topological Insulators”***  
ETH Zürich. Zurich, Switzerland. September 3-6, 2018.

***Invited lecture at “Alfaclass 2018 - Summer School of Mathematics”***  
Osservatorio Astronomico di Saint Barthèlemey.  
Aosta, Italy. September 10-12, 2018.

***Invited lecture at the DPG Summer School***  
***“Gauge Theory and Topological Quantum Matter”***  
Physikzentrum Bad Honnef, Germany. September 16-21, 2018.

2017 ***Invited plenary talk at the international conference “Spectral Days 2017”***  
Universität Stuttgart. Stuttgart, Germany. April 3-7, 2017.

Invited talk at the workshop “Geometry, Symmetry and Dynamics 2017”  
Santa Marinella, Rome, Italy. June 5-12, 2017.

***Invited plenary speaker at the***

***“Tosio Kato Centennial conference”***

University of Tokyo, Komaba Campus. Tokio, Japan. September 4-9, 2017.  
**[Only under-50 invited speaker]**

2016 ***Invited talk at the workshop***  
***“Contemporary Trends in the Mathematics of Quantum Mechanics”***.  
Università di Roma “La Sapienza”. Rome, Italy. July, 4-8, 2016.

***Invited talk at the conference***  
***“Stochastic and Analytic Methods in Mathematical Physics”***.  
American University of Armenia. Yerevan, Armenia, September 4-11, 2016.

***Invited talk at the workshop***  
***“SEMODOY 2016 - Mathematical Models for Quantum and Classical Mechanics”***.  
Università di Firenze. Florence, Italy. November 17-18, 2016.

2015 ***Lecturer at the Winter School***  
***“The Mathematics of Topological Insulators in Naples”***  
Università di Napoli “Federico II”. Napoli, Italy. February 2-5, 2015.

***Invited talk at the conference “Periodic and Other Ergodic Problems”***  
Isaac Newton Institute, Cambridge, UK. March 23-27, 2015.

Seminario di Meccanica Quantistica  
University of Trieste. Trieste, Italy. May, 4 & 11, 2015.

***Colloquium of Mathematics***  
SISSA Scuola Internazionale di Studi Superiori Avanzati. Trieste, Italy. May 7, 2015

***Invited talk at the workshop “Mathematical Methods in Quantum Molecular Dynamics”***  
MFO, Oberwolfach, Germany. June 1-6, 2015.

***Invited talk at 7<sup>th</sup> St.Petersburg Conference in Spectral Theory***  
Euler Institute, Saint-Petersburg, Russia. July 3-6, 2015.

*Invited Session Talk at the*

***XVIII International Congress on Mathematical Physics***

Santiago de Chile, Chile. July 27 - August 1, 2015.

Séminaire de Physique Théorique

ENS – École Nationale Supérieure du Lyon. Lyon, France. November 12, 2015.

Séminaire de calcul scientifique du CERMICS

ENPC - École Nationale des Ponts et Chaussées. Paris, France. November 18, 2015.

*Invited talk at the workshop*

***"Localization and reducibility in Hamiltonian PDE and Quantum Mechanics"***

Università di Milano. Milan, Italy. December 16-18, 2015.

2014 *Invited plenary talk at the workshop*

***"Analysis of Relativistic and Non-Relativistic models in Quantum Mechanics"***

Università di Roma "La Sapienza". Roma, Italy. April 14-18, 2014.

Contributed talk at the conference "Symmetry and perturbation theory"

Cala Gonone, Italy. May 25 - June 1, 2014.

*Invited talk at the conference*

***"Selected Problems in Mathematical Physics, Statistical Mechanics and PDEs"***

La Spezia, Italy. September 1-5, 2014.

*Invited talk at the workshop "Quantum Mechanics and Mathematical Physics"*

ETH, Zurich, Switzerland. October 13-17, 2014.

Mathematical Physics Seminar, Department of Mathematics.

Università di Napoli "Federico II". Naples, Italy. December 11, 2014.

2013 *Invited talk at the workshop*

***"Mathematical Problems of Kinetic Theories and Applications"***

Catania, Italy. February 10-11, 2013.

Mathematical Physics Seminar

Department of Mathematics, Mc Gill University

Montreal, Canada. April 24, 2013.

*Invited plenary talk at the workshop*

***"Mathematical Methods in Quantum Molecular Dynamics"***

BIRS, Banff, Canada. April 28 - May 3, 2013.

***Seminar "Spectral Problems in Mathematical Physics"***

Institut Henri Poincaré, Paris, France. June 10, 2013.

*Invited plenary talk at the workshop*

***"Solitons, Vortices, Minimal Surfaces and their Dynamics"***

Mittag-Leffler Institute. Stockholm, Sweden. July 15-19, 2013.

2012 ***Invited plenary talk at the  
4ème Rencontre du GDR Dynamique Quantique***  
IMT, Toulouse, France. February 8-10, 2012.

Workshop "Meccanica Quantistica e dintorni"  
Dipartimento di Matematica, Università de L'Aquila.  
L'Aquila, Italy. March 22-23, 2012.

Workshop "Modelli matematici per la nanoelettronica"  
Dipartimento di Matematica "U. Dini", Università di Firenze.  
Firenze, Italy. May 30 - June 1, 2012.

***Invited plenary talk at the  
International Conference "Stochastic and Analytic Methods in Mathematical Physics"***  
Yerevan, Armenia. September 2-9, 2012

***Invited plenary talk at the conference  
"Recent Developments in the Mathematical Analysis of Large Systems"***  
Erwin Schrödinger Institute. Vienna, Austria. October 1-6, 2012.

2011 ***Invited plenary talk at the workshop  
"Spectral Theory and Schrödinger operators"***  
Dipartimento di Matematica, Politecnico di Milano.  
Milano, Italy. March 23, 2011.

***Invited plenary talk at the workshop  
"Trails in a Noncommutative Land"***  
SISSA Scuola Internazionale di Studi Superiori Avanzati.  
Trieste, Italy. May 18-20, 2011.

***Invited plenary lecture at the conference  
"Microlocal Methods in Mathematical Physics and Global Analysis"***  
Fachbereich Mathematik, Tübingen Universität.  
Tübingen, Germany. June 18-22, 2011.

***Invited session talk at  
"7<sup>th</sup> International Congress on Industrial and Applied Mathematics" - ICIAM 2011***  
Thematic Minisymposium: Quantum Modelling in Molecular Simulation  
Vancouver (BC), Canada. July, 18-22, 2011.

2010 ***Invited plenary Senior Talk at the conference  
"Differential and topological problems in modern theoretical physics"***  
SISSA Scuola Internazionale di Studi Superiori Avanzati.  
Trieste, Italy. April 26-30, 2010.

Séminaire de Mathématiques Appliquées et de Calcul Scientifique du CERMICS.  
CERMICS, Ecolé de Ponts.  
Paris, France. July 6, 2010.

***Invited plenary talk at the conference "Spectral Days"***  
Pontificia Universidad Catolica de Chile.

Santiago, Chile. September 20-24, 2010.

***Colloquium, Abteilung Mathematik***

Friedrich-Alexander-Universität Erlangen.  
Erlangen, Germany. November 23, 2010.

Mathematische Physik Seminar  
Friedrich-Alexander-Universität Erlangen.  
Erlangen, Germany. November 25, 2010.

***Invited plenary talk at the conference "Quantum Control"***

Institute Henri Poincaré, Paris.  
Paris, France. December 8-11, 2010.

2009 Seminario di Fisica Matematica.  
Dipartimento di Matematica, Università di Roma TRE.  
Roma, Italy. January 27, 2009.

Conference "Sviluppi recenti in Fisica Matematica".  
Dipartimento di Matematica Pura e Applicata, Università dell'Aquila.  
L'Aquila, Italy. February 11-12, 2009.

Seminario di Analisi, Dipartimento di Matematica.  
Università di Napoli "Federico II".  
Napoli, Italy. March 16, 2009.

2008 ***Invited plenary lecture at the conference  
"Spectral problems in Quantum Mechanics"***  
Université de Cergy-Pointoise.  
Cergy Pointoise, France. January 31 – February 2, 2008.

***Colloquium of Mathematics***

SISSA Scuola Internazionale di Studi Superiori Avanzati.  
Trieste, Italy. April 19, 2008.

***Invited plenary lecture at the conference***

***"Mathematical and Algorithmic Challenges in Electronic Structure Theory"***

IMA Institute for Mathematics and Applications.  
Minneapolis, USA. September 29-October 3, 2008

2007 ***Invited plenary lecture at the conference  
"Multiscale problems in quantum mechanics and averaging techniques"***  
500 Jahre Mathematik- Universität Tübingen  
Tübingen, Germany. February 8-9, 2007.

Conference "Problemi Attuali di Fisica Teorica XIII".  
Vietri sul Mare, Italy. March 30 - April 2, 2007.

Seminaire du Laboratoire d'Analyse, Topologie, Probabilités UMR 6632  
Centre de Mathématique et Informatique, Université de Provence.  
Marseille, France. June 15, 2007.

Workshop "Maximally Localized Wannier Functions: Concepts, Applications, and



Beyond". CECAM, ENS Lyon.  
Lyon, France. June 27-29, 2007.

Seminaire de l'Institut de Minéralogie et de Physique des Milieux Condensés.  
Université Pierre et Marie Curie. Paris, France. July 5, 2007.

*Invited plenary lecture at the interdisciplinary conference  
"Mathematical Challenges in Quantum Chemistry".*  
Mathematics Institute, University of Warwick.  
Coventry, United Kingdom. July 16-20, 2007.

Meeting of the National Group for Mathematical Physics.  
Invited plenary lecture "Adiabatic Decoupling of Quantum Dynamics"  
Montecatini Terme, Italy. October 11-13, 2007.

Seminario di Fisica Matematica, Dipartimento di Matematica  
Università di Bologna.  
Bologna, Italy. December 3, 2007.

Scientific communications before 2007 are omitted for the sake of brevity.

Roma, 29/09/2021