Alberto Tacchella

Curriculum vitæ — June 19, 2023

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Age: 43 years old
Nationality: Italian

Education

2006–2010	**PhD in Mathematics and Applications**, *Dipartimento di Matematica (DIMA), Università degli studi di Genova*, Genoa, Italy.
1999–2005	**Laurea in Theoretical Physics**, *Dipartimento di Fisica (DIFI), Università degli studi di Genova*, Genoa, Italy, final mark: 110/110 cum laude.

Academic positions

Aug. 2019 – Jul. 2022	**Post-doctoral Researcher**, *Fondazione Bruno Kessler*, Trento, Italy.
Sep. 2018 – Jul. 2019	**Post-doctoral Researcher**, *Dipartimento di Ingegneria Meccanica, Energetica, Gestionale e dei Trasporti (DIME), Università degli studi di Genova*, Genoa, Italy.
Jan. 2016 – Dec. 2017	**Visiting Researcher**, *Dipartimento di Matematica (DIMA), Università degli studi di Genova*, Genoa, Italy.
Sep. 2011 – Aug. 2014	**Post-doctoral Researcher**, *ICMC, Universidade de São Paulo (USP)*, São Carlos (SP), Brazil.
Oct. 2007 – Feb. 2008	**Early Stage Researcher**, *Mathematics Department, Oxford University*, Oxford, England.

Grants

2018	Research Fellowship (1 year) granted by Università degli Studi di Genova.
2011	Research Fellowship (3 years) granted by FAPESP (Fundação de amparo à pesquisa do estado de São Paulo), c/o the Mathematics Department (ICMC) of the University of São Paulo at São Carlos.
2007	Research Fellowship (4 months) granted by the Research Training Network "ENIGMA" (Marie Curie Actions) as Early Stage Researcher, c/o the Mathematical Institute at the University of Oxford.
2006	PhD Fellowship (3 years) granted by the Mathematics Department of the University of Genoa.

Research interests

My main research interest concerns the application of geometric methods to physical theories, particularly in the field of integrable dynamical systems (continuous or discrete) and exactly solvable models. In more detail, my research so far has been concerned with the following topics (listed in inverse chronological order):

○ the application of functional-analytic methods in the physics of turbulence ([8]);
○ the stability problem for hybrid (e.g. switching) systems ([7]);
○ the application of noncommutative geometry to the theory of completely integrable Hamiltonian systems ([3, 5, 4]);
○ the theory of integrable hierarchies of PDEs, notably the KP hierarchy and its relations with finite-dimensional integrable systems of Calogero-Moser type (PhD thesis, [1, 2]);
○ the study of anomalies using the BRST formalism in quantum field theory (Master thesis).

I am also interested in formal logic, type theories and computer-assisted theorem proving using higher order constructive logics and correct-by-construction programming. My activities within this field are:

○ from March 2018 to February 2019 I was a member of the EU-funded CARVE project (`https://robmosys.eu/carve/`). In this role I developed a certified interpreter for Behavior Trees which has been deployed on actual hardware at the Istituto Italiano di Tecnologia (IIT).
○ from August 2019 to July 2022 I have been a member of the RFI-ACC project at Fondazione Bruno Kessler, whose aim is to design and verify a formal modeling and synthesis tool for the legacy Relay Interlocking Systems used by the Italian railway company RFI [6, 9].

Refereed publications (in chronological order)

[1] Alberto Tacchella. "On rational solutions of multicomponent and matrix KP hierarchies". In: *J. Geom. Phys.* 61.8 (2011), pp. 1319–1328. ISSN: 0393-0440. DOI: 10.1016/j.geomphys.2011.02.007. URL: https://doi.org/10.1016/j.geomphys.2011.02.007.

[2] Igor Mencattini and Alberto Tacchella. "A note on the automorphism group of the Bielawski-Pidstrygach quiver". In: *SIGMA Symmetry Integrability Geom. Methods Appl.* 9 (2013), Paper 037, 13. ISSN: 1815-0659. DOI: 10.3842/SIGMA.2013.037. URL: https://doi.org/10.3842/SIGMA.2013.037.

[3] Alberto Tacchella. "On a family of quivers related to the Gibbons-Hermsen system". In: *J. Geom. Phys.* 93 (2015), pp. 11–32. ISSN: 0393-0440. DOI: 10.1016/j.geomphys.2015.03.002. URL: https://doi.org/10.1016/j.geomphys.2015.03.002.

[4] Claudio Bartocci and Alberto Tacchella. "Poisson-Nijenhuis structures on quiver path algebras". In: *Lett. Math. Phys.* 107.7 (2017), pp. 1265–1291. ISSN: 0377-9017. DOI: 10.1007/s11005-017-0940-4. URL: https://doi.org/10.1007/s11005-017-0940-4.

[5] Alberto Tacchella. "An introduction to associative geometry with applications to integrable systems". In: *J. Geom. Phys.* 118 (2017), pp. 202–233. ISSN: 0393-0440. DOI: 10.1016/j.geomphys.2016.09.013. URL: https://doi.org/10.1016/j.geomphys.2016.09.013.

[6] Arturo Amendola et al. "A Model-Based Approach to the Design, Verification and Deployment of Railway Interlocking System". In: *Leveraging Applications of Formal Methods, Verification and Validation: Applications*. Ed. by Tiziana Margaria and Bernhard Steffen. Cham: Springer International Publishing, 2020, pp. 240–254. ISBN: 978-3-030-61467-6.

[7] Alberto Tacchella and Armando Tacchella. "Computing Resilience Of Interconnected Systems By Piecewise Linear Lyapunov Functions". In: *Proceedings of the 34th International ECMS Conference on Modelling and Simulation, ECMS 2020, Wildau, Germany, June 9-12, 2020*. Ed. by Mike Steglich et al. European Council for Modeling and Simulation, 2020, pp. 345–353. DOI: 10.7148/2020-0345. URL: https://doi.org/10.7148/2020-0345.

[8] A. Dotto et al. "Dynamic mode decomposition and Koopman spectral analysis of boundary layer separation-induced transition". In: *Physics of Fluids* 33.10 (2021), p. 104104. DOI: 10.1063/5.0065554. URL: https://doi.org/10.1063/5.0065554.

[9] Arturo Amendola et al. "NORMA: a tool for the analysis of Relay-based Railway Interlocking Systems". In: *Tools and Algorithms for the Construction and Analysis of Systems - 28th International Conference, TACAS 2022*. Ed. by Dana Fisman and Grigore Rosu. Vol. 13243. Lecture Notes in Computer Science. Springer, 2022, pp. 125–142. DOI: 10.1007/978-3-030-99524-9_7. URL: https://doi.org/10.1007/978-3-030-99524-9_7.

Other publications

○ CARVE project. "Model transformation and correctness proof". Technical Report D5.1. Dec. 3, 2018.

Teaching experience

Dec. 2018–Jan. 2019	Teaching assistant (*tutorato*) for the course "Meccanica Razionale" (Ingegneria navale), University of Genoa.
Oct. 2017–May 2018	"Homotopy type theory: an introduction", seminar for PhD students held at the University of Genoa (~ 36 hours total).
May 2013	"An introduction to the geometry of integrable Hamiltonian systems", *minicurso de extençao* (12 hours total) for advanced graduate and PhD students held at the University of São Paulo, São Carlos.
June 2007	"Introduction to category theory and sheaves", seminar for PhD students held at the University of Genoa (~ 12 hours total).

Selected talks and posters

Oct. 27, 2022	"The moduli space of linear control systems", invited talk at the conference *Shapes of Thought: Geometry, Mathematical Physics, and Philosophy* (online).
Nov. 08, 2019	"An integrable variant of the Lotka-Volterra system", invited talk at the 1st MYR meeting, University of Genoa.
May 03, 2019	"Correct-by-construction execution and compilation of Behavior Trees", invited talk at Fondazione Bruno Kessler, Trento.
Dec. 19, 2017	"Integrable systems and associative geometry", invited talk at SISSA, Italy.
Mar. 22, 2017	"Bihamiltonian structures from non-commutative geometry", invited talk at the University of Angers, France.
Dec. 21, 2016	"Integrable systems on quivers", invited talk at the *2016 Christmas workshop on Quivers, Moduli Spaces and Integrable Systems* in Genoa, Italy.
Nov. 12, 2015	"Calogero-Moser systems from associative geometry", invited talk at the University of Milano-Bicocca, Italy.
Aug. 21, 2015	"Calogero-Moser systems from associative geometry", talk delivered at the conference *Interactions between Geometry and Physics* in Guarujá (SP), Brasil.
Apr. 7, 2014	"The non-commutative geometry of higher-rank Gibbons-Hermsen systems", poster presented at the *IV Iberoamerican Meeting on Geometry, Mechanics and Control* at IMPA, Rio de Janeiro, Brazil.
May 7, 2013	"Noncommutative symplectic and Poisson geometry", talk delivered at the *Mini-Workshop on Poisson Geometry and Related Topics* at IMPA, Rio de Janeiro, Brazil.
Jan. 24, 2013	"Group actions on the moduli space of noncommutative instantons", talk delivered at the *School and Workshop on Moduli Spaces and Mathematical Physics* in Guanajuato, Mexico.

Dec. 19, 2012	"The (noncommutative) symplectic structure of the (noncommutative) instanton moduli space", talk delivered at the *2012 Christmas Workshop on Moduli Spaces and Integrable Systems* in Genoa, Italy.
Jul. 30, 2012	"Noncommutative symplectic geometry of Gibbons-Hermsen varieties", talk delivered at the *Brazil-Italy Geometry Meeting 2012* (EGBI2012) in Salvador (BA), Brazil.

Other

Languages	Italian (native), English (fluent), French (basic), Portuguese (basic).
Technical skills	

- Very good knowledge of the GNU/Linux operating system (esp. Debian or Debian-based distributions), acquired through 24+ years of administration of my personal machines.
- Very good knowledge of the LaTeX document preparation system and related common packages, including `xy` and `tikz`.
- In the past I have used (with various degrees of proficiency) the following programming languages: Basic, Pascal, Modula-2, C, C++ and Fortran. Currently I mostly code in Scheme, Ocaml, C and Javascript.
- Good knowledge of the computer algebra systems Maxima and Matlab.
- Good experience with the proof assistant Coq.
- Basic knowledge of modern website design using HTML 5, CSS 3 and Javascript.