

BIOGRAPHY

Personal Details

Date of Birth: December 13, 1964

Status: Married, two children

Professional experience

2002-present: Professor, University of Palermo

1999-2002: Associate Professor, University of Palermo

1993-1999: Ricercatore, University of Palermo

1992-1993: Visiting Assisting Researcher, Department of Mathematics, UCLA

1991-1992: Visiting Researcher, Mechanical Aerospace Nuclear Engineering Dept, UCLA

Education

1991: PhD in Mathematics, University of Catania, Advisor A.M. Anile

1986: Laurea in Mathematica, University of Catania, Supervised by A.M. Anile

Visiting Positions

2023 July-August: Invited Professor, MSRI, University of Berkeley

2021 January-May: Research Professor, MSRI, University of Berkeley

2020, February: Professeur invité, Université Paris-Est Marne-la-Vallée, Paris

2016, August-December: Visiting Scholar, Institute Pure Appl Math, Los Angeles

2015, September-November: Visiting Scholar, Institute Pure Appl Math, Los Angeles

2015, January: Visiting Scholar, Institute Pure Appl Math, Los Angeles

2014, August-December: Visiting Professor, Math Dept Univ. Southern California, Los Angeles,

2013, August-October: Visiting Scholar, Institute Pure Appl Math, Los Angeles

2003, September-November: Visiting Professor, Math Dept UCLA, Los Angeles

2002, January-February: Professeur invité, Université de Marne-la-Vallée, Paris

2000, May-June: Professeur invité, Université de Paris VII, Paris

1999, February: Visiting Professor, Math Dept Univ. of Arizona, Tucson

1997, July-September: Visiting Faculty, Math Dept UCLA, Los Angeles

1996, July-September: Visiting Faculty, Math Dept UCLA, Los Angeles

1995, July-September: Visiting Faculty, Math Dept UCLA, Los Angeles

1994, July-September: Visiting Faculty, Math Dept UCLA, Los Angeles

1993, July-October Visiting Faculty, Math Dept UCLA, Los Angeles

Awards and Honors

2000, quoted in the book: Development of Mathematics 1950-2000, Birkhauser 2000

2010, quoted in the book: La Matematica IV, Pensare il mondo, C.Bartocci and P.Odifreddi (eds), Einaudi 2010

2013, the paper: M Cannone, MC Lombardo, M Sammartino; Well-posedness of Prandtl equations with non-compatible data, Nonlinearity, 26(12), (2013), pp. 3077-3100, included in the exclusive **2013 Nonlinearity Highlights Collection**

2015, Cataldo Agostinelli e Angiola Gili Agostinelli Prize for Pure and Applied Mechanics and Mathematical Physics, Accademia Nazionale dei Lincei

2019, the paper F. Gargano, G. Ponetti, M. Sammartino, V. Sciacca, Route to chaos in the weakly stratified Kolmogorov flow, Physics of Fluids, 31 (2), art. no. 024106 (2019), included in the **Featured Physics of Fluids Collection**

RESEARCH INTERESTS

Fluid dynamics, rigorous theory: Incompressible Navier-Stokes equations, Prandtl equations, boundary layer theory, zero-viscosity, vortex sheets, MHD equations.

Fluid dynamics, computational: simulations of high-Reynolds-number flows, boundary layer separation, transition to turbulence; numerical study of complex singularities in PDEs; vortex layers, vortex sheets, Kelvin-Helmholtz instability; Kolmogorov flow, weak-turbulence.

Reaction-diffusion equations, pattern formation, biomathematics: instabilities and transitions in reaction-diffusion equations, normal forms; pattern formation in ecological modeling, competitive dynamics, three-species models, nonlinear diffusion, cross-diffusion; modeling of acute inflammation, modeling of multiple sclerosis.

DESCRIPTION OF THE MAIN RESULTS

1. Mathematical theory of fluid dynamics: zero viscosity limit of the Navier-Stokes equations and justification of the Euler-Prandtl equations

The small viscosity limit of the solutions of the Navier-Stokes equations is one of the central problems of the mathematical theory of fluid dynamics, which has seen the contributions of mathematicians of the caliber of Oleinik, Kato, Majda, DiPerna, Constantin, Asano, and others, who have not, however, managed to give a fully satisfactory solution to the problem. Rigorous analysis becomes particularly difficult in the presence of flows in domains with a boundary (when the boundary layer is formed) or data with concentrated vorticity. Sammartino, together with Russ Caflisch [1] and other authors[3,4], has shown that the Prandtl equations, derived from the Navier-Stokes equations through a formal asymptotic expansion, are well posed in spaces of analytic functions. The analyticity hypothesis, initially considered restrictive, was later shown to be necessary due to the ill-posedness of the Prandtl equations in Sobolev spaces, as demonstrated in the works of Grenier, Gerard Varet, Dormy, and others.

These solutions of the Prandtl equations were then used to construct the solutions of the Navier-Stokes equations as a "superposition" of the Euler and Prandtl solutions [2] This result gave a rigorous proof of the fundamental conjecture that the solutions of the Euler and Prandtl equations are good approximations, in their respective domains of validity, far from the boundary and near it, of the solutions of the Navier-Stokes equations. The result mentioned above, in 3D, also provided the first theorem of the existence of Navier-Stokes solutions in boundary domains for times independent of viscosity.

These results have been cited in the book *Development of Mathematics 1950-2000*, Birkhauser 2000, and in the fourth volume of the *History of Mathematics La Matematica IV, Pensare il mondo* C.Bartocci and P.Odifreddi (Einaudi 2010).

Computational aspects

The theorems above are valid for a short time and, in any case, do not go beyond the singularity time of the Prandtl equations. In the articles [5,6,7] a numerical study of the solutions of the Navier Stokes equations in domains with boundaries and at high Reynolds number is reported. This study has given a deep understanding of the phenomenon of boundary layer separation and has numerically demonstrated that, contrary to what is believed in the literature, the separation is not caused by the singularity developed by the Prandtl solutions but, instead, by the interactions between the boundary layer and the external flow.

2. Mathematical theory of fluid dynamics: Euler solutions with concentrated vorticity and justification of the Birkhoff Rott equations

In fluid dynamics, configurations with intense and highly concentrated vorticity are of considerable theoretical and applicative interest. From the mathematical point of view, the problem is non-trivial because the high gradients, potentially unlimited, make classical estimates of no use. Vortex sheets, configurations with vorticity concentrated on a surface of codimension one, are among the most relevant examples. The results of DiPerna, Majda, Schochet, Delort, Pulvirenti and others had left open essential problems, such as the uniqueness of the solution, the case of vorticity of non-constant sign, and the justification of the Birkhoff Rott equation as a good approximation of the Euler equations. In the article [8] an answer to these questions is given for analytical data and without hypotheses on the sign of the vorticity, the solution of the Euler equations is constructed with given initial data of type vortex-layer, layer, and it is demonstrated that the dynamics of the layer is well approximated to the first order in the thickness, by the equations of Birkhoff-Rott.

Computational Aspects

In the papers [9] and [10], Sammartino and collaborators studied the behavior of vortex layers at high Reynolds numbers, comparing them with the dynamics predicted by the Birkhoff-Rott equation. The existence of complex singularities in the solutions of the Navier-Stokes equation, related to the concentration phenomena predicted by DiPerna and Majda, was detected and it was demonstrated that vortex layers, in the zero viscosity limit, have a singularity paradoxically stronger than that shown by Birkhoff-Rott.

3. Bifurcations and Pattern Formation in Reaction-Diffusion Systems

Recently, Sammartino has dealt with reaction-diffusion systems, in particular in the presence of nonlinear diffusion or chemotaxis [11,12,13]. Worthy of note are the works [14,15] where the dynamics of inflammatory diseases (such as multiple sclerosis) have been modeled using reaction-diffusion-

chemotaxis systems, and the authors have shown how some phenomena encountered in clinical practice are the result of instability and bifurcation phenomena (Turing, Hopf or subharmonic) exhibited by such PDE systems.

4. Other results

Shallow water models. Sammartino and Dave Levermore [16] introduced a shallow water model with dissipation and bottom topography, demonstrating its good global position in time. The long-time dynamics of this model were then studied in [17]. Such models are relevant in oceanography and hydrography.

Hydrodynamic limits of kinetic models. Sammartino, Caflisch, and Lombardo introduced nonlocal boundary conditions for the Boltzmann equation, which generalize the classical Maxwell boundary conditions. They derived the corresponding nonlocal boundary conditions for the Navier-Stokes equations in the hydrodynamic limit. Such boundary conditions are useful to describe the interaction of a fluid with a porous wall [18], or [19] they constitute the justification, starting from a kinetic model, of fluid-boundary interaction models often used in Large Eddy Simulations.

Kolmogorov flow. The paper [20] (included in the collection “Featured papers” of the journal *Physics of Fluids*) presents a numerical study of the stratified Kolmogorov flow. In particular, the sequences of bifurcations that, starting from coherent states close to equilibrium, lead to weakly turbulent solutions are analyzed.

Radiative hydrodynamics. In the works [21,22], starting from the radiative transport equation and using closure techniques typical of extended thermodynamics, hyperbolic hydrodynamic models with dissipative effects have been derived. Such models give a macroscopic description of the interaction between radiation and matter and are of astrophysical interest and widely cited in the literature.

Hydrodynamics with incompatible data. In the papers [26,27], the cases of boundary conditions that present incompatibilities with the initial data or with the generation of vorticity deriving from the flow at the boundary have been analyzed for the Navier-Stokes and Euler equations.

25 SELECTED PUBLICATIONS

For a more extensive list of selected publications, please visit

<https://www.marcosammartino.it/publications/full-list/>

1. M. Sammartino, R.E. Caflisch, *Zero viscosity limit for analytic solutions of the Navier-Stokes equations on a half space I: Existence for Euler and Prandtl equations*, **Communications in Mathematical Physics**, vol.192, 433-461 (1998).
2. M. Sammartino, R.E. Caflisch, *Zero viscosity limit for analytic solutions of the Navier-Stokes equations on a half space II: Construction of the Navier-Stokes solution*, **Communications in Mathematical Physics**, vol.192, 463-491 (1998).
3. M. Cannone, M.C. Lombardo, M. Sammartino, *Well-posedness of the boundary layer equations with a non-analyticity hypothesis*, **SIAM Journal on Mathematical Analysis**, vol.35; 987-1004 (2003).
4. M. Cannone, M.C. Lombardo, M. Sammartino, *Well-posedness of Prandtl equations with non-compatible data*, **Nonlinearity**, vol.26(12), 3077-3100 (2013).
5. F. Gargano, M. Sammartino, V. Sciacca, *Singularity formation for Prandtl's equations*, **Physica D-Nonlinear Phenomena**, vol.238, 1975-1991 (2009).
6. F. Gargano, M. Sammartino, V. Sciacca, *High Reynolds number Navier-Stokes solutions and boundary layer separation induced by a rectilinear vortex*, **Computers and Fluids**, vol.52, 73-92 (2011).
7. F. Gargano, M. Sammartino, V. Sciacca, K.W. Cassel, *Analysis of complex singularities in high-Reynolds-number Navier-Stokes solutions*, **Journal of Fluid Mechanics**, vol.747, pp. 381-421 (2014).
8. R.E. Caflisch, M.C. Lombardo, M. Sammartino, *Vortex layers of small thickness*, **Communications on Pure and Applied Mathematics**, 73(10), pp. 2104-2179, (2020).
9. R.E. Caflisch, F. Gargano, M. Sammartino, V. Sciacca, *Complex Singularity Analysis for Vortex Layer Flows*, **Journal of Fluid Mechanics**, vol.932, A21, (2022).
10. F. Gargano, M. Sammartino, V. Sciacca, *Singular behavior of a vortex layer in the zero thickness limit*, **Atti della Accademia Nazionale dei Lincei, Classe di Scienze Fisiche, Matematiche e Naturali, Rendiconti Lincei Matematica e Applicazioni**, 28(3), pp. 553-572 (2017).
11. G. Gambino, M.C. Lombardo, M. Sammartino, *Cross-diffusion-induced subharmonic spatial resonances in a predator-prey system*, **Physical Review E**, 97 (1), art. no. 012220, (2018).
12. G. Gambino, M.C. Lombardo, M. Sammartino, V. Sciacca, *Turing pattern formation in the Brusselator system with nonlinear diffusion*, **Physical Review E**, vol.88(4), 042925 (2013)
13. G. Gambino, M.C. Lombardo, M. Sammartino, *Pattern formation driven by cross-diffusion in a 2D domain*, **Nonlinear analysis B: Real World Applications**, vol.14(3), 1755-1779 (2013).
14. M.C. Lombardo, R. Barresi, E. Bilotta, F. Gargano, P. Pantano, M. Sammartino, *Demyelination patterns in a mathematical model of multiple sclerosis*, **Journal of Mathematical Biology**, 75 (2), pp. 373-417 (2017).

15. V.Giunta, M.C.Lombardo, M.Sammartino, *Pattern formation and transition to chaos in a chemotaxis model of acute inflammation*, **SIAM Journal on Applied Dynamical Systems**, vol.20(4), pp. 1844-1881 (2021).
16. C.D. Levermore, M. Sammartino, *A shallow water model in a basin with varying bottom topography and eddy viscosity*, **Nonlinearity**, Vol.14, n.6, 1493-1515 (2001).
17. V. Sciacca, M. Schonbek, M. Sammartino, *Long time behavior for a dissipative shallow water model*, **Annales de l'Institut Henri Poincaré (C) Analyse Non Lineaire**, 34(3), pp. 731-757 (2017).
18. M.C. Lombardo, R.E. Caflisch, M. Sammartino, *Non-Local Scattering Kernel and the Hydrodynamic Limit*, **Journal of Statistical Physics**, vol.130, 69–82 (2008).
19. R.E. Caflisch, M.C. Lombardo, M. Sammartino, *Asymptotic Analysis of a Slightly Rarefied Gas with Nonlocal Boundary Conditions*, **Journal of Statistical Physics**, vol.143(4), 725–739 (2011).
20. F. Gargano, G. Ponetti, M. Sammartino, V. Sciacca, *Route to chaos in the weakly stratified Kolmogorov flow*, **Physics of Fluids**, 31 (2), art. no. 024106 (2019).
21. A.M. Anile, S. Pennisi, M. Sammartino, *A Thermodynamical Approach to Eddington Factors*, **Journal of Mathematical Physics**, vol.32, 544 (1991).
22. A.M. Anile, S. Pennisi, M. Sammartino, *Covariant Radiation Hydrodynamics*, **Annales de l'Institut Henri Poincaré**, vol.56, (1):48-74 (1992).
23. M. Sammartino, F. Malvagi, G.C. Pomraning, *Diffusive Limits for Particle transport in Stochastic Mixtures*, **Journal of Mathematical Physics**, vol.33, (4), 1480-501 (1992).
24. M.C. Lombardo, M. Sammartino, *Zero viscosity limit of the Oseen equations in a channel*, **SIAM Journal on Mathematical Analysis**, Vol.33(2), 390-410 (2001).
25. I. Kukavica, M.C. Lombardo, M. Sammartino, *Zero viscosity limit for analytic solutions of the Primitive Equations*, **Archive for Rational Mechanics and Analysis**, vol.222, (1), pp.15-45 (2016).
26. A. Argenziano, M. Cannone, M. Sammartino, *Navier-Stokes equations in the half-space with non-compatible data*, vol.26(2), 32 **Journal of Mathematical Fluid Mechanics** (2024).
27. I. Kukavica, W. Ozanski, and M. Sammartino, *The inviscid inflow-outflow problem via analyticity*, accepted for publication in **Archives of Rational Mechanics and Analysis** (2024).

INVITED TALKS AND LECTURES

1. Invited talk at the program Mathematical Problems in Fluid Dynamics, Berkeley, July 17-August 11, 2023.
2. Plenary talk at the XXI WASCOM, Congress on Waves and stability in continuous media, Bari, June 4-9, 2023
3. Invited talk at Meeting on Nonlinear Evolution PDEs, Fluid Dynamics and Transport Equations, Erice, May 25-31, 2023
4. Invited talk at the workshop: Giornate Signorini, on the occasion of the 70th birthday of Maurizio Vianello, Perugia, November 4-5, 2022.

5. Invited talk at the workshop: *Current Trends in Kinetic Theory and Related Models*, Parma, October 13-14, 2022
6. Plenary talk at the XX International Conference on Waves and Stability in Continuous Media, Catania, June 6-10, 2022
7. Invited talk at the *V Workshop on Fluids and PDE*, University of Campinas, September 20–October 1, 2021
8. Invited talk during the semester, *Mathematical problems in fluid dynamics*, MSRI, Berkeley, May 6, 2021
9. Invited talk at the Workshop: *60 minutes of Continuum Mechanics in honor of Alfredo Marzocchi*, Brescia, 16 November 2020
10. Invited talk at the *Groupe de travail équations aux dérivées partielles*, Laboratoire d'analyse et de mathématiques appliquées (LAMA) UMR 8050-CNRS, Paris, January 23, 2020
11. Invited talk at the China-Italy Conference on Partial Differential Equations and Their Applications, Shanghai, December 9 - 14, 2019
12. Plenary talk at the XX International Conference on Waves and Stability in Continuous Media, Maiori (SA), June 10-14, 2019.
13. Invited talk at the INDAM Intensive period “Shape optimization, control and inverse problems for PDEs,” Napoli, June 04 - 07, 2019.
14. Invited talk at the Wolfgang Pauli Institute (Wien), Workshop on *Mathematical Amelioration in Fluid Dynamics*, Wien, December 14-17, 2018.
15. Invited at the First CISAS Biomathematics Workshop, IASI-CNR e IBIM-CNR, Palermo October 12, 2018.
16. Plenary talk at the international conference CICAM9, Ninth China-Italy Colloquium on Applied Mathematics, Assisi, June 12-15, 2018.
17. Invited talk at the *Workshop on Mathematical fine structures in fluid dynamics*, Intensive Program on Fluid and waves, GSSI, L'Aquila, June 11-15, 2018.
18. Invited talk at the conference *Equazioni alle Derivate Parziali nella Dinamica dei Fluidi*, Pisa, February 5-7, 2018.
19. Invited talk at the conference *New Trends in Fluid and Solids Models*, Salerno, January 30-February, 2018.
20. Plenary talk at the XIX International conference on Waves and Stability in Continuous Media, Bologna, June 12-16, 2017.
21. Talk at the First Joint Brazil-Italy Meeting and Workshop on *Recent Progress in Fluid Dynamics*, Rio de Janeiro, August 29, 2016.
22. Invited talk at the conference *Nuove Frontiere in Meccanica dei Continui* in onore di Giuseppe Grioli, Accademia dei Lincei, Rome, June 21-22, 2016.
23. Invited at the BIRS Workshop *Recent Advances in Hydrodynamics*, Banff, Canada, June 5-10, 2016.
24. Invited at the Workshop on *Complex systems of reaction-diffusion*, Paris, March 11-14, 2016.
25. Invited talk at the conference *Couches limites et Interactions Fluide/Structure*, Bordeaux, January 11-14, 2016.
26. Plenary lecture at the XX Congress of Italian Mathematical Association, Siena, September 7-12, 2015.
27. Plenary talk at the XVIII International conference on Waves and Stability in Continuous Media, Cetraro (CZ), June 1-5, 2015.

28. Invited talk at the Seventh China-Italy Colloquium on Applied Mathematics, Cinisi (PA), September 8-11, 2014.
29. invited talk at the International Conference *Advances in Mathematical Fluid Mechanics, Stochastic & Deterministic Methods*, Lisbon, June 30-July 5, 2014.
30. Invited talk at the *Fourth Workshop on Fluids and PDE*, Rio de Janeiro, IMPA, May 26-30, 2014.
31. Plenary talk at the XVII International conference on Waves and Stability in Continuous Media, Levico Terme (TN), June 17-21, 2013.
32. Plenary talk at the *Sixth China-Italy Colloquium on Applied Mathematics*, Shanghai, October 22-27, 2012.
33. Invited talk at the Minisymposium on *Infinite Dimensional Dynamics and Applications*, 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, Florida, July 1-5, 2012.
34. Invited talk at the Minisymposium on *Singular Perturbations and Boundary Layer Theory*, 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, Florida, July 1-5, 2012.
35. Invited talk at the Minisymposium on *The many aspects of Fluids and Harmonic Analysis*, SIAM Conference on Analysis of PDE, San Diego, November 14-17, 2011.
36. Invited talk at the workshop *Stability and Qualitative Analysis of Dynamical Systems*, Levico Terme (TN), October 4-5, 2011.
37. Invited talk at the INDAM workshop *Nonlinear Hyperbolic Systems of Balance Laws in Extended Thermodynamics and Kinetic Theory*, Cortona (Italy), September 4-10, 2011.
38. plenary talk at XVI International conference on Waves and Stability in Continuous Media, Brindisi, June 12-18 2011.
39. Plenary talk at *Fifth China-Italy Colloquium on Applied Mathematics*, Acireale, September 27-30, 2010.
40. Invited talk at the Minisymposium on *Fluids and Harmonic Analysis*, SIAM Conference on Dynamical systems and PDE, Barcelona, May 31-July 4, 2010.
41. plenary talk at IPERBA, *13th Meeting on Hyperbolic Equations*, Bari, February 11-13, 2009.
42. Invited talk at *New Trends in Industrial and Applied Mathematics*, Catania, November 10-13, 2008.
43. Plenary talk at the International conference on *New Trends in Fluid and Solid Models*, Vietri (SA), February 28- March 1 2008.
44. Plenary talk at XIV International conference on Waves and Stability in Continuous Media, Scicli (RG), June 19-July 6, 2007.
45. Plenary talk at the Workshop on *PDE and Fluid Mechanics*, Warwick, May 21-23, 2007.
46. Plenary talk at XIII International conference on Waves and Stability in Continuous Media, Catania, June 19-25, 2005.
47. Plenary talk at the second *China-Italy Joint Symposium on Applied Mathematics*, Grado, September 2005.
48. Plenary talk at IPERPI, *11th Meeting on Hyperbolic Equations*, Pisa, October 20-22 2004.
49. Plenary talk at the Assemblée Scientifica GNFM-INdAM, Montecatini Terme, October 28-30, 2004.
50. Five lectures at the *XXIX School of Mathematical Physics*, Ravello, September 8-18, 2004.
51. plenary talk at XII International conference on Waves and Stability in Continuous Media, Cagliari, June 1-7, 2003.
52. Plenary talk at IPERBS, *8th Meeting on Hyperbolic Equations*, Brescia, November 30-2 December 2000.

- 53. Five lectures at the Summer School on *Non Linear Partial Differential Equations*, Lisbon, July 16-20, 2001.
- 54. Plenary talk at IPERRoma99, *7th Meeting on Hyperbolic Equations*, Rome, October 25-27, 1999.
- 55. Plenary talk at *Equations de Navier-Stokes et analyse microlocale*, Marseille Luminy, 9-13 November, 1998.
- 56. Plenary talk at *Models of Continuous Mechanics and Thermodynamics*, Darmstadt, September 30-Oct.2, 1998.
- 57. Invited talk at *Systems with multiple scales*, Oberwolfach, May 25-29, 1998.

PROJECTS

Principal Investigator: PRIN 2017 “Multiscale phenomena in Continuum Mechanics: singular limits, off-equilibrium and transitions” (project number: 2017YBKNCE).

Progetto di Grid Computing Cometa (Consorzio Multi Ente per la promozione e l'adozione di Tecnologie di calcolo Avanzato) Pi2S2 per l'Implementazione e lo Sviluppo di una e-Infrastruttura basata sul paradigma della grid;

Principal Investigator: INDAM-Progetto GNFM 2004: Problemi di Diffusione e Controllo di Inquinanti nei Fluidi e nei Porosi;

Principal Investigator: INDAM-Progetto GNFM 2003: Analisi qualitativa non lineare per continui dissipativi;

Principal investigator of the italian unit: CRUI: Programma di cooperazione Italo-Francese Galileo 2001-2002 *"Etude mathématique des modèles de pollution des sols: influence sur le nettoyage des sols de la concentration de produits modifiant la mouillabilité et la viscosité de différentes phases"*.

Principal Investigator: INDAM- Progetto GNFM 2002: Insiemi assorbenti, attrattori e varietà inerziali nella fluidodinamica esterna ed applicazioni alla geofisica.

ADMINISTRATION AND OTHER SERVICES

Administration services at the University of Palermo

2010-2011 Chair of the Undergraduate Program in Mathematics.

2003-2007 Chair of the Undergraduate Program in Applied Mathematics.

Administration services at the national level

2013-2020 Member of the Scientific Committee of G.N.F.M.- National Group of Mathematical Physics—Italian Institute for Higher Mathematics.

2020-2023 Member of the Scientific Committee of the Italian Institute for Higher Mathematics.

2023-present President of the Scientific Committee of the Italian Institute for Higher Mathematics.

Other services

Service as Referee for many journals, including *Inventiones Mathematicae*, *Duke Mathematical Journal*, *Advances in Mathematics*, *Archives for Rational Mechanics and Analysis*, *Communications in Mathematical Physics*, and *Journal of Mathematical Biology*.

Service as referee for funding agencies: Horizon 2020, FWF Austrian Science Fund, Israel Science Foundation, the French Haut Conseil de l'évaluation de la recherche et de l'enseignement supérieur (Hcéres).