Daniele Funaro

✉ daniele.funaro@unimore.it

📞 +39 059 2058551

📍 Dipartimento di Scienze Chimiche e Geologiche, Università di Modena e Reggio Emilia, Via Campi 103, 41125 Modena, Italy

🌐 www.matterstructure.it

📅 Born: 7 August 1958

Last update: Sept. 2023

CURRENT POSITION

Full Professor of Numerical Analysis, University of Modena and Reggio Emilia (from 1995)

PREVIOUS POSITIONS

Researcher (Analysis), University of Pavia (1983 -1992)

Associate Professor of Analysis, University of Pavia (1992 -1995)

EDUCATION AND TRAINING

Student, Scuola Normale Superiore, Pisa (1977-1979)

Degree in Mathematics, University of Pavia (1981)

Fellowship, Istituto di Alta Matematica, Rome (1981-1982)

MANAGERIAL POSITIONS

Director of the Computer Centre, University of Modena (1997-2000)

Chairman of the Department of Mathematics, University of Modena (2000-2007)

MOST SIGNIFICANT LONG-TERM VISITS ABROAD

Institute for Computer Applications in Science and Engineering (now dismissed) – NASA Langley Research Centre, Hampton, VA

Department of Mathematics, Princeton University, Princeton, NJ

Division of Applied Mathematics, Brown University, Providence, RI

Department of Mathematics, University of California, Los Angeles, CA

T-5 Applied Mathematics and Plasma Physics, Los Alamos National Laboratory, Los Alamos, NM

RESEARCH IN SHORT

Numerical techniques for the approximation of partial differential equations, with particular emphasis on high-order methods. Applications to various model problems, such as: Vlasov-Poisson and Navier-Stokes equations. Simulation of electromagnetic waves and solitons. Investigation into the foundations of physics.

RELEVANT KEYWORDS

- spectral methods
- domain decomposition methods
- preconditioning
- treatment of boundary layers
- models in electromagnetism
- waves in toroid cavities

PUBLICATIONS

Books

- D. Funaro, Polynomial Approximation of Differential Equations, Lecture Notes in Physics, Volume 8, Springer-Verlag, Heidelberg 1992.
- D. Funaro, Spectral Elements for Transport-Dominated Equations, Lecture Notes in Computational Science and Engineering, Volume 1, Springer-Verlag, New York 1997.
- D. Funaro, Electromagnetism and the Structure of Matter, World-Scientific, Singapore 2008.
- D. Funaro, From Photons to Atoms – The Electromagnetic Nature of Matter, World Scientific, Singapore 2019.

Recent papers on electromagnetism

- D. Funaro, Electromagnetic Waves in Annular Regions, Appl. Sci., Vol. 10, n.5 (2020), p. 1780.
- D. Funaro, Ball Lightning as Plasma Vortexes: A Reinforcement of the Conjecture, Appl. Sci., Vol. 12, n.7 (2022), p. 3451.
- D. Funaro, The Space-Time Outside a Pulsating Charged Sphere, Appl. Sci., Vol. 12, n. 14 (2022), p. 7290.
- L. Fatone, D. Funaro, Electromagnetic Fields Simulating a Rotating Sphere and its Exterior with Implications to the Modeling of the Heliosphere, Math. Meth. Appl. Sci., Vol. 46, n. 2 (2022), pp. 1952-1963.
- D. Funaro, The Impact of a Pervasive Electrodynamical Background on Biological Interactions, Preprint (2022), hal.science/hal-03899223v1.
- D. Funaro, Newtonian Forces Exerted by Electromagnetic Waves Traveling into Matter, Preprint (2023), hal.science/hal-03950038v1.
- D. Funaro, Spacetime Deformations of Electromagnetic Nature are Far from Negligible, Preprint (2023), This essay received an Honorable Mention in the 2023 Essay Competition of the Gravity Research Foundation.
- D. Funaro, A Dynamic Representation of mRNA Nucleotides Clarifies the Conundrum of Codon Redundancy, Biophysica, Vol. 3, n. 3 (2023), p. 548-557.
- L. Fatone, D. Funaro, Electromagnetic Displacements Rotating Inside an Annular Region, in Spectral and High Order Methods for Partial Differential Equations (ICOSAHOM Conference), LNCSE, Springer, Vol. 137 (2023), p. 279-290.

Recent papers on numerical analysis

- L. Fatone, D. Funaro, G. Manzini, Arbitrary-Order Time-Accurate Semi-Lagrangian Spectral Approximations of the Vlasov-Poisson System, J. Comput. Phys., Vol. 384 (2019), pp. 349-375.
- L. Fatone, D. Funaro, G. Manzini, A Semi-Lagrangian Spectral Method for the Vlasov-Poisson System based on Fourier, Legendre and Hermite Polynomials, Comm. Appl. Math. Comput., Vol. 1, n.3 (2019), pp. 333-360.
- D. Funaro, G. Manzini, Stability and Conservation Properties of Hermite-based Approximations of the Vlasov-Poisson System, J. Sci. Comput., Vol. 88, n. 29 (2021).
- L. Fatone, D. Funaro, G. Manzini, A Decision-Making Machine Learning Approach in Hermite Spectral Approximations of Partial Differential Equations, J. Sci. Comput., Vol. 92, n.3 (2022).
- D. Funaro, How and Why non Smooth Solutions of the 3D Navier–Stokes Equations Could Possibly Develop, Numer. Math., Vol. 152 (2022), pp. 789-817.