

Luca Perotti, Ph.D.

Visiting Assistant Professor, Texas Southern University Department of Physics
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Education

- 1996 Ph.D., Physics, University of Pittsburgh, Pittsburgh, Pennsylvania
Thesis: "Semiclassical electron transport within the excited hydrogen atom in a pulsed microwave electric field" *Advisor:* James E. Bayfield, Ph.D.
- 1992 M.S., Physics. University of Pittsburgh, Pittsburgh, Pennsylvania
- 1986 Laurea (Grade: 109/110), Physics. Università degli studi di Milano, Italy
Thesis: "Comportamento caotico in meccanica quantistica: eccitazione e ionizzazione dell'atomo di idrogeno" ("Chaotic behaviour in Quantum Mechanics: Excitation and Ionization of the Hydrogen Atom") *Advisor:* Dr. Giulio Casati.

Academic Appointments

- 2016-present Visiting Assistant Professor, Department of Physics, Texas Southern University, Houston, Texas.
- 2010-2013 Research Assistant Professor, Department of Physics, Texas Southern University, Houston, Texas.
- 2007-2010 Visiting Assistant Professor, Department of Physics, Texas Southern University, Houston, Texas.
- 2001-2007 Research Assistant, Università degli Studi Dell'Insubria, Como, Italy.
- 2000-01 Postdoctoral Fellow, Solid State Physics, Clark Atlanta University
Advisor: Dr. D. Bessis
- 1997-99 Postdoctoral Fellow, Atomic Physics, Max Planck Institut für Quantenoptik, Garching bei München, Germany. *Advisor:* Dr. H. Walther
- 1987-1989 Research Assistant, Center for Nonlinear and Complex Systems, Università degli Studi Di Milano, Milan, Italy. *Advisor:* Dr. Giulio Casati.

Honors and Awards

- 1991 Andrew Mellon Predoctoral Fellowship

Publications

Peer-reviewed journal articles

- [1] L. Perotti, J. DeVito, D. Bessis & Y. Dabaghian: "Discrete Structure of the Brain Rhythms". Scientific Reports | (2019) 9:1105 | <https://doi.org/10.1038/s41598-018-37196-0>. Published online: 28 January 2019.
- [2] M. Carpineti, L. Cazzaniga, L. Perotti, M. Giliberti, M. Cavinato, N. Ludwig: "Embedding Physics into technology: Infrared thermography and building inspection as a teaching tool - a new

participated strategy approach to the physics of heat transfer and energy saving for professional schools". Published on the web 01 February 2019. Canadian Journal of Physics, <https://doi.org/10.1139/cjp-2018-0554>.

- [3] L. C. Perotti, D. Vranceanu, and D. Bessis "Recovery of the Starting Times of Delayed Signals"; IEEE Signal Processing Letters, Vol. 25, Issue 10, pp. 1455-1459 (2018).
- [4] M. Giliberti, L. Perotti, and L. Rossi "Motion of a superconducting loop in an inhomogeneous magnetic field: a didactic experiment"; Eur. J. Phys. 39 (2018) 055503
- [5] L. Perotti and M. Wojtylak "Matrix methods for Padé approximation: Numerical calculation of poles, zeros and residues"; Linear Algebra and its Applications 548 (2018) 95–122.
- [6] G. Mantica and L. Perotti; "Extreme value laws for fractal intensity functions in dynamical systems: Minkowski analysis"; J. Phys. A: Math. Theor. (2016) 49 374001.
- [7] M. Derevyagin, L. Perotti, M. Wojtylak "Truncations of a class of pseudo-Hermitian operators" Journal of Mathematical Analysis and Applications (2016) doi:10.1016/j.jmaa.2016.01.013.
- [8] M. Cavinato, M. Giliberti, L. Perotti; "Cross section for (nearly) everyone" Canadian Journal of Physics, 93, pp. 1555-1560, (2015)
- [9] L. Perotti, T. Regimbau, D. Vranceanu, and D. Bessis "Identification of gravitational-wave bursts in high noise using Padé filtering" Phys. Rev. D 90, 124047 (2014).
- [10] Luca Perotti, Daniel Vranceanu, Daniel Bessis "Enhanced Frequency Resolution in Data Analysis", American Journal of Computational Mathematics, Vol. 3, pp. 242-251 (2013).
- [11] D. Bessis, L. Perotti, and D. Vranceanu; "Noise in the complex plane: open problems", Numer. Algor. Vol. 62, pp. 559–569 (2013).
- [12] L. Perotti, D. Vranceanu and D. Bessis, "Beyond the Fourier Transform: Signal Symmetry Breaking In the Complex Plane", IEEE Signal Processing Letters, Vol. 19, Issue 12, pp. 865-867(2012).
- [13] B. Beckermann, D. Bessis, L. Perotti and D. Vranceanu, "Computing high precision Matrix Pade' approximants", Num. Algor. Vol. 61, pp. 189-208 (2012).
- [14] L. C. Perotti, "Low frequency quantum stabilization of the Hydrogen atom in a Microwave field: scarred states and classical stability island overlap", J. Phys. B: At. Mol. Opt. Phys. 44:245002 (2011).
- [15] L.C. Perotti, "Small phase-space structures and their relevance to pulsed quantum evolution: Stepwise ionization of the excited hydrogen atom in a microwave pulse", Phys Rev. A 81:033407 (2010).
- [16] D. Bessis and L. Perotti "Universal analytic properties of noise: introducing the J-matrix formalism"; J. Phys. A 42 (2009) 365202 (15pp)
- [17] L. C. Perotti, "Ionization of Rydberg alkali-metal atoms in quasistatic electric fields: A classical view of the n^5 scaling of the threshold field"; Phys. Rev. A 73, 053405 (2006).
- [18] L. C. Perotti, "Proposed Interpretation of Microwave Ionization of Rydberg Alkali-metal Atoms"; Phys. Rev. A 71, 033405 (2005)
- [19] L. C. Perotti, "Quantum double pendulum: Study of an autonomous classically chaotic quantum system"; Phys. Rev. E 70, 066218 (2004).
- [20] Luca Perotti and Daniel Bessis, "Realistic Semiconductor Heterostructures design using Inverse Scattering"; Microelectronics Journal 34 (2003)
- [21] L. Perotti, V. Alekseev and H. Walther (2000), "Transport of a single ion in an optical lattice: spatial diffusion and potential energy." *Optics Comm.* **183**: 73-94.

- [22] S. Schlipf, H. Katori, L. Perotti, and H. Walther (1998), “Diffusion of a Single Ion in a One-Dimensional Optical Lattice.” *Optics Express* **3**: 97-103.
- [23] J.E. Bayfield, S.Y. Luie, L. C. Perotti and M. Skrzypkowsky (1996), “Ionization steps and phase space metamorphoses in the pulsed microwave ionization of highly excited hydrogen atoms.” *Phys. Rev. A* **53**:12-15.
- [24] J.E. Bayfield, S.Y. Luie, L. C. Perotti and M. Skrzypkowsky (1995), “Excited hydrogen atoms in pulsed microwaves: journeys to quantum chaos and back.” *Physica D* **83**: 46-54.
- [25] G. Brivio, G. Casati, I. Guarneri and L. Perotti (1988), “Quantum suppression of Chaotic Diffusion: Theory and Experiment.” *Physica D* **33**: 51-57.

Book Chapters

1. N. Bergomi, L. Cazzaniga, M. Giliberti, L. Perotti, G. Vegni (2008), “Campi e particelle: esperienze emblematiche,” in *Approcci e Proposte per l'Insegnamento-Apprendimento della Fisica a Livello Preuniversitario*, P. Guidoni and O. Levrini, eds. FORUM (Udine, Italy) 2008.
2. G. Casati, I. Guarneri and L. Perotti (1985), “Chaos and Quantum Dynamics of Simple Models.” *Proceedings of the 2nd Soviet-Italian Meeting on Statistical Mechanics*, Lvov, October 1985.

Preprints

1. L.C. Perotti, D. Bessis, and G.A. Mezincescu. “Direct Current Photoexcitation: could it be relevant for QWIPs?” http://scienze-como.uninsubria.it/lperotti/Pubblicazioni_files/qwip.pdf
2. J.E. Bayfield, S.Y. Luie and L. C. Perotti, "Ionization of Stretched Hydrogen Atoms by Collinear Short Pulse Microwave and Constant Static Electric Field." http://scienze-como.uninsubria.it/lperotti/Pubblicazioni_files/stretch.pdf

Collaborations

- Yuri Dabaghian, Department of computational and applied mathematics at Rice University in Houston: analysis of neural oscillations in the hippocampus.
- Michal Wojtilak, Jagiellonian University, Faculty of Mathematics and Computer Science, Krakow Poland: quasianality of Padé approximants of the Z-transform of a data series.
- Daniel Vrinceanu, Department of Physics Texas Southern University: applications of Padé approximants of the Z-transform of a data series.
- Giorgio Mantica, Dipartimento di Fisica Università dell' Insubria, Como Italy: dynamical theory of extremal events.
- Marco Giliberti, Dipartimento di Fisica Università degli Studi di Milano Italy: science education.

Presentations at Major Conferences

- 2015 “Using noise to detect faint signals: tricks with Padé approximants to Z-transforms“ Talk presented at the Dagstuhl seminar 15251 “Sparse modelling and multi-exponential analysis”, Dagstuhl, Germany, June 14-19.
- 2010 “Small Classical Phase Space Structures and Pulsed Quantum Evolution: the Stepwise Ionization of the Excited Hydrogen Atom in a Microwave Pulse.” Poster presented at the 41st Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics (DAMOP), Houston, Texas, May 25-29.

- 2009 “An analytical approach to the concept of noise with direct application to the detection of Gravitational Waves.” Joint presentation with D. Bessis at the Gravitational Waves Data Analysis Workshop (GWDAW), San Juan, Puerto Rico, January 19-22.
- 2007 “An analytical approach to the concept of noise using Padé approximations,” Joint presentation with D. Bessis at the 9th International OPSFA Conference “Special Functions, Orthogonal Polynomials and their Applications,” Marseilles, France, July 2-6.
- 2006 “Rutherford scattering explained to high school students within the frame of a semiclassical quantum field theory” and “Training non-graduate secondary school laboratory assistants.” Presented at the GIREP *Modeling in Physics and Physics Education* conference, Amsterdam, Holland, August 20-25.
- 2006 “Rydberg Alkali-metal atoms in quasi-static electric fields: a classical view.” Invited speaker for the *Illuminating Atoms and Molecules* symposium, Marseilles, France, May 19.
- 2003 “An interpretation of microwave ionization of excited alkali atoms.” Poster presented at the Advanced Research Workshop *Quantum Chaos: Theory and Applications*, Como, Italy, June 17-21.
- 1999 “Anomalous Dynamics of a Single Ion in an Optical Lattice,” joint presentation at the Quantum Structures (QSTRUCT) network conference, Innsbruck, Austria, January 11-14.
- 1997 “Anomalous Dynamics of a Single Ion in an Optical Lattice,” joint presentation at the Quantum Structures (QSTRUCT) network conference, Munich, Germany, July 24-27.
- 1994 “N Two-level Atoms in a Two-mode Electromagnetic Cavity,” poster presentation at the April Meeting of the American Physical Society, Crystal City, Virginia, April 18-22.

Other Talks

- 2015 “What can I do with a Padé approximant?” talk at the physics department of the Università dell’Insubria, Como, Italy, December.
- 2015 “Detecting faint signals by analyzing noise: a new method”, talk at the math department of the Jagiellonian University, Kraków, Poland, March.
- 2011 “Science and Art.” 13th Annual McCleary Interdisciplinary Symposium, Houston, Texas, March 24-25.
- 2011 “Signal induced breaking of universal noise statistical properties,” The University of Texas at Brownsville, CGWA, Brownsville, TX, February 18.
- 2009 “The J-Matrix formalism applied to noisy data series: universal properties of noise.” 5th Conference of Italian Researchers, Houston, TX, December 5.
- 2009 “The J-Matrix formalism applied to noisy data series: universal properties of noise,” Meeting of the Texas Sections of the American Physical Society, October 22-24.
- 1999 Laser Physics Division, Max Planck Institut für Quantenoptik conference, Ringberg, Germany, March 1-5.
- 1998 Laser Physics Division, Max Planck Institut für Quantenoptik conference, February 9-13.

Teaching Experience

Texas Southern University

2007-17 Principles of Physical Science and College Physics I and II
2010 Mathematical methods I

Università degli Studi dell'Insubria, Varese, Italy

2005-06 Linear Algebra and Geometry, Calculus A
2004 Practical applications of Algebra

Liceo Scientifico Casiraghi Milano, Italy

1999-2000 Mathematics and Physics for the last three-year cycle
First year class: mathematics: geometry in the cartesian plane and algebra of finite groups (three hours a week); physics: elementary mechanics (two hours a week).
Second year class: mathematics: trigonometry, complex numbers, topology in \mathbf{R}^n and successions (three hours a week); physics: elementary thermodynamics, waves and geometrical optics (three hours a week).
Third year class: mathematics: limits, derivatives, Riemann integrals, and combinatory calculus (three hours a week); physics: elementary electromagnetism and introduction to quantum physics (three hours a week).

University of Pittsburgh

1995-96 General Physics I: one hour a week for each of five sections.
Undergraduate Laboratory: experiments of mechanics, thermodynamics, wave mechanics, electromagnetism, optics and nuclear dosimetry. One four-hour lab a week with a brief introductory lesson, followed by assistance to the students.
1989-90 Undergraduate Laboratory as described above.

Naval Academy of Livorno, Italy

1987-1988 General Physics I: Elementary mechanics, hydrodynamics, and thermodynamics. Two hours a week for each of the five sections of the Staff Officer course and three hours a week for each of the two sections of the Engineer Officer course.
Summer 1988 Recitations in both General Physics I and Linear Algebra on board the Amerigo Vespucci training ship for Staff Officer and Engineer Officer cadets.

Professional Memberships

American Physical Society

Consultancies

2002 Ventomatic S.P.A., Data analysis and simulations

Languages

Italian (native)
English (fluent)
French (conversational)
German (school knowledge)