

UNIVERSITÀ DEGLI STUDI DI MILANO  
selezione pubblica per n. \_1\_ posto/i di Ricercatore a tempo determinato in tenure track (RTT)  
per il settore concorsuale \_\_01/A4\_\_\_\_\_  
settore scientifico-disciplinare \_\_MAT07\_\_\_\_\_  
presso il Dipartimento di \_\_Matematica Federico Enriques\_\_\_\_\_  
(avviso bando pubblicato sulla G.U. n. \_\_21\_\_ del \_\_12/03/2024\_\_) Codice concorso \_5512\_\_

Lorenzo Gavassino  
CURRICULUM VITAE

INFORMAZIONI PERSONALI

COGNOME	GAVASSINO
NOME	LORENZO
DATA DI NASCITA	[REDACTED]

Data 10/04/2024      Luogo Nashville (TN), USA

## Research interests

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*Relativistic physics:* Relativistic fluid dynamics, relativistic kinetic theory, relativistic statistical mechanics, relativistic quantum mechanics, relativistic rheology.

*Mathematical physics:* Partial differential equations for fluid mechanics, functional analysis methods in linear perturbation theory, theory of signal propagation, stability theory.

*Systems of interest:* Neutron stars, quark-gluon plasma, superfluids, unstable particles.

## Primary appointments

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Title: Postdoc, department of Mathematics, Vanderbilt University, and member of the Vanderbilt Initiative for Gravity, Waves, and Fluids (VandyGRAF).

Institution: Vanderbilt University, Nashville (USA).

Period: Fall 2022 – Now.

Mentor: Marcelo Mendes Disconzi.

## Secondary appointments

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Title: PHAROS Short Term Scientific Mission.

Institution: Nicolaus Copernicus Astronomical Center (PAN), Warsaw.

Period: October 2018 – January 2019.

Host: Dr. Marco Antonelli.

## Degrees earned

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Degree: Ph.D. (with distinction) in Astronomy and Astrophysics.

Institution: Nicolaus Copernicus Astronomical Center (PAN), Warsaw.

Period: January 2019 – June 2022.

Supervisor: Prof. Brynmor Haskell.

Thesis title: Thermodynamic methods for relativistic hydrodynamics.

Degree: Master (cum laude) in Physics.

Institution: Università Statale di Milano, Milan.

Period: September 2016 – October 2018.

Advisor: Prof. Pierre M. Pizzochero.

Thesis title: Relativistic hydrodynamics of superfluid neutrons stars.

Degree: Bachelor (cum laude) in Physics.

Institution: Università Statale di Milano, Milan.

Period: September 2013 – July 2016.

## Publications (Click on title to access manuscript, when available)

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### Highlights:

1. Gavassino, L.; Disconzi, M. M.; Noronha, J. *Dispersion relations alone cannot guarantee causality*  
arXiv:2307.05987 (accepted for publication in Physical Review Letters)
2. Gavassino, L. *Can We Make Sense of Dissipation without Causality?*

Physical Review X, 12, 041001 (Oct 2022)

3. Gavassino, L.; Antonelli, M.; Haskell, B. *Thermodynamic Stability Implies Causality*  
Physical Review Letters 128, 010606 (Jan 2022)

#### Other Papers:

4. Gavassino, L. *Relativistic heat conduction in the large-flux regime*  
Entropy 2024, 26(2), 147 (Feb 2024)
5. Mullins, N.; Hippert, M.; Gavassino, L.; Noronha, J. *A new approach to stochastic relativistic fluid dynamics from information flow*  
Contribution to the Quark Matter 2023 conference proceedings (Jan 2024)
6. Wagner, D.; Gavassino, L. *Regime of applicability of Israel-Stewart hydrodynamics*  
Physical Review D 109, 016019 (Jan 2024)
7. Gavassino, L. *Mapping GENERIC hydrodynamics into Carter's multifluid theory*  
Symmetry 2024, 16(1), 78 (Jan 2024)
8. Mullins, N.; Hippert, M.; Gavassino, L.; Noronha, J. *Relativistic hydrodynamic fluctuations from an effective action: causality, stability, and the information current*  
Physical Review D 108, 116019 (Dec 2023)
9. Gavassino, L.; Shokri, M. *Stability of multi-component Israel-Stewart-Maxwell theory for charge diffusion*  
Physical Review D 108, 096010 (Nov 2023)
10. Gavassino, L. *Reply to "Comment on 'Subluminality of relativistic quantum tunneling' "*  
Physical Review A 108, 036202 (Sep 2023)
11. Gavassino, L. *Relativistic bulk viscous fluids of Burgers type and their presence in neutron stars*  
Classical and Quantum Gravity 40 165008 (Jul 2023)
12. Camelio, G.; Gavassino, L.; Antonelli, M.; Bernuzzi, S.; Haskell, B. *Simulating bulk viscosity in neutron stars I: formalism*  
Physical Review D 107, 103031 (May 2023)
13. Camelio, G.; Gavassino, L.; Antonelli, M.; Bernuzzi, S.; Haskell, B. *Simulating bulk viscosity in neutron stars II: evolution in spherical symmetry*  
Physical Review D 107, 103032 (May 2023)
14. Gavassino, L. *Bounds on transport from hydrodynamic stability*  
Physics Letters B, Volume 840, 10 May 2023, 137854 (May 2023)
15. Gavassino, L. *Is Relativistic Hydrodynamics always Symmetric-Hyperbolic in the Linear Regime?*  
Physical Review D 107, 065013 (Mar 2023)
16. Gavassino, L.; Antonelli, M. *Relativistic Liquids: GENERIC or EIT?*  
Classical and Quantum Gravity 40 075012 (Mar 2023)
17. Gavassino, L.; Disconzi, M. M. *Subluminality of relativistic quantum tunneling*  
Physical Review A 107, 032209 (Mar 2023)

18. Gavassino, L. *Should Unstable Quantum Field Theories be Lorentz Invariant?*  
Acta Physica Polonica B, vol. 53, article 11-A4 (10 pages), published online (Dec 2022)
19. Gavassino, L.; Giacosa, F. *Boosting unstable particles*  
Physical Review A 106, 042215 (Oct 2022)
20. Gavassino, L.; Antonelli, M.; Haskell, B. *Symmetric-hyperbolic quasi-hydrodynamics*  
Physical Review D 106, 056010 (Sep 2022)
21. Gavassino, L. *Fundamental asymmetry between space and time in quantum field theory*  
Classical and Quantum Gravity 39 215010 (Sep 2022)
22. Gavassino, L. *Stability and causality of Carter’s multifluid theory*  
Classical and Quantum Gravity 39 185008 (Aug 2022)
23. Dore, T.; Gavassino, L.; Montenegro, D.; Shokri, M.; Torrieri, G. *Fluctuating relativistic dissipative hydrodynamics as a gauge theory*  
Annals of Physics Volume 442, 168902 (Jul 2022)
24. Gavassino, L.; Antonelli, M.; Haskell, B. *Extending Israel and Stewart hydrodynamics to relativistic superfluids via Carter’s multifluid approach*  
Physical Review D 105, 045011 (Feb 2022)
25. Gavassino, L. *Proving the Lorentz invariance of the entropy and the covariance of thermodynamics*  
Foundations of Physics volume 52, Article number: 11 (Dec 2021)
26. Gavassino, L. *Applying the Gibbs stability criterion to relativistic hydrodynamics*  
Classical and Quantum Gravity 38 21LT02 (Oct 2021)
27. Gavassino, L.; Antonelli, M. *Unified Extended Irreversible Thermodynamics and the stability of relativistic theories for dissipation*  
Frontiers in Astronomy and Space Sciences, Volume 8, Research Topic: Neutron Star Physics in the Multi-Messenger Discourse (Jun 2021)
28. Gavassino, L.; Antonelli, M.; Haskell, B. *Bulk viscosity in relativistic fluids: from thermodynamics to hydrodynamics*  
Classical and Quantum Gravity 38 075001 (Apr 2021)
29. Gavassino, L.; Antonelli, M.; Haskell, B. *Superfluid dynamics in neutron star crusts: the Iordanskii force and chemical gauge covariance*  
Universe 2021, 7(2), 28 (Jan 2021)
30. Gavassino, L. *The zeroth law of thermodynamics in special relativity*  
Foundations of Physics volume 50, pages 1554–1586 (Nov 2020)
31. Gavassino, L.; Antonelli, M.; Haskell, B. *Multifluid Modelling of Relativistic Radiation Hydrodynamics*  
Symmetry 2020, 12(9), 1543 (Sep 2020)
32. Gavassino, L.; Antonelli, M.; Haskell, B. *When the entropy has no maximum: A new perspective on the instability of the first-order theories of dissipation*  
Physical Review D 102, 043018 (Aug 2020)

33. Gavassino, L.; Antonelli, M.; Pizzochero, P. M.; Haskell, B. *A universal formula for the relativistic correction to the mutual friction coupling time-scale in neutron stars*  
Monthly Notices of the Royal Astronomical Society, Volume 494, Issue 3, Pages 3562–3580 (May 2020)
34. Gavassino, L.; Antonelli, M. *Thermodynamics of uncharged relativistic multifluids*  
Classical and Quantum Gravity 37 025014 (Dec 2019)

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**Pre-prints** (Click on title to access manuscript, when available)

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35. Gavassino, L. *Infinite Order Hydrodynamics: an Analytical Example*  
arXiv:2402.19343
36. Mullins, N., Hippert, M., Noronha, J., Gavassino, L. *Causal and Stable Relativistic Hydrodynamic Fluctuations*  
arXiv:2402.13119
37. Gavassino, L., Mullins, N., Hippert, M. *Consistent inclusion of fluctuations in first-order causal and stable relativistic hydrodynamics*  
arXiv:2402.06776
38. Gavassino, L., Abboud, N., Speranza, E., Noronha, J. *First-order relativistic hydrodynamics with an information current*  
arXiv:2401.13852
39. Gavassino, L.; Disconzi, M. M.; Noronha, J. *Universality Classes of Relativistic Fluid Dynamics II: Applications*  
arXiv:2302.05332
40. Gavassino, L.; Disconzi, M. M.; Noronha, J. *Universality Classes of Relativistic Fluid Dynamics I: Foundations*  
arXiv:2302.03478
41. Gavassino, L.; Noronha, J. *Relativistic bulk-viscous dynamics far from equilibrium*  
arXiv:2305.04119

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**Honors, Awards, and Distinctions**

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2024 - Award of the MERAC prize 2024 for the best PhD thesis in Theoretical Astrophysics by the European Astronomical Society, 25000 €

2022 - Work **Phys. Rev. X** **12**, **041001** selected for commentary in the APS Viewpoint section.

2021 - Fund for Best Students, Nicolaus Copernicus Astronomical Center, 2197.34 PLN

2020 - Award: Nagroda Młodych 2020, Nicolaus Copernicus Astronomical Center, 3000 PLN

2019 - Scholarship Della Riccia, Fondazione Della Riccia, 8000 €

2019 - Award of the PHAROS STSM, PHAROS, 1700 €

2018 - Award: Exemption per merito magistrale, Università Statale di Milano (Milan)

2018 - Award: Rimborsio laureati regolari, Università Statale di Milano (Milan)

2015 - Award: Fondo sostegno giovani, Università Statale di Milano (Milan), 257.47 €

2015 - Award: Borsa di ateneo, Università Statale di Milano (Milan), 1795.50 €

2013 - Award: Premio regione Lombardia maturità scientifica, Regione Lombardia, 500 €

2013 - Award: Menzione speciale per studenti eccellenti, Liceo Scientifico G.B. Grassi

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**Invited talks** (Click on title to access video/notes/slides, when available)

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**Year 2024:**

*Overview of relativistic hydrodynamics and its applications*

Seminar for graduate students at Vanderbilt University, Nashville (USA), Jan 2024

**Year 2023:**

*HoloTube: Panel Discussion “A rigorous pathway to causal stable hydrodynamics?”*

Online webinar discussion (link available), Nov 2023.

*Slow non-hydrodynamic modes in neutron stars*

Seminar delivered at the Kitp program “The Many Faces of Relativistic Fluid dynamics” (Kavli Institute for Theoretical Physics, California, USA), May 2023.

*Is dissipation compatible with relativity?*

Seminar delivered at the Spontaneous Workshop XV (Institute of Scientific Studies of Cargèse, France), Apr 2023.

*The stability-causality theorem*

Seminar delivered at the Institute for Nuclear Theory (University of Washington), Seattle (USA), Mar 2023.

*The stability-causality theorem*

Seminar delivered at the VandyGraF meeting, Vanderbilt University, Nashville (USA), Feb 2023.

*A new symmetry principle for linearised hydrodynamics*

Online seminar delivered at the MHD Frankfurt meeting, Frankfurt (Germany), Feb 2023.

**Year 2022:**

*Is dissipation compatible with Special Relativity?*

Nuclear physics seminar at the University of Illinois at Urbana Champaign (USA), Nov 2022.

*Stability-Causality Theorem*

Colloquium delivered at the Nicolaus Copernicus Astronomical Center, Warsaw (Poland), Jun 2022.

*Stability-Causality Theorem in Relativistic Hydrodynamics*

Seminar delivered at Jan-Kochanowski University, Kielce (Poland), March 2022.

**Year 2021:**

*The controversial fate of superluminal perturbations*

Online seminar delivered at Frankfurt's transport meeting, Frankfurt (Germany), Nov 2021.

*Heat work and temperature in special relativity*

Colloquium delivered at the Nicolaus Copernicus Astronomical Center, Warsaw (Poland), Feb 2021.

**Year 2020:**

*Do we need a zeroth law?*

Seminar delivered at Bard College (USA), Nov 2020.

*How can relativity make Navier-Stokes unstable?*

IRMQ Webminar (online), Oct 2020.

*Boosting the heat.*

Online seminar delivered at the University of Southampton, Southampton (UK), Oct 2020.

**Year 2019:**

*Carter's user-friendly formalism for multifluid hydrodynamics.*

Seminar delivered at the University of Milan, Milan (Italy), Apr 2019.

**Contributed talks**

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**Year 2021:**

*The controversial fate of superluminal perturbations.*

Talk at the 21st Zimanyi School Winter Workshop on Heavy Ion Physics, Budapest (Hungary), Dec 2021.

*Is hydrodynamic stability enough?*

Online talk at the Workshop on QGP Phenomenology, Berlin (Germany), May 2021.

*The Lyapunov function of relativistic dissipative hydrodynamics.*

Online talk at the 11th Central European Relativity Seminar, Vienna (Austria), Feb 2021.

**Year 2020:**

*Universality of the Relativistic correction to glitch rise times.*

Talk at the 56th Karpacz Winter School in Theoretical Physics, Karpacz (Poland), Feb 2020.

**Year 2019:**

*Universality of the Relativistic correction to glitch rise times.*

Talk at the 30th Texas Symposium on Relativistic Astrophysics, Portsmouth (UK), Dec 2019.

*Thermodynamics of relativistic mult fluids.*

Talk at the Ph.D school “Masterclasses in Relativistic Fluid Dynamics”, Southampton (UK), Jul 2019

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## Conferences, Workshops, Courses, and Schools attended

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The Many Faces of Relativistic Fluid Dynamics (Kavli Institute for Theoretical Physics, Santa Barbara, California), May-Jun 2023.

Spontaneous Workshop XV, Ajaccio (France), remote participation, Apr 2023.

CITI Program course: Responsible Conduct of Research, RCR for Bio/Physical Sciences - VUBPS\*\* 1 - RCR (with score 100/100), online, Mar 2023.

21st Zimanyi School Winter Workshop on Heavy Ion Physics, Budapest (Hungary), Dec 2021.

Workshop on QGP Phenomenology, Berlin (Germany), May 2021.

Online talk at the 11th Central European Relativity Seminar, Vienna (Austria), Feb 2021.

Virtual Conference of the Polish Society on Relativity 2020, Online, Sep 2020.

56th Karpacz Winter School in Theoretical Physics, Karpacz (Poland), Feb 2020.

30th Texas Symposium on Relativistic Astrophysics, Portsmouth (UK), Dec 2019.

Ph.D school “Masterclasses in Relativistic Fluid Dynamics”, Southampton (UK), Jul 2019

PHAROS PhD Training School: Multi-messenger physics and astrophysics with compact binaries, Jena (Germany). I also gave a student written contribution: Inconsistency of binary systems as sources of g-waves in a first-order approach to the weak gravity limit. March 2019.

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## Teaching-related activities

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Fall 2023 - Instructor of “Methods of Ordinary Differential Equations” at Vanderbilt University (Nashville, USA).

Spring 2023 - Instructor of “Differential equations with linear algebra” at Vanderbilt University (Nashville, USA).

Fall 2022 - Teaching assistant of “Calculus II” at Vanderbilt University (Nashville, USA), for two classes.

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## Service to the profession

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- I am an organizer of the meetings of the VandyGRAF initiative



- Referee for several journals: Astronomy, Classical and Quantum Gravity, Iop-Sci Notes, Journal of Physics: Condensed Matter, Physica Scripta, Physical Review A, Physical Review B, Physical Review C, Physical Review D, Physical Review E, Physical Review Letters, Physical Review X, Physics Letters A, Physics Letters B, Studies in Applied Mathematics, Universe.