
The University of Sussex • Brighton, BN1 9QH, United Kingdom • A.Giusti@sussex.ac.uk

Qualifications

University of Bologna & LMU Munich

November 2018

Ph.D. in Physics, *en cotutelle*.

Supervisors: Prof. Roberto Casadio and Prof. Georgi Dvali.

National Scientific Habilitations (ASN)

ASN to the rank of *Associate Professor* in Mathematical Physics (SC 01/A4)

Since Sep. 9, 2019

ASN to the rank of *Associate Professor* in Theoretical Physics (SC 02/A2)

Since May 22, 2020

ASN to the rank of *Full Professor* in Theoretical Physics (SC 02/A2)

Since June 8, 2023

Experience

University of Sussex, School of Mathematical & Physical Sciences

Brighton, UK

Research Fellow in Theoretical and Mathematical Physics

Since April 2024

Supervisor: Prof. Xavier Calmet

Supported by: QSNET consortium.

ETH Zurich, Institute for Theoretical Physics

Zurich, CH

Postdoctoral Fellow & Lecturer

March 2023 - February 2024

Supervisor: Prof. Lavinia Heisenberg

MSCA Postdoctoral Fellow

March 2021 - February 2023

Supervisor: Prof. Lavinia Heisenberg

Supported by: the Marie Skłodowska-Curie Actions (grant agreement No. 895648-CosmoDEC)

Bishop's University, Physics & Astronomy Department

Sherbrooke, CA

Adjunct Professor

Since Sep. 2022

Postdoctoral Fellow

March 2019 - February 2021

Supervisor: Prof. Valerio Faraoni

Teaching

Mathematical Relativity, University of Bologna

Dec. 2023 - Jan. 2024

Course for the Ph.D. degree in Mathematics

ECTS/hours: 20 hours; *SSD:* MAT/07

Advanced General Relativity, Bishop's University

Jan. 2020 - Apr. 2020 & Sep. 2023 - Dec. 2023

ECTS/hours: 36 hours

Advanced Quantum Theory, Bishop's University

Jan. 2023 - Apr. 2023

Introductory course on quantum field theory for the Master's degree in Physics

ECTS/hours: 36 hours

Black Holes and Gravitational Waves, ETH Zurich

Sep. 2022 - Dec. 2022

Course for the Master's and PhD degrees in Theoretical Physics

ECTS/hours: 8 ECTS. *Co-Lecturers:* Prof. L. Heisenberg and Dr. F. D'Ambrosio

Fractional Calculus, University of Naples, Federico II
Short course for the PhD degree in Mathematics
ECTS/hours: 6 hours; *SSD*: MAT/07

May 2022

Mathematical Methods for Automation Engineering, University of Bologna
Role: Teaching assistant
Lecturer: Prof. Andrea Mentrelli
SSD: MAT/07

A.Y. 2016/2017

Meccanica Razionale, University of Bologna
Role: Teaching assistant
Lecturer: Prof. Tommaso Ruggeri
SSD: MAT/07

A.Y. 2015/2016 & 2016/2017

Supervision

PhD Students

Ongoing co-supervision of **2** doctoral students:

Luca Gallerani, U. Bologna (Math. Dep.), with Prof. A. Mentrelli

Since 2023

Serena Giardino, Heidelberg U. & MPI for Gravitational Physics, with Prof. L. Heisenberg

2022-2024

Master's Theses

I have co-supervised **10** Master's theses: **7** at U. Bologna and **3** at ETH Zurich.

Undergraduate Research Projects at Bishop's University

I have supervised, together with Prof. V. Faraoni, **4** undergraduate students.

Grants, Awards & Service

Main Research Grant

Marie Skłodowska-Curie (MSCA) Individual Fellowship, € 191'149.44, EU

Project: CosmoDEC - Cosmological Dark Energy Condensate: A unified description of the Dark Universe

Honors and Awards

Augusto Righi Prize of the Italian Physical Society (2017); *Václav Votruba Prize* of Doppler Institute in Prague (2019); *SIGRAV Prize* of the Italian Society for Gravitational Physics (2021); *Riemann-Liouville Award* (best paper - theory section) at the 2023 International Conference on Fractional Differentiation and its Applications; *Alfredo Di Braccio prize* of the Accademia Nazionale dei Lincei (2023).

Service

Editor of Fractional Calculus and Applied Analysis (Springer)

Since May 2020

Editor of The European Physical Journal Plus (Springer)

Since May 2020

Grant Reviewer for FONDECYT (Government of Chile)

2020

Collaborations

Member of the COST Action RQI, Horizon Europe

Since 2024

WG1 (QFT aspects of Quantum Information) & WG3 (Time, causality, and memory in quantum physics).

Member of the Observational Science Board of the **Einstein Telescope** (OSB-ET)

Since 2021

Division 1 (Fundamental Physics) & Division 2 (Cosmology)

Member of the COST Action CANTATA, EU Horizon 2020

2017-2020

WG1 (Modified Gravity) & WG2 (Relativistic Effects).

Invited contribution to: E. N. Saridakis *et al.* [CANTATA], "Modified Gravity and Cosmology" (Springer, 2021).

Research Profile and Output

Research Profile

I have contributed 80 scientific articles, six of which as single author. My main research interests revolve around the study of quantum effects in gravity. However, in addition to my primary work on gravitational physics, I have led research on fractional calculus and its applications to mathematical physics. Specifically, I contributed to the development of Prabhakar's fractional calculus, investigating both its mathematical foundations and potential applications in continuum mechanics. I have proven a series of theorems that allow for a precise classification of fractional derivatives. These results have then paved the way for the development of the modern framework of General Fractional Calculus. After that, I focused my research efforts on the problem of variable-order fractional operators which led me to the formulation, based on an intuition by Giambattista Scarpi dating back to the seventies, of the only variable-order fractional derivative consistent with General Fractional Calculus. I also extended this work to higher dimensions, providing a variable-order definition of the fractional Laplacian. More recently I began investigating the potential physical origin for the emergence of non-local/memory effects of the fractional type in viscoelasticity and this led to an interesting connection with T. Ruggeri's recent proposal of a Rational Extended Viscoelasticity.

Scientific Output

Published articles: 80 (+ 2 preprints); *Citations:* ~ 2590 ; *H-index:* 30; *Source:* Google Scholar.

Key Research Output

A selection of my scientific publications that I find conceptually most relevant:

1. **A. Giusti**, I. Colombaro, "Prabhakar-like fractional viscoelasticity," Commun. Nonlinear Sci. Numer. Simul. 56 (2018) 138-143.
2. **A. Giusti**, "MOND-like Fractional Laplacian Theory," Phys. Rev. D 101 (2020) 124029.
3. **A. Giusti***, I. Colombaro, R. Garra, R. Garrappa, F. Polito, M. Popolizio, F. Mainardi, "A practical guide to Prabhakar fractional calculus," Fract. Calc. Appl. Anal. 23 (2020) 9-54. [Review article]
4. K. Diethelm, R. Garrappa, **A. Giusti**, M. Stynes, "Why fractional derivatives with nonsingular kernels should not be used," Fract. Calc. Appl. Anal. 23 (2020) 610-634. [Editorial]
5. R. Garrappa, **A. Giusti**, F. Mainardi, "Variable-order fractional calculus: a change of perspective," Commun. Nonlinear Sci. Numer. Simul. 102 (2021) 105904.
6. R. Garrappa, **A. Giusti**, "A computational approach to exponential-type variable-order fractional differential equations," J. Sci. Comput. 96 (2023) 63.
7. **A. Giusti**, A. Mentrelli, T. Ruggeri, "Energy of a non-linear viscoelastic model compatible with fractional relaxation," Int. J. Non-Lin. Mech. 161 (2024) 104685.

* Lead author and main contributor.