

Curriculum Vitae

Trieste 15/03/2021



Cognome: Musco

Nome: Ilia

Data di nascita: 1 Marzo 1975

Luogo di Nascita: Reggio Calabria

Nazionalità: Italiana

Sesso: Maschile

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EDUCAZIONE

- 11/2001 – 4/2006 **Ph.D. in Astrophysics** presso la “Scuola Internazionale di Studi Superiori Avanzati” (S.I.S.S.A.), Trieste.
Supervisor: *Prof J.C. Miller*
Titolo di Tesi: “Primordial Black Hole Formation”
Data di conseguimento: 6 Aprile 2006
- 10/1994 – 11/2000 **Laurea in Fisica**, Università degli Studi di Trieste (Italy).

POSIZIONE CORRENTE

- 1/2021 – 12/2021 **Assegno di Ricerca** presso il Dipartimento di Fisica dell’Università di Roma *La Sapienza* (<https://www.phys.uniroma1.it/fisica>)

POSIZIONI PRECEDENTI

- 6/2020 – 12/2020 **Postdoc** presso Istituto di Fisica delle Alte Energie (IGFAE), Università di Santiago de Compostela (<https://igfae.usc.es/igfae>)
- 9/2019 – 3/2020 **Researcher** al Dipartimento di Fisica Teorica, Università di Ginevra (<https://cosmology.unige.ch>).
- 4/2018 – 8/2019 **Postdoc** presso Institut de Ciències del Cosmos (ICC), Università di Barcelona (<http://icc.ub.edu>).
- 10/2014 – 9/2017 **CNRS Postdoc** presso Laboratoire Univers et Théorie (LUTH) Osservatorio Astronomico di Parigi/Meudon (www.luth.obspm.fr).
- 1/2009 – 12/2011 **Postdoc** presso Centre of Mathematics for Applications (CMA), Università di Oslo (UIO) (www.cma.uio.no).
- 3/2006 – 12/2007 **Postdoc** presso la Scuola di Scienze Matematiche (Dipartimento di Astronomia) della Queen Mary University of London (QMUL) (www.maths.qmul.ac.uk). **Note:** posizione finanziata dalla “Fondazione Italiana della Riccia”.

RICONOSCIMENTI:

Premio HARTLE conferito dalla **International Society on General Relativity and Gravitation** per uno dei miglio talk degli studenti di PhD durante la Conferenza Internazionale GR17 (Dublino 2004).

SUPERVISIONE

2016 - 2017	Davide Crema , co-supervisione di uno studente di master presso l'Università Milano Bicocca.
2019 - 2020	Alba Kalaja , co-supervision di uno studente di master (proveniente dall'Università di Padova) presso l'Università di Barcelona, adesso PhD student presso l'Università di Groningen.
2019 - 2020	Theodoros Papanikolaou , co-supervisione di uno studente di PhD del APC (Università di Parigi), visitatore a Ginevra per una collaborazione.

INSEGNAMENTO

May 2015	Corso di Relativistic Hydrodynamics, Gravitational Collapse and Black Hole formation per gli studenti di Master e di PhD presso l'Università Federico II of Napoli.
2010 – 2011	Corso di Partial Differential Equations (INF-MAT 3360) presso il Dipartimento di Informatica dell'Università di Oslo (UIO).
9/2004 – 2/2005	University Tutor in Fisica per gli studenti del primo anno dell'Università di Trieste.
10/2006 – 12/2007	Teaching Assistant per gli studenti della “School of Mathematical Sciences” (Astronomy Unit), Queen Mary University of London.

COLLABORAZIONI INTERNAZIONALI

2019 - corrente	Membro del LISA consortium, coinvolto nel working group sui Primordial Black Holes.
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STOP DI CARRIERA

2008 (12 mesi)	Insegnante supplente presso scuole secondarie di Trieste.
1/2012 - 9/2014	A causa di problemi familiari ho temporaneamente interrotto la carriera accademica.

RISULTATI CONSEGUITI

- Sono riconosciuto come uno dei maggiori esperti di formazione di **Primordial Black Holes (PBHs)**. Il mio studio prevede l'utilizzo di simulazioni numeriche utilizzando un codice numerico personale AMR (adaptive mesh refinement) sviluppato durante il PhD.
- **Il mio lavoro è interdisciplinare, e combina la relatività numerica con la cosmologia primordiale .**
- **L'articolo “*Threshold for primordial black holes: Dependence on the shape of the cosmological perturbations*” - *Phys.Rev. D* 100 (2019) no.12, 123524 - è stato selezionato dall'Editore.**
- Dal 2004 ho dato diversi seminari, sia durante meeting internazionali, che invitato presso varie Università del mondo. In particolare :
 - Novembre 2013: **invited speaker** per il workshop *Wormholes and Primordial Black Holes* in Nagoya (Japan).
 - Maggio 2018: **invited speaker** per il workshop tematico *Primordial Black Holes* al CERN (Ginevra).
- **During la mia carriera ho vissuto in diversi paesi europei**, creando una rete di contatti e collaborazioni internazionali.

LIST OF PUBLICATIONS

1. Title: Computations of primordial black hole formation
Authors: **Ilia Musco**, John C. Miller & Luciano Rezzolla
Journal: *Class. Quantum Grav.* **22** 1405 (2005)
DOI: [10.1088/0264-9381/22/7/013](https://doi.org/10.1088/0264-9381/22/7/013)
2. Title: Curvature profiles as initial conditions for primordial black hole formation
Authors: Alexander G. Polnarev, **Ilia Musco**
Journal: *Class. Quantum Grav.* **24** 1405 (2007)
DOI: [10.1088/0264-9381/24/6/003](https://doi.org/10.1088/0264-9381/24/6/003)
3. Title: Initial conditions for primordial black hole formation
Authors: **Ilia Musco**, Alexander G. Polnarev
Journal: *Proceedings of the 11th Marcel Grossmann Meeting on General Relativity*, edited by H. Kleinert, R.T. Jantzen and R. Ruffini, World Scientific, Singapore (2008)
4. Title: Primordial black hole formation
Author: **Ilia Musco**
Journal: *Proceedings of Science*, (BHs, GR and Strings 24– 30 August, 2008, Veli Lošinj, Croatia), published by the electronic service of SISSA (<http://pos.sissa.it/index.html>)
5. Title: Primordial black hole formation in the radiative era: investigations of the critical nature of the collapse.
Authors: **Ilia Musco**, John C. Miller, Alexander G. Polnarev
Journal: *Class. Quantum Grav.* **26** 235001 (2009)
DOI: [10.1088/0264-9381/26/23/235001](https://doi.org/10.1088/0264-9381/26/23/235001)
6. Title: Primordial Black Hole formation in the early universe: critical behaviour and self similarity
Authors: **Ilia Musco**, John C. Miller
Journal: *Class. Quantum Grav.* **30** 145009 (2013)
DOI: [10.1088/0264-9381/30/14/145009](https://doi.org/10.1088/0264-9381/30/14/145009)
7. Title: Strongly Coupled Cosmologies
Authors: Silvio Bonometto, Marino Mezzetti, **Ilia Musco**, Roberto Mainini, Andrea Macciò
Journal: *Proceeding of the "Neutrino Oscillation Workshop" NOW 2014*, Conca Specchiulla, Otranto, Italy, 7-14 September 2014
DOI: [10.1016/j.nuclphysbps.2015.06.017](https://doi.org/10.1016/j.nuclphysbps.2015.06.017)
8. Title: Causal horizons and topics in structure formation
Authors: John C. Miller, **Ilia Musco**
Journal: *Proceedings of the RAGtime meetings 2008-2014*, Opava, Czech Republic
DOI: [arXiv:1412.8660](https://arxiv.org/abs/1412.8660)

LIST OF PUBLICATIONS (Last 5 Years)

9. Title: Causal Nature and Dynamics of Trapping Horizons in Black Hole Collapse
Authors: Alexis Helou **Ilia Musco**, John C. Miller
Journal: *Class. Quantum Grav.* **34** 135012 (2017)
DOI: [10.1088/1361-6382/aa6d8f](https://doi.org/10.1088/1361-6382/aa6d8f)
10. Title: Foliation-dependence of black hole apparent horizons in spherical symmetry
Authors: Valerio Faraoni, George F. R. Ellis , Javad T. Firouzjaee, Alexis Helou, **Ilia Musco**
Journal: *Physical Review D* **95** (2017) no.2, 024008
DOI: [10.1103/PhysRevD.95.024008](https://doi.org/10.1103/PhysRevD.95.024008)
11. Title: The abundance of primordial black holes depends on the shape of the inflationary power spectrum
Authors: Cristiano Germani, **Ilia Musco**
Journal: *Phys.Rev.Lett.* **122** (2019) no.14, 141302
DOI: [10.1103/PhysRevLett.122.141302](https://doi.org/10.1103/PhysRevLett.122.141302)
12. Title: Threshold for primordial black holes: Dependence on the shape of the cosmological perturbations
Author: **Ilia Musco**
Journal: *Phys.Rev. D* **100** (2019) no.12, 123524
DOI: [10.1103/PhysRevD.100.123524](https://doi.org/10.1103/PhysRevD.100.123524) - **Editors' Suggestion**
13. Title: Primordial black hole formation and abundance: contribution from the non-linear relation between the density and curvature perturbation
Author: Sam Young, **Ilia Musco**, Christian T. Byrnes
Journal: *JCAP* **1911** (2019) no.11, 012
DOI: [10.1088/1475-7516/2019/11/012](https://doi.org/10.1088/1475-7516/2019/11/012)
14. Title: Non-Gaussian Formation of Primordial Black Holes: Effects on the Threshold
Author: Alex Kehagias, **Ilia Musco**, Antonio Riotto
Journal: *JCAP* **1912** (2019) no.12, 029
DOI: [10.1088/1475-7516/2019/12/029](https://doi.org/10.1088/1475-7516/2019/12/029)
15. Title: From Primordial Black Holes Abundances to Primordial Power Spectrum (and back)
Author: Alba Kalaja, Nicola Bellomo, Nicola Bartolo, Daniele Bertacca, Sabino Matarrese, **Ilia Musco**, Alvisé Racanelli, Licia Verde
Journal: *JCAP* **1910** (2019) no.10, 031
DOI: [10.1088/1475-7516/2019/10/031](https://doi.org/10.1088/1475-7516/2019/10/031)
16. Title: Prospects for Fundamental Physics with LISA
Author: Enrico Barausse et al.
Journal: *Gen.Rel.Grav.* **52** (2020) no. 8, 81
DOI: <https://doi.org/10.1007/s10714-020-02691-1>
17. Title: The Threshold for Primordial Black Hole Formation: a Simple Analytic Prescription
Author: **Ilia Musco**, Valerio De Luca, Gabriele Franciolini, Antonio Riotto
arXiv: 2011.03014 - To be published in PRD
DOI: <https://arxiv.org/abs/2011.03014>

LIST OF PUBBIC TALK AND SEMINARS (Last 5 Years)

2015

- Contributed talk at the *BritGrav-15* meeting, 20-21 April, University of Birmingham (UK)
- Contributed talk at the *2nd Karl Schwarzschild* meeting, 20-24 July, University of Frankfurt (Germany).
- Contributed talk at *COSMO-15* meeting, 11-15 September, University of Warsaw (Poland).
- Two contributed talks at the 28th *TEXAS Symposium*, 13-18 December, University of Geneva (Switzerland).
- Invited seminars:
 1. University of Sussex (UK)
 2. Laboratory for Astroparticle and Cosmology (APC) in Paris (France)

2016

- Three contributed talks at the *General Relativity (GR21)* meeting, 10-15 July, Columbia University of New York (USA)
- invited talk at the conference *Phenomenology of Strong Gravity*, 14-16 September, Nazarbayev University of Astana (Kazakhstan)
- Invited seminars:
 1. University of Marseille (France)
 2. Astronomical Observatory of Nice (France)
 3. Institute of Astrophysics (IAP) of Paris (France)
 4. University of Barcelona (Spain)
 5. University of Milan Bicocca (Italy)

2017

- Invited talk at the workshop *The vacuum of the Universe: from cosmology to particle physics*, 18-20 January, University of Barcelona (Spain).
- Invited talk at the workshop *Do Black Holes Exist? - The Physics and Phylosophy of Black Holes*, 24-28 April, Bad Honnef (Germany).
- Contributed talk at the *3rd Karl Schwarzschild* meeting, 24-28 July, University of Frankfurt (Germany).
- In February I spent one month at UNAM (Mexico City) invited by Prof. Roberto Sussman. During this period I gave three invited talks at UNAM and one at the University of Cuernavaca.
- Invited seminar and lecture at La Sapienza, University of Rome (Italy).

2018

- I February I spent one month in Kyoto, attending the long term workshop Gravity and Cosmology 2018, 5 February - 2 March, at the Yukawa Institute for Theoretical Physics, where I gave a contributed talk.
- Invited talk at the workshop Primordial versus Astrophysical origin of Black Holes, 14-18 May, at CERN in Geneva (Switzerland)
- Contributed talk at the workshop *Numerical Relativity beyond General Relativity*, 3-9 June, Benasque (Spain).
- Two contributed talks at the *15th Marcel Grossman* meeting, 1-7 July, at La Sapienza University of Rome (Italy).
- Contributed talk at the Spanish-Portuguese Relativity meeting, 4-7 September, Palencia (Spain).
- Contributed talk at *SIGRAV 2018 (Italian meeting of General Relativity)*, 9-15 September, at the University of Cagliari (Italy).
- Invited seminar at the University of Bologna (Italy).

2019

- Two contributed talks at the *General Relativity (GR22)* meeting, 7-12 July, Valencia (Spain).
- Contributed talk at the workshop Time Machine Factory, 22-25 September, University of Torino (Italy).
- Contributed talk at the 30th *TEXAS Symposium*, 15-20 December, University of Portsmouth (UK).
- Invited Seminars:
 1. Autonomous University of Barcelona
 2. University of Valencia
 3. Institute of Astrophysics (IAP) of Paris (France)
 4. Catholic University of Louvain (Belgium)
 5. IFPU Trieste (Italy)
 6. University of Marseille (France)
 7. University of Torino (Italy)
 8. University of Montpellier (France)
 9. University of Geneva (Switzerland)
 10. CERN (Switzerland)

2020

- Invited seminar at IGFAE, University of Santiago de Compostela (Spain).
- Invited seminar at the University of Portsmouth (England) (online zoom seminar)
- Invited seminar at APC - University of Paris (online soon seminar)
- Invited seminar at the University of Milan (online soon seminar)
- Invited seminar at SISSA (Trieste) (online soon seminar)