



Matteo Baggioli

Curriculum Vitae

Current Role(s)

- ★ **Associate Professor at the Wilczek Quantum Center in Shanghai Jiao Tong University.**
- ★ **Co-Founder of the GrumpyScientist Project TGS.**
www.thegrumpyscientist.com.
- ★ **Creator of the HoloTube project.**
<https://projects.ift.uam-csic.es/holotube/>.
- ★ **Founder of the Holographic Asian Network (HAN).**

Personal Website

- ★ <https://members.ift.uam-csic.es/matteo.baggioli/>.

Education

- 2001–2006 **High-School**, *Liceo Enrico Fermi, Cecina, Mark: 100/100.*
- 2006–2009 **Bachelor of Physics**, *University of Genova, Italy, Mark: 110/110.*
- 2009–2012 **Master in Theoretical Physics**, *University of Genova, Italy, Mark: 110/110.*
Cum Laude
- 2013–2016 **Ph.D. in Theoretical Physics**, *Universitat Autònoma de Barcelona, Spain, Mark: Excelente Cum Laude.*
- October 2015–
Januar 2016 **Visiting Ph.D. position**, *University of Illinois, USA, Institute for Condensed Matter Theory ICMT.*
- 2016–2018 **Postdoctoral fellow**, *Crete Center for Theoretical Physics and Crete Center for Quantum Complexity and Nanotechnology, University of Crete, Greece.*
- 2018–2020 **Severo Ochoa Postdoctoral fellow**, *Institute for Theoretical Physics IFT-CSIC/UAM, Madrid, Spain.*

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Bachelor Thesis

Title **"Pure Lorentz Transformations and motion without rotation in Special Relativity"**
Supervisor Professor Enrico Massa

Masters Thesis

Title **"M-Branes Geometries"**
Supervisors Professor Stefano Giusto and Professor Camillo Imbimbo
Co-Advisor Professor Carlo Maria Becchi

Phd Thesis

Title **"Gravity, holography and applications to condensed matter"**
Supervisor Professor Oriol Pujolás

Schools attended

- 1) **"Non-perturbative Quantum field theory"**
1-28 April 2013, Crete, Greece
- 2) **"Holography 2013: Gauge/gravity duality and strongly correlated systems"**
13-22 June 2013, Pohang, South Korea
- 3) **"Gauge/Gravity duality and Condensed Matter Physics"**
5-9 August 2013, Munich, Germany
- 4) **"Summer School on String Theory and Holography"**
14-26 July 2014, Lisbon-Porto, Portugal
- 5) **"32nd Winter School in Theoretical Physics, 100 Years to General Relativity: From Theory to Experiment and Back"**
Dec 29- Jan 8 2015, Jerusalem, Israel
- 6) **"Spring School on Superstring Theory and Related Topics"**
16-24 March 2017, ICTP, Trieste, Italy
- 7) **International ICTP school "Complex quantum systems out of equilibrium in many-body physics and beyond"**
27-31 May 2019, Yerevan State University, Yerevan, Armenia
- 8) **"Summer IFT School"**
15-26 July 2019, IFT-CSIC, Madrid, Spain
- 9) **"Course Emergence of Quantum Phases in Novel Materials"**
16-20 September 2019, ICMM-CSIC, Madrid, Spain
- 10) **"Online school on ultra quantum matter"**
10-14 August 2020, Perimeter Institute, Canada

Conferences and Workshops

- 1) **"Holography 2013 :Gauge/Gravity duality and strongly correlated systems"**
14-22 July 2013, Pohang, South Korea
- 2) **"Gauge/Gravity Duality 2013"**
29 July-2 August 2013, Munich, Germany
- 3) **"II Postgraduate Meeting On Theoretical Physics"**
9-11 October 2013, Madrid, Spain
- 4) **"International Postgraduate Meeting on Fundamental Physics"**
6-7 November 2014, Santiago de Compostela, Spain
- 5) **"Gauge-Gravity duality 2015"**
13-17 April 2015, Florence, Italy
- 6) **"International Workshop on Condensed Matter Physics and AdS/CFT"**
25-29 May 2015, Tokyo, Japan
- 7) **"Physics on the Riviera 2015"**
16-18 September 2015, Sestri Levante, Italy
- 8) **"Emergent properties of space-time"**
20 June 2016 - 1st July 2016, CERN, Switzerland
- 9) **"Low energy challenges for high energy physicists II"**
22-26 August 2016, Perimeter Institute, Canada
- 10) **"Heraklion Workshop on Theoretical Physics"**
5-9 September 2016, Crete Center for Theoretical Physics, Greece
- 11) **"Disorder in Condensed Matter and Black Holes "**
9-13 January 2017, Lorentz Center, Leiden, Netherlands
- 12) **"Ninth Crete Regional Meeting in String Theory"**
9-16 July 2017, Kolymbari, Greece
- 13) **"Holography, Geometry and Quantum Criticality"**
18-26 August 2017, Asia Pacific Center for Theoretical Physics APCTP, Pohang, South Korea
- 14) **"Many-Body Quantum Chaos, Bad Metals and Holography"**
4-6 October 2017, NORDITA, Stokholm, Sweden
- 15) **"Holography and Supergravity 2018"**
8-12 January 2018, Vina del Mar, Chile
- 16) **"Gravity, cosmology & physics beyond the standard model"**
11-15 June 2018, UPMC, Paris, France
- 17) **"TYC Soiree: Recent experimental and theoretical advances in soft matter: new understanding of viscoelasticity of liquids and polymers"**
28th June 2018, Queen Mary University, London
- 18) **"HoloQuark2018"**
2-5 July 2018, Santiago de Compostela, Spain

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- 19) **"Gauge/Gravity Duality 2018"**
30 July- 3 August 2018, Wurzburg, Germany
- 20) **"International Conference on Holography, String Theory and Discrete Approaches"**
6-10 August 2018, Hanoi, Vietnam
- 21) **"Workshop on Weyl Metals"**
11-15 February 2019, IFT-UAM, Madrid
- 22) **"XV International Workshop on Complex Systems"**
17-20 March 2019, Andalo, Italy
- 23) **"Emergent hydrodynamics in low dimensional quantum systems"**
5-15 May 2019, Natal, Brasil
- 24) **"StatPhys 27"**
8-12 July 2019, Buenos Aires, Argentina
- 25) **"International Workshop on Strange Metals and Bad Metals"**
19-23 August 2019, Shanghai, China
- 26) **"Workshop on Holography and Quantum Matter"**
24-26 August 2019, Beijing, China
- 27) **"Iberian Strings"**
15-17 January 2020, Santiago de Compostela, Spain
- 28) **"March Meeting 2020"**
2-6 March 2020, Denver, Usa
- 29) **"Frontiers of holographic duality"**
20-25 April 2020, Moscow, Russia
- 30) **"Gauge-Gravity duality 2020"**
27-31 July 2020, CERN, Switzerland
- 31) **"4th international conference on holography string theory and discrete approach"**
3-8 August 2020, Online
- 32) **"Asia Pacific-Nordita Meeting on Quantum Matter"**
17-20 August 2020, Online
- 33) **"Quantum Matter and Quantum Information with Holography", Korea, Online**
23-31 August 2020, Online
- 34) **Virtual INT program "Topological Phases of Matter: From Low to High Energy"**
March 2021, Online
- 35) **2021 International Workshop on Soft Matter and Biophysics Theories—Youth Forum**
22-25 March 2021, Fuzhou, China

- 36) **"Winter School on Mechanics"**
22-26 March 2021, Perm, Russia [online]
- 37) **"GRA 2020/2021 Annual Conference and National Congress on Gravity"**
April 2021, Shenyang, China
- 38) **"Newton Institute ARA programme focus week on asymptotics, relativistic hydro and holography"**
April-May 2021, Cambridge, UK [online]

Talks

More than 80 talks in international conferences and universities. 2 invited colloquia for the full Physics department.

- 1) **"Holographic emergence of Lorentz Invariance"**
April 2013, Crete, Erasmus school 2013
- 2) **"Emergence of Lorentz Invariance and Lifshitz Holography"**
June 2013, Pohang, Holography 2013
- 3) **"Holographic Emergence of Lorentz Invariance"**
October 2013, Madrid, II Postgraduate Meeting On Theoretical Physics
- 4) **"When Einstein invited Landau and Gell-Mann for a Beer"**
March 2014, Barcelona, IFAE Journal Club, Informal talk
- 5) **"Holographic massive gravity, piezoelectric response and Polaron's dynamics"**
7th November 2014, Santiago de Compostela, International Postgraduate Meeting on Fundamental Physics
- 6) **"A real-world application for Massive Gravity"**
3rd December 2014, Barcelona, IFAE pizza seminar
- 7) **"Metal-Insulator transition and holographic massive gravity"**
19th December 2014, University of Genova (Italy)
- 8) **"Theoretical physics with parsimony"**
March 2015, Barcelona, IFAE Journal Club
- 9) **"Electron-Phonon Interactions, MIT and Holographic Massive Gravity"**
15th April 2015, Florence, "Gauge-Gravity duality 2015"
- 10) **"Towards Holographic Mott Insulators"**
26th May 2015, Tokyo, "International Workshop on Condensed Matter Physics and AdS/CFT", Short Talk
- 11) **"Holographic Metal-Insulator transitions"**
11th September 2015, University of Genova (Italy)
- 12) **"Solid applications of massive gravity"**
16th September 2015, Sestri Levante, "Physics on the Riviera 2015"
- 13) **"Holographic conductivities in massive gravity"**

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- 16th October 2015, University of Illinois, Group Meeting
- 14) **"Solid applications of massive gravity"**
4th November 2015, YITP, Stony Brook
 - 15) **"Holographic Solid State Physics"**
16th November 2015, University of Chicago, EFI
 - 16) **"101 uses for Holographic Massive Gravity"**
8th December 2015, University Illinois, ICMT
 - 17) **"Holographic universal bounds: to be or not to be?"**
8th March 2016, Crete center for theoretical physics, University of Crete
 - 18) **"Holographic effective theories for condensed matter"**
31th March 2016, Lorentz Institute for theoretical physics, University of Leiden
 - 19) **"Jogging through holographic massive gravity"**
24th August 2016, Perimeter Institute for Theoretical Physics, Waterloo, Canada
 - 20) **"Holography with momentum dissipation and massive gravity: a status report"**
27th October 2016, Jena University, Germany
 - 21) **"On the existence of universal bounds at strong coupling"**
2th November 2016, Wurzburg University, Germany
 - 22) **"Gravity and Condensed Matter: an unexpected love tale"**
30th November 2016, University of Miami, Miami
 - 23) Informal talk: **"Disordered and chaotic novel materials"**
31th March 2017, INPP NCSR Demokritos, Athens
 - 24) **"Drude falling into a black hole"**
10th May 2017, National Technical University NTU, Athens
 - 25) Physics Colloquium: **"How my condensed matter book fell into a black hole"**
23th May 2017, Dalian University of Technology, Dalian, China
 - 26) **"Holography, momentum dissipation and chaos"**
25th May 2017, Dalian University of Technology, Dalian, China
 - 27) **"Holography, momentum dissipation and chaos"**
2nd June 2017, Chinese Academy of Science CAS, Institute of High Energy Physics IHEP , Beijing, China
 - 28) **"Drude falling into a black hole"**
21st June 2017, Firenze University, Italy
 - 29) **"Universal bounds on diffusion"**
15th July 2017, Ninth Crete Regional Meeting on String Theory, Kolymbari, Crete, Greece
 - 30) **"Holography with broken translational invariance: the status of the art and more"**
16th August 2017, Hanyang University, Seoul, South Korea

- 31) **"Universal bounds on transport: to be or not to be?"**
21st August 2017, Asia Pacific Center for Theoretical Physics APCTP , Pohang, South Korea
- 32) **"Informal blackboard discussion on holographic models without translational invariance and applications to condensed matter"**
August 2017, Gwangju Institute of Science and Technology, Gwangju, South Korea
- 33) **"Elasticity and (pseudo)-phonons in holography"**
6 October 2017, NORDITA, Stockholm, Sweden
- 34) **"Holographic Phonons"**
10 October 2017, University of Crete, Crete, Greece
- 35) **"Holographic Phonons"**
6 December 2017, Imperial College, London, UK
- 36) **"The Trinity of Holographic Massive Gravity"**
8th January 2018, "Holography and Supergravity 2018", Vina del mar, Chile
- 37) **"The Trinity of Holographic Massive Gravity"**
22th January 2018, ICTP-SAIFR Joint seminar, Sao Paulo, Brazil
- 38) **"Massive Gravity and Solid Holograms"**
1st March 2018, The Hebrew University of Jerusalem, Israel
- 39) **"Holographic quantum phase transitions: time to get dirty!"**
9th April 2018, University of Iceland, Iceland
- 40) **"Quantum Criticality gives me butterflies"**
9th May 2018, Crete University, Heraklion, Greece
- 41) **"One, No One and One Hundred Thousand: You know more than you think you know"**
30th May 2018, Enartia Academy, Heraklion, Greece
- 42) **"Viscoelastic Holography: from fluids to solids"**
7th June 2018, Queen Mary University, London
- 43) **"Quantum Criticality gives me butterflies"**
5th July 2018, "Holography and Extreme Chromodynamics", Santiago de Compostela, Spain
- 44) **"Gauge-Gravity, just add honey!!"**
July 2018, "Gauge/Gravity Duality 2018", Wurzburg, Germany, <https://www.physik.uni-wuerzburg.de/en/tp3/gauge-gravity-duality-2018/>
- 45) **"From fluid to solid holography and back"**
August 2018, "International Conference on Holography, String Theory and Discrete Approaches", Hanoi, Vietnam
- 46) **"Universal origin of the boson peak in ordered crystals and in amorphous materials"**
24th October 2018, GCM, UPC, Barcelona, Spain

- 47) **"Low energy challenges for high energy physicists: the vibrational modes of matter"**
26th October 2018, IFAE, Barcelona, Spain
- 48) **"Low energy challenges for high energy physicists: the vibrational modes of matter"**
15th November 2018, MIT, Boston, USA
- 49) **"Low energy challenges for high energy physicists: the vibrational modes of matter"**
20th November 2018, Perimeter Institute, Waterloo, Canada
- 50) **"The vibrational modes of matter"**
26th November 2018, Trottier Energy Institute and Polytechnique Montreal, Montreal, Canada
- 51) **"Low energy challenges for high energy physicists: the vibrational modes of matter"**
5th December 2018, University of Alabama, Tuscaloosa, USA
- 52) **"Universal origin of the boson peak in ordered crystals and in amorphous materials"**
12th December 2018, Universidad Nacional Autonoma de Mexico, Mexico City, Mexico
- 53) **"Holographic viscoelastic phases of matter: from fluids to solids and more"**
20th February 2019, Online Talk, Indian Institute of Technology Madras, Chennai, India
- 54) **"Holographic viscoelastic phases of matter: from fluids to solids and more"**
25th February 2019, NORDITA, Stockholm, Sweden
- 55) **"Momentum Gapped States. Are really liquids and solids different? And more..."**
8th March 2019, University of Helsinki, Finland
- 56) **"Holographic viscoelastic phases of matter: from fluids to solids and more"**
12th March 2019, University of Helsinki, Finland
- 57) **"Bringing holography to the earth"**
Invited department colloquium, 21/22th March 2019, University of Milan, Italy
- 58) **"Beyond Hydrodynamics and the k -gap"**
May 2019, "Emergent Hydrodynamics in low dimensional quantum systems", Natal, Brazil, <https://www.iip.ufrn.br/eventsdetail.php?inf===QTUFFM>
- 59) **"Holographic methods for complex systems"**
July 2019, "StatPhys27", Buenos Aires, Argentina, <https://statphys27.df.uba.ar/>
- 60) **"Breaking Bad translations behind the Bad metals mystery?"**
August 2019, "International Workshop on Strange Metals and Bad Metals", Shanghai, China, <https://indico.leeinst.sjtu.edu.cn/event/118/>

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- 61) **"Holography with Broken Translations: do we really understand it?"**
August 2019, "Workshop on Holography and Quantum Matter", Beijing, China
- 62) **"What Matters?"**
August 2019, Dalian University of Technology, Dalian, China
- 63) **"Strings are (visco)-elastic"**
January 2020, Iberian Strings 2020, Santiago de Compostela, Spain
- 64) **"Homogeneous Holographic viscoelastic model, who are you?"**
March 2020, Lehigh University, Bethlem, USA
- 65) **"A hydrodynamic description of the vibrational modes of ordered and disordered systems"**
March 2020, March Meeting 2020, Denver, USA, **CANCELLED- COVID19**
- 66) **"Creating (some) order in glasses & beyond"**
Invited talk, March 2020, March Meeting 2020, Denver, USA, **CANCELLED- COVID19**
- 67) **"Holographic Viscoelastic model, Who are you?"**
April 2020, University of Crete, Greece, Online talk
- 68) **"Homogeneous Holographic Viscoelastic Model, Who Are You"**
April 2020, Conference "Frontiers of holographic duality" , Moscow, Russia, **CANCELLED- COVID19**
- 69) **"Hydrodynamics, Random Matrix Theory and Quasi-localized modes: a fresh view on an old path"**
April 2020, SPb Polytechnical University , St.Petersburg, Russia, **CANCELLED- COVID19**
- 71) **"From Hydrodynamics to Viscoelasticity in Holography and beyond ..."**
6th May 2020, Online Seminar, ICTS Bangalore, India
- 72) **"Holographic toy models for fluids, solids and viscoelastic materials"**
7th May 2020, Online Seminar for the Series "Quantum Fluids in Isolation" hosted by Boston College University.
- 73) **"Panel discussion on applications of holography"**
26th May 2020, Host of the online panel discussion
- 74) **"Holography and Quasicrystals, an unexpected meeting"**
28th May 2020, Online Seminar for QuantumGravityResearch.org
- 75) **"The power of (broken) symmetries: how glasses and strained Weyl semimetals sound"**
29th May 2020, Donostia International Physics Center, San Sebastian, Spain, **CANCELLED- COVID19**
- 76) **"New hints towards transport universality"**
12th June 2020, "Workshop on Gravity and Cosmology", Dalian University, China, Online talk

- 77) **"Homogeneous Holographic viscoelastic models"**
 July 2020, "Gauge-Gravity duality 2020", CERN, Switzerland, **CANCELLED-COVID19**
- 78) **"New hints towards transport universality"**
 August 2020, "4th international conference on holography, string theory and discrete approach", <http://pias.edu.vn/international-conference-on-holography-string-theory-and-discrete-approach-in-hanoi>, Hanoi, Vietnam, Online talk
- 79) **"Phases of Matter & Collective Excitations in the eyes of a high energy theorist "**
 "Quantum Matter and Quantum Information with Holography", <https://www.apctp.org/plan.php/holography2020>, APCTP (Korea), Online, August 2020
- 80) **"Phases, Phasons & Phase relaxation in Holography and EFTs"**
 Conference "The dual mysteries of gauge theories and gravity", Oct 19-23, 2020, IIT Madras (India), <https://icsrpiis.iitm.ac.in/events/8891/>
- 81) **"Classifying and understanding phases of matter with effective theories"**
 29th October 2020, IFT-Madrid
- 82) **"Five little stories about liquids"**
 14th January 2021, Lubjiana theory group online seminars
- 83) **"How Small Hydrodynamics can go"**
 18th January 2021, Shanghai University, China
- 84) **"How Small Hydrodynamics can go"**
 19th January 2021, Iberian String 2021, Online Conference, <https://ibstrings2021.math.tecnico.ulisboa.pt/>
- 85) **"Solids, liquids and glasses: find the differences (& understand them)"**
 January 2021, Jiao-Tong Shanghai University, China
- 86) **"Is the difference between solids and liquids topological ?"**
 9th March 2021, virtual INT program "Topological Phases of Matter: From Low to High Energy", USA
- 87) **"Is it a liquid or a solid?"**
 24th March 2021, 2021 International Workshop on Soft Matter and Biophysics Theories—Youth Forum
- 88) **"Find the differences between solids and liquids (& understand them)"**
 25th March 2021, plenary lecture on the Winter School on Mechanics, Perm, Russia
- 89) **"Holography with broken symmetries"**
 25 April 2021, "GRA 2020/2021 Annual Conference and National Congress on Gravity", Shenyang, China
- 90) **"???"**
 May 2021, "Newton Institute ARA programme focus week on asymptotics,relativistic hydro and holography", Cambridge [online]

Lectures

1) "A Practical Mini-Course on Applied Holography"

A concise (and therefore not comprehensive) and pragmatic course on applied holography and especially the (basic) analytic and numerical techniques involved. The lectures are not focused on the large theoretical and fundamental background which can be found already in several places in the literature, but rather on concrete applications of Bottom-Up AdSCFT to Hydrodynamics, QCD and Condensed Matter. The idea is to accompany the reader step by step through the various benchmark examples with a classmate attitude, providing details of the computations and open-source numerical codes in Mathematica, and sharing simple tricks and warnings collected during my research experience. At the end of this path, the reader will be in possess of all the fundamental skills and tools to learn by himself/herself more advanced techniques and to produce independent and novel research on the topic.

Notes uploaded at <https://arxiv.org/abs/1908.02667> and the numerical codes at <https://members.ift.uam-csic.es/matteo.baggioli/lectures/>.

Posters

1) "Towards Holographic Mott Insulators"

May 2015, Tokyo, "International Workshop on Condensed Matter Physics and AdS/CFT"

2) "Soft optical phonons induce glassy-like vibrational and thermal anomalies in ordered crystals"

March 2019, Andalo, "XV International Workshop on Complex Systems"

Publications & Citations

Statistics **Total citations:** 1390, **h-index:** 21, **i10-index:** 38
(Google Scholar)

Among them: 4 publications in PRL, 1 PNAS and 1 review paper in Physics Reports

<http://inspirehep.net/author/profile/M.Baggioli.1>

<https://scholar.google.com/citations?user=l7D>

<https://arxiv.org/search/?query=baggioli&searchtype=all&source=header>

1) "Electron-Phonon Interactions, Metal-Insulator Transitions, and Holographic Massive Gravity"

Matteo Baggioli and Oriol Pujolás

<http://arxiv.org/abs/1411.1003>

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Published in Phys. Rev. Lett. 114, 251602, Editor's Suggestions

2) **"Phases of holographic superconductors with broken translational symmetry"**

Matteo Baggioli and Mikhail Goykhman

<http://arxiv.org/abs/1504.05561>

Published in JHEP 2015 35, DOI: 10.1007/JHEP07(2015)035

3) **"Drag phenomena from holographic massive gravity"**

Matteo Baggioli and Danny Brattan

<http://arxiv.org/abs/1504.07635>

Published in Classical and Quantum Gravity, Volume 34, Number 1

4) **"Under The Dome: doped holographic superconductors with broken translational symmetry"**

Matteo Baggioli and Mikhail Goykhman

Published in JHEP 1601 (2016) 011; DOI: 10.1007/JHEP01(2016)011

<http://arxiv.org/abs/1510.06363>

5) **"Solid Holography and Massive Gravity"**

Matteo Baggioli, Lasma Alberte, Andrei Khmelnsky and Oriol Pujolás

<http://arxiv.org/abs/1510.09089>

Published in JHEP 1602 (2016) 114; DOI: 10.1007/JHEP02(2016)114

6) **"Viscosity bound violation in holographic solids and the viscoelastic response"**

Matteo Baggioli, Lasma Alberte, and Oriol Pujolás

<http://arxiv.org/abs/1601.03384>

Published in JHEP 1607 (2016) 074; DOI: 10.1007/JHEP07(2016)074

7) **"On holographic disorder-driven metal-insulator transitions"**

Matteo Baggioli and Oriol Pujolás

<http://arxiv.org/abs/1601.07897>

Published in JHEP 1701 (2017) 040; DOI: 10.1007/JHEP01(2017)040

8) **"Chasing the cuprates with dilatonic dyons"**

Andrea Amoretti, Matteo Baggioli, Nicodemo Magnoli and Daniele Musso

<http://arxiv.org/abs/1603.03029>

Published in JHEP 1606 (2016) 113; DOI: 10.1007/JHEP06(2016)113

9) **"On effective holographic Mott Insulators"**

Matteo Baggioli, Oriol Pujolas

<http://arxiv.org/abs/1604.08915>

Published in JHEP 2016(12), 1-45; DOI: 10.1007/JHEP12(2016)107

10) **"Gravity, Holography and applications to condensed matter"**

Matteo Baggioli

<https://arxiv.org/abs/1610.02681>

PhD thesis

- 11) **"Higher derivative corrections to incoherent metallic transport in holography"**
Matteo Baggioli, Blaise Gouteraux, Elias Kiritsis and Wei-Jia Li
<https://arxiv.org/abs/1612.05500>
Published in JHEP 1703 (2017) 170, DOI: 10.1007/JHEP03(2017)170
- 12) **"Diffusivities bounds and chaos in holographic Horndeski theories"**
Matteo Baggioli and Wei-Jia Li
<https://arxiv.org/abs/1705.01766>
Published in JHEP07(2017)055, DOI: 10.1007/JHEP07(2017)055
- 13) **"Pinning of longitudinal phonons in holographic spontaneous helices"**
Matteo Baggioli, Tomas Andrade, Alexander Krikun and Napat Poovuttikul
<https://arxiv.org/abs/1708.08306>
Published in JHEP 1802 (2018) 085, DOI: 10.1007/JHEP02(2018)085
- 14) **"Black hole elasticity and gapped tranverse phonons in holography"**
Matteo Baggioli, Lasma Alberte, Martin Ammon, Oriol Pujolas and Amadeo Jimenez
<https://arxiv.org/abs/1708.08477>
Published in JHEP 1801 (2018) 129, DOI: 10.1007/JHEP01(2018)129
- 15) **"Holographic phonons"**
Matteo Baggioli, Lasma Alberte, Martin Ammon, Oriol Pujolas and Amadeo Jimenez
<https://arxiv.org/abs/1711.03100>
Published in Phys.Rev.Lett. 120 (2018) no.17, 171602
- 16) **"A smeared quantum phase transition in disordered holography "**
Matteo Baggioli, Martin Ammon, Amadeo Jimenez-Alba, Sebastian Moeckel
<https://arxiv.org/abs/1802.08650>
Published in JHEP 1804 (2018) 068
- 17) **"Conjecture on the Butterfly Velocity across a Quantum Phase Transition"**
Matteo Baggioli, Bikash Padhi, Philip W. Phillips and Chandan Setty
<https://arxiv.org/abs/1805.01470>
Published in JHEP07(2018)049
- 18) **"Holographic Viscoelastic Hydrodynamics"**
Matteo Baggioli and Alex Buchel
<https://arxiv.org/abs/1805.06756>
Published in J. High Energ. Phys. (2019) 2019: 146
- 19) **"Elasticity bounds from Effective Field Theory"**
Matteo Baggioli, Lasma Alberte, Victor Cancer Castillo, Oriol Pujolas
<https://arxiv.org/abs/1807.07474>
Published in PRD, PhysRevD.100.065015
- 20) **"Low frequency propagating shear waves in holographic liquids"**

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Matteo Baggioli, Kostya Trachenko
<https://arxiv.org/abs/1807.10530>

Published in JHEP 1903 (2019) 093

21) **"Maxwell interpolation and close similarities between liquids and holographic models"**

Matteo Baggioli, Kostya Trachenko
<https://arxiv.org/abs/1808.05391>

Published in Phys.Rev. D99 (2019) no.10, 106002

22) **"Universal origin of boson peak vibrational anomalies in ordered crystals and in amorphous materials"**

Matteo Baggioli, Alessio Zaccone
<https://arxiv.org/abs/1810.09516>

Published in Phys.Rev.Lett. 122 (2019) no.14, 145501

23) **"Soft optical phonons induce glassy-like vibrational and thermal anomalies in ordered crystals"**

Matteo Baggioli, Alessio Zaccone
<https://arxiv.org/abs/1812.07245>

Published in Journal of Physics: Materials, JPMATER-100147.R1

24) **"Linear Viscoelastic dynamics in holography"**

Matteo Baggioli, Tomas Andrade, Oriol Pujolas
<https://arxiv.org/abs/1903.02859>

Published in Phys. Rev. D 100, 106014

25) **"Vibrational density of states and specific heat in glasses from random matrix theory"**

Matteo Baggioli, Rico Milkus, Alessio Zaccone
<https://arxiv.org/abs/1903.05237>

Published in Phys. Rev. E 100, 062131

26) **"Gapped Momentum States"**

Matteo Baggioli, Vadim Brazhkin, Mikhail Vasin, Kostya Trachenko
<https://arxiv.org/abs/1904.01419>

Published in Physics Reports, 10.1016/j.physrep.2020.04.002

27) **"A Unified Description of Translational Symmetry Breaking in Holography"**

Matteo Baggioli, Martin Ammon, Amadeo Jimenez Alba
<https://arxiv.org/abs/1904.05785>

Published in JHEP 1909 (2019) 124

28) **"Holographic Plasmon Relaxation with and without Broken Translations"**

Matteo Baggioli, Ulf Gran, Amadeo Jimenez Alba, Marcus Tronso, Tobias Zingg
<https://arxiv.org/abs/1905.00804>

Published in JHEP 1909 (2019) 013

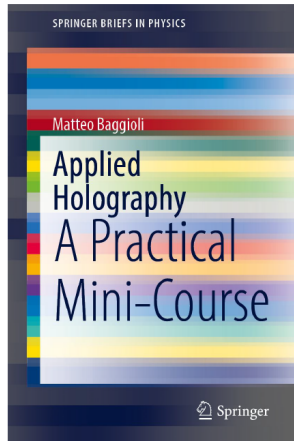
- 29) **"Hydrodynamics of disordered marginally-stable matter"**
Matteo Baggioli, Alessio Zaccone
<https://arxiv.org/abs/1905.03286>
Published as Rapid Communication in PRResearch, Phys. Rev. Research 1, 012010(R)
- 30) **"Longitudinal Sound and Diffusion in Holographic Massive Gravity"**
Martin Ammon, Matteo Baggioli, Sean Gray, Sebastian Grieneringer
<https://arxiv.org/abs/1905.09164>
Published in JHEP 1910 (2019) 064
- 31) **"Zoology of Solid & Fluid Holography"**
Matteo Baggioli, Sebastian Grieneringer
<https://arxiv.org/abs/1905.09488>
Published in JHEP 1910 (2019) 235
- 32) **"Theory of phonon glass behaviour in host-guest thermoelectrics with avoided crossing"**
Matteo Baggioli, Alessio Zaccone, Bingyu Cui
<https://arxiv.org/abs/1906.08079>
Published as Rapid Communication in PRB, Phys. Rev. B 100, 220201 (2019)
- 33) **"A Practical Mini-Course on Applied Holography"**
Matteo Baggioli
<https://arxiv.org/abs/1908.02667>
Published as a book in "Briefs in Physics", Springer
<https://www.springer.com/gp/book/9783030351830>
- 34) **"Scale Invariant Solids"**
Matteo Baggioli, Victor Castillo, Oriol Pujolas
<https://arxiv.org/abs/1910.05281>
Published in Phys. Rev. D 101, 086005.
- 35) **"Nonlinear Oscillatory Shear Tests in Viscoelastic Holography"**
Matteo Baggioli, Sebastian Grieneringer, Hesam Soltanpanahi
<https://arxiv.org/abs/1910.06331>
Published in Phys. Rev. Lett. 124, 081601
- 36) **"Unified theory of vibrational spectra in amorphous materials"**
Matteo Baggioli, Alessio Zaccone
<https://arxiv.org/abs/1911.03351>
Published in Phys. Rev. Research 2, 013267.
- 37) **"Transverse Collective Modes in Interacting Holographic Plasmas"**
Matteo Baggioli, Ulf Gran, Marcus Tornso
<https://arxiv.org/abs/1912.07321>
Published in J. High Energ. Phys. 2020, 106 (2020).

- 38) **"Effective Theory of Superconductivity in Strongly-Coupled Amorphous Materials"**
Matteo Baggioli, Chandan Setty, Alessio Zaccone
<https://arxiv.org/abs/2001.00404>
Phys. Rev. B 101, 214502 – Published 3 June 2020
- 39) **"On the Hydrodynamic Description of Holographic Viscoelastic Models"**
Matteo Baggioli, Martin Ammon, Sebastian Griener, Sean Gray, Akash Jain
<https://arxiv.org/abs/2001.05737>
Published in Physics Letters B., Volume 808, 10 September 2020, 135691
- 40) **"Are The Homogeneous Holographic Viscoelastic Models Quasicrystals ?"**
Matteo Baggioli
<https://arxiv.org/abs/2001.06228>
Phys. Rev. Research 2, 022022(R) Rapid Communication 2020
- 41) **"Anharmonic phonon damping enhances the T_c of BCS-type superconductors"**
Matteo Baggioli, Chandan Setty, Alessio Zaccone
<https://arxiv.org/abs/2003.06220>
Published in Phys. Rev. B 102, 174506
- 42) **"Similarity between the kinematic viscosity of quark-gluon plasma and liquids at the viscosity minimum"**
Matteo Baggioli, V.V.Brazhkin, K.Trachenko
<https://arxiv.org/abs/2003.13506>
- 43) **"Detect Axial Gauge Fields with a Calorimeter"**
Matteo Baggioli, Maxim N. Chernodub, Karl Landsteiner, Maria A. H. Vozmediano
<https://arxiv.org/abs/2004.02473>
Published in SciPost Phys. Core 3, 013 (2020).
- 44) **"Physics of Phonon-Polaritons in Amorphous Materials"**
Matteo Baggioli, Luigi Casella, Tatsuya Mori, Alessio Zaccone
<https://arxiv.org/abs/2004.12358>
Published in J. Chem. Phys. 154, 014501 (2021)
- 45) **"Field Theory of Dissipative Systems with Gapped Momentum States"**
Matteo Baggioli, Vadim Brazhkin, Mikhail Vasin, Kostya Trachenko
<https://arxiv.org/abs/2004.13613>
Published in Phys. Rev. D 102, 025012
- 46) **"Magnetophonons & type-B Goldstones from Hydrodynamics to Holography"**
Matteo Baggioli, Sebastian Griener, Li Li
<https://arxiv.org/abs/2005.01725>
Published in JHEP 09 (2020) 037.

- 47) **"Universal Bounds on Transport in Holographic Systems with Broken Translations"**
Matteo Baggioli, Wei-Jia Li
<https://arxiv.org/abs/2005.06482>
Published in SciPost Phys. 9, 007 (2020)
- 48) **"Anomalous diffusion and Noether's second theorem"**
Matteo Baggioli, Gabriele La Nave and Philip W. Phillips
<https://arxiv.org/abs/2006.10064>
Phys. Rev. E 103, 032115 – Published 12 March 2021
- 49) **"Black Rubber and the Non-linear Elastic Response of Scale Invariant Solids"**
Matteo Baggioli, Victor Cancer Castillo and Oriol Pujolas
<https://arxiv.org/abs/2006.10774>
Published in JHEP 09 (2020) 013.
- 50) **"Anharmonic theory of superconductivity in the high-pressure materials"**
Matteo Baggioli, Chandan Setty, Alessio Zaccone
<https://arxiv.org/abs/2007.04981>
Phys. Rev. B 103, 094519 – Published 29 March 2021
- 51) **"Detecting Topological Quantum Phase Transitions via the c-Function"**
Matteo Baggioli, Dimitrios Giataganas
<https://arxiv.org/abs/2007.07273>
Phys. Rev. D 103, 026009 – Published 11 January 2021
- 52) **"New paradigm for glassy-like anomalies in solids from fundamental symmetries"**
Matteo Baggioli, Alessio Zaccone
<https://arxiv.org/abs/2008.01407>
Published in International Journal of Modern Physics B, Vol. 35, No. 04, 2130002 (2021)
- 53) **"Effective field theory for quasicrystals and phasons dynamics"**
Matteo Baggioli, Michael Landry
<https://arxiv.org/abs/2008.05339>
Published in SciPost Physics, SciPost Phys. 9, 062 (2020)
- 54) **"Universal lower bounds on energy and momentum diffusion in liquids"**
Matteo Baggioli, Kostya Trachenko, Kamran Behnia, Vadim Brazhkin
<https://arxiv.org/abs/2009.01628>
Phys. Rev. B 103, 014311 – Published 28 January 2021
- 55) **"Phase relaxation and pattern formation in holographic gapless charge density waves"**
Matteo Baggioli, Alexander Krikun, Tomas Andrade

- <https://arxiv.org/abs/2009.05551>
Journal of High Energy Physics volume 2021, Article number: 292 (2021)
- 56) **"How small hydrodynamics can go"**
Matteo Baggioli
<https://arxiv.org/abs/2010.05916>
Phys. Rev. D 103, 086001 – Published 1 April 2021
- 57) **"Universal L^{-3} finite-size effects in the viscoelasticity of confined amorphous systems"**
Matteo Baggioli, A. E. Phillips, T. W. Sirk, K. Trachenko, A. Zaccone
<https://arxiv.org/abs/2012.05149>
Phys. Rev. Materials 5, 035602 – Published 5 March 2021
- 58) **"Universal law for the vibrational density of states of liquids"**
Matteo Baggioli, A. Zaccone
<https://arxiv.org/abs/2101.01380>
Published in PNAS, <https://www.pnas.org/content/118/5/e2022303118>
- 59) **"Holographic Axion Model: a simple gravitation tool for quantum matter"**
Matteo Baggioli, Keun-Young Kim, Li Li, Wei-Jia Li
<https://arxiv.org/abs/2101.01892>
SCIENCE CHINA Physics, Mechanics & Astronomy, <https://doi.org/10.1007/s11433-021-1681-8>
- 60) **"Deformations, relaxation and broken symmetries in liquids, solids and glasses: a unified topological field theory"**
Matteo Baggioli, Michael Landry, Alessio Zaccone
<https://arxiv.org/abs/2101.05015>
- 61) **"Plasticity in amorphous solids is mediated by topological defects in the displacement field"**
Matteo Baggioli, Ivan Kriuchevskiy, Timothy W. Sirk, Alessio Zaccone
<https://arxiv.org/abs/2101.05529>
- 62) **"Explaining the specific heat of liquids based on instantaneous normal modes"**
Matteo Baggioli, Alessio Zaccone
<https://arxiv.org/abs/2101.07585>
- 63) **"On the universality of AdS_2 diffusion bounds and the breakdown of linearized hydrodynamics"**
Matteo Baggioli, Ning Wu, Wei-Jia Li
<https://arxiv.org/abs/2102.05810>
- 64) **"Collective modes of polarizable holographic media in magnetic fields"**
Matteo Baggioli, Ulf Gran, Marcus Tornso
<https://arxiv.org/abs/2102.09969>

Books



"Applied Holography, A Practical Mini-Course."

Series: SpringerBriefs in Physics, 1st edition 2020.

<https://www.springer.com/gp/book/9783030351830>

Media coverage

- ★ "Holographist by trade"
APS [physics.org](https://physics.aps.org) article by Michael Schirber
<https://physics.aps.org/articles/v13/57>
- ★ "Understanding how sound waves travel through disordered materials"
Press release in Phys.org
<https://phys.org/news/2021-01-disordered-materials.html>
- ★ Press release on PNAS publication
<https://wqc.sjtu.edu.cn/en/show?f=268&w=112&p=112>
<https://lastatalenews.unimi.it/teoria-matematica-per-distribuzione-stati-energ>
<https://www.physics.sjtu.edu.cn/en/about/news/52>

Teaching Experience

- ★ Total amount of TA hours during the PhD: 150
- TA, 1st year course "Introduction to experimental physics"
Springs 2013-2014-2015-2016, Universitat Autònoma de Barcelona
- TA, 2nd year course "Informatic methods"
Springs 2014-2015-2016, Universitat Autònoma de Barcelona
- TA, 1st year course "Physics for Maths"
Autumn 2014, Spring 2016, Universitat Autònoma de Barcelona
- ★ 5 lectures of 90 minutes on Applied Holography given at the Indian Institute of Technology Madras in September 2019.

*Wilczek Quantum Center, School of Physics and Astronomy, Shanghai Jiao Tong University,
800 Dongchuan Road, Minhang District, Shanghai, P.R. China. 200240*

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<https://thepchennai.home.blog/2019/08/22/mini-course-on-applied-holography-at-iit-madras/>

- ★ Advanced course on Applied Holography for the PhD program in Theoretical Physics at the University of Madrid UAM. 5 lectures of 90 minutes delivered in December 2019. <https://moseranette.wixsite.com/doctorado/copia-de-specialized-2018-2019>
- ★ 3 advanced lectures at the scientific program "Quantum Matter and Quantum information with Holography" on "Phases of Matter & Collective Excitations in the eyes of a high energy theorist " held online in the week of 23-31 of August 2020, <https://www.apctp.org/plan.php/holography2020>
- ★ One week of introductory lectures to holography for the "Korean School on Holography 2021", 22-26 February 2021, <https://sites.google.com/view/holography-school/2021>
- ★ "Electrodynamics and electromagnetism", First semester 2021/2022, Shanghai Jiao Tong University, 2nd year of bachelor course in Physics

Grants and Networks

- ★ Grant from Shanghai Municipal Science and Tech Major Project through Shanghai Research Center for Quantum Sciences (SRCQS)
Subproject N.4, Grant No.2019SHZDZX01

Referee Experience

Total of 63 manuscripts in several international journals :

- Referee for Nature Communications (1 paper)
- Referee for PRL (11 papers)
- Referee for PRD (12 papers)
- Referee for PRB (3 papers)
- Referee for PRE (1 paper)
- Referee for JHEP (13 papers)
- Referee for Scientific Reports (1 paper)
- Referee for Annalen der Physik (2 papers)
- Referee for SciPost Physics (1 paper)
- Referee for European Physical Journal C (9 papers)
- Referee for Physics Letter B (2 paper)
- Referee for Biorheology - The Official Journal of the International Society of Biorheology (1 paper)
- Referee for International Journal of Modern Physics A (1 paper)
- Referee for Nuclear Physics B (1 paper)
- Referee for Journal of Low Temperature Physics (1 paper)
- Referee for Frontiers in Materials, section Glass Science (1 paper)

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20/24

- Referee for Journal of Physical Chemistry (1 paper)
- Referee for Canadian Journal of Physics (1 paper)

External referee roles

- Referee for the National Fund for Scientific and Technological Research (FONDECYT) of the National Research and Development Agency of Chile
NATIONAL RESEARCH FUNDING COMPETITION FONDECYT Regular 2021

Organizational experience

- Organizer of the IFAE Junior Journal Club for the period 2013/2016
- Seminars organizer at Crete Center for Theoretical Physics for the period 2016/2018
- Organizer of the $D + 1$ App Journal Club at IFT Madrid, 2018/2020
- Organizer of the Lectures Series "Electron Hydrodynamics" based on the WIS school <http://www.weizmann.ac.il/conferences/SRitp/Jan2019/>; Spring 2019, IFT Madrid
- Organizer of the international workshop "HoloMatter"; March 2020, IFT Madrid
<https://workshops.ift.uam-csic.es/holomatter>
- Organizer of Applied Holography Online Seminars Series
<https://workshops.ift.uam-csic.es/holomatter/OnlineSeminars>
- Creator of the international HoloTube project
<https://projects.ift.uam-csic.es/holotube/>
- Organizer of the Online Workshop "HoloTube Junior" dedicated to PhD students
<https://projects.ift.uam-csic.es/holotube/600-2/>

Postdocs

2021-2023 Takaaki Ishii
2021-2023 Yongjun Ahn

Students

Bachelor students

- o Luigi Casella, "Theoretical modeling of phonon-polaritons in amorphous material", University of Milano, co-supervising with prof. A. Zaccone.
- o Beatrice Clemente, "The effect of boson peak on thermal conductivity in glasses" University of Milano, co-supervising with prof. A. Zaccone.

Master students

- Giorgio Frangi, "A Holographic Study of Strongly Coupled Superconductors Under Strain Deformations", University of Milano and Jiao-Tong University Shanghai, in collaboration with prof. A.Zaccone (University of Milano) and prof.O.Pujolas (Universidad Autonoma de Barcelona).

PhD students

- Giorgio Frangi, Shanghai Jiao Tong University [2021-].

Other Academic Roles

- Member of the PhD thesis committee of C.Copetti at IFT-UAM Madrid, September 2020
- Member of the PhD thesis committee of Dr.Yongjun Ahn, Gwangju institute of science and technology, Korea

Tutoring

- Tutor for Undergraduate students' final project "Z2 kink and antikink dynamics", Summer 2015, IFAE, Barcelona
- Tutor for the IFAE Summer Fellowship, project: "Simulations in Classical Yang-Mills theory", Summer 2016, IFAE, Barcelona

Social and community service

- Member of the committee for diversity and equality at IFT (2019-2020)
- Organizer of the Postdocs meetings at IFT (2018-2020)

Outreach activities

- Outreach talk: "One, No One and One Hundred Thousand: You know more than you think you know"; theCoResearch meetUp at Enartia, Heraklion, 30th May 2018
- Co-founder of the Grumpy Scientist project
<http://www.thegrumpyscientist.com/>
- Outreach Youtube video "IFT responde": "Pueden existir electrones sin masa?" (in spanish)
<https://www.youtube.com/watch?v=Gc2WtxNS3U0&t=158s>
More than 35k views
- Volunteer for the Researchers Night in Madrid, September 2019, MediaLab Prado
<https://www.icmm.csic.es/Noche-Investigadores/>
- Podcast interview for the scientific blog "Scientificast"
<https://www.scientificast.it/laghi-cappotto/>

Visiting Periods

- 7-11 September 2015, University of Genova (Italy)
- October 2015- January 2016, University of Illinois, Urbana, USA
- 3-5 November 2015, Stony Brook University, YITP, New York, USA
- 16-20 November 2015, University of Chicago, Enrico Fermi Institute, USA
- 9-12 December 2015, New York University NYU, New York, USA
- 7-13 March 2016, Crete center for theoretical physics, Crete, Greece
- 30 March-1st April 2016, Lorentz Institute for theoretical physics, Leiden, Netherlands
- 20 June-1st July 2016, CERN, Geneva, Switzerland
- 22-26 August 2016, Perimeter Institute, Waterloo, Canada
- 24-30 October 2016, Jena University, Jena, Germany
- 31 October-5 November 2016, Wurzburg University, Wurzburg, Germany
- 26 November-12 December 2016, University of Miami, Miami, USA
- 8-12 May 2017, National Technical University NTU, Athens, Greece
- 22-27 May 2017, Dalian University of Technology, Dalian, China
- 29 May-3 June 2017, Institute of High Energy Physics IHEP, Beijing, China
- 19-23 June 2017, Florence University, Firenze, Italy
- 14-18 August 2017, Hanyang University, Seoul, Korea
- 18-26 August 2017, Asia Pacific Center for Theoretical Physics APCTP, Pohang, Korea
- 28 August-1st September 2017, Gwangju Institute of Science and Technology, Gwangju, Korea
- 1-8 October 2017, NORDITA, Stockholm, Sweden
- 2-8 December 2017, Imperial College, London, UK
- 8-12 January 2018, Universidad Adolfo Ibanez, Vina del Mar, Chile
- 15-19 January 2018, Pontificia Universidad Catolica de Valparaiso, Chile
- 22-26 January 2018, University of Sao Paulo, Brazil
- 26 February-2nd March 2018, The Hebrew University of Jerusalem, Israel
- 1-15 April 2018, University of Iceland, Iceland
- 6-8 June 2018, Queen Mary University, London
- 27-29 June 2018, Queen Mary University, London
- 17-19 October 2018, Queen Mary University, London
- 24-26 October 2018, Group of Characterization of Materials UPC and Instituto de Fisica d'altas energies IFAE, Barcelona
- 14-16 November 2018, MIT, Boston, USA
- 19-23 November 2018, Perimeter Institute, Waterloo, Canada
- 26/30 November 2018, University of Montreal, Canada
- 3/6 December 2018, University of Alabama, Tuscaloosa, USA
- 10/13 December 2018, Universidad Autonoma de Mexico, Mexico City, Mexico

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23/24

- 6/13 March 2019, Helsinki University, Finland
- 17/24 August 2019, Tsung-Dao Lee Institute, Shanghai, China
- 24/30 August 2019, Dalian University of Technology, China
- 8/17 September 2019, Indian Institute of Technology, Madras, India
- February 2020, Lehigh University, Bethlehem, USA

Grants and Awards

- ★ **PIF grant**; February 2013/February 2017;
- ★ **Postdoctoral fellow funded by ERC Advanced Grant**; September 2016/September 2018;
- ★ **Premi extraordinari Doctorat en Fisica; Extraordinary prize for PhD in Physics**;, Universidad Autonoma de Barcelona UAB, Barcelona, Spain.
- ★ **Severo Ochoa Postdoctoral fellow**; October 2018/October 2020;

Computer skills

- Basic** ECDL "European Computer Driving Licence";
- Basic** C++, Comsol;
- Advanced** Mathematica, LaTeX;

Languages

- Italian** Mother tongue
- English** Advanced
- Spanish** Advanced
- French** Basic
- Catalan** Basic
- Greek** Elementary
- Portuguese** Elementary