

Luca Buiarelli

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Profile

Condensed matter physicist with experience in analytical modeling, numerical simulations, and group theory. Expertise includes Landau theories, tight-binding models, density functional theory, and Monte Carlo methods, with a current research focus on altermagnetism and unconventional magnetic phases.

Education

<i>University of Minnesota, USA</i> — PhD, Materials Science	<i>Sep. 2023 – Present</i>
<i>University of Copenhagen, Denmark</i> — MSc, Condensed Matter Physics	<i>Sep. 2021 – May 2023</i>
<i>University of Pisa, Italy</i> — BSc, Physics	<i>Sep. 2018 – Sep. 2021</i>

Publications

Published

1. Noncollinear Magnetic Multipoles in Collinear Altermagnets

Luca Buiarelli, Rafael M. Fernandes, Turan Birol

Phys. Rev. B **112**, 224442 (2025) [Journal]

Preprints

1. Interplay between charge correlations and superconductivity across the superconducting domes of $\text{CsV}_3\text{Sb}_{5-x}\text{Sn}_x$

Andrea N. Capa Salinas, Brenden R. Ortiz, Steven J. Gomez Alvarado, Sarah Schwarz, Ganesh Pokharel, **Luca Buiarelli**, Hyeonseo Harry Park, Shiyu Yuan, Roland Yin, Suchismita Sarker, Turan Birol, Stephen D. Wilson
Submitted [arXiv]

2. Observation of mirror-odd and mirror-even spin texture in ultra-thin epitaxially-strained RuO_2 films

Yichen Zhang, Seung Gyo Jeong, **Luca Buiarelli**, Seungjun Lee, Yucheng Guo, Jiaqin Wen, Hang Li, Sreejith Nair, In Hyeok Choi, Zheng Ren, Ziqin Yue, Alexei Fedorov, Sung-Kwan Mo, Junichiro Kono, Jong Seok Lee, Tony Low, Turan Birol, Rafael M. Fernandes, Milan Radovic, Bharat Jalan, Ming Yi
Submitted [arXiv]

3. First-principles study of Rh- and Pd-based kagome-layered shandites

Luca Buiarelli, Turan Birol, Brian M. Andersen, Morten H. Christensen
Submitted [arXiv]

4. Altermagnetic Polar Metallic Phase in Ultra-Thin Epitaxially-Strained RuO_2 Films

Seung Gyo Jeong, In Hyeok Choi, Sreejith Nair, **Luca Buiarelli**, Bita Pourbahari, Jinyoung Oh, Nabil Bassim, Ambrose Seo, Woo Seok Choi, Rafael M. Fernandes, Turan Birol, Liuyan Zhao, Jong Seok Lee, Bharat Jalan
Submitted [arXiv]

Service and Refereeing

Journal Refereeing

Nature *npj Quantum Materials*

Teaching

Teaching Assistant

Spring/Fall 2024

University of Minnesota, Introduction to Materials Science Laboratory (MATS 2001/2002)

Outreach

Penne amiche della scienza

Italy

Science outreach program for Italian high school students based on monthly letter exchanges discussing academic life and scientific research, with the goal of fostering interest in science and academic careers.

Workshops and Conferences

Flatiron Institute, TRIQS School, Paris, France (attended)	<i>September 2025</i>
American Physical Society Global Summit, Los Angeles, CA (talk)	<i>March 2025</i>
School on Electron–Phonon Physics, University of Texas at Austin (attended)	<i>June 2024</i>
American Physical Society March Meeting, Minneapolis, MN (talk)	<i>March 2024</i>

Skills

Coding: Python, MATLAB, C

Scientific Communication: Experience delivering oral presentations with PowerPoint slides and preparation of scientific manuscripts using L^AT_EX

Languages: English (fluent), Italian (native)