

# Luca Buiarelli

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GitHub  
Google Scholar

## Profile

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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

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

## Publications

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### Published

#### 1. Noncollinear Magnetic Multipoles in Collinear Altermagnets

Luca Buiarelli, Rafael M. Fernandes, Turan Birol  
Phys. Rev. B (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 $\text{RuO}_2$ 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 $\text{RuO}_2$ Films

Seung Gyo Jeong, In Hyeok Choi, Sreejith Nair, Luca Buiarelli, Bitu 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

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### Journal Refereeing

Nature *npj Quantum Materials*

## Teaching

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### Teaching Assistant

University of Minnesota, Introduction to Materials Science Laboratory (MATS 2001/2002) Spring/Fall 2024

## Outreach

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### **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

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Flatiron Institute, TRIQS School, Paris, France (attended)

*September 2025*

American Physical Society Global Summit, Los Angeles, CA (talk)

*March 2025*

School on Electron-Phonon Physics, University of Texas at Austin (attended)

*June 2024*

American Physical Society March Meeting, Minneapolis, MN (talk)

*March 2024*

## Skills

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**Coding:** Python, MATLAB, C

**Scientific Communication:** Experience delivering oral presentations with PowerPoint slides and preparation of scientific manuscripts using  $\text{\LaTeX}$

**Languages:** English (fluent), Italian (native)