

Curriculum vitae di Matteo Mitrano

Sottosettori ERC primari (max 3):

- **PE3_4** Electronic properties of materials, surfaces, interfaces, nanostructures;
- **PE3_6** Macroscopic quantum phenomena, e.g. superconductivity, superfluidity, quantum Hall effect;
- **PE3_9** Condensed matter – beam interactions (photons, electrons, etc.)

PERSONAL DETAILS

Family name, First name: Mitrano, Matteo

Birthdate: 15/11/1986

Researcher unique identifier(s) (such as ORCID, Research ID, etc. ...):

ORCID: <https://orcid.org/0000-0002-0102-0391>

ResearcherID: [E-6774-2012](https://orcid.org/0000-0002-0102-0391)

Scopus Author ID: [55173634500](https://orcid.org/0000-0002-0102-0391)

URL for web site: <https://mitrano.physics.harvard.edu/>

• Education and key qualifications

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|------------|--|
| 15/07/2015 | PhD
Max Planck Institute for the Structure and Dynamics of Matter, University of Hamburg, Germany
PhD Supervisor: Prof. Dr. Andrea Cavalleri |
| 2010 | Master of Science (Laurea Specialistica)
Facoltà di Scienze Matematiche, Fisiche e Naturali, Dipartimento di Fisica, Università degli Studi di Roma “Sapienza”, Italy |
| 2008 | Bachelor of Science (Laurea Triennale)
Facoltà di Scienze Matematiche, Fisiche e Naturali, Dipartimento di Fisica, Università degli Studi di Roma “Sapienza”, Italy |

• Current position

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| 2020 - present | Assistant Professor of Physics
Faculty of Arts and Sciences, Department of Physics, Harvard University, United States of America. |
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• Previous positions

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| 2016 - 2020 | Postdoctoral Research Associate and Feodor Lynen Postdoctoral Research Fellow
College of Engineering, Department of Physics, University of Illinois at Urbana-Champaign, United States of America. |
| 2015 - 2016 | Postdoctoral Research Associate
Max Planck Institute for the Structure and Dynamics of Matter, Germany |

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

Total Publications: 51 publications, including Nature (2), Nature Materials (3), Nature Phys. (2), Phys. Rev. X (7), Science Advances (1), Phys. Rev. Lett. (10), PNAS (3).

Total Citations: 3986, h-index: 28 (Google Scholar), 2672, h-index: 26 (Scopus), 2584, h-index: 25 (WoS)

Research achievements

1. D. R. Baykusheva, D. Carmichael, C. S. Weber, I.-T. Lu, F. Glerean, T. Meng, P. B. M. de Oliveira, C. C. Homes, I. A. Zaliznyak, G. D. Gu, M. P. M. Dean, A. Rubio, D. M. Kennes, M. Claassen & **M. Mitrano** (2026): Quantum control of Hubbard excitons, *Nature Materials*. [Featured in [Nature Materials News and Views](#), 1 citation (WoS)]

Significance: *This work demonstrates coherent quantum control of a many-body exciton in the one-dimensional Mott insulator Sr₂CuO₃. By optically rotating Hubbard-exciton wavefunctions between bright and dark states, it establishes a route to programmable ultrafast control of correlated-electron states. I was principal investigator, thus conceiving and leading the experiments.*

2. H. Padma, F. Glerean, S. F. R. TenHuisen, Z. Shen, H. Wang, L. Xu, J. D. Elliott, C. C. Homes, E. Skoropata, H. Ueda, B. Liu, E. Paris, A. Romaguera, B. Lee, W. He, Y. Wang, S. H. Lee, H. Choi, S.-Y. Park, Z. Mao, M. Calandra, H. Jang, E. Razzoli, M. P. M. Dean, Y. Wang, & **M. Mitrano** (2025): Symmetry-protected electronic metastability in an optically driven cuprate ladder, [Nature Materials](#) **24**, 1584-1591. [Featured in [Nature Materials News and Views](#), 5 citations (WoS)]

Significance: *This work establishes a novel mechanism for trapping nonequilibrium electronic states after the driving field dissipates. In $Sr_{1-x}Cu_{2x}O_{41}$, light activates a symmetry-forbidden hopping channel, transfers holes in the sublattice, and creates an electronic metastable state lasting tens of nanoseconds. I was principal investigator. I conceived and led the ultrafast THz, x-ray diffraction, absorption, and RIXS experiments. This work advances the frontier of ultrafast X-ray spectroscopy at X-ray free electron lasers.*

3. H. Padma, J. Thomas, S. F. R. TenHuisen, W. He, Z. Guan, J. Li, B. Lee, S.-H. Lee, Y. Wang, Z. Mao, H. Jang, V. Bisogni, J. Pellicciari, M. P. M. Dean, S. Johnston & **M. Mitrano** (2025): Beyond-Hubbard pairing in a cuprate ladder, [Phys. Rev. X](#) **15**, 021049 [7 citations (WoS)].

Significance: *This work uses ultrahigh-resolution RIXS to identify magnetic signatures of strong hole pairing in a doped cuprate ladder. The results show that theoretical descriptions based on a single-band Hubbard model require additional attractive interactions as essential ingredients of cuprate physics. I was principal investigator and conceived and supervised the experiments and their interpretation.*

4. J. Hales, U. Bajpai, T. Liu, D. R. Baykusheva, M. Li, **M. Mitrano**, & Y. Wang, (2023): Witnessing Light-Driven Entanglement using Time-Resolved Resonant Inelastic X-Ray Scattering, [Nature Communications](#) **14**, 3512 [14 citations (WoS)].

Significance: *This work proposes a practical route to measure many-body entanglement in driven quantum materials using time-resolved RIXS. By connecting trRIXS spectra to the nonequilibrium quantum Fisher information, it turns an ultrafast X-ray spectroscopy into an entanglement witness. I was co-PI for the project, conceived the idea and contributed to the interpretation of the numerical simulations.*

5. A. A. Husain, E. W. Huang, **M. Mitrano**, M. S. Rak, S. I. Rubeck, X. Guo, H. Yang, C. Sow, Y. Maeno, B. Uchoa, T. -C. Chiang, P. E. Batson, P. W. Phillips, & P. Abbamonte (2023): Pines' demon observed as a 3D acoustic plasmon in Sr_2RuO_4 , [Nature](#) **621**, 66–70 [30 citations (WoS)].

Significance: *This work reports the first experimental identification of Pines' demon, an out-of-phase acoustic plasmon predicted for multiband metals in 1956. The observation established Sr_2RuO_4 as a model system for hidden collective charge modes in correlated multiband materials. I co-led the experiments with A. A. Husain that enabled the identification of this excitation.*

6. D. R. Baykusheva, M. H. Kalthoff, D. Hofmann, M. Claassen, D. M. Kennes, M. A. Sentef, & **M. Mitrano** (2023): Witnessing nonequilibrium entanglement dynamics in a strongly correlated fermionic chain, [Physical Review Letters](#) **130**, 106902. [18 citations (WoS)]

Significance: *This work established the conceptual foundation for using entanglement witnesses as diagnostics of driven quantum matter. The paper shows that quantum Fisher information can track multipartite entanglement during a nonequilibrium transition in a correlated fermionic system. I was principal investigator, conceived the project and interpreted the theoretical simulations.*

7. D. R. Baykusheva, H. Jang, A. A. Husain, S. Lee, S. F. R. TenHuisen, P. Zhou, S. Park, H. Kim, J. Kim, H.-D. Kim, M. Kim, S.-Y. Park, P. Abbamonte, B. J. Kim, G. D. Gu, Y. Wang, & **M. Mitrano** (2022): Ultrafast renormalization of the onsite Coulomb repulsion in a cuprate superconductor. [Physical Review X](#) **12**, 011013 [43 citations (WoS)].

Significance: *This work reports the first direct observation that intense light can transiently renormalize the onsite Coulomb repulsion (Hubbard U) in a cuprate superconductor. It challenged the view of U as a fixed material parameter and showed that central terms of a correlated-electron Hamiltonian can be dynamically controlled with light. I was principal investigator and led the time-resolved x-ray absorption experiments at a X-ray free electron laser.*

8. **M. Mitrano**, S. Lee, A. A. Husain, L. Delacretaz, M. Zhu, G. A. de la Pena, S. X.-L. Sun, Y. I. Joe, A. H. Reid, S. F. Wandel, G. Coslovich, W. Schlotter, T. van Driel, J. Schneeloch, G. D. Gu, S. Hartnoll, N. Goldenfeld, & P. Abbamonte (2019): Ultrafast time-resolved x-ray scattering reveals diffusive charge order dynamics in $La_{2-x}Ba_xCuO_4$. [Science Advances](#) **5**, eaax3346 [65 citations (WoS)].

Significance: *This work established time-resolved resonant x-ray scattering as a microscopic probe of charge-order dynamics in cuprates. It revealed that photoexcited charge order relaxes through diffusive*

dynamics, linking ultrafast measurements to hydrodynamic descriptions of collective electronic order. I was first author and led the first time-resolved RIXS/x-ray scattering study of charge order in the cuprates.

9. **M. Mitrano**, A. A. Husain, S. Vig, A. Kogar, M. S. Rak, S. I. Rubeck, J. Schmalian, B. Uchoa, J. Schneeloch, R. Zhong, G. D. Gu, & P. Abbamonte (2018): Anomalous density fluctuations in a strange metal. [*Proceedings of the National Academy of Sciences* **115**, 5392-5396](#) [105 citations (WoS)].

Significance: *This work used momentum-resolved EELS to uncover anomalous charge-density fluctuations in the strange-metal regime of cuprate superconductors. The results provided direct spectroscopic evidence that charge dynamics in the strange metal depart from conventional metallic behavior. I was first author and led the experiments and analysis.*

10. **M. Mitrano**, A. Cantaluppi, D. Nicoletti, S. Kaiser, A. Perucchi, S. Lupi, P. Di Pietro, D. Pontiroli, M. Riccò, S. R. Clark, D. Jaksch, & A. Cavalleri (2016): Possible light-induced superconductivity in K_3C_{60} at high temperature. [*Nature* **530**, 461-464](#) [690 citations (WoS)].

Significance: *This work reported transient optical signatures consistent with light-induced superconductivity in K_3C_{60} far above its equilibrium transition temperature. Now a milestone in the light control of quantum materials, this project helped establish nonlinear phonon driving as a route to creating superconducting-like states outside equilibrium. I was first author, conceived the project, and led the time-resolved THz experiments that produced the central discovery.*

Peer recognition

Invited talks

- 111 plenary speaker, and invited presentations in academic institutes, and international conferences.

Selected recent talks

- Gordon Research Conference, Ultrafast Phenomena in Cooperative Systems, 02/2026
- California Institute of Technology, Quantum Matter Seminar, I01/2026
- Columbia University, Condensed Matter Seminar, 12/2025
- Ca' Foscari University of Venice, FisMat 2025 International conference, Invited Talk 07/2025
- Busan, S. Korea, International Conference Low-energy Electrodynamics in Solids (LEES2025), 06/2025
- UCSB/KITP Conference: Harnessing Quantum-optical Techniques in Solid-state Materials, 02/2025

Honors and Awards

- 2026 Alfred P. Sloan Research Fellowship in Physics
 - *The fellowships honor exceptional researchers at US and Canadian educational institutions, whose creativity, innovation, and research accomplishments make them stand out as the next generation of leaders.*
- 2025 Mercator Fellowship of the German Research Foundation
- 2024 IUPAP C10 Early Career Scientist Prize in the Structure and Dynamics of Condensed Matter
 - *Citation: "For his incisive contributions to the study and manipulation of dynamical behaviours in quantum materials"; given annually to early-career scientists for in recognition of their outstanding contribution to the areas of physics within the remit of the Commission*
- 2024 APS Outstanding Referee of the Physical Review journals
- 2023 Star-Friedman Challenge for Promising Scientific Research Award
- 2023 Abilitazione Scientifica Nazionale (ASN) di Prima Fascia *Settore Concorsuale 02/B1 – Fisica Sperimentale Della Materia.*
- 2022 U.S. Department of Energy Early Career Award
 - *Five-year awards to exceptional early career researchers at U.S. academic institutions, DOE National Laboratories, and Office of Science User Facilities to stimulate new research directions in mission critical areas supported by DOE's Office of Science.*
- 2021 PRISM Award of the Italian National Research Council (ISM-CNR)
 - *Citation: "For breakthrough achievements in the field of Science of Matter in the last five years"*
- 2021 Aramont Fellowship Fund for Emerging Science Research
- 2020 Harvard William F. Milton Fund Award
- 2019 LCLS Young Investigator Award

- *Citation: “For pioneering new techniques to probe high-temperature superconductivity”; given annually to early-career scientists for exceptional research using the Linac Coherent Light Source (LCLS) X-ray free-electron laser*
- 2017 Feodor Lynen Research Fellowship of the Alexander von Humboldt Foundation

ADDITIONAL INFORMATION

Other contributions to the research community

- Conference co-chair (2021) and lead organizer (2022) of the “Emergent Phenomena in Quantum Systems (EPiQS) Young Investigator” Workshop, supported by Gordon and Betty Moore Foundation. Focus session organizer “Light-induced structural control of electronic phases” APS March Meeting, 2023, 2025.
- Chair (2022-2023) of the LCLS User Executive Committee, the formal organization representing the user community of the Linac Coherent Light Source (SLAC National Accelerator Laboratory, USA)
- Chair of the LCLS Scientific Advisory Committee (2025-2028)
- Referee for *Nature*, *Science*, *Science Advances*, *Nature Physics*, *Nature Materials*, *Nature Communications*, *Physical Review X*, *Physical Review Letters*, *Physical Review B*, *Physical Review Materials*, *Proceedings of the National Academy of Sciences*, *Communications Physics*, *Commun. Materials*, *Nature Asia Materials*, *The Journal of Chemical Physics*, *New Journal of Physics*, *ACS Nano Letters*, *Applied Physics Letters*, *npj Quantum Materials*, *npj Scientific Reports*
- Grant Reviewer for *U. S. Department of Energy (USA)*, *Natural Sciences and Engineering Research Council (Canada)*, *Centre national de la recherche scientifique (France)*, *Freiburg Institute for Advanced Studies (Germany)*, *European Research Council (ERC Starting and Consolidator grants)*, *Serrapilheira Institute (Brazil)*, *Photonique Quantique Quebec (Canada)*, *SLAC National Accelerator Laboratory (LDRD grants, USA)*, *Gordon & Betty Moore Foundation (USA)*.
- Member of the MeV-UED Proposal Review Panel at the SLAC National Accelerator Laboratory (2021,2024)
- Member of the FERMI Proposal Review Panel at the Elettra Sincrotrone Trieste, Italy (2023-2025)

Career breaks, diverse career paths and major life events

Currently on the tenure track (no permanent chair). My appointment was extended by two years due to the COVID-19 pandemic, with final tenure review starting in September 2028.