Edoardo Baldini

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Professional Experience

The University of Texas at Austin, USA — 01/2022 - present
Department of Physics
Assistant Professor

Massachusetts Institute of Technology, USA — 05/2017 - 12/2021
Department of Physics
Postdoctoral Fellow

Education

École Polytechnique Fédérale de Lausanne, Switzerland — 10/2012 - 04/2017
Ph.D. in Physics (with honors)

University of Pavia, Italy — 10/2010 - 09/2012
Master's Degree in Quantum Electronics (110/110 *summa cum laude*)

University of Pavia, Italy — 10/2007 - 07/2010
Bachelor's Degree in Electronic Engineering (110/110 *summa cum laude*)

Honors and Awards

1. MDPI Materials 2021 Young Investigator Award (2020)
2. Materials Research Society (MRS), MRS Postdoctoral Award (2020)
3. American Chemical Society (ACS), ACS Physical Chemistry Young Investigator Award (2020)
4. MDPI Physics 2020 Young Investigator Award (2020)
5. American Physical Society (APS), Division of Laser Science "Carl E. Anderson" Award (2019)
6. IBM Award in Condensed Matter Physics, Zürich, Switzerland (2019)
7. Swiss National Science Foundation, Postdoc Mobility Fellowship (2018)
8. EPFL Doctorate Award 2018, "*Special distinction to the 10 best PhD theses in all fields*" (2018)
9. Springer Theses Award, "*for outstanding PhD research*" (2017)
10. EPFL Physics Doctoral School Award, "*Special distinction to the 3 best PhD theses in physics*" (2017)

11. Dimitris N. Chorafas Foundation Award, "*for outstanding work in selected fields in the engineering sciences, medicine and the natural sciences*" (2017)
12. Swiss National Science Foundation, Early Postdoc Mobility Fellowship (2016)
13. University of Pavia, Best Undergraduate Student Award (2013)
14. European iGEM Competition (Amsterdam), Gold Medal (2011)
15. University of Pavia, Merit Scholarship (2007/2008 - 2011/2012)

Publications

Books

1. **E. Baldini**, "*Nonequilibrium Dynamics of Collective Excitations in Quantum Materials*," Springer (2018).

Articles

† These authors contributed equally to this work

∗ Corresponding author

1. Z. Zhang†, J. Zhang†, Z.-J. Liu†, N. S. Dahodl, W. Paritmongkol, N. Brown, Y.-C. Chien, Z. Dai, K. A. Nelson∗, W. A. Tisdale, A. M. Rappe, **E. Baldini**∗, "Discovery of Enhanced Lattice Dynamics in a Single-Layered Hybrid Perovskite," *arXiv:2301.03501*, in review (2023).
2. Z. Zhang†, F. Y. Gao†, J. B. Curtis, Z.-J. Liu, Y.-C. Chien, A. von Hoegen, T. Kurihara, T. Suemoto, P. Narang, **E. Baldini**∗, K. A. Nelson∗, "Three-Wave Mixing of Anharmonically Coupled Magnons," in review (2023).
3. Z. Zhang†, F. Y. Gao†, Y.-C. Chien, Z.-J. Liu, J. B. Curtis, E. R. Sung, X. Ma, W. Ren, S. Cao∗, P. Narang, A. von Hoegen, **E. Baldini**∗, K. A. Nelson∗, "Nonlinear Coupled Magnonics: Terahertz Field-Driven Magnon Upconversion," *arXiv:2207.07103*, in review (2023).
4. J.-J. Shi†, Y.-Q. Bie†,∗, W. Chen, S. Fang, A. Zong, J. Han, Zhaolong Cao, Yong Zhang, T. Taniguchi, K. Watanabe, V. Bulović, E. Kaxiras, P. Jarillo-Herrero∗, **E. Baldini**∗, K. A. Nelson∗, "Terahertz-Field-Driven Metastable Topological Phase in an Atomically Thin Crystal," *arXiv:2112.08533*, in review (2023).
5. G. M. Vanacore†,∗, J. Hu†,∗, **E. Baldini**†,∗, C. A. Rozzi, M. Amato, H. Wei, J. Huang, S. Polishchuk, M. Puppin, A. Crepaldi, M. Grioni, M. Chergui, F. Carbone, A. H. Zewail, "Observation of a Phonon Avalanche in Highly Photoexcited Hybrid Perovskite Single Crystals", *arXiv:1801.03731*, in review (2023).
6. **E. Baldini**, A. Zong, D. Choi, C. Lee, M. H. Michael, L. Windgätter, I. I. Mazin, S. Latini, D. Azoury, B. Lv, A. Kogar, Y. Wang, Y. Lu, T. Takayama, H. Takagi, A. J. Millis, A. Rubio, E. A. Demler, N. Gedik∗, "The Spontaneous Symmetry Breaking in Ta_2NiSe_5 is Structural in Nature," *arXiv:2007.02909*, in review (2023).
7. D. S. Kim†,∗, Di Huang†,∗, C. Guo, K. Li, D. Rocca, F. Y. Gao, J. Choe, D. Lujan, **E. Baldini**, S. Sharma, R. Shankar, S.-F. Lee, Y. Ping∗, X. Li∗, "Strongly Bound Excitons Reveal Local Spin Order in a van der Waals Antiferromagnet," accepted in *Advanced Materials* (2023).

8. D. Shin, S. Latini, C. Schäfer, S. A. Sato, **E. Baldini**, U. De Giovannini, H. Hübener, A. Rubio*, "Simulating Terahertz Field-Induced Transient Ferroeletricity in Quantum Paraelectric $SrTiO_3$," *Physical Review Letters* 129, 167401 (2022).

9. F. Dirnberger†,*, R. Bushati†, B. Datta, A. Kumar, A. H. MacDonald, **E. Baldini***, V. M. Menon*, "Observation of Spin-Correlated Exciton-Polaritons in a van der Waals Magnet," *Nature Nanotechnology* 17, 1060-1064 (2022).

10. F. Y. Gao†, Z. Zhang†, Z. Sun, L. Ye, Y.-H. Cheng, Z.-J. Liu, J. G. Checkelsky, **E. Baldini***, K. A. Nelson*, "Snapshots of a Light-Induced Metastable Hidden Phase Driven by the Collapse of Charge Order," *Science Advances* 8, eabp9076 (2022).

11. J.-J. Shi, F. Y. Gao, Z. Zhang, H. Utzat, U. Barotov, A. Farahvash, J. Han, J. Deschamps, C.-W. Baik, K.-S. Cho, V. Bulović, A. P. Willard, **E. Baldini**, N. Gedik, M. G. Bawendi, K. A. Nelson*, "Terahertz Field-Induced Reemergence of Quenched Photoluminescence in Quantum Dots," *Nano Letters* 4, 1718 (2022).

12. C. A. Belvin†, **E. Baldini**†, I. Ö. Ozel, D. Mao, H. C. Po, C. J. Allington, S. Son, B. H. Kim, J. Kim, I. Hwang, J. H. Kim, J.-G. Park*, T. Senthil, N. Gedik*, "Exciton-Driven Antiferromagnetic Metal in a Correlated van der Waals Insulator," *Nature Communications* 12, 4837 (2021).

13. P. Piekarz*, D. Legut, **E. Baldini**, C. A. Belvin, T. Kołodziej, W. Tabiś, A. Kozłowski, Z. Kakol, Z. Tarnawski, J. Lorenzana, N. Gedik, A. M. Oleś, J. M. Honig, K. Parlinski, "Trimeron-Phonon Coupling in Magnetite," *Physical Review B* 103, 104303 (2021).

14. **E. Baldini**†, C. A. Belvin†, M. Rodriguez-Vega, I. Ö. Ozel, D. Legut, A. Kozłowski, A. M. Oleś, K. Parlinski, P. Piekarz, J. Lorenzana, G. A. Fiete, N. Gedik*, "Discovery of the Soft Electronic Modes of the Trimeron Order in Magnetite," *Nature Physics* 16, 541-545 (2020).

15. C. Lee, T. Rohwer, E. J. Sie, A. Zong, **E. Baldini**, J. Straquadine, P. Walmsley, D. Gardner, Y. S. Lee, I. R. Fisher, N. Gedik*, "High Resolution Time- and Angle-Resolved Photoemission Spectroscopy with 11 eV Laser Pulses," *Review of Scientific Instruments* 91, 043102 (2020).

16. **E. Baldini***, T. Palmieri, A. Dominguez, A. Rubio, M. Chergui*, "Giant Exciton Mott Density in Bulk Anatase TiO_2," *Physical Review Letters* 125, 116403 (2020).

17. J.-J. Shi†, **E. Baldini**†, S. Latini, S. A. Sato, Y. Zhang, B. C. Pein, P.-C. Shen, J. Kong, A. Rubio, N. Gedik, K. A. Nelson*, "Room Temperature Terahertz Electroabsorption Modulation by Excitons in Monolayer Transition Metal Dichalcogenides," *Nano Letters* 20, 5214-5220 (2020).

18. **E. Baldini***, M. A. Sentef, S. Acharya, T. Brumme, E. Sheveleva, F. Lyzwa, E. Pomjakushina, C. Bernhard, M. van Schilfgaarde, F. Carbone, A. Rubio*, C. Weber*, "Electron-Phonon-Driven Three-Dimensional Metallicity in an Insulating Cuprate," *Proceedings of the National Academy of Sciences* 117, 6409-6416 (2020).

19. T. Palmieri†, **E. Baldini**†,*, A. Steinhoff, A. Akrap, M. Kollár, E. Horváth, L. Forró, F. Jahnke, M. Chergui*, "Mahan Excitons in Room-Temperature Methylammonium Lead Bromide Perovskites," *Nature Communications* 11, 850 (2020).

20. **E. Baldini***, A. Dominguez, T. Palmieri, O. Cannelli, A. Rubio, P. Ruello, M. Chergui*, "Exciton Control in a Room-Temperature Bulk Semiconductor with Coherent Strain Pulses," *Science Advances* 5, eaax2937 (2019).

21. X. Li, T. Qiu, J. Zhang, **E. Baldini**, J. Lu, A. M. Rappe, K. A. Nelson*, "Terahertz-Field-Induced Ferroelectricity in Quantum Paraelectric $SrTiO_3$," *Science* 364, 1079-1082 (2019).

22. A. Zong†, A. Kogar†, Y.-Q. Bie, T. Rohwer, C. Lee, **E. Baldini**, E. Ergeçen, M. B. Yilmaz, B. Freelon, E. J. Sie, H. Zhou, J. Straquadine, P. Walmsley, P. E. Dolgirev, A. V. Rozhkov, I. R. Fisher, P. Jarillo-Herrero, B. V. Fine, N. Gedik*, "Evidence for Topological Defects in a Photo-Induced Phase Transition," *Nature Physics* 15, 27-31 (2019).

23. I. Ö. Ozel, C. A. Belvin, **E. Baldini**, I. Kimchi, S. Do, K.-Y. Choi, N. Gedik*, "Magnetic Field-Dependent Low-Energy Magnon Dynamics in α-$RuCl_3$," *Physical Review B* 100, 085108 (2019).

24. **E. Baldini***, T. Palmieri, A. Dominguez, P. Ruello, A. Rubio, M. Chergui*, "Phonon-Driven Selective Modulation of Exciton Oscillator Strengths in Anatase TiO_2 Nanoparticles," *Nano Letters* 18, 5007-5014 (2018).

25. **E. Baldini***, T. Kubacka, B. P. P. Mallett, C. Ma, S. M. Koohpayeh, Y. Zhu, C. Bernhard, S. L. Johnson, F. Carbone, "Lattice-Mediated Magnetic Order Melting in $TbMnO_3$," *Physical Review B* 97, 125149 (2018).

26. **E. Baldini**, T. Palmieri, E. Pomarico, G. Auböck, M. Chergui*, "Clocking the Ultrafast Electron Cooling in Anatase Titanium Dioxide Nanoparticles," *ACS Photonics* 5, 1241-1249 (2018).

27. **E. Baldini**, A. Mann, L. Benfatto*, E. Cappelluti*, A. Acocella, V. M. Silkin, S. V. Eremeev, A. B. Kuzmenko, S. Borroni, T. Tan, X. X. Xi, F. Zerbetto, R. Merlin, F. Carbone*, "Real-Time Observation of Phonon-Mediated σ-π Interband Scattering in MgB_2," *Physical Review Letters* 119, 097002 (2017).

28. **E. Baldini**, T. Palmieri, T. Rossi, M. Oppermann, E. Pomarico, G. Auböck, M. Chergui*, "Ultrafast Interfacial Electron Injection Probed by a Substrate-Specific Excitonic Signature," *Journal of American Chemical Society* 139, 11584-11589 (2017).

29. **E. Baldini***, A. Dominguez, L. Chiodo, E. Sheveleva, M. Yazdi-Rizi, C. Bernhard, A. Rubio, M. Chergui, "Anomalous Anisotropic Exciton Temperature Dependence in Rutile TiO_2," *Physical Review B* 96, 041204(R) (2017).

30. **E. Baldini***, L. Chiodo, A. Dominguez, M. Palummo, S. Moser, M. Yazdi-Rizi, G. Auböck, B. P. P. Mallett, H. Berger, A. Magrez, C. Bernhard, M. Grioni, A. Rubio, M. Chergui*, "Strongly Bound Excitons in Anatase TiO_2 Single Crystals and Nanoparticles," *Nature Communications* 8, 13 (2017).

31. **E. Baldini**, A. Mann, B. P. P. Mallett, C. Arrell, F. van Mourik, T. Wolf, D. Mihailovic, J. Tallon, C. Bernhard, J. Lorenzana, F. Carbone*, "Clocking the Onset of Bilayer Coherence in a High-T_C Cuprate," *Physical Review B* 95, 024501 (2017).

32. S. Borroni, **E. Baldini**, V. M. Katukuri, A. Mann, K. Parlinski, D. Legut, C. Arrell, F. van Mourik, J. Teyssier, A. Kozłowski, P. Piekarz, O. V. Yazyev, A. M. Oleś, J. Lorenzana, F. Carbone*, "Coherent Generation of Symmetry-Forbidden Phonons by Light-Induced Electron-Phonon Interactions in Magnetite," *Physical Review B* 96, 104308 (2017).

33. M. Oppermann, N. S. Nagornova, A. Oriana, **E. Baldini**, L. Mewes, B. Bauer, T. Palmieri, T. Rossi, F. van Mourik, M. Chergui*, "The LOUVRE Laboratory: State-of-the-Art Ultrafast Ultraviolet Spectroscopies for Molecular and Materials Science," *CHIMIA International Journal for Chemistry* 71, 5, 288-294 (2017).

34. **E. Baldini**†, A. Mann†, S. Borroni, C. Arrell, F. van Mourik, F. Carbone*, "A Versatile Setup for Ultrafast Broadband Optical Spectroscopy on Strongly Correlated Quantum Systems," *Structural Dynamics* 3, 064301 (2016).

35. A. Mann, **E. Baldini**, A. Odeh, A. Magrez, H. Berger, F. Carbone*, "Probing the Coupling between a Doublon Excitation and the Charge-Density Wave in TaS_2 by Ultrafast Optical Spectroscopy," *Physical Review B* 94, 115122 (2016).

36. J. Rajeswari, H. Ping, G. F. Mancini, Y. Murooka, T. Latychevskaia, D. McGrouther, M. Cantoni, **E. Baldini**, J. S. White, A. Magrez, T. Giamarchi, H. M. Rønnow, F. Carbone*, "Filming the Formation and Fluctuation of Skyrmion Domains by Cryo-Lorentz Transmission Electron Microscopy," *Proceedings of the National Academy of Sciences* 112, 46, 14212-14217 (2015).

37. F. G. Santomauro, A. Lubcke, J. Rittmann, **E. Baldini**, A. Ferrer, M. Silatani, P. Zimmermann, S. Grubel, J. A. Johnson, S. O. Marianger, P. Beaud, D. Grolimund, C. Borca, G. Ingold, S. L. Johnson, M. Chergui*, "Femtosecond X-Ray Absorption Study of Electron Localization in Photoexcited Anatase TiO_2," *Scientific Reports* 5, 14834 (2015).

38. A. Mann, **E. Baldini**, A. Tramontana, E. Pomjakushina, K. Conder, C. Arrell, F. van Mourik, J. Lorenzana, F. Carbone*, "Probing the Electron-Phonon Interaction in Correlated Systems with Coherent Lattice Fluctuation Spectroscopy," *Physical Review B* 92, 035147 (2015).

39. C. Lacava, P. Minzioni, **E. Baldini**, L. Tartara, J. M. Fedeli, I. Cristiani, "Nonlinear Characterization of Hydrogenated Amorphous Silicon Waveguides and Analysis of Carrier Dynamics," *Applied Physics Letters* 103, 141103 (2013).

40. L. Ferrara, **E. Baldini**, P. Minzioni, F. Bragheri, C. Liberale, E. Di Fabrizio, I. Cristiani, "Experimental Study of the Optical Forces Exerted by a Gaussian Beam within the Rayleigh Range," *Journal of Optics* 13, 075712 (2011).

Teaching Experience

Teaching as Instructor:

- PHY 303L: Engineering Physics II, Bachelor's Degree in Engineering, The University of Texas at Austin
  Spring 2022 Instructor Evaluation: 4.7/5
  Fall 2022 Instructor Evaluation: 4.6/5

Complementary lectures as Teaching Assistant:

- 2014 - 2015 General Physics II (30 hours), Bachelor's Degree in Civil Engineering, EPFL
- 2013 - 2016 Electronic Spectroscopy (60 hours), Master's Degree in Physical Chemistry, EPFL
- 2012 - 2014 Atoms and Radiation (30 hours), Bachelor's Degree in Physics, EPFL

Support as Teaching Assistant:

- 2011 - 2012 Experimental Physics Laboratory (40 hours), Bachelor's Degree in Physics, University of Pavia
- 2011 - 2012 Electronics (30 hours), Bachelor's Degree in Electrical Engineering, University of Pavia
- 2009 - 2012 General Physics I, II ($>$ 200 hours), Bachelor's Degree in Electrical Engineering, University of Pavia

Advising

- Postdoctoral Researchers: Dr. Frank Yi Gao (2022 - present), Dr. Wenjing You (2022 - present)
- Ph.D. Thesis Advisees: Ms. Xinyue Peng (2022 - present), Mr. Gregory P. Sehr (2022 - present), Mr. Lincoln Weber (2022 - present)
- Undergraduate Research Advsees: Ms. Prakruti Raghunarayan (2022 - present), Mr. Neal Jare (2022), Mr. Nicholas P. Verzic (2022), Ms. Ingalena Bucher (2015 - 2016)

Oral Presentations

Invited Talks

1. TU Dortmund, Dortmund, Germany, May 2022
2. Clemson University, Clemson, South Carolina, February 2022
3. University of Notre Dame, Notre Dame, Indiana, December 2021
4. ACS Southwest Regional Meeting, Austin, Texas, November 2021
5. University of California, Los Angeles, October 2021
6. University of Birmingham, Birmingham, United Kingdom, June 2021
7. Radbound University, Nijmegen, Netherlands, April 2021
8. University of Toronto, Toronto, Canada, March 2021
9. University of Pennsylvania, Philadelphia, Pennsylvania, USA, March 2021
10. University of Texas at Austin, Austin, Texas, USA, March 2021
11. California Institute of Technology, Pasadena, California, USA, February 2021
12. University of California, Berkeley, California, USA, January 2021
13. Massachusetts Institute of Technology *(Chez Pierre Seminar)*, Cambridge, Massachusetts, USA, December 2020
14. MRS Spring/Fall Meeting 2020 *(Awards session)*, November 2020
15. ACS Fall Meeting 2020 *(Awards session)*, August 2020
16. University of Pittsburgh, Pittsburgh, Pennsylvania, USA, July 2020
17. Brookhaven National Laboratory, Upton, New York, USA, June 2020
18. ARO Condensed Matter Physics Workshop, Raleigh, NC, USA, February 2020
19. Frontiers in Optics *(Awards session)*, Washington, DC, USA, September 2019
20. Swiss Physical Society Meeting *(Awards session)*, Zürich, Swizterland, August 2019
21. Materials in Quantum Cavities and Excitonic Insulators, New York City, USA, July 2019
22. Ultrafast Science from the Infrared to the X-Rays, Lausanne, Switzerland, November 2018
23. Harvard University, Cambridge, Massachusetts, USA, April 2018
24. École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland, February 2017
25. Princeton University, Princeton, New Jersey, USA, June 2016

26. Massachusetts Institute of Technology, Cambridge, Massachusetts, USA, June 2016
27. Max Planck Institute fur Struktur und Dynamik der Materie, Hamburg, Germany, February 2016
28. NCCR MUST Meeting *(Highlight talk)*, Engelberg, Switzerland, January 2016
29. Nonequilibrium Phenomena in Complex Matter, Krvavec, Slovenia, December 2015

Contributed Talks

1. Emergent Phenomena in Quantum Materials, Beverly, Massachusetts, USA, June 2019
2. APS March Meeting 2019, Boston, Massachusetts, USA, March 2019
3. 256th ACS National Meeting, Boston, Massachusetts, USA, August 2018
4. XXIst International Conference on Ultrafast Phenomena, Hamburg, Germany, July 2018
5. Ultrafast Phenomena in Quantum Physics, Lausanne, Switzerland , April 2016
6. New Generation in Strongly Correlated Electron Systems 2015, Trogir, Croatia, September 2015
7. Materials and Mechanisms of Superconductivity, Geneva, Switzerland, August 2015
8. 3rd International Conference on Ultrafast Structural Dynamics, Zürich, Switzerland, June 2015

Synergistic Activities

Internal Activities, The University of Texas at Austin

- Physics Department Faculty Hiring Committee (Condensed Matter Experiment), 2022 - present
- Physics Department Graduate Admissions Committee, 2022 - present
- Physics Department APS Bridge Committee, 2022 - present
- Physics Department Outreach Committee, 2022 - present
- Organizer of a Mentoring Program for Physics Undergraduate Students
  from Underrepresented Minorities, 2022 - present
- Reviewer for the Office of the Vice President for Research, Scholarship and Creative Endeavors, 2022 - present

External Activities

- Conference Organization:
  The Gordon and Betty Moore Foundation
  Emergent Phenomena in Quantum Systems (EPiQS)
  Symposium for Postdoctoral Scholars
  Austin, TX (2023); Salt Lake City, UT (2024); Pasadena, CA (2025)
- Technical Program Committee: CLEO 2023 "Quantum Optics of Atoms, Molecules, and Solids" session.

- Journal Reviewer: Applied Physics Letters, Applied Sciences, Condensed Matter, Journal of Applied Physics, Nano Letters, Nanomaterials, Nature, Nature Communications, Nature Physics, npj Quantum Materials, Physical Review A, Physical Review B, Physical Review Letters, Physical Review X, Proceedings of the National Academy of Sciences, Science Advances, Scientific Reports, Structural Dynamics, Symmetry
- Proposal Reviewer: Center for Integrated Nanotechnologies, U.S. Department of Energy, Photonique Quantique Québec, Agence Nationale de la Recherche