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Professional Experience

The University of Texas at Austin, USA Department of Physics Assistant Professor	01/2022 - present
Massachusetts Institute of Technology, USA Department of Physics Postdoctoral Researcher Faculty Mentor: Nuh Gedik	05/2017 - 12/2021

Education

École Polytechnique Fédérale de Lausanne, Switzerland PhD in Physics (with honors) Advisors: Majed Chergui, Fabrizio Carbone <i>Committee:</i> Prof. Anthony J. Leggett, Prof. Thomas Elsaesser, Prof. Joël Mesot, Prof. Vincenzo Savona	10/2012 - 04/2017
University of Pavia, Italy Master's Degree in Quantum Electronics (110/110 <i>summa cum laude</i>)	10/2010 - 09/2012
University of Pavia, Italy Bachelor's Degree in Electronic Engineering (110/110 <i>summa cum laude</i>)	10/2007 - 07/2010

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 authors

1. 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,” in review (2022).
2. 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,” in review (2022).
3. 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 (2022).
4. D. Shin, S. Latini, C. Schäfer, S. A. Sato, **E. Baldini**, U. De Giovannini, H. Hübener, A. Rubio*, Simulating “Terahertz Field-Induced Transient Ferroelectricity in Quantum Paraelectric SrTiO₃,” *arXiv:2106.03957*, in review (2022).
5. G. M. Vanacore^{†,*}, J. Hu^{†,*}, **E. Baldini**^{†,*}, C. A. Rozzi, M. Amato, H. Wei, J. Huang, S. Polishchuk, M. Puppini, 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 (2022).
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 Ta₂NiSe₅ is Structural in Nature,” *arXiv:2007.02909*, in review (2022).

7. 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,” *arXiv:2203.06129*, to appear in *Nature Nanotechnology* (2022).
8. 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,” *arXiv:2112.11015*, to appear in *Science Advances* (2022).
9. 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).
10. 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).
11. P. Piekarczyk^{*}, 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).
12. **E. Baldini**[†], C. A. Belvin[†], M. Rodriguez-Vega, I. Ö. Ozel, D. Legut, A. Kozłowski, A. M. Oleś, K. Parlinski, P. Piekarczyk, 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).
13. 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).
14. **E. Baldini**^{*}, T. Palmieri, A. Dominguez, A. Rubio, M. Chergui^{*}, “Giant Exciton Mott Density in Bulk Anatase TiO₂,” *Physical Review Letters* 125, 116403 (2020).
15. 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).
16. **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).
17. 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).
18. **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).
19. X. Li, T. Qiu, J. Zhang, **E. Baldini**, J. Lu, A. M. Rappe, K. A. Nelson^{*}, “Terahertz-Field-Induced Ferroelectricity in Quantum Paraelectric SrTiO₃,” *Science* 364, 1079-1082 (2019).
20. 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).

21. 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 -RuCl₃,” *Physical Review B* 100, 085108 (2019).
22. **E. Baldini***, T. Palmieri, A. Dominguez, P. Ruello, A. Rubio, M. Chergui*, “Phonon-Driven Selective Modulation of Exciton Oscillator Strengths in Anatase TiO₂ Nanoparticles,” *Nano Letters* 18, 5007-5014 (2018).
23. **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 TbMnO₃,” *Physical Review B* 97, 125149 (2018).
24. **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).
25. **E. Baldini**, A. Mann, L. Benfatto*, E. Cappelluti*, A. Acocella, V. M. Silkin, S. V. Ereemeev, 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 MgB₂,” *Physical Review Letters* 119, 097002 (2017).
26. **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).
27. **E. Baldini***, A. Dominguez, L. Chiodo, E. Sheveleva, M. Yazdi-Rizi, C. Bernhard, A. Rubio, M. Chergui, “Anomalous Anisotropic Exciton Temperature Dependence in Rutile TiO₂,” *Physical Review B* 96, 041204(R) (2017).
28. **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 TiO₂ Single Crystals and Nanoparticles,” *Nature Communications* 8, 13 (2017).
29. **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).
30. S. Borroni, **E. Baldini**, V. M. Katukuri, A. Mann, K. Parlinski, D. Legut, C. Arrell, F. van Mourik, J. Teyssier, A. Kozłowski, P. Piekarczyk, 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).
31. 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).
32. **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).
33. 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 TaS₂ by Ultrafast Optical Spectroscopy,” *Physical Review B* 94, 115122 (2016).
34. 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).

35. 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 TiO₂,” *Scientific Reports* 5, 14834 (2015).
36. 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).
37. 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).
38. 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 and Mentoring

Teaching as instructor:

- 2022 - present “PHY 303L: Engineering Physics II” (45 hours)
Bachelor’s Degree in Engineering, The University of Texas at Austin

Mentoring and supervision of junior researchers:

- 2017 - 2022 PhD project of Ms. Carina A. Belvin, Mr. Dongsung Choi, Mr. Clifford J. Allington
Graduate Programs in Physics, Electrical Engineering, and Chemistry, Massachusetts Institute of Technology
- 2014 - 2017 PhD project of Ms. Tania Palmieri
Graduate Program in Photonics, École Polytechnique Fédérale de Lausanne
- 2015 - 2016 Thesis co-advisor of Ms. Ingalena Bucher
Master’s Degree in Physics, École Polytechnique Fédérale de Lausanne

Lectures as teaching assistant:

- 2014 - 2015 “General Physics II” (30 hours), Prof. Fabrizio Carbone
Bachelor’s Degree in Civil Engineering, École Polytechnique Fédérale de Lausanne
- 2013 - 2016 “Electronic Spectroscopy” (60 hours), Prof. Majed Chergui
Master’s Degree in Physical Chemistry, École Polytechnique Fédérale de Lausanne
- 2012 - 2014 “Atoms and Radiation” (30 hours), Prof. Majed Chergui
Bachelor’s Degree in Physics, École Polytechnique Fédérale de Lausanne

Teaching support as tutor assistant:

- 2011 - 2012 “Experimental Physics Laboratory” (40 hours), Prof. Alberto Rotondi
Bachelor’s Degree in Physics, University of Pavia
- 2011 - 2012 “Electronics” (30 hours), Prof. Franco Maloberti
Bachelor’s Degree in Electrical Engineering & Computer Science, University of Pavia
- 2009 - 2012 “General Physics I, II” (> 200 hours), Prof. Marco Malvezzi and Prof. Giancarlo Reali
Bachelor’s Degree in Electrical Engineering & Computer Science, University of Pavia

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. Radboud 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, Switzerland, 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 für 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

Conference Organization:

The Gordon and Betty Moore Foundation

Emergent Phenomena in Quantum Systems (EPiQS)

Postdoctoral Symposium: 2023 (Austin), 2024 (Salt Lake City), 2025 (Pasadena)