

Alberto de la Torre

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Professional Experience

June 2023 - Present Assistant Professor of Physics at Northeastern University

Dec. 2022 - Present Guest Researcher at MSD-Argonne National Lab

Jun. 2019 - May 2023 Postdoctoral Fellow in Physics at Brown University, USA in the group of Prof. Kemp Plumb

Jan. 2016 - May 2019 Swiss National Science Foundation EarlyMobility Postdoctoral Fellow in Physics at the California Institute of Technology, USA in the group of Prof. David Hsieh

Education

Jan. 2022 - Apr. 2022 Applied Data Science Professional Certification by MIT Professional Education.

Sep. 2011 - Dec. 2015 Ph.D. in Physics, Université de Genève, Switzerland

- Thesis: “Spectroscopic Studies of Layered Iridium Oxides”
- Advisor: Prof. Felix Baumberger

Aug. 2008 - Aug. 2011 Undergraduate research assistant at Universidade de Vigo, Spain

Sep. 2007 - Aug. 2011 Undergraduate Studies: Universidade de Santiago de Compostela, Spain

- *Licenciatura en Física* (Equivalent to Bachelors plus Masters degree in Physics)

Professional activities and institutional responsibilities

- Northeastern University Graduate Advisory Committee member Sept 23 - present
- CHESS User committee member Jul 23 - present
- IEEE AtC-AtG 2023 Advisory Committee Co-chair
- CCQ Workshop ”Harnessing light-matter interactions in quantum materials” co-organizer
- IEEE AtC-AtG 2022 Conference Co-chair
- Organizer member of the Virtual Science Forum since Jan 2021
- APS-FGSA International Student Affairs Committee member (Jun 2021 - Jan 2022)
- Referee for *Advanced Materials*, *European Physical Journal Plus*, *Nature Communications*, *Physical Review Applied*, *Physical Review B*, *Physical Review Materials*, *Physical Review Letters*, *npj Quantum Materials* and *Physical Review X*

Honors and Awards

- New England Regional SACNAS meeting 2022 best oral contribution
- Early-Mobility (Swiss National Science Foundation) Fellow at the California Institute of Technology (Jan. 2016 - Sep. 2017)
- Prix Vacheron Constantin des Sciences 2016 for the best Ph.D. thesis at Faculty of Science at the Université de Genève (2016)
- FIP-Authorea travel grant to present at the APS Meeting (March 2015)
- Scottish EPSRC Doctoral Training Centre Ph.D. grant (4 year funding, active for 2011-2012).
- Xatcobeo project research grant (Aug. 2008 - Sep. 2011)

Teaching and Outreach

- Northeastern University PHYS1148 Fall'23
- Northeastern University PHYS7210 Fall'23
- Brown University UTRAs (Undergraduate Teaching and Research Awards) reviewer
- Brown University Sheridan teaching certification (Fall 2020)
- Mentor at Tuding Education since August 2020
- At Caltech (2016 -2019): SURF (Summer Undergraduate Research Fellow) mentor, WAVE (mentor, IQIM council member and outreach volunteer at local high schools
- At Université de Genève: teacher assistant for Mechanics (11P010 CE) and Bachelors and Masters level Travaux Pratiques (13P950 L) and (14P950)
- At University of St Andrews: teaching assistant for undergraduate Electromagnetism (PH3007), Mathematics for first year physicists (PH1011) and Honours Physics laboratory (PH4105) Volunteered at Fife 2012 Science Festival demonstrating experiments for families and children

Invited Presentations

35. *Dynamic control of macroscopic phases via thermal quench in 1T-TaS2* APS X-ray SIG seminar Aug 2022
34. *Engineering magnetic ground states in Iridium oxides* SPICE Young Research Leaders Group Workshop July 2023
33. *Controlling emergence with light pulses* CINBIO Universidade de Vigo July 2023
32. *Harnessing nonthermal phenomena in quantum materials* Physics seminar Universidad Complutense de Madrid July 2023
31. *Momentum-independent magnetic excitation continuum in the honeycomb iridate $H_3LiIr_2O_6$* DQMP Seminar, University of Geneva June 2023
30. *Engineering magnetic ground states in Iridium oxides* Dynamical Control of Quantum Matter - MPI-PKS May 2023

29. *Engineering magnetic ground states in Iridium oxides* MRS 2023 April 2023
28. *Magnetic excitations and dynamics of the honeycomb iridate $H_3LiIr_2O_6$* ANL MSD seminar April 2023
27. *Revealing the magnetic excitations of the quantum spin liquid $H_3LiIr_2O_6$* APS X-ray SIG seminar Dec 2022
26. *Revealing the magnetic excitations of the quantum spin liquid $H_3LiIr_2O_6$* CM seminar Rutgers University Dec 2022
25. *Controlling magnetic interactions in Kitaev iridates* LCLS 2022 User meeting Oct 2022
24. *Engineering magnetic ground states in Iridium oxides* NGSCES 2022 Sep 2022
23. *Resonant x-ray studies in new generation Kitaev honeycomb iridates* Twelfth Workshop on Competing Interactions and Colossal Responses in Transition Metal Oxides and Related Compounds Jun 2022
22. *Towards uniaxial control of in-plane topological defects in $1T-TaS_2$* APS Users meeting 2022
21. *Harnessing nonthermal phenomena in quantum materials* Physics seminar, University of Notre Dame Feb 2022
20. *Harnessing nonthermal phenomena in quantum materials* Physics seminar, Northeastern University Feb 2022
19. *Realizing the Kitaev limit in new generation honeycomb iridates* Physics seminar, University of Michigan—Ann Arbor Nov 2021
18. *Controlling quantum matter: towards nonthermality as a resource* Physics seminar, Aalto University May 2021
17. *Controlling quantum matter: towards nonthermality as a resource* AEP Faculty candidate seminar, Cornell University April 2021
16. *Engineering groundstates in quantum materials* CLASSE Seminar, Cornell University January 2021
15. *Towards non-thermal control of quantum materials*, DQMP Seminar, Universite de Geneve December 2020
14. *Towards non-thermal control of quantum materials*, QN seminar, TU Delft December 2020
13. *Towards non-thermal control of quantum materials*, Leiden University December 2020
12. *Unusual Symmetry Breaking in the Parent Compound Cuprate $Sr_2CuO_2Cl_2$* , Strongly Correlated Electron Systems 2019
11. *Controlling Magnetism in an Optically Pumped Mott Insulator*, SoCal Condensed Matter Meeting 2019
10. *Controlling Mott Insulators: chemical doping and optical pumping*, University of Kentucky, Physics colloquium February 2019
9. *Spectroscopic studies of doped spin-orbit driven Mott insulators* Brown University, September 2018

8. *Detection and manipulation of odd-parity hidden order in the pseudogap region* Strongly Correlated Electron Systems. August 2017
7. *Ultrafast dynamics of hidden order in Sr_2IrO_4 probed by time-resolved nonlinear optical anisotropy* Boston College. July 2017
6. *Optical studies of layered Iridium Oxides* Université de Genève. June 2016
5. *Spectroscopical studies of doped iridium oxides* IQIM - Caltech. April 2016
4. *Doping evolution of the pseudospin-1/2 antiferromagnets Sr_2IrO_4 and $Sr_3Ir_2O_7$ from ARPES* Oxford Symposium on Quantum Materials. May 2015
3. *Doping evolution of the pseudospin-1/2 antiferromagnets Sr_2IrO_4 and $Sr_3Ir_2O_7$ from ARPES* ISIS and Diamond SCE series. April 2015
2. *Doping evolution of the pseudospin-1/2 antiferromagnets Sr_2IrO_4 and $Sr_3Ir_2O_7$ from ARPES* Universidade de Santiago de Compostela. March 2015
1. *Doping evolution of the pseudospin-1/2 antiferromagnets Sr_2IrO_4 and $Sr_3Ir_2O_7$ from ARPES* Forum Université de Genève. February 2015

List of Publications

Citations: 2700 (Google Scholar);

h-index: 21;

<https://goo.gl/ToDXks>

Submitted

- J. V. Riffle, J. V., B. Campbell, **A. de la Torre**, Q. Wang, K. W. Plumb and S. M. Hollen, *Nanoscale electronic inhomogeneities in 1T-TaS₂* (Oct. 2023)
- Z. Hasan, G.A. Pan, A. Kaczmarek, S Sharma, H. LaBollita, M. R. Barone, C. M. Brooks, **A. de la Torre**, D. G. Schlom, A. S. Botana, K. C. Nowack, B. D. Faeth, and J. A. Mundy, *Signatures of bosonic coupling in the electronic structure of superconducting LiTi₂O₄* (Sep. 2023)
- Y.-T. Hsu, A. Rydh, M. Berben, C. Duffy, **A. de la Torre**, R. Perry and N. Hussey *Carrier density crossover and quasiparticle mass enhancement in a doped 5d Mott insulator* (Sep. 2023)
- M. F. di Scala, D. Staros, **A. de la Torre**, A. Lopez, D. Wong, C. Schulz, M. Bartkowiak, B. Rubenstein, and K. W. Plumb *Dimensionality dependent electronic structure in exfoliated van der Waals antiferromagnet NiPS₃*. arxiv:2302.07910 (2023)

Accepted (* selected publications)

33. ***A. de la Torre**, B. Zager, F. Bahrami, M. H. Upton, G. Fabbris, D. Haskel, D. Casa, Jungho Kim, F. Tafti, and K. W. Plumb, *Momentum independent magnetic excitation continuum in the honeycomb iridate H₃LiIr₂O₆*. Nat Commun 14, 5018 (2023)
32. **A. de la Torre**, B. Zager, J. R. Chamorro, M. H. Upton, G. Fabbris, D. Haskel, D. M. Casa, T. M. McQueen, and K. W. Plumb, *Electronic ground state of two non-magnetic pentavalent honeycomb iridates* Phys. Rev. Materials 6, 084406 (2022)
31. * **A. de la Torre**, K. L. Seyler, M. Buchhold, Y. Baum, G. Zhang, N. J. Laurita, J. W. Harter, L. Zhao, I. Phinney, X. Chen, S. D. Wilson, G. Cao, R. Averitt, G. Rafael and D. Hsieh, *Decoupling of static and dynamic antiferromagnetic critical behavior in an optically pumped Mott insulator*, Communications Physics 5, 35 (2022)
30. X. Li, S. E. Cooper, A. Krishnadas, **A. de la Torre**, R. S. Perry, F. Baumberger, D. M. Silevitch, D. Hsieh, T. F. Rosenbaum and Y. Feng, *Magnetic order, disorder, and excitations under pressure in the Mott insulator Sr₂IrO₄*, Phys. Rev. B 104, L201111 (2021)
29. **A. de la Torre**, B. Zager, F. Bahrami, M. DiScala, J. R. Chamorro, M. H. Upton, G. Fabbris, D. Haskel, D. Casa, T. M. McQueen, F. Tafti, and K. W. Plumb, *Enhanced hybridization in the electronic groundstate in the intercalated honeycomb iridate Ag₃LiIr₂O₆*, Phys Rev B 109, L100416 (2021)
28. * **A. de la Torre**, D. Kennes, M. Claassen, S. Gerber, J. McIver and M. Sentef, *Colloquium: Nonthermal pathways to ultrafast control in quantum materials*, Rev. Mod. Phys. 93, 041002 (2021)
27. **A. de la Torre**, S. Di Matteo, D. Hsieh and M. R. Norman, *Implications of second harmonic generation for hidden order in Sr₂CuO₂Cl₂*, Phys. Rev. B 104, 035138 (2021)
26. * **A. de la Torre**, K. L. Seyler, L. Zhao, S. Di Matteo, M. Scheurer, B. Yu, M. Greven, S. Sachdev, M. R. Norman and D. Hsieh, *Mirror symmetry breaking in a model insulating cuprate*, Nat. Phys. 17, 777 (2021)

25. K. L. Seyler, **A. de la Torre**, Z. Porter, E. Zoghlin, R. Polski, M. Nguyen, S. Nadj-Perge, S. D. Wilson and D. Hsieh, *Spin-orbit-enhanced magnetic surface second harmonic generation in Sr_2IrO_4* , Phys. Rev. B 102, 201113(R) (2020)
24. J. Y. Shan, **A. de la Torre**, N. J. Laurita, L. Zhao, C. D. Dashwood, D. Puggioni, K. Yamaura, Y. Shi, J. M. Rondinelli, and D. Hsieh, *Evidence for an extended critical fluctuation region above the polar ordering transition in $LiOsO_3$* , Phys. Rev. Research 2, 033174 (2020)
23. C. D. Dashwood, H. Miao, J. G. Vale, D. Ishikawa, D. A. Prishchenko, V. V. Mazurenko, V. G. Mazurenko, R. S. Perry, G. Cao, **A. de la Torre**, F. Baumberger, A. Q. R. Baron, D. F. McMorrow and M. P. M Dean, *Momentum-resolved lattice dynamics of parent and electron-doped Sr_2IrO_4* , Phys. Rev. B 100, 085131 (2019)
22. A. Tamai, M. Zingl, E. Rozbicki, E. Cappelli, S. Ricco, **A. de la Torre**, S. McKeown Walker, F. Y. Bruno, P.D.C. King, W. Meevasana, M. Shi, M. Radovic, N.C. Plumb, A.S. Gibbs, A.P. Mackenzie, C. Berthod, H. Strand, M. Kim, A. Georges and F. Baumberger, *High-resolution photoemission on Sr_2RuO_4 reveals correlation-enhanced effective spin-orbit coupling and dominantly local self-energies*, Phys. Rev. X 9 021048 (2019)
21. F. Y. Bruno, S. McKeown Walker, S. Ricco, **A. de la Torre**, Z. Wang, A. Tamai, T. K. Kim, M. Hoesch, M. S. Bahramy and F. Baumberger, *Band Structure and Spin-Orbital Texture of the (111)- $KTaO_3$ Two-Dimensional Electron Gas*, Advanced Electronic Materials, 1800860 (2019)
20. K. Wang, N. Bachar, J. Teyssier, W. Luo, C. W. Rischau, G. Scheerer, **A. de la Torre**, R. S. Perry, F. Baumberger and D. van der Marel, *Mott transition and collective charge pinning in electron doped Sr_2IrO_4* , Phys. Rev. B 98, 045107 (2018)
19. L. Zhao, D. H. Torchinsky, J. W. Harter, **A. de la Torre** and D. Hsieh, *Second harmonic generation spectroscopy of hidden phases*, Encyclopedia of Modern Optics (2nd edition) 2, 207 (2018)
18. * D. M. Kennes, **A. de la Torre**, A. Ron, D. Hsieh, and A. J. Millis, *Floquet engineering in quantum chains*, Phys. Rev. Lett. 120, 127601 (2018)
17. J. W. Harter, D. M. Kennes, H. Chu, **A. de la Torre**, Z. Y. Zhao, J.-Q. Yan, D. G. Mandrus, A. J. Millis and D. Hsieh, *Evidence of an improper displacive phase transition in $Cd_2Re_2O_7$ via time-resolved coherent phonon spectroscopy*, Phys. Rev. Lett. 120, 047601 (2018)
16. D. Pincini, J. G. Vale, C. Donnerer, **A. de la Torre**, E. C. Hunter, R. Perry, M. Moretti Sala, F. Baumberger, and D. F. McMorrow, *Anisotropic exchange and spin-wave damping in pure and electron-doped Sr_2IrO_4* , Phys. Rev. B 96, 075162 (2017)
15. I. Battisti, V. Fedoseev, K. M. Bastiaans, **A. de la Torre**, R. S. Perry, F. Baumberger, and M. P. Allan, *Poor electronic screening in lightly doped Mott insulators observed with scanning tunneling microscopy*, Phys. Rev. B 95, 235141 (2017)
14. * H. Chu, L. Zhao, **A. de la Torre**, T. Hogan, S.D. Wilson and D. Hsieh, *A charge density wave-like instability in a doped spin-orbit-assisted weak Mott insulator*, Nature Materials. 16, 200 (2017)
13. I. Battisti, K. M. Bastiaans, V. Fedoseev, **A. de la Torre**, N. Iliopoulos, A. Tamai, E. C. Hunter, R. S. Perry, J. Zaanen, F. Baumberger and M. P. Allan, *Universality of pseudogap and emergent order in lightly doped Mott insulators*, Nature Physics 13, 21 - 25 (2017)

12. F. Y. Bruno, M. Gibert, S. McKeown Walker, O. E. Peil, **A. de la Torre**, S. Ricco, Z. Wang, S. Catalano, A. Tamai, F. Bisti, V. N. Strocov, J.-M. Triscone, and F. Baumberger, *Electronic structure of buried LaNiO₃ layers in (111)-oriented LaNiO₃/LaMnO₃ superlattices probed by soft x-ray ARPES*, APL Materials 5, 016101 (2017)
11. F. Y. Bruno, A. Tamai, Q. S. Wu, I. Cucchi, C. Barreteau, **A. de la Torre**, S. McKeown Walker, S. Ricco, Z. Wang, T. K. Kim, M. Hoesch, M. Shi, N. C. Plumb, E. Giannini, A. A. Soluyanov, and F. Baumberger, *Observation of large topologically trivial Fermi arcs in the candidate type-II Weyl semimetal WTe₂*, Phys. Rev. B 94, 121112(R) (2016)
10. * Z. Wang, S. McKeown Walker, A. Tamai, Y. Wang, Z. Ristic, F. Y. Bruno, **A. de la Torre**, S. Ricco, N. C. Plumb, M. Shi, P. Hlawenka, J. Sanchez-Barriga, A. Varykhalov, T. K. Kim, M. Hoesch, P. D. C. King, W. Meevasana, U. Diebold, J. Mesot, B. Moritz, T. P. Devereaux, M. Radovic and F. Baumberger, *Tailoring the nature and strength of electron-phonon interactions in the SrTiO₃ (001) two-dimensional electron liquid*, Nature Materials 15, 835-839 (2016)
9. S. McKeown Walker, S. Riccò, F. Y. Bruno, **A. de la Torre**, A. Tamai, E. Golias, A. Varykhalov, D. Marchenko, M. Hoesch, M. S. Bahramy, P. D. C. King, J. Sánchez-Barriga and F. Baumberger, *Absence of giant spin splitting in the two-dimensional electron liquid at the surface of SrTiO₃ (001)*, Phys. Rev. B 93, 245143 (2016)
8. * **A. de la Torre**, S. McKeown Walker, F. Y. Bruno, S. Ricco, Z. Wang, I. Gutierrez Lezama, G. Scheerer, G. Girit, D. Jaccard, C. Berthod, E. C. Hunter, T. Kim, M. Hoesch, R. Perry, A. Tamai, F. Baumberger, *Collapse of the Mott gap and emergence of a nodal liquid in lightly doped Sr₂IrO₄*, Phys. Rev. Lett 115, 176402 (2015)
7. S. McKeown Walker, F. Y. Bruno, Z. Wang, **A. de la Torre**, S. Ricco, A. Tamai, T. K. Kim, M. Hoesch, M. Shi, M. S. Bahramy, P. D. C. King and F. Baumberger, *Carrier Density Control of the SrTiO₃ (001) surface 2DEG studied by ARPES*, Advanced Materials, 27, 3894-3899 (2015)
6. * **A. de la Torre**, E. C. Hunter, A. Subedi, S. McKeown Walker, A. Tamai, T. Kim, M. Hoesch, R. Perry, A. Georges, F. Baumberger, *Coherent quasiparticles with a small fermi surface in lightly doped Sr₃Ir₂O₇*, Phys. Rev. Lett. 113, 256402 (2014)
5. S. McKeown Walker, **A. de la Torre**, F. Y. Bruno, A. Tamai, T. K. Kim, M. Hoesch, M. Shi, M. S. Bahramy, P. D. C. King, F. Baumberger, *Control of a two-dimensional electron gas on SrTiO₃ (111) by atomic oxygen*, Phys. Rev. Lett. 113, 177601 (2014)
4. P. D. C. King, S. McKeown Walker, A. Tamai, **A. de la Torre**, T. Eknapakul, P. Buaphet, S.-K. Mo, W. Meevasana, M. S. Bahramy, F. Baumberger, *Quasiparticle dynamics and spin-orbital texture of the SrTiO₃ two-dimensional electron gas*, Nat. Comm. 5, 3414 (2014)
3. A. Tamai, W. Meevasana, P. D. C. King, C. W. Nicholson, **A. de la Torre**, E. Rozbicki, F. Baumberger, *Spin-orbit splitting of the Shockley surface state on Cu (111)*, Phys. Rev. B 87, 075113 (2013)
2. M. S. Bahramy, P. D.C King, **A. de la Torre**, J. Chang, M. Shi, L. Patthey, G. Balakrishnan, Ph. Hofmann, R. Arita, N. Nagaosa, F. Baumberger, *Emergent quantum confinement at topological insulator surfaces*, Nat. Comms, 3, 1159 (2012)
1. D.O. Scanlon, P. D. C. King, R. P. Singh, **A. de la Torre**, S. McKeown Walker, G. Balakrishnan, F. Baumberger and C. R. A. Catlow, *Controlling Bulk Conductivity in Topological Insulators: Key Role of Anti-Site Defects*, Adv. Mat. 24, 2154 (2012)