

Curriculum Vitae

Alex Frañó

Education

2014: Technical University of Berlin/Max Planck Institute (Berlin, Germany): Ph.D. in Physics (*summa cum laude*)

2010: University of Stuttgart (Stuttgart, Germany): M.Sc. in Physics (*summa cum laude*)

2005: National University of Honduras (Tegucigalpa, Honduras): B.S. in Physics

Work Experience

July 2023 – Present: Associate Professor. UC San Diego; La Jolla, CA.

July 2017 – June 2023: Assistant Professor. UC San Diego; La Jolla, CA.

July 2017 – September 2017: Visiting Professor. UC Berkeley; Berkeley, CA.

July 2016 – June 2017: UC Presidential Postdoctoral Fellow. UC Berkeley; Berkeley, CA

July 2014 – June 2016: Postdoctoral Researcher. Materials Science Division/Advanced Light Source (ALS), Lawrence Berkeley National Lab; Berkeley, CA.

February 2014 – June 2014: Postdoctoral Researcher. Max Planck Institute for Solid State Research (MPI-SSR); Stuttgart, Germany.

October 2010 – January 2014: Graduate Researcher. MPI-SSR / Helmholtz Center Berlin; Germany.

Synergistic Activities

August 2018 – present: Assistant Director of the “[Quantum Materials for Energy Efficient Neuromorphic Computing](#)” DOE Energy Frontiers Research Center, UC San Diego.

July 2025 - present: Chair of the Spectroscopy – Condensed Matter Physics/Magnetism Peer Review Panel, Advanced Photon Source, Argonne National Laboratory (served as panel reviewer 2023–2025).

February 2026 – present: Member of the Proposal Review Panel, Linac Coherent Light Source (LCLS), SLAC National Accelerator Laboratory.

2019: Chair of the American Physical Society—Far West Section Executive Committee.

2020: Chair of the [User Executive Committee](#) of the Advanced Light Source (ALS), Lawrence Berkeley National Lab (LBNL).

2020: Member of the Scientific Advisory Committee (SAC) of the ALS, LBNL.

Awards/Fellowships

2025: Fellow of Scialog: Quantum Matter and Information (QMI)

2025: Outstanding Faculty Mentor, Graduate Student & Professional Association Awards

2024: Sheldon Shultz Chancellor's Endowed Professor of Physics UCSD

2023: Fellow of Scialog: Molecular Basis of Cognition (MBC)

2022: CIFAR Global Azrieli [Scholar](#)

2022: NSF CAREER Award

2022: American Physical Society's Forum for Early Career Scientists (FECS) “Diversity & Inclusion Award”

2022: UCSD Division of Physical Science “Equity, Diversity, and Inclusion Excellence Award”

2021: Cottrell Scholar [Award](#)

2020: [Sloan Research](#) Fellow

2016: University of California Presidential Postdoctoral Fellow (Berkeley, CA)

2014: Ernst-Eckhard-Koch Prize (Helmholtz Center Berlin; Berlin, Germany)

2014: Outstanding PhD Research Prize (Springer Publishing House; Germany)

Publications

- 1) Biswajit Sahoo, et al, *Enhanced spin-to-charge conversion in epitaxial $\text{La}_{0.67}\text{Sr}_{0.33}\text{MnO}_3/\text{NdNiO}_3$ bilayers at the nickelate metal-insulator phase transition*, Nature Communications (2026).
- 2) Elliot Kisiel, et al., *Dynamic asymmetric strain imprinted into substrates by an oxide thin film*, Science 393, 392-397 (2026)
- 3) Yimei Zhu, Alex Frano, Shriram Ramanathan, *Operando microscopy for neuromorphic hardware*, Nature Materials 25, 1095-1109 (2026)
- 4) Wenxin Li, et al., *Electronic Origin of Delicate Antiferromagnetism in Fe_xNbS_2* , Phys. Rev. Lett. 136, 216503 (2026)
- 5) Jinming Yang, et al., *Superconductivity suppression and bilayer decoupling in Pr-substituted $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$* , Proceedings of the National Academy of Sciences 123, e2536919123 (2026).
- 6) C. M. Duffy et al., *Charge order in Pr-substituted $\text{YBa}_2\text{Cu}_3\text{O}_7$ from high-field Hall effect measurements*, Phys. Rev. B 113, 174529 (2026).
- 7) Youjeong Na, et al., *Role of Polymer–Protein Interactions in the Dynamics of Polymer-Integrated Protein Crystals*, J. Am. Chem. Soc. 148, 18080–18094 (2026)
- 8) A. Kar, et al., *Charge correlations and magnetoelastic coupling in intercalated transition metal dichalcogenides*, Phys. Rev. Materials 10, 034006 (2026).
- 9) Wei He, et al., *Demonstration of a dual-beam zone plate for phase-contrast coherent soft x-ray imaging*. Proc. SPIE 13620, Advances in X-Ray/EUV Sources, Optics, and Components XX, 136200H (2025).
- 10) Mara Casebeer, Alex Frano, *Incorporating a research project and coding exercises into existing undergraduate physics courses*. Am. J. Phys. 93, 724–729 (2025)
- 11) Elliot Kisiel, et al., *High-Resolution Full-Field Structural Microscopy of the Voltage-Induced Filament Formation in VO_2 -Based Neuromorphic Devices*. ACS Nano 19, 16, 15385–15394 (2025).
- 12) Biswajit Sahoo, et al., *Temperature Dependent Spin Dynamics in $\text{La}_{0.67}\text{Sr}_{0.33}\text{MnO}_3/\text{Pt}$ Bilayers*. Adv. Mater. Interfaces, 2401038 (2025)
- 13) Eduardo da Silva Neto, Alex Frano, Fabio Boschini, *Dynamic Charge Order from Strong Correlations in the Cuprates*. Frontiers in Electronic Materials, 4 (2024)
- 14) Pavel Salev, et al., *Local strain inhomogeneities during electrical triggering of a metal–insulator transition revealed by X-ray microscopy*. Proceedings of the National Academy of Sciences 121, e2317944121 (2024).
- 15) Ivan A. Zaluzhnyy, et al., *Structural Changes in $\text{YBa}_2\text{Cu}_3\text{O}_7$ Thin Films Modified with He^+ -Focused Ion Beam for High-Temperature Superconductive Nanoelectronics*. ACS Appl. Nano Mater., 7, 15943 (2024).

- 16) Elliot Kisiel, *et al.*, *Direct detection system for full-field nanoscale X-ray diffraction-contrast imaging*. Optics Express 32, 27682-27689 (2024).
- 17) Yufei Wang, *et al.*, *Self-Assembly of Nanocrystal Checkerboards via Non-Specific Interactions*. Nature Communications 15, 3913 (2024).
- 18) Xiang Chen, *et al.*, *Antiferromagnetic order in the layered magnetic topological insulator $MnBi_2Se_4$ probed by resonant soft x-ray scattering*. Phys. Rev. B 109, 184418 (2024).
- 19) K. Scott, *et al.*, *Detection of a two-phonon mode in a cuprate superconductor via polarimetric resonant inelastic x-ray scattering*. Phys. Rev. B 109, 125126 (2024).
- 20) Henry Navarro, *et al.*, *Disentangling transport mechanisms in a correlated oxide by photoinduced charge injection*. Phys. Rev. Materials 7, L123201 (2023).
- 21) Shan Wu, *et al.*, *Discovery of Charge Order in the Transition Metal Dichalcogenide Fe_xNbS_2* . Phys. Rev. Lett. 131, 186701 (2023).
- 22) Ravindra Singh Bisht, *et al.*, *Spatial Interactions in Hydrogenated Perovskite Nickelate Synaptic Networks*, Nano Letters 23, 7166 (2023).
- 23) Biswajit Sahoo, Alex Frano, Eric Fullerton, *Efficient charge to spin conversion in iridium oxide thin films*. Applied Physics Letters 123, 032404 (2023).
- 24) Kirsty Scott, *et al.*, *Low-energy quasi-circular electron correlations with charge order wavelength in $Bi_2Sr_2CaCu_2O_{8+\delta}$* . Science Advances, 9, eadg371 (2023).
- 25) Veronika Sunko, *et al.*, *Spin-carrier coupling induced ferromagnetism and giant resistivity peak in $EuCd_2P_2$* . Phys. Rev. B 107, 144404 (2023).
- 26) A. Ruiz, *et al.*, *Stabilization of three-dimensional charge order through interplanar orbital hybridization in $Pr_xY_{1-x}Ba_2Cu_3O_{6+\delta}$* . Nature Communications 13, 6197 (2022).
- 27) X. Chen, E. *et al.*, *Antiferromagnetic order in Co-doped Fe_5GeTe_2 probed by resonant magnetic x-ray scattering*. Phys. Rev. Materials 6, 094404 (2022).
- 28) M. Bluschke, *et al.*, *Imaging mesoscopic antiferromagnetic spin textures in the dilute limit from single-geometry resonant coherent x-ray diffraction*, Science Advances, 8, eabn6882 (2022).
- 29) I. K. Schuller, *et al.*, *Neuromorphic computing: Challenges from quantum materials to emergent connectivity*, Applied Physics Letters 120, 140401 (2022).
- 30) A. Hoffmann, *et al.*, *Quantum materials for energy-efficient neuromorphic computing: Opportunities and challenges*, APL Materials 10, 070904 (2022).
- 31) S. Zhang, *et al.*, *Determining the Oxygen Stoichiometry of Cobaltite Thin Films*, Chemistry of Materials 34, 2076-2084 (2022).
- 32) M. Vagadia, *et al.*, *Extraordinary anisotropic magnetoresistance in $CaMnO_3/CaIrO_3$ heterostructures*, Phys. Rev. B 105, L020402 (2022).
- 33) I. A. Zaluzhnyy, *et al.*, *Proton distribution visualization in perovskite nickelate devices utilizing nanofocused x rays*, Phys. Rev. Materials 5, 095003 (2021).
- 34) U. S. Goteti *et al.*, *Low-temperature emergent neuromorphic networks with correlated oxide devices*, Proceedings of the National Academy of Sciences 118, e2103934118 (2021).
- 35) X. Chen, *et al.*, *Structural and magnetic transitions in the planar antiferromagnet $Ba_4Ir_3O_{10}$* , Phys. Rev. B 103, 224420 (2021).
- 36) A. Ruiz, *et al.*, *Magnon-spinon dichotomy in the Kitaev hyperhoneycomb β - Li_2IrO_3* , Phys. Rev. B 103, 184404 (2021).
- 37) T. J. Boyle, *et al.*, *Large response of charge stripes to uniaxial stress in $La_{1.475}Nd_{0.4}Sr_{0.125}CuO_4$* , Phys. Rev. Research 3, L022004 (2021).

- 38) H. Navarro, *et al.*, *A hybrid optoelectronic Mott insulator*, Appl. Phys. Lett. 118, 141901 (2021).
- 39) S. Wu, *et al.*, *Short-Range Nematic Fluctuations in $Sr_{1-x}Na_xFe_2As_2$ Superconductors*, Phys. Rev. Lett. 126, 107001 (2021).
- 40) F. Boschini, *et al.*, *Dynamic electron correlations with charge order wavelength along all directions in the copper oxide plane*, Nature Communications 12, 597 (2021).
- 41) H.-T. Zhang, *et al.*, *Perovskite Neural Trees*, Nature Communications 11, 2245 (2020).
- 42) A. Frano, *et al.*, *Charge ordering in superconducting copper oxides*, J. Phys.: Condens. Matter 32, 374005 (2020).
- 43) Y.-D. Chuang, *et al.*, *Momentum-resolved resonant inelastic soft X-ray scattering (q RIXS) endstation at the ALS*, Journal of Electron Spectroscopy and Related Phenomena (2020).
- 44) A. Ruiz, *et al.*, *High-temperature magnetic anomaly in the Kitaev hyperhoneycomb compound β - Li_2IrO_3* , Phys. Rev. B 101, 075112 (2020).
- 45) N. P. Breznay, *et al.*, *Interplay of structure and charge order revealed by quantum oscillations in thin films of $Pr_2CuO_{4\pm\delta}$* , Phys. Rev. B 100, 235111 (2019).
- 46) A. Frano, *et al.*, *Control of dopant crystallinity in electrochemically treated cuprate thin films*, Phys. Rev. Materials 3, 063803 (2019).
- 47) M. Kang, *et al.*, *Evolution of charge order topology across a magnetic phase transition in cuprate superconductors*, Nature Physics 15, 721 (2019).
- 48) M. Yi, *et al.*, *Spectral Evidence for Emergent Order in $Ba_{1-x}Na_xFe_2As_2$* , Phys. Rev. Lett. 121, 127001 (2018).
- 49) M. Bluschke, *et al.*, *Stabilization of three-dimensional charge order in $YBa_2Cu_3O_{6+x}$ via epitaxial growth*, Nature Communications 9, 2978 (2018).
- 50) M. Hepting, *et al.*, *Complex magnetic order in nickelate slabs*, Nature Physics 14, 1097 (2018).
- 51) Y. He, *et al.*, *Persistent low-energy phonon broadening near the charge order q -vector in bilayer cuprate $Bi_2Sr_2CaCu_2O_{8+y}$* , Phys. Rev. B 98, 035102 (2018).
- 52) A. Ruiz, *et al.*, *Field-induced intertwined orders in 3D Mott-Kitaev honeycomb β - Li_2IrO_3* , Nature Communications 8, 961 (2017).
- 53) B. A. Frandsen, *et al.*, *Local Orthorhombicity in the Magnetic C4 Phase of the Hole-Doped Iron-Arsenide Superconductor $Sr_{1-x}Na_xFe_2As_2$* , Phys. Rev. Lett. 119, 187001 (2017).
- 54) N. P. Breznay, *et al.*, *Resonant x-ray scattering reveals possible disappearance of magnetic order under hydrostatic pressure in the Kitaev candidate γ - Li_2IrO_3* , Phys. Rev. B Rapid Communications 96, 020402(R) (2017).
- 55) M. Bluschke, *et al.*, *Transfer of Magnetic Order and Anisotropy through Epitaxial Integration of 3d and 4f Spin Systems*, Phys. Rev. Lett. 118, 207203 (2017).
- 56) M. Foerst, *et al.*, *Multiple supersonic phase fronts launched at a complex-oxide hetero-interface*, Phys. Rev. Lett. 118, 027401 (2017).
- 57) Y.-D. Chuang, *et al.*, *Modular soft X-ray spectrometer for applications in energy sciences and quantum materials*, Rev. Sci. Instrum. 88, 013110 (2017)
- 58) A. Frano, *et al.*, *Stabilizing Charge Density Wave Order in Cuprate-Manganite Superlattices*, Nature Materials 15, 831 (2016).
- 59) Y. Lu, *et al.*, *Quantitative determination of bond order and lattice distortions in nickel oxide heterostructures by resonant x-ray scattering*, Phys. Rev. B 93, 165121 (2016).
- 60) R. Comin, *et al.*, *Symmetry of charge order in cuprates*, Nature Materials 14, 796 (2015).

- 61) M. Foerst, *et al.*, *Femtosecond x rays link melting of charge-density wave correlations and light-enhanced coherent transport in $\text{YBa}_2\text{Cu}_3\text{O}_{6.6}$* . Phys. Rev. B 90, 184514 (2014).
- 62) R. Mankowsky, *et al.*, *Nonlinear lattice dynamics as a basis for enhanced superconductivity in $\text{YBa}_2\text{Cu}_3\text{O}_{6.5}$* , Nature 516, 71 (2014).
- 63) M. Hepting, *et al.*, *Tunable Charge and Spin Order in PrNiO_3 Thin Films and Superlattices*, Phys. Rev. Lett. 113, 227206 (2014).
- 64) S. Blanco-Canosa, *et al.*, *Resonant x-ray scattering study of charge-density wave correlations in $\text{YBa}_2\text{Cu}_3\text{O}_{6+x}$* . Phys. Rev. B 90, 054513 (2014).
- 65) R. Comin, *et al.*, *Charge Order Driven by Fermi-Arc Instability in Underdoped Cuprates*. Science 343, 390 (2014).
- 66) E. da Silva Neto, *et al.*, *Ubiquitous Interplay between Charge Ordering and High-Temperature Superconductivity in Cuprates*. Science 343, 393 (2014).
- 67) A. Frano, *et al.*, *Layer Selective Control of the Lattice Structure in Oxide Superlattices*. Advanced Materials 26, 258 (2013).
- 68) A. Frano, *et al.*, *Orbital Control of Noncollinear Magnetic Order in Nickelate Heterostructures*. Phys. Rev. Lett. 111, 106804 (2013).
- 69) S. Blanco-Canosa, *et al.*, *Momentum-Dependent Charge Correlations in $\text{YBa}_2\text{Cu}_3\text{O}_{6+\delta}$ Superconductors Probed by Resonant X-Ray Scattering: Evidence for Three Competing Phases*. Phys. Rev. Lett. 110, 187001 (2013).
- 70) J.A. Rosen, *et al.*, *Surface-enhanced charge-density-wave instability in underdoped $\text{Bi}_2\text{Sr}_{2-x}\text{La}_x\text{CuO}_{6+\delta}$* . Nature Communications 4, 1977 (2013).
- 71) M. Wu, *et al.*, *Strain and composition dependence of orbital polarization in nickel oxide superlattices*. Phys. Rev. B 88, 125124 (2013).
- 72) M. Rössle, *et al.*, *Electric-Field-Induced Polar Order and Localization of the Confined Electrons in $\text{LaAlO}_3/\text{SrTiO}_3$ Heterostructures*. Phys. Rev. Lett. 110, 136805 (2013).
- 73) A. J. Achkar, *et al.*, *Distinct Charge Orders in the Planes and Chains of Ortho-III Ordered $\text{YBa}_2\text{Cu}_3\text{O}_{6+\delta}$ Superconductors Identified by Resonant Elastic X-ray Scattering*. Phys. Rev. Lett. 109, 167001 (2012).
- 74) G. Ghiringhelli, *et al.*, *Long-Range Incommensurate Charge Fluctuations in $(\text{Y,Nd})\text{Ba}_2\text{Cu}_3\text{O}_{6+x}$* . Science 337, 821 (2012).
- 75) D. K. Satapathy, *et al.*, *Magnetic Proximity Effect in $\text{YBa}_2\text{Cu}_3\text{O}_7/\text{La}_{2/3}\text{Ca}_{1/3}\text{MnO}_3$ and $\text{YBa}_2\text{Cu}_3\text{O}_7/\text{LaMnO}_{3+\delta}$ Superlattices*. Phys. Rev. Lett. 108, 197201 (2012).
- 76) E. Detemple, *et al.*, *Polarity-driven nickel oxide precipitation in LaNiO_3 - LaAlO_3 superlattices*. Appl. Phys. Lett. 99, 211903 (2011).
- 77) A. V. Boris, *et al.*, *Dimensionality Control of Electronic Phase Transitions in Nickel-Oxide Superlattices*. Science 332, 937 (2011).
- 78) E. Benckiser, *et al.*, *Orbital Reflectometry of Oxide Heterostructures*. Nature Materials 10, 189 (2011).

Book Published

Spin Spirals and Charge Textures in Transition-Metal-Oxide Heterostructures
Springer (Heidelberg, Germany) (2014)