SALVADOR BARRAZA-LOPEZ

- Associate Professor of Physics. University of Arkansas (2017-)
- Department of Energy Early Career Awardee (2016-2021)
- Theory Lead. MonArk NSF Quantum Foundry (2021-)

(Updated 8/8/2023)

EDUCATION

Bachelor's (Licenciado) Degree in Physics and Mathematics

Instituto Politécnico Nacional (Mexico City). 1995 - 2000

Undergraduate Research Assistant. Los Alamos National Laboratory

Advisor: Paul Kwiat. Summer-Fall, 1999 and Summer, 2000

PhD in Physics

University of Illinois at Urbana-Champaign

Advisor: Karl Hess. 2001 – 2006

WORK EXPERIENCE

Associate Professor. *University of Arkansas, Fayetteville.* 04/2017–

Teaching Physics courses and researching two-dimensional ferroelectrics and other 2D materials. Developing a two-semester graduate level course in 2D materials since 2016. Theory Lead of the MonArk NSF Quantum Foundry. Funded by the US Department of Energy as well.

María Zambrano Fellow (declined)

Beneficiary of a one-year salary grant to improve the Spanish University System. Academic year 2022.

Visiting Professor

Universidad de Oviedo (Spain). December 2019. Working at Jaime Ferrer's group.

Resident Associate

Center for Nanoscale Materials. Argonne National Laboratory. Summer, 2018.

I spent the Summer of 2018 working with Pierre Darancet at Argonne National Laboratory. A paper on 2D quantum paraelectrics came out of that effort; see *PRL* **122**, 015703 (2019) for details.

Assistant Professor. *University of Arkansas, Fayetteville*. 2011– 2017.

Postdoctoral Research Associate. *Georgia Tech*. Advisor: Mei-Yin Chou. 2008 – 2011.

Postdoctoral Research Associate. *Virginia Tech*. Advisor: Kyungwha Park. 2006 – 2008.

RESEARCH ACTIVITIES

I established a Theory Program in 2D materials in Arkansas (2D materials are few-atom thick and they have amazing properties). My approach to research is *hands on*: I come to the office and am involved in most aspects of the research being carried out in my group.

Starting in 2015 and continuing through the writing of this CV, my group has been mainly studying thermal phase transitions taking place in two-dimensional ferroelectrics. My first work on that subject (Mehboudi *et al*. *Nano Lett.* **16**, 1704 (2016)) opened a way to think of phase transitions of those materials whereby the quenching of the intrinsic electric dipole **P** is tied with an elastic transformation of the lattice from a rectangle onto a square. This field remains quite active both from experiment and theory and, besides my own theory work on this, I also maintain an ongoing collaboration with experimentalists in China and Germany on this subject.

I have published 67 manuscripts (three more are under review presently), including the following ones:

- One *Rev. Mod. Phys.* (Barraza-Lopez *et al.*, *Rev. Mod. Phys.* **93**, 011001 (2021)).
- One *Rep. Prog. Phys.* with over 400 citations by Google Scholar (*Rep. Prog. Phys.* **80**, 096501 (2017)).
- A 49-page update of the previous Review was submitted to *Rep. Prog. Phys.* in August 2023.
- One Nature (*Nature* **409**, 1014 (2001)).
- Two *Adv. Mater.* with experimental collaborators in China and Germany (*Adv. Mater.* **31**, 1804428 (2019) and *Adv. Mater.* **33**, 2102267 (2021)).
- One *PNAS* (*PNAS* **112**, 5888 (2015)).
- Six *Phys. Rev. Lett.* (*PRL* **102**, 246801 (2009), *PRL* **104**, 076807 (2010), *PRL* **117**, 246802 (2016), *PRL* **118**, 227401 (2017), *PRL* **122**, 015703 (2019) and *PRL* **122**, 206402 (2019)).
- Five *Nano Lett.* (*Nano Lett.* **10**, 3446 (2010), *Nano Lett.* **12**, 3424 (2012), *Nano Lett.* **16**, 1704 (2016), *Nano Lett.* **20**, 6590 (2020), *Nano Lett.* **22**, 7984 (2022)).
- One *ACS Nano* (*ACS Nano* **8**, 1136 (2014)).
- Two *ACS Central Science* (*ACS Central Sci.* **1**, 320 (2015), *ACS Central Sci.* **4**, 1436 (2018)).

EDUCATIONAL ACTIVITIES AND UNDERGRADUATE RESEARCH MENTORING

I am developing comprehensive notes for a novel graduate-level course in Condensed Matter Physics based on 2D materials; 409 pages have been written up to now.

Since 1986, the Goldwater Scholarship has been given to about 9,000 students Nationwide. About 60 University of Arkansas' students have been named Goldwater Scholars in those nearly four decades. **5% of Arkansas' Goldwater Awardees have been my students:**

Joseph Roll (2022), Tyler Bishop (2019), and Tobias Bothwell (2013).

ADVISEES

Mentoring leading to competitive placement: Undergraduates going for Grad. School at UC-Boulder, Washington, Cornell, and UT-Austin. Postdocs joining National Laboratories in the US and Canada.

Ten Undergraduates, Four Master's Students, Six PhD students, and Six Postdoctoral Associates since 2011. Three PhD degrees awarded. Two Master's degrees awarded as an Assoc. Professor.

Undergraduates

1. Hannah Isbell. In progress (2023-)

2. Darren Blount. In progress (2022-)

3. Mattie McLelan. In progress (2022-)

4. Joseph W Roll. (2019-2023). Goldwater Scholar (2022). NSF Graduate Fellow (2023). Lead author of PRB 105, 214105 (2022). Graduate student at UT Austin in Fall 2023.

5. Tyler Bishop (2016 - 2020). Goldwater Scholar (2019). Carried out quantum molecular dynamics calculations that led to the discovery of 2D paraelastic 2D materials (Bishop et al., PRL (2019)). Went to University of Colorado-Boulder for Graduate Studies.

6. Erin Farmer (2015-2019). Alumni Association Senior Honor Citation received from the University of Arkansas' Chancellor. Indicated the integration process leading to the analytical model for 2D paraelastic 2D materials (Bishop et al., PRL (2019)). Currently an NSF Graduate Research Fellow at Cornell University.

7. Ryu Nakae (2017). Went to work for Bosch in Japan.

8. Kainen Utt. (2013-2017). Went to Washington University at Saint Louis for Graduate Studies.

9. Tobias Bothwell. Goldwater Scholar (2013). Went to University of Colorado-Boulder for Graduate Studies. Currently a Postdoctoral Associate at JILA.

10. James Sloan. (2012). Went to the University of Washington for Graduate Studies.

Masters students

1. Gustavo Orozco Galvan (2021 -)

2. Afsana Sharmin (2017)

3. Caleb Heath (2016-2019). Private sector.

4. Cedric Horvath (2013). Now at Samsung.

PhD students

1. David Diya (2023-)

2. Jose Luis Rosas Hernandez (2022-)

3. John Davis (2021-)

4. Shiva Poudel (2016 - 2022)

5. Brandon Miller (2016 - 2021)

6. Mehrshad Mehboudi (2011 - 2018)

Postdoctoral Research Associates

1. Angiolo Huaman (2023–)

2. Shiva Poudel (2022–)

3. Debajit Chakraborty (2021 – 2023)

4. John Villanova (2018 – 2021). Now a Postdoctoral Associate at Oak Ridge National Laboratory.

5. Taneshwor Kaloni. (2016 – 2018). Joined the Chalk River Nuclear Laboratory in Canada as a staff member.

6. Pablo Rivero. (2012 – 2014). Left for Postdoctoral Position at Louisiana State University. He currently works in the private sector.

UofA Chancellor Robinson with Marshallese group in 2022.

LEADING UNIVERSITY-WIDE DIVERSITY INITIATIVES

Since Fall 2015, and in coordination with Admissions, the Multicultural Center, and the Honors College, we bring of the order of 50 Marshallese High School Students every April, provide aid in enrolling (including financial aid).

As a result of those efforts, twelve Marshallese students are enrolled right now; three of them are majoring in Computer Science; another in Mechanical Engineering.

LEADERSHIP WITHIN PROFESSION (FROM 2017 ONWARDS)

1. Lead organizer. Focus Session on 2D Materials: Correlated States: Superconductivity, Ferroelectricity, Density Waves for the 2023 APS March Meeting.

2. Co-organizer. Focus Session on 2D Materials: Synthesis, Heterostructures, and Defects for the 2022 APS March Meeting.

3. Invited Speaker at *Graphene21* Conference (the main in-person meeting point of the Graphene community Worldwide). Grenoble (France). October 2021.

4. Editor with Fengnan Xia (Yale), Wenjuan Zhu (Illinois), and H Wang (Southern California) of a special issue on anisotropic 2D materials. See *Beyond graphene: Low-symmetry and anisotropic 2D materials*. S Barraza-Lopez, F Xia, W Zhu, H Wang. *J. Appl. Phys.* **128**, 140401 (2020).

5. Invited talk at Max Planck Institute (Halle, Germany). Host: Stuart S. P. Parkin. December 2017.

RESEARCH FUNDING

All listed funds have been utilized while an Associate Professor. Funds for my own research exceed $2.1M from 2017 to date.

As a single principal investigator: **~$1,300,000**, including a DOE Early Career Award

1. Toward optical quantum entanglement on a 2D ferroelectric/ferroelastic platform. Department of Energy. Amount: $465,000+80,000 supplement. 08/01/2021 – 5/30/2024.

2. Quantum phenomena in few-layer group IV monochalcogenides: interplay among structural, thermal, optical, spin, and valley properties in 2D. Early Career Award, Department of Energy. Amount: $750,000. 7/01/2016–6/30/2021.

As a co-PI:

3. Q-AMASE: Rapidly Incubating Translational Advances in Quantum Information Sciences and Technologies with a 2D-Quantum Materials Pipeline (2D-QMaP). National Science Foundation (Co-PI, and one of the three writers of the proposal). $19,900,000+4,000,000 supplement (**~800,000 to Barraza-Lopez** fund two Postdoctoral Associates). 9/1/21–8/31/27.

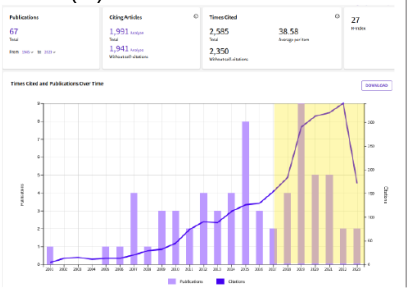
4. Symmetry engineering of topological quantum states. Department of Energy (Lead PI: Hu). $750,000 (covered one graduate student). 10/30/18–10/30/21.

5. OP-Interlayer Excitons in Double Layer Black Phosphorus. National Science Foundation (Lead PI: Churchill). Total amount: $466,954 (covered one graduate student). 01/01/2016 –12/31/2018.

PUBLICATIONS

Sixty-seven published papers; three submitted ones.

(a) Web of Science



(b) Google Scholar

Cites from (a) Web of Science and (b) Google Scholar both indicate upward trends since 2017 (yellow).

3281 citations, H-factor of 29, and h-10 factor of 54 according to Google Scholar.

Publications in High Profile Journals, such as Nature (1), Reviews of Modern Physics (1), Advanced Materials (2), Physical Review Letters (6), Reports of Progress in Physics (1), ACS

Central Science (2), ACS Nano (1), Nano Letters (5), Proceedings of the National Academy of Sciences (1), among others.

Two Review articles: the first one, on the physical properties of deformed graphene (published in 2017), and the second one on the physical properties of a novel family of 2D ferroelectrics (published in 2021). A third, 49-page review has been just submitted. Advisees underlined.

Submitted manuscripts:

70. Mechanical, Electronic, Optical, Piezoelectric and Ferroic Properties of Strained Graphene and Other Strained Monolayers and Multilayers: an Update. GG Naumis, SA Herrera, SP Poudel, H Nakamura, and S. Barraza-Lopez. This Update was commissioned by Rep. Prog. Phys., and submitted on 08/02/2023.

69. Defect-free nanowelding of monolayer and bilayer semiconducting SnSe nanoplates assisted by anisotropic lubricity. JR Ji, JW Villanova, S Barraza-Lopez, SSP Parkin, and K Chang. Under review.

68. Minimal tight-binding model with spin-orbit coupling for the ZrSiSe nodal line Dirac semimetal. GS Orozco-Galvan, S Barraza-Lopez. Under review at PRB.

Published manuscripts:

67. Thermally-driven phase transitions in freestanding low-buckled silicene, germanene, and stanene. JM Davis, GS Orozco-Galvan, and S Barraza-Lopez. *Physical Review Materials* **7**, 054008 (2023).

66. Creating a three-dimensional intrinsic electric dipole on rotated CrI_3 bilayers. SP Poudel, JM Marmolejo-Tejada, JE Roll, MA Mosquera, and S Barraza-Lopez. *Physical Review B* **107**, 195128 (2023).

65. Two-atom-thin topological crystalline insulators lacking out of plane inversion symmetry. S Barraza-Lopez and GG Naumis. *Journal of Physics: Condensed Matter* **35**, 035502 (2023).

64. Slippery paraelectric transition metal dichalcogenide bilayers. JM Marmolejo-Tejada, JE Roll, SP Poudel, S Barraza-Lopez, and Martin Mosquera. *Nano Letters* **22**, 7984 (2022).

63. Elasticity of 2D ferroelectrics across their paraelectric phase transformation. JE Roll, JM Davis, JW Villanova, S Barraza-Lopez. *Physical Review B* **105**, 214105 (2022).

62. Magnetic Topological Semimetal Phase with Electronic Correlation Enhancement in SmSbTe. K Pandey, D Mondal, JW Villanova, JE Roll, R Basnet, A Wegner, G Acharya, M R Un Nabi, B Ghosh, J Fuji, J Wang, B Da, A Agarwal, I Vobornik, A Politano, S Barraza-Lopez, and Jin Hu. *Advanced Quantum Technologies* **4**, 202100063 (2021).

61. Vortex-oriented ferroelectric domains in SnTe/PbTe monolayer lateral heterostructures. K Chang, JW Villanova, JR Ji, S Das, F Küster, S Barraza-Lopez, P Sessi, SSP Parkin. *Advanced Materials* **33**, 2102267 (2021).

60. Colloquium: Physical properties of group-IV monochalcogenide monolayers. S Barraza-Lopez, B Fregoso, J Villanova, S Parkin, K Chang. *Reviews of Modern Physics* **93**, 011001 (2021).

59. Metastable piezoelectric group IV monochalcogenide monolayers with a buckled honeycomb structure. SP Poudel, S Barraza-Lopez. *Physical Review B* **103**, 024107 (2021).

58. Anomalous thermoelectricity at the two-dimensional structural transition of SnSe monolayers. JW Villanova, S Barraza-Lopez. *Physical Review B* **103**, 035421 (2021).

57. Beyond graphene: Low-symmetry and anisotropic 2D materials. S Barraza-Lopez, F Xia, W Zhu, H Wang. *Journal of Applied Physics* **128**, 140401 (2020). (Editorial for a special issue on anisotropic 2D materials with Fengnan Xia (Yale), Zhu (Illinois), and Wang (Southern Cal).)

56. Tuning energy barriers by doping 2D group-IV monochalcogenides. A Du, Z Pendergrast, S Barraza-Lopez. *Journal of Applied Physics* **127**, 234103 (2020).

55. Theory of finite-temperature two-dimensional structural transformations in group-IV monochalcogenide monolayers. JW Villanova, P Kumar, S Barraza-Lopez. *Physical Review B* **101**, 184101 (2020).

54. Microscopic manipulation of ferroelectric domains in SnSe monolayers at room temperature. K Chang, F Küster, BJ Miller, JR Ji, JL Zhang, P Sessi, S Barraza-Lopez, SSP Parkin. *Nano Letters* **20**, 6590 (2020). (First experimental demonstration of a ferroelectric SnSe monolayer).

53. Toward quantum paraelectric, paraelastic, and paramagnetic 2D materials. S Barraza-Lopez. *Annalen der Physik* **532**, 1900448 (2020).

52. Group-IV monochalcogenide monolayers: Two-dimensional ferroelectrics with weak intra-layer bonds and a phosphorene-like monolayer dissociation energy. SP Poudel, JW Villanova, S Barraza-Lopez. *Physical Review Materials* **3**, 124004 (2019).

51. Injection current in ferroelectric group-IV monochalcogenide monolayers. SR Panday, S Barraza-Lopez, T Rangel, BM Fregoso. *Physical Review B* **100**, 195305 (2019).

50. Standing waves induced by valley-mismatched domains in ferroelectric SnTe monolayers. K Chang, BJ Miller, H Yang, H Lin, SSP Parkin, S Barraza-Lopez, QK Xue, X Chen, S-H Ji. *Physical Review Letters* **122**, 206402 (2019). (Editor's suggestion.)

49. From an atomic layer to the bulk: low-temperature atomistic structure, ferroelectric and electronic properties of SnTe films. T Kaloni, K Chang, BJ Miller, QK Xue, X Chen, SH Ji, SSP Parkin, S Barraza-Lopez. *Physical Review B* **99**, 134108 (2019).

48. Evolution of elastic moduli through a two-dimensional structural transformation. A Pacheco-Sanjuan, TB Bishop, EE Farmer, P Kumar, S Barraza-Lopez. *Physical Review B* **99**, 104108 (2019).

47. Quantum paraelastic two-dimensional materials. TB Bishop, EE Farmer, A Sharmin, A Pacheco-Sanjuan, P Darancet, S Barraza-Lopez. *Physical Review Letters* **122**, 015703 (2019).

46. Enhanced spontaneous polarization in ultrathin SnTe films with layered antipolar structure. K Chang, T Kaloni, H Lin, A Bedoya-Pinto, AK Pandeya, I Kostanovskiy, K Zhao, Y Zhong, X Hu, QK Xue, X Chen, S-H Ji, S Barraza-Lopez, SSP Parkin. *Advanced Materials* **31**, 1804428 (2019). (First collaboration with Max-Planck Institute at Halle.)

45. Water splits to degrade two-dimensional group-IV monochalcogenides in nanoseconds. S Barraza-Lopez, T Kaloni. *ACS Central Science* **4**, 1436 (2018).

44. Exfoliation energy, quasiparticle band structure, and excitonic properties of selenium and tellurium atomic chains. E Andharia, TP Kaloni, GJ Salamo, SQ Yu, HOH Churchill, S Barraza-Lopez. *Physical Review B* **98**, 035420 (2018).

43. Tuning the ferroelectric-to-paraelectric transition temperature and dipole orientation of group-IV monochalcogenide monolayers. S Barraza-Lopez, TP Kaloni, SP Poudel, P Kumar. *Physical Review B* **97**, 024110 (2018).

42. Layered material GeSe and vertical GeSe/MoS2 p-n heterojunctions. WC Yap, Z Yang, M Mehboudi, JA Yan, S Barraza-Lopez, W Zhu. *Nano Research* **11**, 420 (2018).

41. Electronic and optical properties of strained graphene and other strained 2D materials: a review. GG Naumis, S Barraza-Lopez, M Oliva-Leyva, H Terrones. *Reports of Progress in Physics* **80**, 096501 (2017). (Cited 400 times according to Google Scholar.)

40. Photostrictive two-dimensional materials in the monochalcogenide family. R Haleoot, C Paillard, M Mehboudi, T Kaloni, B Xu, L Bellaiche, S Barraza-Lopez. *Physical Review Letters* **118**, 227401 (2017). Effect experimentally verified at Stanford University (*Nano Lett.* **23** 2287 (2023)).

39. Structural phase transition and material properties of few-layer monochalcogenides. M Mehboudi, BM Fregoso, Y Yang, W Zhu, A van der Zande, J Ferrer, L Bellaiche, P Kumar, S Barraza-Lopez. *Physical Review Letters* **117**, 246802 (2016).

38. Two-dimensional disorder in black phosphorus and monochalcogenide monolayers. M Mehboudi, AM Dorio, W Zhu, A van der Zande, H Churchill, A Pacheco-Sanjuan, E Harriss, P Kumar, S Barraza-Lopez. *Nano Letters* **16**, 1704 (2016). (Pioneering work on phase transitions in 2D materials.)

37. Discrete differential geometry and the properties of conformal two-dimensional materials. S Barraza-Lopez. *Synthetic Metals* **210**, 32 (2015).

36. Preserving the 7× 7 surface reconstruction of clean Si (111) by graphene adsorption. JC Koepke, JD Wood, CM Horvath, J Lyding, S Barraza-Lopez. *Applied Physics Letters* **107**, 071603 (2015).

35. Intrinsic defects, fluctuations of the local shape, and the photo-oxidation of black phosphorus. KL Utt, P Rivero, M Mehboudi, EO Harriss, MF Borunda, AA Pacheco SanJuan, S Barraza-Lopez. *ACS Central Science* **1**, 320 (2015).

34. Strain and the optoelectronic properties of nonplanar phosphorene monolayers. M Mehboudi, K Utt, H Terrones, EO Harriss, AAP SanJuan, S Barraza-Lopez. *Proceedings of the National Academy of Sciences* **112**, 5888 (2015).

33. Strain-tunable topological quantum phase transition in buckled honeycomb lattices. JA Yan, MAD Cruz, S Barraza-Lopez, L Yang. *Applied Physics Letters* **106**, 183107 (2015).

32. Systematic pseudopotentials from reference eigenvalue sets for DFT calculations: Pseudopotential files. P. Rivero, V. M. Garcia-Suarez, D. Pereniguez, K. Utt, Y. Yang, L. Bellaiche, K. Park, J. Ferrer, and S. Barraza-Lopez. *Data in Brief* 3, 21 (2015). (Open access article.)

31. Systematic pseudopotentials from reference eigenvalue sets for DFT calculations. P Rivero, VM García-Suárez, D Pereñiguez, K Utt, Y Yang, L Bellaiche, K Park, J Ferrer, S Barraza-Lopez. *Computational Materials Science* **98**, 372 (2015).

30. Anomalous charge and negative-charge-transfer insulating state in cuprate chain-compound $KCuO_2$. D. Choudhury, P. Rivero, D. Meyers, X. Liu, Y. Cao, S. Middey, MJ Whitaker, S Barraza-Lopez, JW Freeland, M Greenblatt, J Chakhalian. *Physical Review B* **92**, 201108(R) (2015).

29. Simulated scanning tunneling microscopy images of few-layer-phosphorus capped by graphene and hexagonal boron nitride monolayers. P Rivero, CM Horvath, Z Zhu, J Guan, D Tománek, S Barraza-Lopez. *Physical Review B* **91**, 115413 (2015).

28. Stability and properties of high-buckled two-dimensional tin and lead. P Rivero, JA Yan, VM García-Suárez, J Ferrer, S Barraza-Lopez. *Physical Review B* **90**, 241408 (2014).

27. Polarity compensation in ultra-thin films of complex oxides: The case of a perovskite nickelate. S Middey, P Rivero, D Meyers, M Kareev, X Liu, Y Cao, JW Freeland, S Barraza-Lopez, J Chakhalian. *Scientific Reports* **4**, 6819 (2014).

26. Graphene's morphology and electronic properties from discrete differential geometry. AAP Sanjuan, Z Wang, HP Imani, M Vanević, S Barraza-Lopez. *Physical Review B* **89**, 121403 (2014).

25. Quantitative chemistry and the discrete geometry of conformal atom-thin crystals. AAP Sanjuan, M Mehboudi, EO Harriss, H Terrones, S Barraza-Lopez. *ACS Nano* **8**, 1136 (2014).

24. Strain-engineering of graphene's electronic structure beyond continuum elasticity. S Barraza-Lopez, AAP Sanjuan, Z Wang, M Vanević. *Solid State Communications* **166**, 70 (2013).

23. Coherent electron transport through freestanding graphene junctions with metal contacts: a materials approach. S Barraza-Lopez. *Journal of Computational Electronics* **12**, 145 (2013).

22. Strain gauge fields for rippled graphene membranes under central mechanical load: An approach beyond first-order continuum elasticity. JV Sloan, AAP Sanjuan, Z Wang, C Horvath, S Barraza-Lopez. *Physical Review B* **87**, 155436 (2013).

21. Signatures of the semiconductor crystallographic orientation on the charge transport across non-epitaxial diodes. JJ Garramone, JR Abel, S Barraza-Lopez, VP LaBella. *Applied Physics Letters* **100**, 252102 (2012).

20. A pathway between Bernal and rhombohedral stacked graphene layers with scanning tunneling microscopy. P Xu, Y Yang, D Qi, SD Barber, ML Ackerman, JK Schoelz, TB Bothwell, S Barraza-Lopez, L Bellaiche, PM Thibado. *Applied Physics Letters* **100**, 201601 (2012).

19. Atomic control of strain in freestanding graphene. P Xu, Y Yang, SD Barber, ML Ackerman, JK Schoelz, D Qi, IA Kornev, L Dong, L Bellaiche, S Barraza-Lopez, PM Thibado. *Physical Review B* **85**, 121406(R) (2012).

18. Charge transport through graphene junctions with wetting metal leads. S Barraza-Lopez, M Kindermann, MY Chou. *Nano Letters* **12**, 3424 (2012).

17. Giant surface charge density of graphene resolved from scanning tunneling microscopy and first-principles theory. P Xu, Y Yang, SD Barber, ML Ackerman, JK Schoelz, IA Kornev, S Barraza-Lopez, L Bellaiche, PM Thibado. *Physical Review B* **84**, 161409 (2011).

16. Effects of electrostatic fields and charge doping on the linear bands in twisted graphene bilayers. L Xian, S Barraza-Lopez, MY Chou. *Physical Review B* **84**, 075425 (2011).

15. Separation-dependent electronic transparency of monolayer graphene membranes on III−V semiconductor substrates. K He, J Koepke, S Barraza-Lopez, J Lyding. *Nano Letters* **10**, 3446 (2010).

14. Effects of bonding type and interface geometry on coherent transport through the single-molecule magnet Mn_{12}. K Park, S Barraza-Lopez, VM García-Suárez, J Ferrer. *Physical Review B* **81**, 125447 (2010).

13. Effects of metallic contacts on electron transport through graphene. S Barraza-Lopez, M Vanević, M Kindermann, MY Chou. *Physical Review Letters* **104**, 076807 (2010).

12. Carbon nanotubes on partially depassivated n-doped Si (100)−(2×1): H substrates. S Barraza-Lopez, PM Albrecht, JW Lyding. *Physical Review B* **80**, 045415 (2009).

11. First-principles study of electron transport through the single-molecule magnet Mn_{12}. S Barraza-Lopez, K Park, V García-Suárez, J Ferrer. *Physical Review Letters* **102**, 246801 (2009).

10. Spin-filtering effect in the transport through a single-molecule magnet Mn12 bridged between metallic electrodes. S Barraza-Lopez, K Park, V García-Suárez, J Ferrer. *Journal of Applied Physics* **105**, 07E309 (2009).

9. The interaction between a monolayer of single-molecule magnets and a metal surface. S Barraza-Lopez, MC Avery, K Park. *Journal of Applied Physics* **103**, 07B907 (2008).

8. First-principles study of a single-molecule magnet Mn_{12} monolayer on the Au (111) surface. S Barraza-Lopez, MC Avery, K Park. *Physical Review B* **76**, 224413 (2007).

7. Preferential orientation of a chiral semiconducting carbon nanotube on the locally depassivated Si (100)-2×1: H surface identified by scanning tunneling microscopy. PM Albrecht, S Barraza-Lopez, JW Lyding. *Small* **3**, 1402 (2007).

6. High-visibility interferometric measurement of the diffraction phase. S Barraza-Lopez, DFV James, PG Kwiat. *Journal of the Optical Society of America A* **24**, 1148 (2007).

5. Scanning tunnelling spectroscopy and ab initio calculations of single-walled carbon nanotubes interfaced with highly doped hydrogen-passivated Si (100) substrates. PM Albrecht, S Barraza-Lopez, JW Lyding. *Nanotechnology* **18**, 095204 (2007).

4. Ab initio study of semiconducting carbon nanotubes adsorbed on the Si (100) surface: Diameter-and registration-dependent atomic configurations and electronic properties. S Barraza-Lopez, PM Albrecht, NA Romero, K Hess. *Journal of Applied Physics* **100**, 124304 (2006).

3. Local time dependent instruction-set model for the experiment of Pan et al. M Aschwanden, W Philipp, K Hess, S Barraza-Lopez, G Adenier. *AIP Conference Proceedings* **810**, 437 (2006).

2. Conductance modulation of metallic carbon nanotubes by remote charged rings. S Barraza-Lopez, SV Rotkin, Y Li, K Hess. *Europhysics Letters* **69**, 1003 (2005).

1. Experimental entanglement distillation and ‘hidden’ non-locality. PG Kwiat, S Barraza-Lopez, A Stefanov, N Gisin. *Nature* **409**, 1014 (2001).

SEMINARS AND PRESENTATIONS

a) As an organizer:

- APS 2023 March Meeting Focus Session 12.01.04 (2D Materials: Correlated States: Superconductivity, Ferroelectricity, Density Waves) with Kai Chang (Beijing) and Yang Liu (Columbia University).
- APS 2022 March Meeting Focus Session 12.01.01 (Growth and defects on 2D matertials) with Pengpeng Zhang (Michigan State) and Yeonwoong Jung (Central Florida).
- Co-organizer with María Vozmediano and Mikhail Katsnelson. CECAM Workshop in Graphene Strain Engineering. July, 2014.

I have given multiple contributed presentations for the APS March Meeting since 2003.

Invited presentations (27 from 2016 to date)

2024

27. Just received an invitation from Petro Maksymovych (ORNL) for an invited talk at EMA 2024: Basic Science and Electronics Division Meeting. February 13-16. Denver. CO.

2023

26. Ferroelectric and magnetoelectric multiferroic 2D materials. 10th international workshop on surfaces and interfaces of quantum materials. Institute of Physics. Beijing 06/07/2023. (I delivered a remote talk as I could not get a Chinese Visa.)

25. Surveying flatland from the Hill. Physics Colloquium. University of Arkansas. 04/07/2023.

24. Two dimensional ferroelectrics. Chemistry Seminar. Montana State University. 01/13/2023.

2022

23. Four-day (8-hour) workshop on quantum equations for single electrons at National Polytechnic Institute in Mexico City. It was attended by 25 students in person, and by about 10 students joining via Zoom. 10/24/2022 – 10/27/2022.

22. 2D Ferroelectrics and Antiferroelectrics: Nature of their Structural Transitions and Predicted Critical Temperature Trends. (Nano4Neuro Workshop 2022). Oak Ridge National Laboratory. 08/16/2022.

2021

21. Workshop on 2D materials. Catedra Mendez Docurro. Instituto Politecnico Nacional. A five-day two-hour/day workshop on 2D materials, delivered at my Undergraduate *Alma Mater*. November, 2021.

20. 2D Ferroelectrics. Graphene21 Conference, Grenoble (France). October 2021.

19. Engineering static topological vortices on 2D ferroelectrics. DOE Biannual Theory Meeting, US Department of Energy, Zoom. 10/262021.

18. Propiedades del primer modelo de aislantes topológicos cristalinos. Seminario Sotero Prieto. Instituto de Física. Universidad Nacional Autónoma de México. Virtual. 05/12/2021.

17. Atomically thin ferroelectric membranes. Physics Colloquium. South Dakota School of Mines. Virtual. 04/26/2021.

2020

16. Membranas ferroeléctricas de espesor atómico. Instituto de Ciencias Físicas, UNAM. Virtual. 11/18/2020.

15. How good is DFT in determining structural properties of 2D ferroelectrics? 60th Sanibel Symposium. Saint Simons Island, Florida. 02/22/2020.

2019

14. Thermally-driven two-dimensional structural transitions in 2D materials. Colloquium. Department of Mathematics. University of Arkansas. 11/20/2019.

13. Thermally-driven two-dimensional structural transitions in 2D materials. Frontiers in Theory and Simulations of Two-dimensional Materials. Telluride Science Research Center. Telluride, Colorado. 06/18/2019.

2018

12. Two-dimensional structural phase transitions in 2D non-graphene materials. XXVII International Materials Research Congress. Cancun, Mexico. 08/23/2018.

11. 2D materials with structural degeneracies and thermally-driven 2D structural phase transitions. Colloquium. Department of Physics. Ohio University. 02/3/2018.

2017

10. 2D materials with structural degeneracies and thermally-driven 2D structural phase transitions. Colloquium. Max Planck Institute for Microstructure Physics. Halle, Germany. 12/18/2017.

9. 2D materials with structural degeneracies and thermally-driven 2D structural phase transitions. 6th International Meeting on Silicene. Soleil Syncrotron. Orsay, France. 12/14/2017.

8. 2D materials with structural degeneracies and thermally-driven 2D structural phase transitions. Colloquium. Physics Department. Kent State University. 11/17/2017.

7. An overview of 2D materials with structural degeneracies (and potential consequences on 2D phase transitions and finite-temperature behavior). Colloquium. Physics Department. University of Central Florida. 11/03/2017

6. An overview of 2D materials with structural degeneracies (and potential consequences on 2D phase transitions and finite-temperature behavior). Workshop of Transport at the Nanoscale. Instituto de Ciencias Físicas. National Autonomous University of Mexico. Cuernavaca, Mexico. 09/25/2017.

2016

5. Towards phase-change two-dimensional atomic materials. Workshop in 2D and Dirac materials. University of North Florida. 12/14/2016.

4. Finite-temperature structural phase transitions in 2D materials beyond graphene. Physics Colloquium. University of Arkansas. 11/11/2016.

3. Transiciones de fase en materiales atómicos bidimensionales Instituto de Física. National Autonomous University of Mexico (Mexico City). 10/16/2016.

2. Transiciones de fase en materiales atómicos bidimensionales. Instituto Politécnico Nacional (Mexico City). 10/14/2016.

1. Layered group-IV monochalcogenides: A playground for phase transitions and tunable material properties in 2D. Oak Ridge National Laboratory. 08/16/2016.

COURSES GIVEN (2011 TO DATE)

Instruction in Quantum Mechanics, Condensed Matter Physics, Analytical Mechanics, Modern Physics, and University Physics.

Spring 2024

PHYS 6713-001. Graduate Level Condensed Matter Physics II (based on 2D materials)

Fall 2023

PHYS 5713-001. Graduate Level Condensed Matter Physics I (based on 2D materials)

Spring 2023

PHYS 4991-001. Physics Senior Seminar

PHYS 5111-001. Research Lab Rotation

Fall 2022

PHYS 2074-001. University Physics II (Electromagnetism)

Over 260 enrolled students

Spring 2022

PHYS 6713-001. Graduate Level Condensed Matter Physics II (based on 2D materials)

Fall 2021

PHYS 5713-001. Graduate Level Condensed Matter Physics I (based on 2D materials)

Spring 2021

PHYS 5423-001. Graduate Level Quantum Mechanics II

Fall 2020

PHYS 5713-001. Graduate Level Condensed Matter Physics I (based on 2D materials)

Spring 2020

PHYS 2074-001. University Physics II (Electromagnetism)

Over 360 enrolled students

Managed online transition due to COVID

Fall 2019

PHYS 588V-001. 2D Materials (Graduate level course)

No teaching load in Fall 2018 and Spring 2019 due to Sabbatical leave

Spring 2018

PHYS 306V – 022. Projects (Irregular) – Applied Quantum Mechanics

Fall 2017

PHYS 502V 001 2D materials

PHYS 5713 001 Condensed Matter Physics I

Spring 2017

PHYS 3613-001. Modern Physics

Fall 2016

PHYS 502V-001. 2D Materials (Graduate level course)

Spring 2016

PHYS 3613-001. Modern Physics

Fall 2015

PHYS 3113-001. Analytical Mechanics

Spring 2015

PHYS 3613-001. Modern Physics

Spring 2014

PHYS 4713-001. Solid State Physics

Fall 2013

PHYS 588V-002. Special Topics

Spring 2013

PHYS 5423-001. Graduate Level Quantum Mechanics II

Fall 2012

PHYS 5413-001, Graduate Level Quantum Mechanics I

Spring 2012

PHYS 5423-001. Graduate Level Quantum Mechanics II

Fall 2011

PHYS 5413-001, Graduate Level Quantum Mechanics I

SERVICE

To Physics Department

- Theory Lead. MonArk NSF Quantum Foundry (2021-)
- Committee Member, ECE/Physics Search Committee. (November 1, 2020 - April 30, 2021).
- 2020. Personnel Committee Member: Reading annual reviews, and providing recommendations concerning research, education, and service output from Physics Faculty peers.
- 2020 - . Recruiting graduate students from my Undergraduate Alma Mater (Instituto Politecnico Nacional) in Mexico City in Fall 2020, 2021, and 2022. Gustavo Orozco-Galvan and Luis Enrique Rosas came to Fayetteville because of those dedicated efforts.
- 2017 - 2020. Chair. Undergraduate Affairs Committee.
- In charge of 2017-2018 Physics colloquia.
- 2011 - 2014. Personnel Committee Member.

To the University of Arkansas

- 2016 to date: Part of a group reaching out to Marshallese within NWA for enrollment and follow-through at the UofA. This effort includes Admissions, the Honors College, and the Multicultural Center.
- 2020: Scholarship reviewer for 17 UA scholarships.
- 2017-2019: — I am an advisory committee member at the local High-Performance Computing center, which meets about once a month.
- Member, Institute for Nanoscience and Engineering. (2011 - Present).

To Funding Agencies

Grant Reviewer for The National Science Foundation, US Department of Energy, ACS (Petroleum Research Fund), and for international funding agencies such as DFG (German Research Foundation) and CONICYT (Chilean Research Foundation).

I reviewed grants geared to supercomputer allocations for (i) XSEDE at NSF, which met quarterly to allocate computer resources from NSF-funded supercomputers; for (ii) PRAC at NSF, which awarded allocations on the 340,000-processor Blue Waters Supercomputer based at UIUC, and also reviewed applications for (iii) supercomputing resources at Argonne National Laboratory.

Other service:

2020. External Ethics Committee of ICN2 (Institución Catalana de Nanociencia y Nanotecnología), Barcelona. Responsibilities/Brief Description: an ethics inquire about the professional behavior of a colleague at ICN2 was opened, and I had to provide input concerning lack of credit on prior work.

Reviewer for over 20 Journals: I review articles for multiple journals (about 30 per year); this is an incomplete list: Science Advances, Physical Review Letters, Physical Review B, Physical Review Materials, Physical Review Applied, Applied Physics Letters, Journal of Applied Physics, 2D Materials, Journal of Physics: Condensed Matter, New Journal of Physics, Solid State Communications, Europhysics Letters, Annalen der Physik, ACS Central Science, ACS Nano, Nano Letters, ACS Applied Materials and Interfaces, Journal of Physical Chemistry Letters, Advanced Materials, Nanoscale, Carbon, and others.

About 30 papers reviewed per year.