

# Ryan Comes

Associate Professor of Materials Science and Engineering, University of Delaware

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## I. Education

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Aug 2008 – May 2013 | **University of Virginia**  
*PhD, Engineering Physics*

- *Dissertation:* "Self-Assembled Epitaxial Multiferroic Oxide Nanostructures Grown by Pulsed Electron Deposition"
- *Advisor:* Prof. Stuart Wolf

Aug 2004 – May 2008 | **Carnegie Mellon University**  
*BS, Physics; BS, Electrical and Computer Engineering*

## 2. Work Experience

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Aug 2024 - Present | **University of Delaware**  
*Department of Materials Science and Engineering*

- Associate Professor, 2024-Present

Aug 2016 - Aug 2024 | **Auburn University**  
*Department of Physics*

- Thomas and Jean Walter Associate Professor, 2022-2024
- Assistant Professor, 2016-2022; Thomas and Jean Walter Assistant Prof., 2020-2022

Jul 2013 - Jul 2016 | **Pacific Northwest National Laboratory**  
*Physical and Computational Sciences Directorate, Linus Pauling Distinguished Postdoctoral Fellow*

- *Mentor:* Dr. Scott Chambers

### 3. Teaching Experience

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Aug 2016 - Aug 2024	<b>Auburn University, Department of Physics</b> <i>Courses Taught</i> <ul style="list-style-type: none"><li>• Physics 2 for Engineers and Honors Physics 2 (Introductory Level)</li><li>• Physics of the World Around Us: Energy Sources and Storage (Intermediate Level)</li><li>• Quantum Mechanics (Senior Level)</li><li>• Solid State Physics (Graduate Level)</li><li>• Group Theory for Solid State Physics (Graduate Level)</li></ul>
Aug 2012 - Dec 2012	<b>University of Virginia, School of Engineering and Applied Science Graduate Teaching Fellow</b> <i>Course Taught</i> <ul style="list-style-type: none"><li>• Introductory Calculus for Engineers (Co-Instructor)</li></ul>

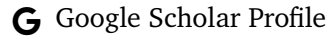
### 4. Research Grants Awarded

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Total Value: \$3.3 million; As PI: \$2.7 million; To Comes' Group: \$2.1 million

2023	<ul style="list-style-type: none"><li>• Wencan Jin (PI) and <b>Ryan Comes</b>. "Studying magnetoelectric coupling in van der Waals/oxide thin film heterostructures" <i>Department of Defense, Air Force Office of Scientific Research, Condensed Matter Physics</i>. August 1, 2023-July 31, 2026. \$598,311.</li></ul>
2022	<ul style="list-style-type: none"><li>• <b>Ryan Comes</b> (PI) and Wencan Jin. "In Situ Studies of Charge Transfer Phenomena in Complex Oxide Heterostructures" <i>Department of Energy, Basic Energy Sciences, Synthesis and Processing Science</i>. October 1, 2022-September 30, 2025. \$749,728.</li></ul>
2021	<ul style="list-style-type: none"><li>• <b>Ryan Comes</b>. "CAREER: Topological Phenomena in 4d and 5d Complex Oxide Interfaces and Superlattices Grown by Hybrid Molecular Beam Epitaxy." <i>National Science Foundation, Division of Materials Research, Ceramics</i>. May 1, 2021-April 30, 2026. \$651,110.</li></ul>
2020	<ul style="list-style-type: none"><li>• <b>Ryan Comes</b> (PI), Majid Beidaghi, Byron Farnum, Masoud Mahjouri-Samani, and Tae-Sik Oh. "MRI: Acquisition of a X-Ray Diffraction System for Materials Research in Alabama." <i>National Science Foundation, Major Research Instrumentation program</i>. August 1, 2020-July 31, 2023. \$280,487.</li><li>• <b>Ryan Comes</b>. "Metastable Oxides for High-Mobility and Spin-Orbit 2D Electronics." <i>Air Force Office of Scientific Research, Young Investigator Program, GHz and THz Electronics</i>. January 1, 2020-December 31, 2023. \$448,790.</li></ul>
2018	<ul style="list-style-type: none"><li>• <b>Ryan Comes</b> (PI) and Byron Farnum. "Exploration of Electronic and Catalytic Behavior in Epitaxial Complex Oxide Films and Nanocomposites." <i>National Science Foundation, Division of Materials Research, Solid State and Materials Chemistry</i>. July 1, 2018-June 30, 2022. \$531,981.</li></ul>

## 5. Publications



\* indicates equal contributions † indicates corresponding author(s)

*Italic/bold text* indicates a member of Films, Interfaces, and Nanostructures of Oxides Lab

- Pending
53. **Gemperline, P. T.**, Tang, C., Thind, A., Sterbinsky, G., Klie, R., Kiefer, B., Jin, W. & **Comes, R. B.**<sup>†</sup>. Epitaxial Strain Effects in SrHfO<sub>3</sub> Films Grown by Hybrid Molecular Beam Epitaxy. *In preparation* (o).
  52. **Ramkorun, B.**<sup>†</sup>, Chandrasekhar, G., Rangari, V., Thakur, S. C., **Comes, R. B.** & Thomas Jr., E. Comparing growth of titania and carbonaceous dusty nanoparticles in weakly magnetised capacitively coupled plasmas. *Submitted for publication*. eprint: <https://arxiv.org/abs/2402.00951> (o).
- 2024
51. **Rimal, G.**<sup>†</sup>, **Tasnim, T.**, Ortiz, G. C., Sterbinsky, G., Hwang, J. & **Comes, R. B.**<sup>†</sup>. Strain-dependent Insulating State and Kondo Effect in Epitaxial SrIrO<sub>3</sub> Films. *Physical Review Materials* **8**, L071201. doi:10.1103/PhysRevMaterials.8.L071201 (July 2024).
  50. **Rimal, G.** & **Comes, R. B.**<sup>†</sup>. Advances in Complex Oxide Quantum Materials Through New Approaches to Molecular Beam Epitaxy (Invited Review). *Journal of Physics D: Applied Physics* **57**, 193001. doi:10.1088/1361-6463/ad2569 (May 2024).
  49. **Ramkorun, B.**, Jain, S., Taba, A., Mahjouri-Samani, M., Miller, M. E., Thakur, S. C., Thomas Jr., E. & **Comes, R. B.**<sup>†</sup>. Introducing dusty plasma particle growth of nanospherical titanium dioxide. *Applied Physics Letters* **124**, 144102. doi:10.1063/5.0186797 (Apr. 2024).
  48. Mahatara, S., **Comes, R. B.** & Kiefer, B.<sup>†</sup>. Enhanced Carrier Densities in Two-Dimensional Electron Gas Formed at BaSnO<sub>3</sub>/SrTaO<sub>3</sub> and SrSnO<sub>3</sub>/SrTaO<sub>3</sub> Interfaces. *Journal of Physics: Condensed Matter* **36**, 145001. doi:10.1088/1361-648X/ad17f8 (Apr. 2024).
- 2023
47. **Paudel, R.**, Burton, A. R., Kuroda, M. A., Farnum, B. H. & **Comes, R. B.**<sup>†</sup>. Band-Engineered LaFeO<sub>3</sub>-LaNiO<sub>3</sub> Thin Film Interfaces for Electrocatalysis of Water. *Journal of Vacuum Science and Technology A* **41**, 063207. doi:10.1116/6.0002987 (Dec. 2023).
  46. **Blanchet, M. D.**, Matthews, B. E., Spurgeon, S. R., Heald, S. M., Isaacs-Smith, T. & **Comes, R. B.**<sup>†</sup>. Jahn-Teller-driven Phase Segregation in Mn<sub>x</sub>Co<sub>3-x</sub>O<sub>4</sub> Spinel Thin Films. *Journal of Vacuum Science and Technology A* **41**, 052703. doi:10.1116/6.0002329 (Sept. 2023).
  45. Budhathoki, S., Rai, A., Law, K. M., Nahar, R., Stewart, A., Ranjit, S., KC, S., Isaacs-Smith, T., Bikmukhametov, I., **Comes, R. B.**, Thompson, G. B., LeClair, P., Mewes, T. & Hauser, A. J.<sup>†</sup>. Co<sub>2</sub>Fe(Ti<sub>0.5</sub>Al<sub>0.5</sub>) epitaxial thin films: Structural and magnetic properties of a Heusler alloy with Z-site transition metal Ti substitution. *Journal of Magnetism and Magnetic Materials* **582**, 170946. doi:10.1016/j.jmmm.2023.170946 (Sept. 2023).
  44. Nair, S., Yang, Z., Lee, D., Guo, S., Sadowski, J., Johnson, S., Saboor, A., **Comes, R. B.**, Jin, W., Mkhoyan, K. A., Janotti, A. & Jalan, B.<sup>†</sup>. Engineering Metal Oxidation using Epitaxial Strain. *Nature Nanotechnology* **18**, 1005–1011. doi:10.1038/s41565-023-01397-0 (Sept. 2023).

- 2022 43. Sardar, A., Isaacs-Smith, T., Lawson, J., Asel, T., **Comes, R. B.**, Merrett, J. N. & Dhar, S.<sup>†</sup>. High conductivity  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> formed by hot ion implantation. *Applied Physics Letters* **121**, 262101. doi:10.1063/5.0127457 (Dec. 2022).
42. Chown, A., Yeasmin, H., **Paudel, R.**, **Comes, R. B.** & Farnum, B. H.<sup>†</sup>. Lithium Dependent Electrochemistry of p-Type Nanocrystalline CuCrO<sub>2</sub> Films. *ChemElectroChem* **9**, e202200825. doi:10.1002/celec.202200825 (Dec. 2022).
41. Mahatara, S.\* , **Thapa, S.\*** , Paik, H., **Comes, R. B.<sup>†</sup>** & Kiefer, B.<sup>†</sup>. High Mobility Two-Dimensional Electron Gas at the BaSnO<sub>3</sub>/SrNbO<sub>3</sub> Interface. *ACS Applied Materials and Interfaces* **14**, 45025–45031. doi:10.1021/acsami.2c12195 (Oct. 2022).
40. **Thapa, S.**, **Provence, S. R.**, **Gemperline, P. T.**, **Battles, S.**, Heald, S. M., Kuroda, M. A. & **Comes, R. B.<sup>†</sup>**. Surface Stability of SrNbO<sub>3+δ</sub> Thin Films Grown by Hybrid Molecular Beam Epitaxy. *APL Materials* **10**, 091112. doi:10.1063/5.0097699 (Sept. 2022).
39. Bredar, A. R.\* , **Blanchet, M. D.\*** , Burton, A. R., Matthews, B. E., Spurgeon, S. R., **Comes, R. B.<sup>†</sup>** & Farnum, B. H.<sup>†</sup>. Oxygen Reduction Electrocatalysis with Epitaxially Grown Spinel MnFe<sub>2</sub>O<sub>4</sub> and Fe<sub>3</sub>O<sub>4</sub>. *ACS Catalysis* **12**, 3577–3588. doi:10.1021/acscatal.1c05172 (Mar. 2022).
38. Burton, A. R.\* , **Paudel, R.\*** , Matthews, B., Sassi, M., Spurgeon, S. R., Farnum, B. H. & **Comes, R. B.** Thickness Dependent OER Electrocatalysis of Epitaxial LaFeO<sub>3</sub> Thin Films. *Journal of Materials Chemistry A*. doi:10.1039/D1TA07142D (Jan. 2022).
37. Suyolcu, E., Christiani, G., **Gemperline, P. T.**, **Provence, S. R.**, Bussmann-Holder, A., **Comes, R. B.**, van Aken, P. A. & Logvenov, G.<sup>†</sup>. Engineering ordered arrangements of oxygen vacancies at the surface of superconducting La<sub>2</sub>CuO<sub>4</sub> thin films. *Journal of Vacuum Science and Technology A* **40**, 013214. doi:10.1116/6.0001473 (Jan. 2022).
- 2021 36. Lapano, J., Pai, Y.-Y., Mazza, A., Zhang, J., Isaacs-Smith, T., **Gemperline, P.**, Zhang, L., Li, H., Lee, H. N., Miao, H., Eres, G., Yoon, M., **Comes, R. B.**, Ward, T. Z., Lawrie, B. J., McGuire, M., Moore, R. G., Nelson, C. T., May, A. & Brahlek, M.<sup>†</sup>. Self-regulated growth of candidate topological superconducting parkerite by molecular beam epitaxy. *APL Materials* **9**, 101110. doi:10.1063/5.0064746 (Oct. 2021).
35. **Thapa, S.**, **Provence, S. R.**, Jessup, D., Lapano, J., Brahlek, M., Sadowski, J. T., Reinke, P., Jin, W. & **Comes, R. B.<sup>†</sup>**. Correlating surface stoichiometry and termination in SrTiO<sub>3</sub> films grown by hybrid molecular beam epitaxy. *Journal of Vacuum Science & Technology A* **39**, 053203. doi:10.1116/6.0001159 (Sept. 2021).
34. Kaspar, T. C.<sup>†</sup>, Spurgeon, S. R., Matthews, B. E., Bowden, M., Heald, S. M., Wang, L., Kelley, R., **Paudel, R.**, Isaacs-Smith, T., **Comes, R. B.**, Yin, X., Tang, C. S., Wee, A. T. & Chambers, S. A. Incorporation of Ti in epitaxial Fe<sub>2</sub>TiO<sub>4</sub> thin films. *Journal of Physics: Condensed Matter* **31**, 314004. doi:10.1088/1361-648X/ac0571 (June 2021).
33. Blanchet, M. D., Heath, J. J., Kaspar, T. C., Matthews, B. E., Spurgeon, S. R., Bowden, M. E., Heald, S. M., Isaacs-Smith, T., Kuroda, M. A. & **Comes, R. B.<sup>†</sup>**. Electronic and structural properties of single-crystal Jahn–Teller active Co<sub>1+x</sub>Mn<sub>2-x</sub>O<sub>4</sub> thin films. *Journal of Physics: Condensed Matter* **33**, 124002. doi:10.1088/1361-648X/abd573 (Jan. 2021).
32. **Thapa, S.\*** , **Paudel, R.\*** , **Blanchet, M. D.\*** , **Gemperline, P. T.\*** & **Comes, R. B.<sup>†</sup>**. Probing surfaces and interfaces in complex oxide films via in situ X-ray photoelectron spectroscopy (Invited Review). *Journal of Materials Research* **36**, 26–51. doi:10.1557/s43578-020-00070-9 (Jan. 2021).

- 2020 | 31. **Provence, S. R.<sup>†</sup>, Thapa, S., Paudel, R.,** Truttmann, T., Prakash, A., Jalan, B. & **Comes, R. B.<sup>†</sup>**. Machine Learning Analysis of Perovskite Oxides Grown by Molecular Beam Epitaxy. *Physical Review Materials* **4**, 083807. doi:10.1103/PhysRevMaterials.4.083807 (Aug. 2020).
- 2019 | 30. Wang, Y., Zhang, J., Ni, Y., Chen, X., Mescall, R., Isaacs-Smith, T., **Comes, R. B.**, Kittiwatanakul, S., Wolf, S. A., Lu, J.<sup>†</sup> & Liu, M. Structural, transport, and ultrafast dynamic properties of  $V_{1-x}Nb_xO_2$  thin films. *Physical Review B* **99**, 245129. doi:10.1103/PhysRevB.99.245129 (June 2019).
29. Kaspar, T. C.<sup>†</sup>, Sushko, P. V., Spurgeon, S. R., Bowden, M. E., Keavney, D. J., **Comes, R. B.**, Saremi, S., Martin, L. & Chambers, S. A. Electronic Structure and Band Alignment of  $LaMnO_3/SrTiO_3$  Polar/Nonpolar Heterojunctions. *Advanced Materials Interfaces* **6**, 1801428. doi:10.1002/admi.201801428 (Jan. 2019).
- 2018 | 28. Bredar, A. R., **Blanchet, M. D., Comes, R. B.** & Farnum, B. H.<sup>†</sup>. Evidence and influence of copper vacancies in p-type  $CuGaO_2$  mesoporous films. *ACS Applied Energy Materials* **2**, 19–28. doi:10.1021/acsaem.8b01558 (Dec. 2018).
27. Lin, S.-C.<sup>†</sup>, Kuo, C.-T., **Comes, R. B.**, Rault, J. E., Rueff, J.-P., Nemšák, S., Taleb, A., Kortright, J. B., Meyer-Ilse, J., Gullikson, E., Sushko, P. V., Spurgeon, S. R., Gehlmann, M., Bowden, M. E., Plucinski, L., Chambers, S. A. & Fadley, C. S.<sup>†</sup>. Interface properties and built-in potential profile of a  $LaCrO_3/SrTiO_3$  superlattice determined by standing-wave excited photoemission spectroscopy. *Physical Review B* **98**, 165124. doi:10.1103/PhysRevB.98.165124 (Oct. 2018).
26. Kaspar, T. C.<sup>†</sup>, Hong, S., Bowden, M. E., Varga, T., Yan, P., Wang, C., Spurgeon, S. R., **Comes, R. B.**, Ramuhalli, P. & Henager, C. H. Tuning piezoelectric properties through epitaxy of  $La_2Ti_2O_7$  and related thin films. *Scientific reports* **8**, 1–11. doi:10.1038/s41598-018-21009-5 (Feb. 2018).
- 2017 | 25. Spurgeon, S. R., Sushko, P. V., **Comes, R. B.** & Chambers, S. A.<sup>†</sup>. Dynamic Interface Rearrangement in  $LaFeO_3/n SrTiO_3$  Heterojunctions. *Physical Review Materials* **1**, 063401. doi:10.1103/PhysRevMaterials.1.063401 (Nov. 2017).
24. **Comes, R. B.<sup>†</sup>**, Perea, D. E. & Spurgeon, S. R. Heterogeneous Two-Phase Pillars in Epitaxial  $NiFe_2O_4-LaFeO_3$  Nanocomposites. *Advanced Materials Interfaces* **4**, 1700396. doi:10.1002/admi.201700396 (Aug. 2017).
23. Stoerzinger, K. A.<sup>†</sup>, **Comes, R. B.**, Spurgeon, S. R., Thevuthasan, S., Ihm, K., Crumlin, E. J. & Chambers, S. A.<sup>†</sup>. Influence of  $LaFeO_3$  Surface Termination on Water Reactivity. *Journal of Physical Chemistry Letters* **8**, 1038–1043. doi:10.1021/acs.jpcllett.7b00195 (Mar. 2017).
22. Chambers, S. A.<sup>†</sup>, Du, Y., **Comes, R. B.**, Spurgeon, S. R. & Sushko, P. V. The effects of core-level broadening in determining band alignment at the epitaxial  $SrTiO_3(001)/p-Ge(001)$  heterojunction. *Applied Physics Letters* **110**, 082104. doi:10.1063/1.4977422 (Feb. 2017).
21. **Comes, R. B.<sup>\*†</sup>**, Spurgeon, S. R.<sup>\*</sup>, Kepaptsoglou, D. M., Engelhard, M. H., Perea, D. E., Kaspar, T. C., Ramasse, Q. M., Sushko, P. V. & Chambers, S. A.<sup>†</sup>. Probing the Origin of Interfacial Carriers in  $SrTiO_3-LaCrO_3$  Superlattices. *Chemistry of Materials* **29**, 1147. doi:10.1021/acs.chemmater.6b04329 (Feb. 2017).

- 2016 | 20. **Comes, R. B.<sup>†</sup>** & Chambers, S. A.<sup>†</sup>. Interface Structure, Band Alignment, and Built-In Potentials at LaFeO<sub>3</sub>/n-SrTiO<sub>3</sub> Heterojunctions. *Physical Review Letters* **117**, 226802. doi:10.1103/PhysRevLett.117.226802 (Nov. 2016).
19. Xu, P., Ayino, Y., Cheng, C., Pribiag, V. S., **Comes, R. B.**, Sushko, P. V., Chambers, S. A. & Jalan, B.<sup>†</sup>. Predictive control over charge density in the two-dimensional electron gas at the polar-nonpolar NdTiO<sub>3</sub>/SrTiO<sub>3</sub> interface. *Physical Review Letters* **117**, 106803 (Sept. 2016).
18. **Comes, R. B.<sup>†</sup>**, Spurgeon, S. R., Heald, S. M., Kepaptsoglou, D. M., Jones, L., Ong, P. V., Bowden, M. E., Ramasse, Q. M., Sushko, P. V. & Chambers, S. A.<sup>†</sup>. Interface-induced Polarization in SrTiO<sub>3</sub>-LaCrO<sub>3</sub> Superlattices. *Advanced Materials Interfaces* **3**, 1500779. doi:10.1002/admi.201500779 (May 2016).
17. **Comes, R. B.<sup>†</sup>**, Kaspar, T. C., Heald, S. M., Bowden, M. E. & Chambers, S. A.<sup>†</sup>. Infrared Optical Absorption in Low-spin Fe<sup>2+</sup>-doped SrTiO<sub>3</sub>. *Journal of Physics: Condensed Matter* **28**, 035901. doi:10.1088/0953-8984/28/3/035901 (Jan. 2016).
16. Li, X., Ma, C. T., Lu, J., Devaraj, A., Spurgeon, S. R., **Comes, R. B.** & Poon, S. J.<sup>†</sup>. Exchange Bias and Bistable Magneto-Resistance States in Amorphous TbFeCo thin Films. *Applied Physics Letters* **108**, 012401. doi:10.1063/1.4939240 (Jan. 2016).
15. Wang, Y.<sup>†</sup>, **Comes, R. B.**, Wolf, S. A. & Lu, J. Threshold switching characteristics of Nb/NbO<sub>2</sub>/TiN vertical devices. *IEEE Journal of the Electron Devices Society* **4**, 11–14. doi:10.1109/JEDS.2015.2503922 (Jan. 2016).
- 2015 | 14. **Comes, R. B.<sup>†</sup>**, Xu, P., Jalan, B. & Chambers, S. A.<sup>†</sup>. Band alignment of epitaxial SrTiO<sub>3</sub> thin films with (LaAlO<sub>3</sub>)<sub>0.3</sub>-(Sr<sub>2</sub>AlTaO<sub>6</sub>)<sub>0.7</sub> (001). *Applied Physics Letters* **107**, 131601. doi:10.1063/1.4932063 (Sept. 2015).
13. **Comes, R. B.<sup>†</sup>**, Smolin, S. Y., Kaspar, T. C., Gao, R., Apgar, B. A., Martin, L. W., Bowden, M. E., Baxter, J. B. & Chambers, S. A.<sup>†</sup>. Visible light carrier generation in co-doped epitaxial titanate films. *Applied Physics Letters* **106**, 092901. doi:10.1063/1.4913930 (Mar. 2015).
12. **Comes, R. B.<sup>†</sup>**, Siebein, K., Lu, J. & Wolf, S. A.<sup>†</sup>. Microstructural Effects of Chemical Island Templating in Patterned Matrix-Pillar Oxide Nanocomposites. *CrystEngComm* **17**, 2041–2049. doi:10.1039/C5CE00025D (Mar. 2015).
11. Wang, Y.<sup>†</sup>, **Comes, R. B.**, Kittiwatanakul, S., Wolf, S. A. & Lu, J. Epitaxial niobium dioxide thin films by reactive-biased target ion beam deposition. *Journal of Vacuum Science & Technology A* **33**, 021516. doi:10.1116/1.4906143 (Mar. 2015).
10. Steiner, M. A.<sup>†</sup>, **Comes, R. B.**, Floro, J. A., Soffa, W. A. & Fitz-Gerald, J. M. LI<sup>†</sup> ordering: Evidence of LI<sub>0</sub>-LI<sub>2</sub> hybridization in strained Fe<sub>38.5</sub>Pd<sub>61.5</sub> epitaxial films. *Acta Materialia* **85**, 261–269. doi:10.1016/j.actamat.2014.11.036 (Feb. 2015).
- 2014 | 9. **Comes, R. B.<sup>†</sup>**, Sushko, P. V., Heald, S. M., Colby, R. J., Bowden, M. E. & Chambers, S. A.<sup>†</sup>. Band-Gap Reduction and Dopant Interaction in Epitaxial La,Cr Co-doped SrTiO<sub>3</sub> Thin Films. *Chemistry of Materials* **26**, 7073–7082. doi:10.1021/cm503541u (Dec. 2014).

- 2013
8. Steiner, M. A., **Comes, R. B.**, Floro, J. A., Soffa, W. A., Fitz-Gerald, J. M.<sup>†</sup> & Smentkowski, V. S. Strain induced microstructural and ordering behaviors of epitaxial Fe<sub>38.5</sub>Pd<sub>61.5</sub> films grown by pulsed laser deposition. *Journal of Vacuum Science & Technology A* **31**, 050824. doi:10.1116/1.4819376 (Aug. 2013).
  7. Liu, H., **Comes, R. B.**, Pei, Y., Lu, J. & Wolf, S. A. Structural, magnetic, and nanoscale switching properties of BiFeO<sub>3</sub> thin films grown by pulsed electron deposition. *Journal of Vacuum Science & Technology B* **31**, 032801. doi:10.1116/1.4802924 (May 2013).
  6. **Comes, R. B.**<sup>†</sup>, Gu, M., Khokhlov, M., Liu, H., Lu, J. & Wolf, S. A. Electron molecular beam epitaxy: Layer-by-layer growth of complex oxides via pulsed electron-beam deposition. *Journal of Applied Physics* **113**, 023303. doi:10.1063/1.4774238 (Jan. 2013).
- 2012
5. **Comes, R. B.**<sup>†</sup>, Liu, H., Khokhlov, M., Kasica, R., Lu, J. & Wolf, S. A. Directed self-assembly of epitaxial CoFe<sub>2</sub>O<sub>4</sub>-BiFeO<sub>3</sub> multiferroic nanocomposites. *Nano Letters* **12**, 2367–2373. doi:10.1021/nl3003396 (May 2012).
  4. **Comes, R. B.**<sup>†</sup>, Khokhlov, M., Liu, H., Lu, J. & Wolf, S. A. Magnetic anisotropy in composite CoFe<sub>2</sub>O<sub>4</sub>-BiFeO<sub>3</sub> ultrathin films grown by pulsed-electron deposition. *Journal of Applied Physics* **111**, 07D914. doi:10.1063/1.3676413 (Apr. 2012).
  3. **Comes, R. B.**<sup>†</sup>, Gu, M., Khokhlov, M., Lu, J. & Wolf, S. A. Microstructural and domain effects in epitaxial CoFe<sub>2</sub>O<sub>4</sub> films on MgO with perpendicular magnetic anisotropy. *Journal of Magnetism and Magnetic Materials* **324**, 524–527. doi:10.1016/j.jmmm.2011.08.033 (Feb. 2012).
- 2010
2. **Comes, R. B.**, Terrell, E. J. & Higgs, C. F.<sup>†</sup>. Pad Deflection-Based Model of Chemical–Mechanical Polishing for Use in CAD IC Layout. *IEEE Transactions on Semiconductor Manufacturing* **23**, 121–131. doi:10.1109/TSM.2009.2039182 (Feb. 2010).
  1. Terrell, E. J., **Comes, R. B.** & Higgs, C. F.<sup>†</sup>. Analysis of feature-scale wear in chemical mechanical polishing: modeling and experiments. *Tribology Letters* **37**, 327–336. doi:10.1007/s11249-009-9524-5 (Feb. 2010).

## 6. Invited Conference Presentations

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| 2024 | 11. <i>Emergent Properties in SrIrO<sub>3</sub> Heterostructures Grown by Metalorganic MBE</i> , MRS Spring Meeting 2024. Apr. 2024.   |
|      | 10. <i>Charge Transfer and Electronic Transport in SrIrO<sub>3</sub> Heterostructures Grown by Metalorganic MBE</i> , American Physical Society March Meeting 2024. Mar. 2024.                                 |
| 2023 | 9. <i>Interfacial Phenomena in 4d and 5d Transition Metal Oxides Grown by Metal-organic MBE</i> , 37th North American Conference on Molecular Beam Epitaxy, Workshop on Quantum Materials Epitaxy. Sept. 2023. |
|      | 8. <i>In Situ Studies of Charge Transfer Phenomena in Complex Oxide Heterostructures</i> , 2023 Synthesis and Processing Science Principal Investigators' Meeting. July 2023.                                  |
|      | 7. <i>Hybrid MBE Growth of Metastable SrNbO<sub>3</sub> for High Mobility 2DEGs</i> , Fusion Conference, 5th Functional Oxide Thin Films for Advanced Energy and Information Technology Conference. Feb. 2023. |
| 2022 | 6. <i>Engineering Metastable 4d and 5d Complex Oxide Films for Emergent Interfacial Phenomena by Hybrid Molecular Beam Epitaxy</i> , ACERS Electronic Materials and Applications. Jan. 2022.                   |
| 2020 | 5. <i>Structural and Electronic Phenomena in Jahn-Teller Active Mn Spinel Thin Films</i> , ACERS Electronic Materials and Applications. Jan. 2020.   |
| 2019 | 4. <i>Surface and Interface Studies of Complex Oxides Grown by Hybrid MBE</i> , Fusion Conferences, 4th Functional Oxide Thin Films for Advanced Energy and Information Technology Conference. July 2019.      |
| 2018 | 3. <i>Surface and Interface Defects in SrTiO<sub>3</sub> Polar/Non-Polar Heterostructures</i> , Gordon Research Conference on Defects in Semiconductors. Aug. 2018.  |
| 2017 | 2. <i>Measuring Built-in Electric Fields in Oxide Heterostructures with X-rays</i> , ACERS Electronic Materials and Applications. Jan. 2017.   |
| 2016 | 1. <i>Interfacial Engineering and Characterization in Polar/Non-Polar Oxide Heterostructures</i> , 83rd Annual Meeting of the Southeastern Section of the American Physical Society. Nov. 2016.                |



## 7. Invited Seminars

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- 2024 | 29. *MBE-grown 4d and 5d Oxide Heterostructures for Electronic and Quantum Systems*, University of Delaware, Department of Materials Science and Engineering. Jan. 2024.
- 2023 | 28. *MBE-grown 4d and 5d Oxide Heterostructures for Electronic and Quantum Systems*, Case Western Reserve University, Department of Materials Science and Engineering. Dec. 2023.
27. *MBE-grown 4d and 5d Oxide Heterostructures for Electronic and Quantum Systems*, New Mexico State University, Department of Physics. Oct. 2023.
26. *Band-Engineered Oxide Heterostructures: A Platform for Electronic, Energy, and Quantum Systems*, Baylor University, Department of Physics, Virtual. May 2023.
25. *Band-Engineered Oxide Heterostructures: A Platform for Electronic, Energy, and Quantum Systems*, University of Arizona, Department of Materials Science and Engineering. Mar. 2023.
24. *Band-Engineered Oxide Heterostructures: A Platform for Electronic, Energy, and Quantum Systems*, Virginia Tech, Department of Materials Science and Engineering. Feb. 2023.
- 2022 | 23. *Interfacial Band Engineering of Oxide Heterostructures for Electronic, Energy, and Quantum Systems*, Clemson University, Department of Materials Science and Engineering. Apr. 2022.
22. *Interfacial Band Engineering of Oxide Heterostructures for Electronic, Energy, and Quantum Systems*, Louisiana State University, Department of Physics. Mar. 2022.
21. *Interfacial Band Engineering of Oxide Heterostructures for Electronic, Energy, and Quantum Systems*, University of Cincinnati, Department of Physics, Virtual. Feb. 2022.
- 2021 | 20. *New Approaches to Atomic Scale Oxide Films Synthesis for Electronic and Energy Applications*, University of South Alabama, Department of Physics, Virtual. Oct. 2021.
19. *New Approaches to Atomic Scale Oxide Films Synthesis for Electronic and Energy Applications*, Oakland University, Department of Physics, Virtual. Apr. 2021.
18. *New Approaches to Atomic Scale Oxide Films Synthesis for Electronic and Energy Applications* University of Virginia, Department of Materials Science and Engineering, Virtual. Mar. 2021.
- 2020 | 16. *Engineering Oxide Thin Films at the Atomic Level for New Electronic and Energy Applications* Alabama A&M, Department of Physics. Feb. 2020.
15. *Engineering Oxide Thin Films at the Atomic Level for New Electronic and Energy Applications* University of Georgia, Department of Physics. Jan. 2020.
- 2019 | 14. *Engineering Oxide Thin Films at the Atomic Level for New Electronic and Energy Applications* Clemson University, Department of Physics. Sept. 2019.
13. *Atom-by-Atom Engineering of Oxide Thin Films and Nanocomposites via Molecular Beam Epitaxy* University of Cincinnati, Department of Materials Science and Engineering. Apr. 2019.
12. *Atom-by-Atom Engineering of Oxide Thin Films and Nanocomposites via Molecular Beam Epitaxy* Augusta University, Department of Physics. Mar. 2019.
- 2018 | 11. *Atom-by-Atom Engineering of Oxide Thin Films and Nanocomposites via Molecular Beam Epitaxy* University of Alabama-Huntsville, Department of Physics. Nov. 2018.
10. *Atom-by-Atom Engineering of Oxide Thin Films and Nanocomposites via Molecular Beam Epitaxy* Tuskegee University, Department of Physics. Oct. 2018.

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| 2017 | <ol style="list-style-type: none"> <li>9. <i>Atom-by-Atom Engineering of Oxide Thin Films and Nanocomposites via Molecular Beam Epitaxy</i> University of Alabama, Department of Physics. Oct. 2017.</li> <li>8. <i>Atom-by-Atom Engineering of Oxide Thin Films and Nanocomposites via Molecular Beam Epitaxy</i> University of Alabama-Birmingham, Department of Physics. Apr. 2017.</li> </ol>  |
| 2016 | <ol style="list-style-type: none"> <li>7. <i>Engineering Electronic and Optical Properties in Oxides by Design</i> Lehigh University, Department of Materials Science and Engineering. Mar. 2016.</li> <li>6. <i>Controlling Band Structure in Complex Oxide Thin Films with Dopants and Interfaces</i> Auburn University, Department of Physics. Feb. 2016.</li> </ol>  |
| 2015 | <ol style="list-style-type: none"> <li>5. <i>Engineering Band Structure in SrTiO<sub>3</sub> Thin Films with Dopants and Interfaces</i> Naval Research Laboratory, Physics of Electronic Materials Branch. Oct. 2015.</li> <li>4. <i>Engineering Band Structure in SrTiO<sub>3</sub> Thin Films with Dopants and Interfaces</i> University of Idaho, Department of Chemical Engineering and Materials Science. Apr. 2015.</li> </ol>   |
| 2012 | <ol style="list-style-type: none"> <li>3. <i>Growth and Patterning of Epitaxial Multiferroic Nanocomposites Using Pulsed Electron Deposition</i> Argonne National Laboratory, Materials Science Division. Nov. 2012.</li> <li>2. <i>Epitaxial Multiferroic Nanocomposites: PED Growth and EBL Patterning</i> Oak Ridge National Laboratory, Materials Science and Technology Division. Sept. 2012.</li> <li>1. <i>Directed Self-Assembly of Epitaxial Multiferroic Nanocomposites</i> Argonne National Laboratory, Materials Science Division. Feb. 2012.</li> </ol> |

## 8. Courses Taught

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### Auburn University, Department of Physics

Semester	Course Number	Title	Enrollment	Credit Hours
Fall 2016	PHYS1610	Physics II for Engineers	126	4
Fall 2017	PHYS1610	Physics II for Engineers	85	4
Spring 2018	PHYS5610/6610	Solid State Physics	9	3
Fall 2018	PHYS1610	Physics II for Engineers	211	4
Spring 2019	PHYS1617	Honors Physics II	36	4
Fall 2019	PHYS4100	Fundamentals of Quantum Mechanics	15	3
Spring 2020	PHYS1617	Honors Physics II	24	4
Summer 2020	PHYS8970	Special Topics in Advanced Physics: Symmetry in Molecules and Crystals	8	3
Fall 2020	PHYS4100	Fundamentals of Quantum Mechanics	7	3
Spring 2021	PHYS8700	Solid State Physics	4	3
Fall 2021	PHYS4100	Fundamentals of Quantum Mechanics	14	3
Spring 2022	PHYS3500	Physics of the World Around Us: Energy Sources and Storage	6	3
Fall 2022	PHYS1610	Physics II for Engineers	117	4
Spring 2023	PHYS8700	Solid State Physics	5	3
Fall 2023	PHYS1617	Honors Physics II	15	4

## 9. Mentorship

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Ph.D. Students Supervised	<ul style="list-style-type: none"><li>• <b>Arka Sardar</b>, Auburn University, Department of Physics, Oct 2023-Present</li><li>• <b>Mohamed Kandil</b>, Auburn University, Department of Physics, Aug 2023-Present, Co-advised with Prof. Wencan Jin</li><li>• <b>Tanzila Tasnim</b>, Auburn University, Department of Physics, Jan 2022-Present</li><li>• <b>Brian Opatosky</b>, Auburn University, Department of Physics, Jan 2022-Present</li><li>• <b>Bhavesh Ramkorun</b>, Auburn University, Department of Physics, Aug 2021-Present, Co-advised with Prof. Edward Thomas</li><li>• <b>Jibril Ahammad</b>, Auburn University, Department of Physics, Aug 2021-Present</li><li>• <b>Patrick Gemperline</b>, Ph.D. Auburn University, Department of Physics, Aug 2018-Aug 2024; Now with Davidson Technologies, Huntsville, AL</li><li>• <b>Rajendra Paudel</b>, Ph.D. Auburn University, Department of Physics, Aug 2017-Aug 2022; Now with Micron, Boise, ID</li><li>• <b>Suresh Thapa</b>, Ph.D. Auburn University, Department of Physics, Aug 2017-May 2022; Now with Intel, Hillsboro, OR</li><li>• <b>Miles Blanchet</b>, Ph.D. Auburn University, Department of Physics, Aug 2016-May 2022; Now with GlobalFoundries, Albany, NY</li></ul>
M.S. Students Supervised	<ul style="list-style-type: none"><li>• <b>Uchenna Ubeh</b>, M.S. Auburn University, Department of Physics, Aug 2016-May 2019; Pursuing Ph.D. in Physics at University of Houston</li></ul>
Postdocs Supervised	<ul style="list-style-type: none"><li>• <b>Dr. Gaurab Rimal</b>, Dec 2022-Aug 2023; Now Assistant Prof, Western Michigan University Physics</li><li>• <b>Dr. Sydney Provence</b>, Jan 2019-March 2021; Now with Tignis, Inc.</li><li>• <b>Dr. Shalinee Chikara</b>, Jan 2017-Aug 2019; Now with National High Magnetic Field Lab, Florida State University</li></ul>
Undergraduate Researchers Supervised	<ul style="list-style-type: none"><li>• <b>Reid Markland</b>, Sep 2021-Dec 2023</li><li>• <b>Sydney Battles</b>, Sep 2021-May 2023; Now pursuing M.S. in Physics at Auburn University</li><li>• <b>Michael Demos</b>, Jan 2020-May 2021; Now pursuing Ph.D. in Physics at University of Kentucky</li><li>• <b>Faith Tiller</b>, Sep 2018-May 2019; Now with Booz Allen Hamilton</li><li>• <b>Will Bowers</b>, Jan 2017-May 2020; Now with Trimble Maps as software engineer</li></ul>
REU Students Supervised	<ul style="list-style-type: none"><li>• <b>Zoe Adams</b>, May 2023-Jul 2023; Co-advised with Byron Farnum through Auburn CASE REU</li><li>• <b>Kennedi Banks</b>, May 2022-Jul 2022; Co-advised with Byron Farnum through Auburn CASE REU</li><li>• <b>Brandon Dye</b>, May 2021-Jul 2021; Co-advised with Byron Farnum through Auburn CASE REU</li><li>• <b>Elyssa Roeder</b>, Jun 2018-Aug 2018; Auburn Physics REU, Now pursuing Ph.D. in Physics at Florida State University</li><li>• <b>Patrick Gemperline</b>, Jun 2017-Aug 2017; Auburn Physics REU, Now pursuing Ph.D. in Physics at Auburn University</li></ul>

## 10. Honors and Awards

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2021	<ul style="list-style-type: none"><li>• <i>National Science Foundation</i>, CAREER Award</li><li>• <i>Journal of Materials Research</i>, Early Career Scholars in Materials Science Prize for best paper in early career scholars issue</li></ul>
2020	<ul style="list-style-type: none"><li>• <i>Journal of Physics: Condensed Matter</i>, Emerging Leaders, Invited original research paper</li><li>• <i>Air Force Office of Scientific Research</i>, Young Investigator Award</li><li>• <i>Auburn University, Department of Physics</i>, Society of Physics Students Most Outstanding Professor</li></ul>
2019	<ul style="list-style-type: none"><li>• <i>Fusion Conferences</i>, 4th Functional Oxide Thin Films for Advanced Energy and Information Technology Conference, Emerging Young Investigator Award</li></ul>
2017	<ul style="list-style-type: none"><li>• <i>Southeastern Conference</i>, SEC Faculty Travel Grant</li></ul>
2013	<ul style="list-style-type: none"><li>• <i>Pacific Northwest National Laboratory</i>, Linus Pauling Distinguished Postdoctoral Fellow</li><li>• <i>Materials Research Society</i>, Graduate Student Silver Award, Spring Meeting</li></ul>
2012	<ul style="list-style-type: none"><li>• <i>University of Virginia</i>, Department of Materials Science and Engineering, Doris Kuhlmann-Wilsdorf Outstanding Graduate Student Award</li><li>• <i>University of Virginia</i>, School of Engineering and Applied Sciences, Engineering Research Symposium, First Place</li></ul>
2010	<ul style="list-style-type: none"><li>• <i>Army Research Office</i>, National Defense Science and Engineering Graduate Fellowship</li></ul>
2009	<ul style="list-style-type: none"><li>• <i>National Science Foundation</i>, Graduate Research Fellowship Program, Honorable Mention</li></ul>
2008	<ul style="list-style-type: none"><li>• <i>University of Virginia</i>, School of Engineering and Applied Sciences, Dean's Fellow</li><li>• <i>University of Virginia</i>, Vice President of Research and Graduate Studies, Fellowship Enhancement</li><li>• <i>Carnegie Mellon University</i>, Phi Beta Kappa</li></ul>
2007	<ul style="list-style-type: none"><li>• <i>Carnegie Mellon University</i>, Tau Beta Pi, Engineering Honors</li></ul>
2006	<ul style="list-style-type: none"><li>• <i>Carnegie Mellon University</i>, Eta Kappa Nu, Electrical Engineering Honors</li></ul>

## 11. Service to University

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Departmental Service: Auburn Physics	<ul style="list-style-type: none"><li>• Theoretical Condensed Matter Physics faculty search committee, Sep 2023-Feb 2024</li><li>• Strategic Planning Working Group, Undergraduate curriculum, Jan 2022-May 2023</li><li>• Graduate Admissions Committee, Member; Nov 2020-Aug 2022</li><li>• Biophysics faculty search committee, Sep 2019-Mar 2020</li><li>• Experimental Condensed Matter Physics faculty search committee, Sep 2018-Mar 2019</li><li>• Website Coordinator, 2017-2022</li><li>• Graduate Recruiting, Committee member; Oct 2016-Aug 2022; Chair, Oct 2019-Aug 2022</li></ul>
Auburn College of Sciences and Mathematics (COSAM) Service	<ul style="list-style-type: none"><li>• COSAM Dean Search Committee, Member; Sep 2022-Feb 2023</li><li>• COSAM Diversity Task Force, Member; May 2020-Sep 2020</li><li>• COSAM Website Redesign Contract, Search Committee; 2018</li><li>• COSAM Office of Communications Manager, Search Committee; 2018</li></ul>

## 12. Service to Research Community

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Peer Review

- Journal referee for *Nature Materials*, *Nature Communications*, *Science Advances*, *Proceedings of the National Academy of Sciences*, *Physical Review Letters*, *Physical Review B*, *Physical Review Materials*, *Nano Letters*, *ACS Nano*, *Chemistry of Materials*, *Advanced Materials*, *Advanced Functional Materials*, *Applied Physics Letters*, *APL Materials*, *Journal of Vacuum Science and Technology*, and others.
- *National Science Foundation*, Division of Materials Research ad hoc and panel reviewer
- *Department of Energy*, Basic Energy Science, Proposal reviewer
- *Air Force Office of Scientific Research*, Proposal reviewer

Conference Organization

### **American Physical Society**

- *Conference for Undergraduate Women in Physics 2023*: Co-organizer for Auburn site
- *March Meeting 2019*: Focus Session Organizer and Session Chair, Complex Oxide Interfaces and Heterostructures
- *Southeastern Section of the APS 2017*: Session Organizer and Chair, Emerging Thin Film Materials and Interfaces
- *March Meeting 2017*: Focus Session Organizer and Session Chair, Complex Oxide Interfaces and Heterostructures

### **American Ceramics Society**

- *Electronic Materials and Applications 2020*: Symposium Co-organizer, “Complex oxide and chalcogenide semiconductors”; Session chair: “Low Dimensional Systems”
- *Electronic Materials and Applications 2019*: Lead Symposium Organizer, “Complex oxide and chalcogenide semiconductors”; Session chair: “Oxide Semiconductors”
- *Electronic Materials and Applications 2018*: Symposium Co-organizer, “Complex oxide and chalcogenide semiconductors: Research and applications”; Session chair: “Multifunctional nanocomposites”

### **American Vacuum Society**

- *North American Conference on Molecular Beam Epitaxy, 2023*: Program Committee

### **International Workshop on Oxide Electronics**

- *28th International Workshop on Oxide Electronics, 2022*: Co-organizer

## 13. Outreach

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On Campus

- *Auburn COSAM Summer Science Institute*, Instructor, 2017-2019, 2021-2023
- *Auburn Gameday Physics*, Organizer for public demonstrations at football home games, 2022-2023

In Community

- *Alabama Prison Arts & Education Project*, Lecturer (2019, 2022), Correspondence course instructor (2021)
- *South’s BEST Robotics Competition*, Judge (2016-2019)
- *Greater East Alabama Regional Science Fair*, Judge (2017)