Daniel J. Trainer

tue83375@temple.edu

4610 Silverwood St., Apt 2 • Philadelphia, PA 19128 • (215) 932–5457

EDUCATION

Temple University, Department of Physics — Philadelphia, PA

- Ph.D., Physics 2019

Saint Joseph's University — Philadelphia, PA

- B.S., Physics 2012

RESEARCH EXPERIENCE

Argonne National Laboratory — Lemont, Il
SCGSR Fellow with Dr. Saw W. Hla — June - September 2018

- Synthesized and studied samples consisting of magnetic and molecular films characterizing them using the synchrotron X-ray scanning tunneling microscope (SX-STM) at the advanced photon source (APS).

Temple University — Philadelphia, PA
Research Assistant with Dr. Maria Iavarone — 2014 – present

- Study the electronic properties of mono- to few layer MoS_2 as a function of thickness and rotational orientation with the underlying substrate using low-temperature (milli-Kelvin) scanning tunneling microscopy.

Temple University — Philadelphia, PA
Research Assistant with Dr. Xiaoxing Xi — 2014 - present

- Assembled a chemical vapor deposition (CVD) system for the growth of 2D transition metal dichalcogenides.

Temple University — Philadelphia, PA
Research Assistant with Dr. Ke Chen — 2012– 2014

- Used CVD to grow single layer graphene on Cu foil and utilized both wet and dry transfer techniques to fabricate tunnel junction devices for chemical sensing applications using inelastic electron tunneling spectroscopy (IETS).
- Investigated the viability of HPCVD-grown MgB_2 for flexible coaxial cables.

ACADEMIC AWARDS AND HONORS

American Physical Society — Boston, Ma

The 2019 Ovshinsky Student Travel Grant Award — *March* 2019

Argonne National Laboratory — Lemont, IL

U.S. DOE Office of Science Graduate Student Research (SCGSR) Program Award — *April* 2018

Temple University — Philadelphia, PA

Peter Havas Humanitarian Scholarship for Outstanding Physics Graduate Student — *April* 2018

LEADERSHIP EXPERIENCE

Temple University Philadelphia, PA

Early Career Network Representative CCM EFRC 2016 - 2017, 2019

SKILLS AND TECHNIQUES

- Low-temperature (milli-Kelvin), ultra-high vacuum (10^{-11} Torr) scanning tunneling microscopy/spectroscopy
- Synchrotron x-ray scanning tunneling microscopy and spectroscopy including XMCD measurements
- Atomic force microscopy with modalities such as Kelvin probe force microscopy and Conducting – AFM
- Thin film deposition using thermal evaporation, e-beam evaporation, sputtering, CVD and HPCVD
- Scanning electron microscopy and energy-dispersive x-ray spectroscopy
- Low energy electron diffraction and Auger electron spectroscopy
- Photolithography and device fabrication including the use of lift-off procedures and reactive ion etching
- Data analysis programs such as MatLab, Origin, WSxM

SELECTED CONFERENCE PRESENTATIONS

D. J. Trainer, Y. Zhang, A. V. Putilov, C. DiGiorgio, M. Precner, T. Polakovic, Q. Qiao, Y. Zhu, X. X. Xi, G. Karapetrov, F. Bobba, S. Hla, M. Iavarone. Electronic Properties of Mono- to Few Layer Molybdenum Disulfide. School on quantum materials and workshop on vortex behavior in unconventional superconductors, Braga, Portugal. October 2018. *Invited Oral Presentation*.

D. J. Trainer, Y. Zhang, A. V. Putilov, C. DiGiorgio, M. Precner, T. Polakovic, Q. Qiao, Y. Zhu, X. X. Xi, G. Karapetrov, F. Bobba, S. Hla, M. Iavarone. Electronic Properties of Mono- to Few Layer Molybdenum Disulfide. International Conference Tunneling Through Nanoscience, Ravello, Italy. October 2018. *Oral Presentation*.

D. J. Trainer, Y. Zhang, F. Bobba, X. X. Xi, S. Hla, M. Iavarone. The Effect of Strain and Strain Relaxation on the Atomic-Scale in Monolayer MoS2 Films. American Physical Society March Meeting, Boston, Ma. March 2019. Oral Presentation, Abstract X15.00003.

D. J. Trainer, Y. Zhang, F. Bobba, X. X. Xi, S. Hla, M. Iavarone. The Effect of Applied Strain on the Quasiparticle Band Gap of Monolayer MoS2. American Physical Society March Meeting, Los Angeles, Ca. March 2018. Oral Presentation, Abstract K40.00001.

D. J. Trainer, A. Putilov, C. Di Giorgio, I. Cone, C. Lane, T. Saari, B. Wang, M. Precner, T. Polakovic, Q. Qiao, R. Chandrasena, F. Kronast, A. Gray, X. X. Xi, Y. Zhu, G. Karapetrov, J. Nieminen, A. Bansil, M. Iavarone. Electronic Properties of Few Layers Thick MoS2. CCDM EFRC Annual Meeting, Temple University, Philadelphia, Pa. May 2017. Poster Presentation.

D. J. Trainer, A. Putilov, T. Saari, T.-R. Chang, H.-T. Jeng, H. Lin, B. Wang, C. Lane, J. Nieminen, A. Bansil, X. X. Xi, M. Iavarone. The Role of the Moire Pattern on the Electronic Band Structure of Mono-to Few Layer MoS2. American Physical Society March Meeting, New Orleans, La. March 2017. Oral Presentation, Abstract S33.00001.

D. J. Trainer, A. Putilov, C. Di Giorgio, M. Wolak G. Li, Q. Qiao, G. Plummer, L. Frazer, Y. Aulin, E. Borguet, L. Cao, Y. Zhu, X. X. Xi, M. Iavarone. Growth and Characterization of MoS2 Films. CCDM EFRC Annual Meeting, Temple University, Philadelphia, Pa. May 2016. Poster Presentation.

D. J. Trainer, A. Putilov, M. Wolak, R.U. Chandrasena, F. Kronast, A.X. Gray, X. X. Xi, M. Iavarone. Structure and Electronic Properties of Single-to Few Layers Molybdenum Disulfide Films. American Physical Society March Meeting, Baltimore, Md. March 2016. Oral Presentation, Abstract V26.006.

D. J. Trainer, A. Putilov, C. Di Giorgio, M. Wolak G. Li, Q. Qiao, G. Plummer, L. Frazer, Y. Aulin, E. Borguet, L. Cao, Y. Zhu, X. X. Xi, M. Iavarone. Structural and Electronic Characterization of MoS2 Films. CCDM EFRC Mid-Term Review, Washington D.C. February 2016. Poster Presentation.

PUBLICATIONS

1 **D.J Trainer,** Y. Zhang, F. Bobba, X.X. Xi, S.-W. Hla, M. Iavarone. The Effects of Atomic Scale Strain Relaxation on the Electronic Properties of Monolayer MoS2. *Submitted, 2019.*

2 **D.J. Trainer**, A.V. Putilov, B. Wang, C. Lane, T. Saari, T.-R. Chang, H.-T. Jeng, H. Lin, X. X. Xi, J. Nieminen, A. Bansil, M. Iavarone. Moiré Superlattices and 2D electronic properties in graphite/MoS2 heterostructures. *Journal of Physics and Chemistry of Solids*. In Press (2017). DOI: https://doi.org/10.1016/j.jpcs.2017.10.034

3 **D.J. Trainer**, A.V. Putilov, C. DiGiorgio, T. Saari, B. Wang, M. Wolak, R.U. Chandrasena, C. Lane, T.-R. Chang, H.-T. Jeng, H. Lin, F. Kronast, A.X. Gray, X. X. Xi, J. Nieminen, A. Bansil, M. Iavarone. Inter-Layer Coupling Induced Valence Band Edge Shift in Mono-to Few-Layer MoS2. *Scientific Reports* **7**, 42619 (2017).

4 M. Precner, T. Polakovic, Q. Qiao, **D.J. Trainer**, A. V. Putilov, C. Di Giorgio, I. Cone, Y. Zhu, X. X. Xi, M. Iavarone, G. Karapetrov. Evolution of Metastable Defects and Its Effect on the Electronic Properties of MoS2. *Scientific Reports* **8**, 6724 (2018).

5 M. Precner, T. Polakovic, **D.J. Trainer**, A. V. Putilov, C. Di Giorgio, I. Cone, X. X. Xi, M. Iavarone, G. Karapetrov. Metastable Defects in monolayer and few-layer films of MoS2. *AIP Conference Proceedings* **1**, 020004 (2018).

6 A.V. Putilov, C. DiGiorgio, V. L. Vadimov, **D. J. Trainer**, E. M. Lechner, J. L. Curtis, M. Abdel-Hafiez, O. S. Volkova, A. N. Vasiliev, D. A. Chareev, G. Karapetrov, A. E. Koshelev, A. Y. Aladyshkin, A. S. Mel'nikov, M. Iavarone. Vortex-core properties and vortex-lattice transformation in FeSe. *Phys. Rev. B.* **99**, 144514 (2019).

7 D. Chareev, Y. Ovchenkov, L. Shvanskaya, A. Kovalskii, M. Abdel-Hafiex, **D.J. Trainer**, E.M. Lechner, M. Iavarone, O. Volkova, A. Vasiliev. Single Crystal Growth, Transport and Scanning Tunneling Microscopy and Spectroscopy of FeSe1-xSx. *CrystEngComm*. **20** (17), 2449-2454 (2018).

8 C. DiGiorgio, A.V. Putilov, **D.J. Trainer**, O.S. Volkova, A.N. Vasiliev, D. Chareev, G. Karapetrov, J.F. Zasadzinski, M. Iavarone. Anisotropic Superconducting Gaps and Boson Mode in FeSe 1− xSx Single Crystals. *Journal of Superconductivity and Novel Magnetism* **30**, 763-768 (2017).

9 Y. Feng, **D.J. Trainer**, H. Peng, Y. Liu, K. Chen. Safe growth of graphene from non-flammable gas mixtures via chemical vapor deposition. *Journal of Materials Science & Technology* **33**, 285-290 (2017).

10 Y. Feng, **D.J. Trainer**, K. Chen. Electrical properties of graphene tunnel junctions with high-κ metal-oxide barriers. *Journal of Physics D: Applied Physics* **50**, 155101 (2017).

11 Y. Feng, **D.J. Trainer**, K. Chen. Graphene tunnel junctions with aluminum oxide barrier. *Journal of Applied Physics* **120**, 164505 (2016).