Yun-Yi Pai

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My site: https://yypai.github.io/

Postdoctoral Research Associate Applicant on Experimental Condensed Matter Physics
(Mesoscopic Physics, Superconductivity, Heterostructures, Complex Oxides)

- Self-motivated and highly competitive Ph.D. candidate in experimental condensed matter physics on low temperature transport, scanning probe microscopy for mesoscopic devices of complex oxides.
- First-authored 2 review articles.
- Rich experience in instrumentation, maintenance and troubleshooting.
- Highly proficient programing skills: LabVIEW and Python.

Education

University of Pittsburgh, School of Arts & Sciences, Pittsburgh, PA — Jun. 2014 - present.
Ph.D. in Physics.
Thesis: "Superconductivity and Mesoscopic Physics at $LaAlO_3/SrTiO_3$".
Supervisor: Jeremy Levy
- Observed "1D nature" of the superconductivity at $LaAlO_3/SrTiO_3$
- Proposed a possible source of superconductivity in $SrTiO_3$ (a 50-year puzzle)
- Investigate superconductivity in 1D Zigzag nanowires
- Characterize electron waveguides, single electron transistors
- Work on instrumentation of milli-Kelvin scanning probe microscop

Cornell University, College of Engineering, Ithaca, NY — Aug. 2012 - May 2014
Master of Science in Applied Physics.
Supervisor: Gregory David Fuchs
Thesis: "Investigation and Perturbation of the Optical Properties of the Single Defects in Zinc Oxide".

National Taiwan University (NTU), College of Science, Taipei, Taiwan — Sep. 2005 - Jun. 2010
Bachelor of Science in Physics

Honors

Kenneth P. Dietrich School of Arts & Sciences Predoctoral Fellowship 2019-2019
Andrew Mellon Predoctoral Fellowship 2018-2019
Kenneth P. Dietrich School of Arts & Sciences Fellowship 2014-2015

Publication

Yun-Yi Pai, Hyungwoo Lee, Jung-Woo Lee, Anil Annadi, Guanglei Cheng, Shicheng Lu, Michelle Tomczyk, Mengchen Huang, Chang-Beom Eom, Patrick Irvin, Jeremy Levy, "One-Dimensional Nature of Pairing and Superconductivity at the $LaAlO_3/SrTiO_3$ Interface." Phys. Rev. Lett. 120, 147001 (2018).

Yun-Yi Pai, Anthony Tylan-Tyler, Patrick Irvin, Jeremy Levy, "Physics of $SrTiO_3$-based heterostructures and nanostructures: a review." 2018 Rep. Prog. Phys. 81 036503.

L. Chen, J. Li, Y. Tang, Y-Y Pai, Y. Chen, N. Pryds, P. Irvin and J. Levy, "Extreme reconfigurable nanoelectronics at the $CaZrO_3/SrTiO_3$ interface." Advanced Materials, 2018, 1801794.

Yun-Yi Pai, Anthony Tylan-Tyler, Patrick Irvin, Jeremy Levy, "$LaAlO_3/SrTiO_3$: a tale of two magnetisms." arxiv:1610.00789 (2016), to appear in Vol. 2, Sec. 5 of "Spintronics Handbook: Spin Transport and Magnetism, 2nd ed" by CRC Press (2019).

N. R. Jungwirth, Y. Y. Pai, H. S. Chang, Evan. R. MacQuarrie, K. X. Nguyen, and G. D. Fuchs, "A single-molecule approach to ZnO defect studies: single photons and single defects." J. Appl. Phys. 116, 043509 (2014).

My Google Scholar: https://scholar.google.com/citations?user=J5DidfYAAAAJ

Conference Talks

Yun-Yi Pai, Megan Briggeman, Hyungwoo Lee, Jung-Woo Lee, Mengchen Huang, Jianan Li, Chang-Beom Eom, Patrick Irvin, Jeremy Levy, "Superconductivity in 1D Zigzag Nanowires", 2019 APS March Meeting, P09.14.

Yun-Yi Pai, Hyungwoo Lee, Jung-Woo Lee, Anil Annadi, Guanglei Cheng, Shicheng Lu, Michelle Tomczyk, Mengchen Huang, Chang-Beom Eom, Patrick Irvin, Jeremy Levy, "One-Dimensional Nature of Pairing and Superconductivity at the $LaAlO_3/SrTiO_3$", 2018 Materials and Mechanisms of Superconductivity (M^2S-2018), Beijing, Th-S48-05.

Yun-Yi Pai, Hyungwoo Lee, Jung-Woo Lee, Anil Annadi, Guanglei Cheng, Shicheng Lu, Michelle Tomczyk, Mengchen Huang, Chang-Beom Eom, Patrick Irvin, Jeremy Levy, "One-Dimensional Nature of Pairing and Superconductivity at the $LaAlO_3/SrTiO_3$", 2018 APS March Meeting, B30.12.

Yun-Yi Pai, Anthony Tylan-Tyler, Patrick Irvin, Jeremy Levy, "$LaAlO_3/SrTiO_3$: a tale of two magnetisms", 2017 APS March Meeting, A37a.12.

Yun-Yi Pai, Dong-Wook Park, Mengchen Huang, Anil Annadi, Hyungwoo Lee, Zhenqiang Ma, Chang-Beom Eom, Patrick Irvin, Jeremy Levy, "Vertical gating of sketched nanodevices", 2016 APS March Meeting, S24.3.

Yun-Yi Pai, Mengchen Huang, Hyungwoo Lee, Chang-Beom Eom, Patrick Irvin, Jeremy Levy, "$LaAlO_3/SrTiO_3$ field-effect nanodevices using in-situ-grown Au top gates", 2015 APS March Meeting, G13.4.

Expertise

Quantum Transport Measurements
- Fabricate (conductive-AFM lithography) and characterize (5 years): quantum dots, electron waveguides, superconducting nanowires.
- Instrument troubleshoots and maintenance:
  - Quantum Design PPMS (4 years as the superuser) with experience on Quantum Design Vibration Sampling Magnetometry (PPMS-VSM) and Quantum Design dilution refrigerator.
  - Dilution refrigerators: Leiden CF900 (3 years as the superuser)

Scanning Probe Microscopy
- Asylum Research MFP-3D (>1,000 hours of usage; 2 years as the superuser), Asylum Research Cypher. Nanomagnetics milliKelvin-Scanning Probe Microscope.
- C-AFM lithography

Confocal microscopy
- Built a confocal microscope onto Asylum Research MFP-3D. Used time-correlated single-photon counting to characterize single photon source in zinc-oxide.

Programming
- Python: data analysis and multi-index manipulation (Numpy, Scipy and Pandas), visualization (matplotlib, plot.ly), website (Django), interfacing instruments (PyVisa), machine learning (scikit-learn, lgbm, pytorch)
- LabVIEW (NI-DAQmx, JKI state machine, etc.)
- Mathematica (wrote a *Density Functional Renormalization Group* code).
- bash, zsh.

Database Management
- I setup and manage (for 5 years) a lab-wide database in our research group. It collects the stats for various instruments of the lab as time series. It has now about 450 time-series and size about 400 GB. The database has successfully helped us troubleshoot our lab instruments numerous times.

CAD, Modeling and graphical design, multimedia
- AutoCAD, Blender (my gallery: https://www.behance.net/yypai), Pad2Pad (PCB design), Illustrator, Photoshop, InDesign, Lightroom, machine shop.

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