

# Yun-Yi Pai

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

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## 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 programming skills: LabVIEW and Python.

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<b>Education</b>	University of Pittsburgh, School of Arts & Sciences, Pittsburgh, PA Ph.D. in Physics. Thesis: "Superconductivity and Mesoscopic Physics at $\text{LaAlO}_3/\text{SrTiO}_3$ ". Supervisor: <a href="#">Jeremy Levy</a> <ul style="list-style-type: none"><li>• Observed "1D nature" of the superconductivity at <math>\text{LaAlO}_3/\text{SrTiO}_3</math></li><li>• Proposed a possible source of superconductivity in <math>\text{SrTiO}_3</math> (a 50-year puzzle)</li><li>• Investigate superconductivity in 1D Zigzag nanowires</li><li>• Characterize electron waveguides, single electron transistors</li><li>• Work on instrumentation of milli-Kelvin scanning probe microscope</li></ul>	Jun. 2014 - present.
	Cornell University, College of Engineering, Ithaca, NY Master of Science in Applied Physics. Supervisor: <a href="#">Gregory David Fuchs</a> Thesis: "Investigation and Perturbation of the Optical Properties of the Single Defects in Zinc Oxide".	Aug. 2012 - May 2014
	National Taiwan University (NTU), College of Science, Taipei, Taiwan Bachelor of Science in Physics	Sep. 2005 - Jun. 2010

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<b>Honors</b>	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

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<b>Publication</b>	<a href="#">Yun-Yi Pai</a> , 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 $\text{LaAlO}_3/\text{SrTiO}_3$ Interface." <a href="#">Phys. Rev. Lett. 120, 147001 (2018)</a> .
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[Yun-Yi Pai](#), Anthony Tylan-Tyler, Patrick Irvin, Jeremy Levy, "Physics of  $\text{SrTiO}_3$ -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  $\text{CaZrO}_3/\text{SrTiO}_3$  interface." [Advanced Materials, 2018, 1801794](#).

[Yun-Yi Pai](#), Anthony Tylan-Tyler, Patrick Irvin, Jeremy Levy, "La $\text{AlO}_3$ /Sr $\text{TiO}_3$ : 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>

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**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  $\text{LaAlO}_3/\text{SrTiO}_3$ ", 2018 Materials and Mechanisms of Superconductivity (M<sup>2</sup>S-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  $\text{LaAlO}_3/\text{SrTiO}_3$ ", 2018 APS March Meeting, [B30.12](#).

Yun-Yi Pai, Anthony Tylan-Tyler, Patrick Irvin, Jeremy Levy, " $\text{LaAlO}_3/\text{SrTiO}_3$ : 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, " $\text{LaAlO}_3/\text{SrTiO}_3$  field-effect nanodevices using in-situ-grown Au top gates", 2015 APS March Meeting, [G13.4](#).

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**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. Nanomagnetism 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.
- 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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