

Yu Saito, Ph.D.

Personal and Contact Information

Date/place of birth: November 10, 1990 in Fukushima (Japan) Nationality: Japanese
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Research Interests

Condensed Matter Physics:

2D materials, van der Waals heterostructures, Superconductivity, Quantum transport, Energy dissipation, Nanomagnetometry and nanothermometry, Functional devices

Education

Doctor of Philosophy in Applied Physics (with Dean's Award) March 2018
Department of Applied Physics, The University of Tokyo
Thesis title: "Study on Electric-Field-Induced 2D Superconductivity"
Advisor: Prof. Yoshihiro Iwasa

Master of Engineering in Applied Physics (with Distinguished Master's Thesis Award)
Department of Applied Physics, The University of Tokyo March 2015

Bachelor of Engineering (with Distinguished Bachelor's Thesis Award) March 2013
Department of Applied Physics, The University of Tokyo

Research Experience

Elings Prize Fellow October 2018 – present
California NanoSystems Institute, University of California, Santa Barbara
Advisor: Prof. Andrea Young
Experimental research on quantum phenomena in twisted bilayer graphene and flat band physics

Postdoctoral Researcher April 2018 – September 2018
Center for Advanced Intelligence Project, RIKEN
Advisor: Prof. Koji Tsuda
Research on 2D materials informatics using machine learning and Bayesian optimization

JSPS Research Fellow April 2015 – March 2018
Department of Applied Physics, The University of Tokyo
Advisor: Prof. Yoshihiro Iwasa
Experimental research on transport properties in ion-gated 2D materials and 2D superconductors

Teaching Experience

Teaching Assistant October 2013 – March 2015
Department of Applied Physics, The University of Tokyo
▷ Statistical Thermodynamics
▷ Physical Mathematics

Supervision of Students

- ▷ Two undergraduate/master students at the University of Tokyo for their research projects
- ▷ Intern master student from Harvard University for the summer project
- ▷ Two undergraduate students at UC Santa Barbara for their research projects
- ▷ Two undergraduate students from Peking University for their summer projects

Skills

Experimental skills

- ▷ Nanofabrication Techniques: Scanning Electron Microscope, Atomic Force Microscope, Photo-lithography, Electron-beam lithography, Electron-beam deposition, Basic semiconductor process, Stacking of van der Waals heterostructure
- ▷ Low-Temperature Transport Measurements: general cryogenic electrical measurement techniques, dilution refrigerator

Computer skills

- ▷ Programming
 - Languages: C/C++, Python
 - Optimization, machine learning, statics and basic numerical calculations.

Honors, Awards and Fellowships

- ▷ **Selected Participant of / Travel grant for 69th Lindau Nobel Laureate Meeting in Physics**
Council for the Lindau Nobel Laureate Meetings and Japan Society for the Promotion of Science (JSPS), June 2019
- ▷ **2019 Young Scientist Award of the Physical Society of Japan (Division 6)**
Physical Society of Japan, March 2019
- ▷ **Elings Prize Fellowship in Science 2018 (Postdoctoral Fellowship)**
California NanoSystems Institute, University of California, Santa Barbara
March 2018
- ▷ **8th JSPS Ikushi Prize**
Japan Society for the Promotion of Science (JSPS), March 2018
- ▷ **Dean's Award in the Graduate School of Engineering**
Graduate School of Engineering, The University of Tokyo, March 2018
- ▷ **JSPS Research Fellowship for Young Scientists DC1 (Graduate Student Fellowship)**
Japan Society for the Promotion of Science (JSPS), April 2015- March 2018
- ▷ **Tanaka Shouji Award (Distinguished Master's Thesis Award)**
Department of Applied Physics, The University of Tokyo, March 2015
- ▷ **Distinguished Bachelor's Thesis Award**
Department of Applied Physics, The University of Tokyo, March 2013

Grants

1. **Grant-in-Aid for JSPS Research Fellow (DC1)** April 2015 – March 2018
(No.JP15J07681)
from Japan Society for the Promotion of Science (JSPS)

Synergistic Activities

Reviewer Experience

- ▷ Science, Nature Physics, Science Advances, Nature Communications, Nano Letters, Chemistry of Materials, ACS Applied Materials & Interfaces, Nanoscale, npj Quantum Materials, Communication Physics, Journal of Materials Chemistry C

Outreach Activity

- ▷ Seminars and talks at Asaka high school in Fukushima, Japan, 2012-2014
- ▷ Press releases of the researches published in (Science 2015, Nature Physics 2016, Science Advances 2017, Nature Communications 2018) from the University of Tokyo

List of Publications ([Google Scholar Citations](#), [Publons](#), [ORCID](#))

Review Articles (peer-reviewed)

1. **Highly crystalline 2D superconductors**
Y. Saito, T. Nojima and Y. Iwasa
Nature Reviews Materials **2**, 16094 (2016).
[DOI: 10.1038/natrevmats.2016.94](#)
Top 1% highly cited paper in the Web of Science (2017/5-6)
2. **Gate-induced superconductivity in two-dimensional atomic crystals**
Y. Saito, T. Nojima and Y. Iwasa
Superconductor Science and Technology (SUST) **29**, 093001 (2016).
[DOI: 10.1088/0953-2048/29/9/093001](#)

Original Papers (peer-reviewed)

1. **Decoupling superconductivity and correlated insulators in twisted bilayer graphene**
Y. Saito, J. Ge, K. Watanabe, T. Taniguchi, A. F. Young
arXiv:1911.13302 (2019)
2. **Nonreciprocal transport in gate-induced polar superconductor SrTiO₃**
Y. M. Itahashi, T. Ideue, Y. Saito, S. Shimizu, T. Ouchi, T. Nojima and Y. Iwasa
submitted.
3. **Quantum and classical ratchet motions of vortices in a 2D trigonal superconductor**
Y. M. Itahashi*, Y. Saito*(co-first), T. Nojima, T. Ideue and Y. Iwasa
arXiv:1904.00611 (2019)
4. **Deep learning-based quality filtering of mechanically exfoliated 2D crystals**
Y. Saito, Kento Shin, Kei Terayama, Shaan Desai, Masaru Onga, Yuji Nakagawa, Yuki M. Itahashi, Yoshihiro Iwasa, Makoto Yamada, Koji Tsuda
npj Computational Materials, in press (2019)
5. **Gate-controlled low carrier density superconductors: Toward the two-dimensional BCS-BEC crossover**
Y. Nakagawa, Y. Saito, T. Nojima, K. Inumaru, S. Yamanaka and Y. Kasahara and Y. Iwasa
Physical Review B **98**, 064512 (2018).
[DOI: 10.1103/PhysRevB.98.064512](#)
6. **Electric-field-control of electronic states in WS₂ nanodevices by electrolyte gating**
F. Qin, T. Ideue, W. Shi, Y. Zhang, R. Suzuki, M. Yoshida, Y. Saito and Y. Iwasa
Journal of Visualized Experiments **134**, e56862 (2018).
[DOI: 10.3791/56862](#)
7. **Quantum phase transitions in highly crystalline two-dimensional superconductors**
Y. Saito, T. Nojima and Y. Iwasa
Nature Communications **9**, 778 (2018).
[DOI: 10.1038/s41467-018-03275-z](#)
See also [UTokyo Research](#)
8. **Nonreciprocal charge transport in noncentrosymmetric superconductors**
R. Wakatsuki*, Y. Saito*(co-first), S. Hoshino, Y. M. Itahashi, T. Ideue, M. Ezawa,

Y. Iwasa and N. Nagaosa
(*equal contribution)
Science Advances **3**, e1602390 (2017).
DOI: [10.1126/sciadv.1602390](https://doi.org/10.1126/sciadv.1602390)
See also [UTokyo Research](#)

9. **Gate-tuned thermoelectric power in black phosphorus**
Y. Saito*, T. Iizuka*, T. Koretsune, R. Arita, S. Shimizu and Y. Iwasa
(*equal contribution)
Nano Letters **16**, 4819-4824 (2016).
DOI: [10.1021/acs.nanolett.6b00999](https://doi.org/10.1021/acs.nanolett.6b00999)
10. **Gate-optimized thermoelectric power factor in ultrathin WSe₂ single crystals**
M. Yoshida, T. Iizuka, Y. Saito, M. Onga, R. Suzuki, Y. J. Zhang, Y. Iwasa and S. Shimizu
Nano Letters **16**, 2061-2065 (2016).
DOI: [10.1021/acs.nanolett.6b00075](https://doi.org/10.1021/acs.nanolett.6b00075)
11. **Superconductivity protected by spin-valley locking in ion-gated MoS₂**
Y. Saito, Y. Nakamura, M. S. Bahramy, Y. Kohama, J. T. Ye, Y. Kasahara, Y. Nakagawa, M. Onga, M. Tokunaga, T. Nojima, Y. Yanase and Y. Iwasa
Nature Physics **12**, 144-149 (2016).
DOI: [10.1038/nphys3580](https://doi.org/10.1038/nphys3580)
Highlighted in "Perspective" in Science, "News and Views" in Nature Physics and [UTokyo Research](#)
Top 1% highly cited paper in the Web of Science (2016/5-6)
12. **Metallic ground state in an ion-gated two-dimensional superconductor**
Y. Saito, Y. Kasahara, J. T. Ye, Y. Iwasa and T. Nojima
Science **350**, 409-413 (2015).
DOI: [10.1126/science.1259440](https://doi.org/10.1126/science.1259440)
See also [UTokyo Research](#)
13. **Superconductivity series in transition metal dichalcogenides by ionic gating**
W. Shi, J. T. Ye, Y. J. Zhang, R. Suzuki, M. Yoshida, J. Miyazaki, N. Inoue, Y. Saito and Y. Iwasa
Scientific Reports **5**, 12534 (2015).
DOI: [10.1038/srep12534](https://doi.org/10.1038/srep12534)
Top 1% highly cited paper in the Web of Science (2017/5-6)
14. **Ambipolar insulator-to-metal transition in black phosphorus by ionic-liquid gating**
Y. Saito and Y. Iwasa
ACS Nano **9**, 3192-3198 (2015).
DOI: [10.1021/acs.nano.5b00497](https://doi.org/10.1021/acs.nano.5b00497)
Top 1% highly cited paper in the Web of Science (2016/1-2)

Japanese Articles (peer-reviewed)

1. **2D superconducting state maintained in 50 Tesla magnetic fields**
Y. Saito, Y. Iwasa, Y. Kohama and M. Tokunaga
BUSSEIKEN DAYORI **56**(3), 20-22 (2016).
2. **Electric-double-layer transistor and two-dimensional superconductivity**
Y. Saito, T. Nojima and Y. Iwasa

List of Invited Talks

1. **Study on Electric-field-induced 2D superconductivity**
JSPS 74th Annual Meeting, Fukuoka, March 2018
2. **Highly crystalline 2D superconductors produced by ionic-liquid gating**
EMRS 2018 Fall meeting - Recent progress in superconductivity of two-dimensional layered system, Warszawa, Poland, September 18th, 2018
3. **Quantum phase transitions and symmetry-breaking physics in ion-gated 2D crystalline superconductors**
Superthin 2017 Superconductivity in atomically thin materials and heterostructures, Rugano, Switzerland, November 22nd, 2017
4. **2D crystalline superconductors with broken inversion symmetry.**
28th International Conference on Low Temperature Physics (LT28), Gothenburg, Sweden, August 11th, 2017
5. **2D crystalline superconductors based on transition metal dichalcogenides.**
EMN Lyon meeting on 2D materials, Lyon, France, August 8th, 2017
6. **Highly crystalline 2D superconductors.**
CEMS Topical Meeting on Emergent 2D Materials 2017, Tokyo, Japan, July 21th, 2017
7. **Highly crystalline 2D superconductors.**
YITP Workshop: Cutting-edge of superconductivity, Kyoto, Japan, June 19th, 2017
8. **Highly crystalline 2D superconductors protected by spin-valley locking.**
IEEE International Magnetism Conference INTERMAG Europe 2017, Dublin, Ireland, April 28th, 2017
9. **2D superconductors without inversion symmetry.**
CEMS Topical Meeting on Emergent Superconductivity under Extreme Condition, Tokyo, Japan, January 17th, 2017
10. **Highly-crystalline 2D superconductors and beyond.**
29th International Symposium on Superconductivity (ISS 2016), Tokyo, Japan, December 15th, 2016
11. **Ion-gated interface superconductivity in two-dimensional layered materials.**
NORDITA program : Physics of Interfaces and Layered Structures (PILS 2015), Stockholm, Sweden, September 11th, 2015

List of Seminars

1. **Ion-Gated 2D Crystalline Superconductors**
Seminar at ICFO, Barcelona, Spain, July 9th, 2019
Hosted by Prof. Dimitri Efetov

References

Yoshihiro Iwasa (PhD supervisor)
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Koji Tsuda (Postdoc supervisor)

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Associate Professor

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