

# Stanford

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## Srinivas Raghu

Professor of Physics

 Curriculum Vitae available Online

### CONTACT INFORMATION

#### • Administrative Contact

Noelle Rudolph

**Email** nrudolph@stanford.edu

### Bio

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#### BIO

I am interested in the emergent behavior of quantum condensed matter systems. Some recent research topics include non-Fermi liquids, quantum criticality, statistical mechanics of strongly interacting and disordered quantum systems, physics of the half-filled Landau level, quantum Hall to insulator transitions, superconductor-metal-insulator transitions, and the phenomenology of quantum materials.

Past contributions that I'm particularly proud of include the co-founding of the subject of topological photonics (with Duncan Haldane), scaling theories of non-Fermi liquid metals (with Shamit Kachru and Gonzalo Torroba), Euclidean lattice descriptions of Chern-Simons matter theories and their dualities in 2+1 dimensions (with Jing-Yuan Chen and Jun Ho Son), and 'dual' perspectives of quantum Hall transitions (with Prashant Kumar and Michael Mulligan).

#### ACADEMIC APPOINTMENTS

- Professor, Physics
- Principal Investigator, Stanford Institute for Materials and Energy Sciences

#### ADMINISTRATIVE APPOINTMENTS

- Postdoctoral Scholar, Stanford University, (2006-2010)
- Assistant Professor, Rice University, (2010-2011)
- Assistant Professor, Department of Physics, Stanford University, (2011-2017)
- Associate Professor, Department of Physics, Stanford, (2017- present)

#### HONORS AND AWARDS

- Elected Fellow, American Physical Society
- Terman Fellowship, Stanford University (2012)
- Sloan Research Fellowship, Alfred P. Sloan Foundation (2012)
- Young Investigator Award, U.S. Department of Energy (2012)

#### PROFESSIONAL EDUCATION

- Ph.D., Princeton University, Physics (2006)

## LINKS

- "SITP Webpage": <https://sitp.stanford.edu/people/srinivas-raghu>

## Teaching

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### COURSES

#### 2023-24

- Classical Electrodynamics: PHYSICS 220 (Win)
- Quantum Field Theory I: PHYSICS 330 (Aut)

#### 2022-23

- Classical Electrodynamics: PHYSICS 220 (Win)

#### 2021-22

- Classical Electrodynamics: PHYSICS 220 (Win)

#### 2020-21

- Intermediate Electricity and Magnetism I: PHYSICS 120 (Win)

### STANFORD ADVISEES

#### Doctoral Dissertation Reader (AC)

Xue Han, Kyung-Su Kim, Andrew Yuan, Mark Zic

#### Postdoctoral Faculty Sponsor

Tobias Helbig, Julian May-Mann, Yiming Wu

#### Doctoral Dissertation Advisor (AC)

Pavel Nosov

## Publications

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### PUBLICATIONS

- **Linear-in-temperature resistivity for optimally superconducting (Nd,Sr)NiO<sub>2</sub>.** *Nature*  
Lee, K., Wang, B. Y., Osada, M., Goodge, B. H., Wang, T. C., Lee, Y., Harvey, S., Kim, W. J., Yu, Y., Murthy, C., Raghu, S., Kourkoutis, L. F., Hwang, et al  
2023; 619 (7969): 288-292
- **The Hubbard Model** *ANNUAL REVIEW OF CONDENSED MATTER PHYSICS*  
Arovas, D. P., Berg, E., Kivelson, S. A., Raghu, S.  
2022; 13: 239-274
- **Universal behavior of the bosonic metallic ground state in a two-dimensional superconductor** *NPJ QUANTUM MATERIALS*  
Chen, Z., Wang, B., Swartz, A. G., Yoon, H., Hikita, Y., Raghu, S., Hwang, H. Y.  
2021; 6 (1)
- **Robust dx<sub>2</sub>-y<sub>2</sub>-wave superconductivity of infinite-layer nickelates** *PHYSICAL REVIEW B*  
Wu, X., Di Sante, D., Schwemmer, T., Hanke, W., Hwang, H. Y., Raghu, S., Thomale, R.  
2020; 101 (6)
- **Two-Dimensional Non-Fermi-Liquid Metals: A Solvable Large-N Limit.** *Physical review letters*  
Damia, J. A., Kachru, S., Raghu, S., Torroba, G.  
2019; 123 (9): 096402

- **Two-Dimensional Non-Fermi-Liquid Metals: A Solvable Large-N Limit** *PHYSICAL REVIEW LETTERS*  
Aguilera Damia, J., Kachru, S., Raghu, S., Torroba, G.  
2019; 123 (9)
- **Publisher Correction: Carrier density and disorder tuned superconductor-metal transition in a two-dimensional electron system.** *Nature communications*  
Chen, Z., Swartz, A. G., Yoon, H., Inoue, H., Merz, T. A., Lu, D., Xie, Y., Yuan, H., Hikita, Y., Raghu, S., Hwang, H. Y.  
2018; 9 (1): 4570
- **Superconducting Tunneling Spectroscopy of Spin-Orbit Coupling and Orbital Depairing in Nb :SrTiO<sub>3</sub>** *PHYSICAL REVIEW LETTERS*  
Swartz, A. G., Cheung, A. C., Yoon, H., Chen, Z., Hikita, Y., Raghu, S., Hwang, H. Y.  
2018; 121 (16): 167003
- **Carrier density and disorder tuned superconductor-metal transition in a two-dimensional electron system.** *Nature communications*  
Chen, Z., Swartz, A. G., Yoon, H., Inoue, H., Merz, T. A., Lu, D., Xie, Y., Yuan, H., Hikita, Y., Raghu, S., Hwang, H. Y.  
2018; 9 (1): 4008
- **Carrier density and disorder tuned superconductor-metal transition in a two-dimensional electron system** *NATURE COMMUNICATIONS*  
Chen, Z., Swartz, A. G., Yoon, H., Inoue, H., Merz, T. A., Lu, D., Xie, Y., Yuan, H., Hikita, Y., Raghu, S., Hwang, H. Y.  
2018; 9
- **Polaronic behavior in a weak-coupling superconductor** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
Swartz, A. G., Inoue, H., Merz, T. A., Hikita, Y., Raghu, S., Devereaux, T. P., Johnston, S., Hwang, H. Y.  
2018; 115 (7): 1475–80
- **Non-Fermi-liquid superconductivity: Eliashberg approach versus the renormalization group** *PHYSICAL REVIEW B*  
Wang, H., Raghu, S., Torroba, G.  
2017; 95 (16)
- **Emergent particle-hole symmetry in the half-filled Landau level** *PHYSICAL REVIEW B*  
Mulligan, M., Raghu, S., Fisher, M. P.  
2016; 94 (7)
- **Spin-orbit coupling and odd-parity superconductivity in the quasi-one-dimensional compound Li<sub>0.9</sub>Mo<sub>6</sub>O<sub>17</sub>** *PHYSICAL REVIEW B*  
Platt, C., Cho, W., McKenzie, R. H., Thomale, R., Raghu, S.  
2016; 93 (21)
- **Composite fermions and the field-tuned superconductor-insulator transition** *PHYSICAL REVIEW B*  
Mulligan, M., Raghu, S.  
2016; 93 (20)
- **Topological properties of ferromagnetic superconductors** *PHYSICAL REVIEW B*  
Cheung, A. K., Raghu, S.  
2016; 93 (13)
- **Metallic quantum critical points with finite BCS couplings** *PHYSICAL REVIEW B*  
Raghu, S., Torroba, G., Wang, H.  
2015; 92 (20)
- **Spin-triplet superconductivity in a weak-coupling Hubbard model for the quasi-one-dimensional compound Li<sub>0.9</sub>Mo<sub>6</sub>O<sub>17</sub>** *PHYSICAL REVIEW B*  
Cho, W., Platt, C., McKenzie, R. H., Raghu, S.  
2015; 92 (13)
- **Elastoconductivity as a probe of broken mirror symmetries** *PHYSICAL REVIEW B*  
Hlobil, P., Maharaj, A. V., Hosur, P., SHAPIRO, M. C., Fisher, I. R., Raghu, S.  
2015; 92 (3)
- **Enhanced pairing of quantum critical metals near d=3+1** *PHYSICAL REVIEW B*  
Fitzpatrick, A. L., Kachru, S., Kaplan, J., Raghu, S., Torroba, G., Wang, H.  
2015; 92 (4)

- **Evidence for a nematic component to the hidden-order parameter in URu<sub>2</sub>Si<sub>2</sub> from differential elastoresistance measurements** *NATURE COMMUNICATIONS*  
Riggs, S. C., SHAPIRO, M. C., Maharaj, A. V., Raghu, S., Bauer, E. D., Baumbach, R. E., Giraldo-Gallo, P., Wartenbe, M., Fisher, I. R.  
2015; 6
- **Evidence for a nematic component to the hidden-order parameter in URu<sub>2</sub>Si<sub>2</sub> from differential elastoresistance measurements.** *Nature communications*  
Riggs, S. C., SHAPIRO, M. C., Maharaj, A. V., Raghu, S., Bauer, E. D., Baumbach, R. E., Giraldo-Gallo, P., Wartenbe, M., Fisher, I. R.  
2015; 6: 6425-?
- **Suppression of spontaneous currents in Sr<sub>2</sub>RuO<sub>4</sub> by surface disorder** *PHYSICAL REVIEW B*  
Lederer, S., Huang, W., Taylor, E., Raghu, S., Kallin, C.  
2014; 90 (13)
- **Crisscrossed stripe order from interlayer tunneling in hole-doped cuprates** *PHYSICAL REVIEW B*  
Maharaj, A. V., Hosur, P., Raghu, S.  
2014; 90 (12)
- **Anomalous Fermi-liquid phase in metallic skyrmion crystals** *PHYSICAL REVIEW B*  
Watanabe, H., Parameswaran, S. A., Raghu, S., Vishwanath, A.  
2014; 90 (4)
- **Non-Fermi-liquid behavior of large-N-B quantum critical metals** *PHYSICAL REVIEW B*  
Fitzpatrick, A. L., Kachru, S., Kaplan, J., Raghu, S.  
2014; 89 (16)
- **Tunable coupling of two-dimensional superconductors in bilayer SrTiO<sub>3</sub> heterostructures** *PHYSICAL REVIEW B*  
Inoue, H., Kim, M., Bell, C., Hikita, Y., Raghu, S., Hwang, H. Y.  
2013; 88 (24)
- **Particle-hole condensates of higher angular momentum in hexagonal systems** *PHYSICAL REVIEW B*  
Maharaj, A. V., Thomale, R., Raghu, S.  
2013; 88 (20)
- **Quantum critical metals in d=3+1 dimensions** *PHYSICAL REVIEW B*  
Mahajan, R., Ramirez, D. M., Kachru, S., Raghu, S.  
2013; 88 (11)
- **Non-Fermi-liquid fixed point in a Wilsonian theory of quantum critical metals** *PHYSICAL REVIEW B*  
Fitzpatrick, A. L., Kachru, S., Kaplan, J., Raghu, S.  
2013; 88 (12)
- **Band structure effects on the superconductivity in Hubbard models** *PHYSICAL REVIEW B*  
Cho, W., Thomale, R., Raghu, S., Kivelson, S. A.  
2013; 88 (6)
- **Higher angular momentum pairing from transverse gauge interactions** *PHYSICAL REVIEW B*  
Chung, S. B., Mandal, I., Raghu, S., Chakravarty, S.  
2013; 88 (4)
- **Kerr effect as evidence of gyrotropic order in the cuprates** *PHYSICAL REVIEW B*  
Hosur, P., Kapitulnik, A., Kivelson, S. A., Orenstein, J., Raghu, S.  
2013; 87 (11)
- **Spin-orbit coupling in LaAlO<sub>3</sub>/SrTiO<sub>3</sub> interfaces: magnetism and orbital ordering** *NEW JOURNAL OF PHYSICS*  
Fischer, M. H., Raghu, S., Kim, E.  
2013; 15
- **Theory of 'hidden' quasi-1D superconductivity in Sr<sub>2</sub>RuO<sub>4</sub>** *10th International Conference on Materials and Mechanisms of Superconductivity (M2S)*  
Raghu, S., Chung, S. B., Lederer, S.  
IOP PUBLISHING LTD.2013

- **Optimal T-c of cuprates: The role of screening and reservoir layers** *PHYSICAL REVIEW B*  
Raghu, S., Thomale, R., Geballe, T. H.  
2012; 86 (9)
- **Charge and spin collective modes in a quasi-one-dimensional model of Sr<sub>2</sub>RuO<sub>4</sub>** *PHYSICAL REVIEW B*  
Chung, S. B., Raghu, S., Kapitulnik, A., Kivelson, S. A.  
2012; 86 (6)
- **Field-Induced p-Wave Superconducting State of Mesoscopic Systems** *PHYSICAL REVIEW LETTERS*  
Huo, J., Chen, W., Raghu, S., Zhang, F.  
2012; 108 (25)
- **Majorana zero modes in a quantum Ising chain with longer-ranged interactions** *PHYSICAL REVIEW B*  
Niu, Y., Chung, S. B., Hsu, C., Mandal, I., Raghu, S., Chakravarty, S.  
2012; 85 (3)
- **Effects of longer-range interactions on unconventional superconductivity** *PHYSICAL REVIEW B*  
Raghu, S., Berg, E., Chubukov, A. V., Kivelson, S. A.  
2012; 85 (2)
- **Thermodynamics of phase formation in the quantum critical metal Sr<sub>3</sub>Ru<sub>2</sub>O<sub>7</sub>** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
Rost, A. W., Grigera, S. A., Bruin, J. A., Perry, R. S., Tian, D., Raghu, S., Kivelson, S. A., Mackenzie, A. P.  
2011; 108 (40): 16549-16553
- **Superconductivity from repulsive interactions in the two-dimensional electron gas** *PHYSICAL REVIEW B*  
Raghu, S., Kivelson, S. A.  
2011; 83 (9)
- **Hidden Quasi-One-Dimensional Superconductivity in Sr<sub>2</sub>RuO<sub>4</sub>** *PHYSICAL REVIEW LETTERS*  
Raghu, S., Kapitulnik, A., Kivelson, S. A.  
2010; 105 (13)
- **Superconductivity in the repulsive Hubbard model: An asymptotically exact weak-coupling solution** *PHYSICAL REVIEW B*  
Raghu, S., Kivelson, S. A., Scalapino, D. J.  
2010; 81 (22)
- **Collective Modes of a Helical Liquid** *PHYSICAL REVIEW LETTERS*  
Raghu, S., Chung, S. B., Qi, X., Zhang, S.  
2010; 104 (11)
- **Microscopic theory of the nematic phase in Sr<sub>3</sub>Ru<sub>2</sub>O<sub>7</sub>** *PHYSICAL REVIEW B*  
Raghu, S., Paramakanti, A., Kim, E. A., Borzi, R. A., Grigera, S. A., Mackenzie, A. P., Kivelson, S. A.  
2009; 79 (21)
- **Time-Reversal-Invariant Topological Superconductors and Superfluids in Two and Three Dimensions** *PHYSICAL REVIEW LETTERS*  
Qi, X., Hughes, T. L., Raghu, S., Zhang, S.  
2009; 102 (18)
- **Vortex-dynamics approach to the Nernst effect in extreme type-II superconductors dominated by phase fluctuations** *PHYSICAL REVIEW B*  
Raghu, S., Podolsky, D., Vishwanath, A., Huse, D. A.  
2008; 78 (18)
- **Analogs of quantum-Hall-effect edge states in photonic crystals** *PHYSICAL REVIEW A*  
Raghu, S., Haldane, F. D.  
2008; 78 (3)
- **Minimal two-band model of the superconducting iron oxypnictides** *PHYSICAL REVIEW B*  
Raghu, S., Qi, X., Liu, C., Scalapino, D. J., Zhang, S.  
2008; 77 (22)

- **Topological Mott insulators** *PHYSICAL REVIEW LETTERS*  
Raghu, S., Qi, X., Honerkamp, C., Zhang, S.  
2008; 100 (15)
- **Theory of the three-dimensional quantum hall effect in graphite** *PHYSICAL REVIEW LETTERS*  
Bernevig, B. A., Hughes, T. L., Raghu, S., Arovas, D. P.  
2007; 99 (14)
- **Nernst effect and diamagnetism in phase fluctuating superconductors** *PHYSICAL REVIEW LETTERS*  
Podolsky, D., Raghu, S., Vishwanath, A.  
2007; 99 (11)