

JACK SINGAL

Curriculum Vitae

University of Richmond
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Assistant Professor of Physics, University of Richmond (Fall 2013 - present)

- 3-2 teaching schedule at undergraduate liberal arts institution
- Development of challenging, comprehensive, and successful introductory and advanced undergraduate physics courses incorporating a variety of appropriate pedagogical styles
- Development of writing intensive First Year Seminar course
- Mentoring of numerous undergraduate students in original research

RESEARCH AREAS

- **Multiwavelength Astrophysics Analysis**
Use of multiwavelength data and novel techniques to achieve new determinations of the cosmological evolution of quasars, blazars, gamma-ray bursts, and other populations
 - **Studies of the Diffuse Radio Emission**
Explorations of the radio synchrotron background and galactic radio and microwave foregrounds
 - **Data and Instrumentation Challenges in Large Survey Astrophysics**
Studies of photometric redshift strategies, and theoretical and in situ quantization of contamination effects on astronomical CCD detectors
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PREVIOUS ACADEMIC APPOINTMENTS

- **Postdoctoral Scientist (2007-2013)**
KIPAC, Stanford University and SLAC National Accelerator Laboratory
- **Postdoctoral Research Associate (2007)**
NASA Goddard Space Flight Center

PREVIOUS TEACHING APPOINTMENTS

- Lecturer for Stanford University Physics 15 course, summer 2010, 2011, and 2012
- Lecturer for UC Berkeley Extension Physics I course, fall 2012 and spring 2013

EDUCATION

BS in Physics, 2000
New York University (1996-2000)
Magna Cum Laude with minor in History

PhD in Physics, 2006
University of California, Santa Barbara (2002-2006)

REFEREED JOURNAL ARTICLES AS FIRST AUTHOR OR WITH A SUPERVISED UR STUDENT AS FIRST AUTHOR

- “Waveband Luminosity Correlations in Flux-Limited Multiwavelength Data.” **J. Singal**, V. Petrosian, S. Malik*, and J. Haider*, 2018, *ApJ*, submitted (arXiv:1806.03738)

- “Tests of Catastrophic Outlier Prediction in Empirical Photometric Redshift Estimation with Redshift Probability Distributions.” E. Jones* and **J. Singal**, 2018, *A&A*, in revision (arXiv: 1709.01576)
- “The Radio Synchrotron Background: Conference Summary and Report.” **J. Singal**, J. Haider*, M. Ajello, D. R. Ballantyne, E. Bunn, J. Condon, J. Dowell, D. Fixsen, N. Fornengo, B. Harms, G. Holder, E. Jones*, K. Kellermann, A. Kogut, T. Linden, R. Monsalve, P. Mertsch, E. Murphy, E. Orlando, M. Regis, D. Scott, T. Vernstrom, L. Xu, 2018, *PASP*, 130, 985
- “Analysis of a Custom Support Vector Machine for Photometric Redshift Estimation and the Inclusion of Galaxy Shape Information.” E. Jones* and **J. Singal**, 2017, *A&A*, 600, A113
- “The Mid-Infrared Luminosity Evolution and Luminosity Function of Quasars with SDSS and WISE.” **J. Singal**, J. George*, and A. Gerber*, 2016, *ApJ*, 831, 60
- “A Determination of the Gamma-ray Flux and Photon Spectral Index Distributions of Blazars from the Fermi-LAT 3LAC.” **J. Singal**, 2015, *MNRAS*, 115, 122
- “Axial Ratio of Edge-On Spiral Galaxies as a Test for Bright Radio Halos.” **J. Singal**, A. Kogut, E. Jones*, and H. Dunlap*, 2015, *ApJL*, 799, L10
- “Gamma-ray Luminosity and Photon Index Evolution of FSRQ Blazars and Contribution to the Gamma-ray Background.” **J. Singal**, A. Ko, and V. Petrosian, 2014, *ApJ*, 786, 109
- “Geant4 Applications for Modeling Molecular Transport in Complex Vacuum Geometries.” **J. Singal**, J. Langton, and R. Schindler, 2014, *IJMSSC*, 5, 2
- “The Radio and Optical Luminosity Evolution of Quasars II – The SDSS Sample.” **J. Singal**, V. Petrosian, L. Stawarz, and A. Lawrence, 2013, *ApJ*, 764, 43
- “Flux and Photon Spectral Index Distributions of Fermi-LAT Blazars and Contribution to the Extragalactic Gamma-ray Background.” **J. Singal**, V. Petrosian, and M. Ajello, 2012, *ApJ*, 753, 45
- “On The Radio and Optical Luminosity Evolution of Quasars.” **J. Singal**, V. Petrosian, A. Lawrence, and L. Stawarz, 2011, *ApJ*, 743, 104
- “The Efficacy of Galaxy Shape Parameters in Photometric Redshift Estimation: A Neural Network Approach.” **J. Singal**, M. Shmakova, B. Gerke, and J. Lotz, 2011, *PASP*, 615, 621
- “The ARCADE 2 Instrument.” **J. Singal**, D. Fixsen, A. Kogut, S. Levin, M. Limon, P. Lubin, P. Mirel, M. Seiffert, T. Villela, E. Wollack, and C.A. Wuensche, 2011, *ApJ*, 730, 138
- “Sources of the Radio Background Considered.” **J. Singal**, L. Stawarz, A. Lawrence, and V. Petrosian, 2010, *MNRAS*, 409, 1172
- “A Multi-Chamber System for Analyzing the Outgassing, Deposition, and Associated Optical Degradation Properties of Materials in a Vacuum.” **J. Singal**, R. Schindler, C. Chang, P. Czodrowski, and P. Kim, 2010, *Rev Sci Instrum*, 81, 025101
- “The CMB and Galactic Microwave Absolute Spectrum: Science and Measurement with ARCADE 2.” **J. Singal** (Invited Review), 2008, *MPLA*, 23, 1719
- “The Cosmic Microwave Background Temperature and Galactic Emission at 8.0 and 8.3 GHz.” **J. Singal**, D. Fixsen, A. Kogut, S. Levin, M. Limon, P. Lubin, P. Mirel, M. Seiffert, and E. Wollack, 2006, *ApJ*, 653, 835
- “Design and Performance of Sliced-Aperture Corrugated Feed Horn Antennas.” **J. Singal**, E. Wollack, A. Kogut, P. Lubin, M. Limon, P. Mirel, and M. Seiffert, 2005, *Rev Sci Instrum*, 76, 124703

REFEREED JOURNAL ARTICLES AS CONTRIBUTING AUTHOR

- “Determination of the Intrinsic Luminosity Time Correlation in the X-ray Afterglows of GRBs.” M. Dainotti, V. Petrosian, **J. Singal**, and M. Ostrowski, 2013, *ApJ*, 774, 157
- “ARCADE 2 Measurement of the Absolute Sky Brightness at 3-90 GHz.” D. Fixsen, A. Kogut, S. Levin, M. Limon, P. Lubin, P. Mirel, M. Seiffert, **J. Singal**, T. Villela, E. Wollack, and C.A. Wuensche, 2011, *ApJ*, 734, 5
- “ARCADE 2 Observations of Galactic Radio Emission.” A. Kogut, D. Fixsen, S. Levin, M. Limon, P. Lubin, P. Mirel, M. Seiffert, **J. Singal**, T. Villela, E. Wollack, and C.A. Wuensche, 2011, *ApJ*, 734, 4
- “Interpretation of the ARCADE 2 Absolute Sky Brightness Measurement.” M. Seiffert, D. Fixsen, A. Kogut, S. Levin, M. Limon, P. Lubin, P. Mirel, **J. Singal**, T. Villela, E. Wollack, and C.A. Wuensche, 2011, *ApJ*, 734, 6
- “PHAT: Photo-z Accuracy Testing.” H. Hildebrandt, S. Arnouts, P. Capak, L. Moustakas, C. Wolf, F. Abdalla, R. Assef, M. Banerj, G. Brammer, S. Carliles, D. Coe, T. Dahlen, R. Feldmann, D. Gerdes, B. Gillis, R. Kotulla, I. Li, J.-M. Miralles, N. Purger, S. Schmidt, and **J. Singal**, 2010, *A&A*, 523, A31
- “Radiometric Waveguide Calibrators.” E. Wollack, D. Fixsen, A. Kogut, M. Limon, P. Mirel, and **J. Singal**, 2007, *IEEE Trans. Instrum. and Meas.*, 56, 5
- “A Compact Microwave Calibrator.” D. Fixsen, E. Wollack, A. Kogut, M. Limon, P. Mirel, **J. Singal**, and S. Fixsen, 2006, *Rev Sci Instrum*, 77, 064905

CONFERENCE PROCEEDINGS

- “On the Relation Between AGN Jet and Accretion Disk Emissions.” V. Petrosian and **J. Singal**, (in *Extragalactic Jets From Every Angle, Proc. IAU S313, 2015*, F. Massaro, C. C. Cheung, E. Lopez, A. Siemiginowska, eds.)
- “Flat Spectrum Radio Quasar Evolution and the Gamma-ray Background.” **J. Singal**, A. Ko, and V. Petrosian (in *Multiwavelength AGN Surveys and Studies, Proc. IAU S304, 2014*, A. Michaelian, F. Aharonian, & D. Sanders, eds.)
- “Luminosity Correlations, Luminosity Evolutions, and Radio Loudness of AGNs from Multiwavelength Observations.” V. Petrosian, **J. Singal**, and L. Stawarz (in *Multiwavelength AGN Surveys and Studies, Proc. IAU S304, 2014*, A. Michaelian, F. Aharonian, & D. Sanders, eds.)
- “LSST Camera Instrument Modeling.” D. Gilmore, S. Kahn, P. Hascall, J. Ku, P. O’Connor, A. Rasmussen, V. Riot, and **J. Singal** (in *Proc. SPIE*, 2012)
- “Design and Development of the 3.2 Gigapixel Camera for the Large Synoptic Survey Telescope.” S. Kahn, N. Kurita, K. Gilmore, M. Nordby, P. O’Connor, R. Schindler, J. Oliver, R. Van Berg, S. Olivier, V. Riot, P. Antilogous, T. Schalk, M. Huffer, G. Bowden, **J. Singal**, and M. Foss (in *Proc. SPIE*, 7735, 2010)
- “The Cosmic Radio Background and AGN Connection.” **J. Singal**, L. Stawarz, A. Lawrence, and V. Petrosian, 2010, *IJMPD*, 19, 965
- “The Large Synoptic Survey Telescope - Prospects and Progress.” **J. Singal**. (in 8th Dark Matter / Dark Energy Symposium, January, 2009)

MAJOR TALKS AND COLLOQUIA

Scientific Talks and Colloquia Representing University of Richmond

- Invited Talk — Anisotropic Universe Workshop, Barolo, Italy (09/03/18) “Radio Background and Anisotropies”
- Colloquium — Green Bank Observatory, Green Bank, WV (05/10/2018) “The Radio Background: Recent Reckonings”
- Astrophysics Colloquium — NASA Goddard Space Flight Center (04/17/18) “The Radio Synchrotron Background: Recent Reckonings”
- Seminar — Sydney Institute for Astronomy, University of Sydney, Australia (04/28/17) “The Cosmic Radio Background: Six(ty) Years of an Enigma”
- KIPAC Tea Talk — Stanford University (03/09/17) “A Support Vector Machine for Photometric Redshifts and Probability Distributions”
- Colloquium — Louisiana State University (03/02/17) “A View with AGN Population Studies of the Evolution of Supermassive Black Holes”
- CMB Spectral Distortions from Cosmic Baryon Evolution conference — Bangalore, India (07/14/16) “Unaccounted Isotropic Radio Backgrounds”
- CMB Spectral Distortions from Cosmic Baryon Evolution conference — Bangalore, India (07/11/16) “ARCADE”
- Statistical Challenges in 21st Century Cosmology — Chania, Greece (05/25/16) “Non-parametric Determination of Luminosity Evolutions, Correlations, and Distributions in AGN from Flux Limited Survey Data”
- Colloquium — Harvard-Smithsonian Center for Astrophysics (02/11/16) “The Cosmic Radio Background: Six(ty) Years of an Enigma”
- Seminar — Harvard-Smithsonian Center for Astrophysics (02/11/16) “Evolution of the FSRQ Gamma-ray Luminosity Function”
- Colloquium — University of Virginia and National Radio Astronomy Observatory (01/21/16) “The Radio Synchrotron Background: The Enigma Continues”
- Colloquium — Texas A&M University (10/12/15) “The Cosmic Radio Background: Six(ty) Years of an Enigma”
- Invited Talk and Panel — “Pathfinding with ARCADE” CMB @ 50 workshop, Princeton University (6/10/15)
- Invited Talk — High Energy Messengers workshop, University of Chicago (6/09/14)
- KIPAC Tea Talk — Stanford University (10/24/13) “The Cosmic Radio Background: Still a Mystery”
- IAU Symposium — Byurakan, Armenia (10/15/13) “Cosmological Evolution of the FSRQ Gamma-ray Luminosity Function and Spectra Based on Fermi-LAT Observations”

Major Previous Scientific Talks and Colloquia

- Astrophysics Seminar — Hebrew University of Jerusalem, Israel (9/9/12)
- Astrophysics Seminar — Weizmann Institute, Israel (9/5/12)
- 219th AAS Meeting — Anchorage, AK (6/19/12)
- Special Colloquium — NASA Marshall Space Flight Center (4/19/12)
- RAL Seminal — University of California, Berkeley (01/24/11)
- CCAPP Seminar — Ohio State University (11/02/10)
- ROE colloquium — University Edinburgh (09/22/10)
- Cavendish Astrophysics Seminar — University of Cambridge, England (09/07/10)
- ROE Coffee Talk — University of Edinburgh, Scotland (9/3/10)
- Astrophysics Seminar — Fermilab (05/03/10)

- Space Sciences Colloquium — NASA Ames (6/23/09)
- Cosmology Seminar — University of Chicago (03/02/09)
- Astrophysics Colloquium — Stanford University (02/05/09)
- Astronomy Tea Talk — Caltech (03/12/07)
- Physics Department Colloquium — University of Miami (02/02/07)

SELECT STUDENT EXTERNAL POSTERS AND PRESENTATIONS

- Talk: “Correlations Between Luminosities in Widely Separated Wavebands in Quasars.” Presented by Jibran Haider at 6th Mid-Atlantic Radio Loud AGN Meeting, University of Maryland, Baltimore County (10/25/2018)
- Seminar: “Shape Information for Photometric Redshifts with a Support Vector Machine Algorithm.” Presented by Evan Jones at Yale University Galaxy Lunch (10/12/2016)
- Poster: “Catastrophic Outlier Identification in Photometric Redshifts with Effective Probability Distributions.” Presented by Michael Wyatt at 233rd American Astronomical Society meeting in Seattle, WA
- Poster: “Waveband Luminosity Correlations in Flux-Limited Multiwavelength Data.” Presented by Jibran Haider at 231st American Astronomical Society meeting in Washington, DC
- Poster: “Shape Information for Photometric Redshifts with a Support Vector Machine Algorithm.” Presented by Evan Jones at 227th American Astronomical Society meeting in Kissimmee, Florida
- Poster: “Population Studies of Quasars in Infrared and X-ray Light.” Presented by Joseph George at 227th American Astronomical Society meeting in Kissimmee, Florida

OUTREACH TALKS

- “Exoplanets” Henrico County Public Library (4/26/18)
- “Contemporary Cosmology” UR Osher lecture (04/09/18)
- “The (formerly) Invisible Universe” Presented at UR downtown and sponsored in part by the National Science Foundation (5/24/2017)
- “All the Light in the Universe” Charlottesville Astronomical Society (3/7/18)
- “Exoplanets - A Scientific Revolution in Progress” UR Osher Lecture (4/10/17)
- “Contemporary Cosmology: (Relatively) Recent Revolutions in the Big Questions” UR Osher lecture (09/22/16)
- “An Astronomical Revolution: Planets Beyond Our Solar System” Science Pub RVA event (10/20/15)
- “An Introduction to Quantum Mechanics” Chrysalis Institute (9/11/14)
- Lecture explaining Cosmic Microwave Background polarization at Science Pub RVA event (5/30/14)

MEDIA APPEARANCES

- Quoted in CNN.com article, picked up by 50+ news outlets (11/27/18)
- Live Interview – WRIC channel 8 television noon news (8/16/17)
- Taped Interview – WRIC channel 8 television evening news (8/16/17)
- Quote from Interview – Richmond Times-Dispatch (8/21/17)
- Live Interview – KBND radio (7/25/17)
- Promotional segments – WCVE radio *Science Matters* (May 2017)

GRANTS AND TELESCOPE OBSERVING TIME

Grants and Observing Time Obtained at University of Richmond

- PI, Green Bank Telescope, “*How Bright is the Radio Sky – A 310 MHz Absolute Map*” – 2018 (rated Highest Priority)
- PI, Green Bank Telescope, “*300 MHz Absolute Map – a Pathfinder*” – 2018 (rated Highest Priority)
- PI, NSF, “*Conference Proposal: The Radio Synchrotron Background*” – 2016 (\$31,195)
- VFIC Undergraduate Science Research Fellowship – 2016 (\$2,000)
- UR Faculty Travel Grants – 2014 (\$1200), 2016 (\$1,425), 2018 (\$1500)
- UR Student Travel Grants – 2x2016, 2x2018 (\$700 each)
- UR Faculty Summer Research Fellowships – 2014, 2015, 2016, 2017, 2018 (\$6000 each)
- UR Summer Student Research Fellowships – 9x (\$7500 each)
- Travel Grant from University of Chicago – 2014 (\$600)

Previous Grants Obtained

- Co-I, NASA Fermi Guest Investigator – 2012-2013 “*Distributions and Cosmological Evolutions of Blazar Luminosity & Spectra and Implications for the Gamma-ray Background*” (\$75,000)
- Co-I, NASA Fermi Guest Investigator – 2011-2012 “*Flux and Spectral Index Distributions of Fermi-LAT Blazars*” (\$75,000)

UNIVERSITY AWARDS

- Outstanding Mentor Award, University of Richmond College of Arts and Sciences, 2018
- UR, Arts and Sciences Symposium Paper Competition (research student Jibran Haider), 2018
- UR, Arts and Sciences Symposium Paper Competition (research student Evan Jones), 2017

SERVICE ACTIVITIES TO DEPARTMENT AND UNIVERSITY

- UR physics department web coordinator and blogmaster
- Service on Richmond Scholars selection committee, 2014-2015, 2015-2016, and 2018-2019
- Service on Richmond Goldwater Scholars selection committee, a2018-2019
- Faculty co-advisor for UR Astronomy Club
- Frequent outreach lectures to community
- Participant in UR NEXT career event

SERVICE ACTIVITIES TO NATIONAL AND INTERNATIONAL GROUPS

- Reviewer for *Astrophysical Journal*
- Reviewer for *Astrophysical Journal Letters*
- Reviewer for *Monthly Notices of the Royal Astronomical Society*
- Reviewer for *Modern Physics Letters A*
- Reviewer for *Review of Scientific Instruments*