

JACK SINGAL

Curriculum Vitae

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

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.
- **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
- **Studies of the Diffuse Radio Emission**
Explorations of the cosmic radio background and galactic radio and microwave foregrounds

TEACHING

- Professor for successful and challenging, and comprehensive customized introductory and advanced 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
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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 2011, spring 2011, and fall 2012

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)

RESEARCH EXPERIENCE

data analysis, data simulations, statistical techniques, machine learning, optical, radio, microwave, x-ray, and gamma-ray datasets, IDL, Geant4, C++, cryogenics, vacuum systems, mechanical design, SolidWorks, antenna design, radiometer component fabrication, light machining, thermal design and analysis, thermal calibration, signal I/O, integration and testing, field launch campaigns

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

- “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

- 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

- AAS HEAD Meeting — Monterrey, CA (4/9/13)
- 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)
- CINC Symposium — University of California, Davis (10/28/11)
- 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)

- 8th Dark Matter / Dark Energy Symposium — University of California, Los Angeles (02/20/08)
- Instrumentation Seminar — SLAC National Accelerator Laboratory (09/13/07)
- Special Seminar — University of California, Berkeley (06/15/07)
- KIPAC Tea Talk — Stanford University (05/08/07)
- Astronomy Tea Talk — Caltech (03/12/07)
- Physics Department Colloquium — University of Miami (02/02/07)

STUDENT EXTERNAL POSTERS AND PRESENTATIONS

- 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: “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

STUDENT INTERNAL POSTERS AND PRESENTATIONS

- 5 posters at A&S Student Symposium, 2014, 2015, 2016, and 2017
- 1 oral presentation at A&S Student Symposium, 2015
- Oral Presentation: “The Reptilian Elite Conspiracy Theory” Presented by Nathaniel Paul at 2015 FYS Student Conference
- Oral Presentation: “The Chemtrails Conspiracy Theory” Presented by Connor Geraghty at 2015 FYS Student Conference

OUTREACH TALKS

- “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)

GRANTS

Grants Obtained at University of Richmond

- 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)
- UR Student Travel Grants – 2x2016 (\$700 each)
- UR Faculty Summer Research Fellowships – 2014, 2015, 2016, 2017 (\$6000 each)
- UR Summer Student Research Fellowships – 2x 2014, 2x 2015, 2x2016, 2x2017 (\$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)
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SERVICE ACTIVITIES TO DEPARTMENT AND UNIVERSITY

- UR physics department web coordinator and blogmaster
- Service on Richmond Science Scholars selection committee, 2014-2015 and 2015-2016
- 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*