

Dr. Leo P. Singer

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Areas of Specialization

Astronomy · Gravitational Waves · Optical Transients · Gamma-Ray Bursts
Bayesian Inference · Open-Source Astronomy Software · Data Visualization

Education & Employment

2017-present	Research Astrophysicist (Civil Servant)
2014-2016	NASA Postdoctoral Program Fellow
2015	Ph.D. in Physics, California Institute of Technology Thesis Title: “From <i>Fermi</i> GRBs to LIGO Discoveries: The Needle in the 100 deg ² Haystack”
2009	B.Sc. in Physics, University of Maryland

Honors, Appointments, & Awards

2019-21	Project Scientist, Dorado
2015-17	Co-Chair, Electromagnetic Follow-Up Working Group, LIGO Scientific Collaboration
2016	co-recipient, Milner Breakthrough Prize in Fundamental Physics
2014	GWIC Thesis Prize
2013-14	John and Ursula Kanel Charitable Foundation Scholar
2010-13	Graduate Research Fellow, National Science Foundation
2012	Best Poster, LSC-Virgo Collaboration Meeting, Rome

Selected Publications

2022	Singer , Parazin, Coughlin, et al., “HEALPix Alchemy: Fast All-Sky Geometry and Image Arithmetic in a Relational Database for Multimessenger Astronomy Brokers”, <i>Astrophysical Journal</i> , in press
2022	Martinez-Castellanos, Singer , Burns, et al., “Multi-Resolution HEALPix Maps for Multi-Wavelength and Multi-Messenger Astronomy”, <i>Astrophysical Journal</i> , in press
2022	Petrov, Singer , Coughlin, et al., “Data-Driven Expectations for Electromagnetic Counterpart Searches Based on LIGO/Virgo Public Alerts”, <i>Astrophysical Journal</i> 924: 54
2021	Ahumada, Singer , Anand, et al., “Discovery and Confirmation of the Shortest Gamma Ray Burst with a Collapsar”, <i>Nature Astronomy</i> 5: 917
2021	Magee, Chatterjee, Singer , et. al., “First Demonstration of Early Warning Gravitational Wave Alerts”, <i>Astrophysical Journal Letters</i> 910: 21

2021 Anand et al., “Optical Follow-Up of the Neutron Star-Black Hole Mergers S200105ae and S200115j”, *Nature Astronomy* 5: 46

2020 Sachdev, Magee, Hanna, Cannon, **Singer**, et al., “An Early-warning System for Electromagnetic Follow-up of Gravitational-wave Events”, *Astrophysical Journal Letters* 905: 25

2020 Messick et al., “Automating the Inclusion of Subthreshold Signal-to-Noise Ratios for Rapid Gravitational-Wave Localization”, submitted to *Physical Review D*

2020 Bhakta et al., “The JAGWAR Prowls LIGO/Virgo O3 Paper I: Radio Search of a Possible Multi-Messenger Counterpart of the Binary Black Hole Merger Candidate S191216ap”, *Astrophysical Journal* 911: 77

2020 Almualla et al., “Dynamic Scheduling: Target of Opportunity Observations of Gravitational Wave Events”, *Monthly Notices of the Royal Astronomical Society* 495: 4366

2019 Andreoni, Goldstein, Anand, Coughlin, **Singer**, et al., “GROWTH on S190510g: DECam Observation Planning and Follow-up of a Distant Binary Neutron Star Merger Candidate”, *Astrophysical Journal Letters* 881: 16

2019 Goldstein et al., “GROWTH on S190426c: Real-time Search for a Counterpart to the Probable Neutron Star–Black Hole Merger using an Automated Difference Imaging Pipeline for DECam”, *Astrophysical Journal Letters* 881: 7

2019 Andreoni et al., “A Strategy for LSST to Unveil a Population of Kilonovae without Gravitational-wave Triggers”, *Publications of the Astronomical Society of the Pacific* 131: 068004

2019 Ginsburg et al., “Astroquery: An Astronomical Web-querying Package in Python”, *Astronomical Journal* 157: 98

2019 Corley, Bartos, **Singer**, et al., “Localization of Binary Black Hole Mergers with Known Inclination”, *Monthly Notices of the Royal Astronomical Society* 488: 4459

2019 Huerta et al., “Enabling Real-Time Multi-Messenger Astrophysics Discoveries with Deep Learning”, *Nature Reviews Physics* 1: 600

2019 Coughlin et al., “GROWTH on S190425z: Searching Thousands of Square Degrees to Identify an Optical or Infrared Counterpart to a Binary Neutron Star Merger with the Zwicky Transient Facility and Palomar Gattini-IR”, *Astrophysical Journal Letters* 885: 19

2019 Zonca, Singer, Lenz, et al., “Healpy: Equal Area Pixelization and Spherical Harmonics Transforms for Data on the Sphere in Python”, *Journal of Open Source Software* 4: 1298

2018 Del Pozzo, Berry, Ghosh, Haines, **Singer**, & Vecchio, “Dirichlet Process Gaussian-Mixture Model: An Application to Localizing Coalescing Binary Neutron Stars with Gravitational-Wave Observations”, *Monthly Notices of the Royal Astronomical Society* 479: 601

2018 Mooley, Frail, Myers, Kulkarni, Hotokezaka, **Singer**, et al., “A Case Study of On-the-fly Wide-field Radio Imaging Applied to the Gravitational Wave Event GW151226”, *Astrophysical Journal* 857: 143

2017 Kasliwal, Nakar, **Singer**, et. al., “Illuminating gravitational waves: A concordant picture of photons from a neutron star merger”, *Science* 358: 1559

2017 Arcavi, McCully, Hosseinzadeh, Howell, Vasylyev, Poznanski, Zaltzman, Maoz, **Singer**, et al., “Optical Follow-up of Gravitational-wave Events with Las Cumbres Observatory”, *Astrophysical Journal Letters* 848: 33

2017 LIGO Scientific Collaboration and Virgo Collaboration, “GW170817: Observation of Gravitational Waves from a Binary Neutron Star Inspiral”, *Physical Review Letters* 119: 161101

2017 **Singer**, Chen, Holz, et al., “GW170817: Observation of Gravitational Waves from a Binary Neutron Star Inspiral”, *Physical Review Letters* 119: 161101

- 2016 Singer, Chen, Holz, et al., “Going the Distance: Mapping Host Galaxies of LIGO and Virgo Sources in Three Dimensions Using Local Cosmography and Targeted Follow-up”, *Astrophysical Journal Letters* 829: 15
- 2016 **(note: corresponding author)** “Localization and Broadband Follow-Up of the Gravitational-Wave Transient GW150914”, *Astrophysical Journal Letters* 826: 13
- 2016 Kasliwal, Cenko, Singer, et al., “iPTF Search for an Optical Counterpart to Gravitational Wave Transient GW150914”, *Astrophysical Journal Letters* 824: 24
- 2016 Connaughton et al., “Fermi GBM Observations of LIGO Gravitational Wave Event GW150914”, *Astrophysical Journal Letters* 826: 6
- 2016 LIGO Scientific Collaboration & Virgo, “Observation of Gravitational Waves from a Binary Black Hole Merger”, *Physical Review Letters* 116: 061102
- 2016 Gehrels, Cannizzo, Kanner, Kasliwal, Nissanke, & Singer, “Galaxy Strategy for LIGO-Virgo Gravitational Wave Counterpart Searches”, *Astrophysical Journal* 820: 136
- 2016 LIGO Scientific Collaboration & Virgo, “Prospects for Localization of Gravitational Wave Transients by the Advanced LIGO and Advanced Virgo Observatories”, *Living Reviews in Relativity* 19: 1
- 2016 Singer & Price, “Rapid Bayesian Position Reconstruction for Gravitational-Wave Transients”, *Physical Review D* 93: 024013
- 2015 Singer, Kasliwal, Cenko, Perley, et al., “The Needle in the 100 deg² Haystack: Uncovering Afterglows of *Fermi* GRBs with the Palomar Transient Factory”, *Astrophysical Journal* 806: 52
- 2015 Berry, Mandel, Middleton, Singer, et al., “Parameter Estimation for Binary Neutron-Star Coalescences with Realistic Noise During the Advanced LIGO Era”, *Astrophysical Journal* 804: 114
- 2014 Singer, Price, Farr, et al., “The First Two Years of Electromagnetic Follow-Up with Advanced LIGO and Virgo”, *Astrophysical Journal* 795: 105
- 2013 Singer, Cenko, Kasliwal, Perley, et al., “Discovery and Redshift of an Optical Afterglow in 71 deg²: iPTF13bxl and GRB 130702A”, *Astrophysical Journal Letters* 776: 34
- 2013 Robitaille et al., “Astropy: A Community Python Package for Astronomy”, *Astronomy & Astrophysics* 558: A33
- 2013 Dietz, Fotopoulos, Singer, & Cutler, “Outlook for Detection of GW Inspirals by GRB-Triggered Searches in the Advanced Detector Era”, *Physical Review D* 87: 064033
- 2012 **(note: corresponding author)** Cannon et al., “Toward Early-warning Detection of Gravitational Waves from Compact Binary Coalescence”, *Astrophysical Journal* 748: 136

Selected Invited Talks

- 2019 *LSST Detection of Optical Counterparts of Gravitational Waves*, Columbia University, New York City, NY
- 2018 *Miami 2018 Topical Conference on Elementary Particles, Astrophysics, & Cosmology*, Fort Lauderdale, FL
- 2018 *3rd PANDA Symposium*, Chengdu, China
- 2018 **Keynote Talk**, *SciPy 2018*
- 2017 **Plenary Talk**, *29th meeting of the Indian Association for General Relativity and Gravitation*, Indian Institute of Technology, Guwahati, India
- 2016 *7 years of MAXI : Monitoring X-ray Transients*, RIKEN, Japan

- 2016 *Supernovae Through the Ages*, Easter Island, Chile
- 2016 *LIGO Dawn II Workshop*, Georgia Institute of Technology, Atlanta, GA
- 2016 Physics & Astronomy Department Colloquium, Johns Hopkins University, Baltimore, MD
- 2016 Physics Department Colloquium, George Washington University, Washington, DC
- 2016 Kavli Institute Colloquium, Massachusetts Institute of Technology, Cambridge, MA
- 2016 “Multimessenger Astronomy with LIGO and the Zwicky Transient Facility”, *Astrophysical Multimessenger Observatory Network Workshop*, Pennsylvania State University, State College, PA
- 2015 **Plenary Talk**, “The Needle in the Hundred-Square-Degree Haystack: The Hunt for Binary Neutron Star Mergers with LIGO and Palomar Transient Factory”, *11th Edoardo Amaldi Conference on Gravitational Waves*, Gwangju, South Korea
- 2015 “Compact Binary Mergers in the Era of Advanced LIGO”, *General Relativity & Gravitation: A Centennial Perspective*, Penn. State University, State College, PA
- 2015 “Gravitational Wave Observations and Optical Follow-up with Advanced LIGO”, *Improving Data Mobility & Management for International Cosmology*, Lawrence Berkeley National Lab, Berkeley, CA
- 2013 “The Needle in the Hundred-Square-Degree Haystack: from Fermi GRBs to LIGO Discoveries”, *Hot-Wiring the Transient Universe III*, Santa Fe, NM
- 2013 “Relativistic Explosions with Palomar Transient Factory”, *Gamma-ray Bursts: New Missions to New Science*, Skobeltsyn Institute of Nuclear Physics of Moscow State University, Moscow, Russia
- 2013 “HTCondor in MacPorts”, *HTCondor Week*, University of Wisconsin, Madison, WI

Service to Profession

- 2020 Proposal Reviewer, UK Science and Technology Facilities Council
- 2017 Proposal Reviewer, US National Science Foundation
- 2016 Session Chair at April 2016 American Physical Society Meeting
- 2015 Session Chair at April 2015 American Physical Society Meeting

Teaching & Outreach

- 2019 “Gravity in Science Fact and Science Fiction”, Public Lecture at DC Public Library for *Astronomy on Tap*, Washington, DC
- 2018 “Black and Gold: The Astrophysics of LIGO Signals”, Public Observatory Talk at George Mason University, Fairfax, VA
- 2017 “Advanced LIGO: Hearing the Sound of Gravity”, Public Lecture at University of Maryland Observatory, Greenbelt, MD
- 2016 “LIGO: How Gravitational Waves Taught me to Stop Worrying and Love the Bomb”, Public Lecture for *Astronomy on Tap*, Washington, DC
- 2010–13 Mentor for LIGO Summer Undergraduate Research Fellowship
- 2011 Teaching assistant for the course “Waves, Quantum Mechanics, and Statistical Physics”, California Institute of Technology, Pasadena, CA
- 2011 Lecture for LIGO Summer Undergraduate Research Fellowship program, “Introduction to Digital

Signal Processing”, California Institute of Technology, Pasadena, CA

Selected Contributions to Open-Source Software

Astropy · Matplotlib · SciPy · HEALPix · GWPy · ligo.skymap · PyGCN · MacPorts · Debian
· HTCondor · GStreamer

Other Qualifications

Eligible for Top Secret clearance with SCI access (full scope polygraph, April 11, 2006)