

# Geoffrey Lovelace

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*Curriculum Vitae revised July 9, 2021*

## ***Personal Data, Education, and Appointments***

### **Personal Data**

Born April 1980, Huntingdon Valley, Pennsylvania  
Married Elizabeth Wendel, August 2015; child William born April 2017

### **Education**

Ph.D. in Physics <i>California Institute of Technology</i>	Oct. 2002 – Jun. 2007
B.S. in Physics <i>University of Oklahoma</i>	Aug. 1998 – May 2002

### **Employment**

Professor of Physics <i>Department of Physics</i> <i>California State University, Fullerton</i>	Aug. 2021 – present
Associate Professor of Physics <i>Department of Physics</i> <i>California State University, Fullerton</i>	Aug. 2017 – Aug. 2021
Assistant Professor of Physics <i>Department of Physics</i> <i>California State University, Fullerton</i>	Aug. 2012 – Aug. 2017
Research Associate <i>Department of Astronomy</i> <i>Cornell University</i>	Sep. 2007 – Aug. 2012
Postdoctoral Scholar <i>Department of Physics</i> <i>California Institute of Technology</i>	Jul. 2007 – Aug. 2007

## Visiting Appointments

Visitor in Theoretical Astrophysics Aug. 2018 – present  
*Division of Physics, Mathematics, and Astronomy*  
*California Institute of Technology*

Visiting Associate in Physics Aug. 2012 – July 2013  
*Department of Physics*  
*California Institute of Technology*

## Research

### Philanthropic Support

Nicholas and Lee Begovich's Bequest to Cal State Fullerton 2020  
*\$10,000,000 to CSUF, including \$6,650,000 to the Nicholas and Lee Begovich*  
*Center for Gravitational-Wave Physics and Astronomy*

### Extramural Grants

*7 extramural proposals funded (\$1,929,771), including 6 as PI (\$992,403), since Fall 2012.*

1. PI for CSUF, National Science Foundation, PHY — Gravitational 2018  
 Experiments, "Collaborative Research: The Next Generation of Gravitational  
 Wave Detectors"  
*\$211,283 to CSUF, funded 2018–2021*
2. Co-PI for CSUF, National Science Foundation, PHY — Gravitational 2017  
 Experiments, "Collaborative Research: The Next Generation of Gravitational  
 Wave Detectors"  
*\$206,227 to CSUF, declined*
3. PI for CSUF, National Science Foundation, PHY — LIGO Research Support, 2016  
 "Collaborative Research: LSC Center for Coatings Research"  
*\$136,819 to CSUF, funded 2017–2020, collaborative proposal spanning*  
*10 institutions, led by Stanford*
4. PI, National Science Foundation, PHY — Integrative Activities 2016  
 in Physics, "CAREER: Computational gravitational-wave science  
 and education in the era of first observations"  
*\$400,070, funded 2017–2022*
5. PI, National Science Foundation, PHY — Gravitational Theory, 2015  
 "RUI: Computational gravitational-wave research for the  
 era of first observations"  
*\$135,000 over three years, funded 2016–2019*

6. Co-PI, National Science Foundation, AST — PAARE, “Catching a new wave: the CSUF-Syracuse partnership for inclusion of underrepresented groups in gravitational-wave astronomy” 2015  
*\$937,368 over five years to CSUF, \$1,320,966 total budget, funded 2016-2021*
7. PI, National Science Foundation, PHY — Integrative Activities in Physics, “CAREER: Computational gravitational-wave science and education for the era of first observations” 2015  
*\$420,190 over five years, declined*
8. PI, National Science Foundation, MRI, “MRI: Acquisition of a high-performance computer cluster for gravitational-wave astronomy with Advanced LIGO” 2014  
*\$119,791 over three years, funded 2014–2017*
9. Co-PI, National Science Foundation, AST - PAARE, “Catching the new wave: the CSUF-Syracuse partnership for advancing minority participation in gravitational-wave astronomy” 2013  
*\$977,931 over five years to CSUF, \$1,476,553 total budget, declined*
10. PI, Research Corporation for Science Advancement, Multi Investigator 2013 Cottrell College Science Award, “Developing a numerical injection analysis pipeline for gravitational waves from merging black holes and neutron stars” 2013  
*\$75,000 over two years, funded 2014–2017*
11. PI, National Science Foundation, PHY - Gravitational Theory, “RUI: 2012 Numerical Simulations of Merging Black Holes and Neutron Stars” 2012  
*\$125,723 over three years, funded 2013–2016*

### **Intramural Grants**

- PI, Course Redesign with Technology: Sustaining Success, “Early intervention in introductory mechanics” 2015  
*\$8,824 (\$1,960 + \$6,864 teaching release), funded 2015–2016*
- PI, Junior/Senior Faculty Grant for Research, Scholarship, and Creative Activity, “Modeling thermal noise for gravitational-wave antennas” 2015  
*\$6,312 teaching release, declined*
- PI, Junior/Senior Faculty Grant for Research, Scholarship, and Creative Activity, “Simulating merging black holes on a computer cluster” 2013  
*\$1986 + \$4747 for teaching release, funded 2013-2014*

## External Computer Time Grants

Co-PI, Extreme Science and Engineering Discovery Environment, “Gravitational Waves from Compact Binaries: Computational Contributions to LIGO” <i>15.1 million CPU-hours computer time awarded to the Simulating eXtreme Spacetimes Collaboration</i>	2020
Co-PI, Frontera Large-Scale Community Partnerships, “Gravitational Waves from Compact Binaries: Computational Contributions to LIGO” <i>56 million CPU-hours computer time awarded to the Simulating eXtreme Spacetimes Collaboration</i>	2020
Co-PI, Extreme Science and Engineering Discovery Environment, “Gravitational Waves from Compact Binaries: Computational Contributions to LIGO” <i>14 million CPU-hours computer time awarded to the Simulating eXtreme Spacetimes Collaboration</i>	2019
Co-PI, Extreme Science and Engineering Discovery Environment, “Gravitational Waves from Compact Binaries: Computational Contributions to LIGO” <i>7.1 million CPU-hours computer time awarded to the Simulating eXtreme Spacetimes Collaboration</i>	2018
Co-PI, Extreme Science and Engineering Discovery Environment, “Gravitational Waves from Compact Binaries: Computational Contributions to LIGO” <i>Declined</i>	2018
Co-PI, Extreme Science and Engineering Discovery Environment, “Gravitational Waves from Compact Binaries: Computational Contributions to LIGO” <i>6.41 million CPU-hours computer time awarded to the Simulating eXtreme Spacetimes Collaboration</i>	2016
Co-PI, Extreme Science and Engineering Discovery Environment, “Gravitational Waves from Compact Binaries: Computational Contributions to LIGO” <i>6.23 million CPU-hours computer time awarded to the Simulating eXtreme Spacetimes Collaboration</i>	2015
Co-PI, Extreme Science and Engineering Discovery Environment, “Gravitational Waves from Compact Binaries: Computational Contributions to LIGO” <i>6.15 million CPU-hours computer time awarded to the Simulating eXtreme Spacetimes Collaboration</i>	2014

Co-PI, Extreme Science and Engineering Discovery Environment, 2013

2013

“Gravitational Waves from Compact Binaries:

Computational Contributions to LIGO”

*3.2 million CPU-hours computer time awarded*

*to the Simulating eXtreme Spacetimes Collaboration*

## Selected Peer-Reviewed Publications

*Publications selected from the complete list of publications below. Note: California State University, Fullerton Student Co-Authors in **Bold-Italics**.*

1. Michael Boyle, Daniel Hemberger, Dante A.B. Iozzo, **Geoffrey Lovelace**, Serguei Ossokine, Harald P. Pfeiffer, Mark A. Scheel, Leo C. Stein, Charles J. Woodford, Aaron B. Zimmerman, *Nousha Afshari*, Kevin Barkett, Jonathan Blackman, Katerina Chatziioannou, Tony Chu, *Nicholas Demos*, Nils Deppe, Scott E. Field, Nils L. Fischer, *Evan Foley*, Heather Fong, *Alyssa Garcia*, Matthew Giesler, Francois Hebert, Ian Hinder, *Reza Katebi*, *Haroon Khan*, Lawrence E. Kidder, Prayush Kumar, *Kevin Kuper*, Halston Lim, Maria Okounkova, *Teresita Ramirez*, *Samuel Rodriguez*, Hannes R. Rüter, Patricia Schmidt, Bela Szilagy, Saul A. Teukolsky, Vijay Varma, and Marissa Walker. “The SXS Collaboration catalog of binary black hole simulations.” *Class. Quantum Grav.* **36**, 195006 (2019).
2. Katerina Chatziioannou, **Geoffrey Lovelace**, Michael Boyle, Matthew Giesler, Daniel A. Hemberger, *Reza Katebi*, Lawrence E. Kidder, Harald P. Pfeiffer, Mark A. Scheel, and Béla Szilágyi. “Measuring the properties of nearly extremal black holes with gravitational waves.” *Phys. Rev. D* **98**, 044028 (2018). <https://doi.org/10.1103/PhysRevLett.121.231103>
3. **Geoffrey Lovelace**, *Nicholas Demos*, and *Haroon Khan*. “Numerically modeling Brownian thermal noise in amorphous and crystalline thin coatings.” *Class. Quantum Grav.* **35**, 025017 (2017).
4. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. “GW170817: Observation of Gravitational Waves from a Binary Neutron Star Inspiral.” *Phys. Rev. Lett.* **119**, 161101 (2017).
5. **Geoffrey Lovelace**, Carlos O. Lousto, James Healy, Mark A. Scheel, *Alyssa Garcia*, Richard O’Shaughnessy, Michael Boyle, Manuela Campanelli, Daniel A. Hemberger, Lawrence E. Kidder, Harald P. Pfeiffer, Béla Szilágyi, Saul A. Teukolsky, and Yosef Zlochower. “Modeling the source of GW150914 with targeted numerical-relativity simulations.” *Class. Quantum Grav.* **33**, 244002 (2016).
6. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. “GW151226: Observation of Gravitational Waves from a 22-Solar-Mass Binary Black Hole Coalescence.” *Phys. Rev. Lett.* **116**, 241103 (2016).
7. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. “Observation of Gravitational Waves from a Binary Black Hole Merger.” *Phys. Rev. Lett.* **116**, 061102 (2016).

8. Prayush Kumar, Kevin Barkett, Swetha Bhagwat, **Nousha Afshari**, Duncan A. Brown, **Geoffrey Lovelace**, Mark A. Scheel, and Béla Szilágyi. “Accuracy and precision of gravitational-wave models of inspiraling neutron star-black hole binaries with spin: Comparison with matter-free numerical relativity in the low-frequency regime.” *Phys. Rev. D* **92**, 102001 (2015).
9. Mark A. Scheel, Matthew Giesler, Daniel A. Hemberger, **Geoffrey Lovelace**, **Kevin Kuper**, Michael Boyle, Béla Szilágyi, and Lawrence E. Kidder. “Improved methods for simulating nearly extremal binary black holes.” *Class. Quantum Grav.* **32**, 105009 (2015).
10. Geoffrey Lovelace, Mark A. Scheel, Robert Owen, Matthew Giesler, **Reza Katebi**, Béla Szilágyi, Tony Chu, **Nicholas Demos**, Daniel A. Hemberger, Lawrence E. Kidder, Harald P. Pfeiffer, **Nousha Afshari**. “Nearly extremal apparent horizons in simulations of merging black holes.” *Class. Quantum Grav.* **32**, 065007 (2015). *IOPselect article. Selected for CQG+ Author Insight.*
11. Andrea Taracchini, Alessandra Buonanno, Yi Pan, Tanja Hinderer, Michael Boyle, Daniel A. Hemberger, Lawrence E. Kidder, **Geoffrey Lovelace**, Abdul H. Mroué, Harald P. Pfeiffer, Mark A. Scheel, Béla Szilágyi, Nicholas W. Taylor, and Anıl Zenginoglu. “Effective-one-body model for black-hole binaries with generic mass ratios and spins.” *Phys. Rev. D* **89**, 061502 (2014).
12. Abdul H. Mroué, Mark A. Scheel, Béla Szilágyi, Harald P. Pfeiffer, Michael Boyle, Daniel A. Hemberger, Lawrence E. Kidder, Geoffrey Lovelace, Serguei Ossokine, Nicholas W. Taylor, Anıl Zenginoglu, Luisa T. Buchman, Tony Chu, **Evan Foley**, **Matthew Giesler**, Robert Owen, Saul A. Teukolsky. “A catalog of 174 high-quality binary black-hole simulations for gravitational-wave astronomy.” *Phys. Rev. Lett.* **111**, 241104 (2013).
13. **Geoffrey Lovelace**, Matthew D. Duez, Francois Foucart, Lawrence E. Kidder, Harald P. Pfeiffer, Mark A. Scheel, and Béla Szilágyi. “Massive disk formation in the tidal disruption of a neutron star by a nearly extremal black hole.” *Class. Quantum Grav.* **30**, 135004 (2013). *Class. Quantum Grav. 2013-2014 Highlight article.*

## Undergraduate and Graduate Research Students Advised

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| 1. <b>Samuel Rodriguez</b><br><i>Pursuing Ph.D. in physics at University of Mississippi in fall 2021</i>                                   | M.S., May 2021  |
| 2. <b>Teresita Ramirez Aguilar</b><br><i>Pursuing Ph.D. in physics at Northwestern University in fall 2021</i>                             | B.S., May 2021  |
| 3. <b>Sierra Thomas</b><br><i>Pursuing Ph.D. in physics at Syracuse University starting fall 2021</i>                                      | B.S., Dec. 2020 |
| 4. <b>Jennifer Sanchez</b><br><i>Pursuing Ph.D. in physics at Northwestern University starting fall 2021</i>                               | B.S., Dec. 2020 |
| 5. <b>Denyz Melchor</b><br><i>Pursuing Ph.D. in astrophysics at University of California, Los Angeles<br/>NSF Graduate Research Fellow</i> | B.S., May 2020  |

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6. **Nicholas Demos** B.S., May 2017  
*Pursing Ph.D. in physics at Massachusetts Institute of Technology*
  7. **John Derby** M.S., May 2017
  8. **Alyssa Garcia** B.S., May 2017  
*Pursing Ph.D. in physics at University of Michigan,  
NSF Graduate Research Fellow*
  9. **Haroon Khan** B.S., May 2017  
*Employed at NASA Ames*
  10. **Nousha Afshari** B.S., May 2016  
*Pursuing a graduate degree in medical physics at Louisiana State University*
  11. **Kevin Kuper** B.S., May 2015  
*Pursuing Ph.D. in optics at University of Arizona*
  12. **Evan Foley** M.S., May 2014  
*Now Chief Engineer at DNB Engineering, Fullerton, California*
  13. **Reza Katebi** M.S., May 2014  
*Ph.D. in physics, Ohio University, Oct. 2019  
Now a Senior Advanced AI Engineer at Honeywell*
  14. **Matthew Giesler** B.S., May 2013  
*Ph.D. in physics, California Institute of Technology, March 2020  
Now a Research Associate at Cornell University*

### **Selected Invited Presentations**

1. "Modeling binary black holes with numerical relativity in the era of gravitational-wave observations" Mar. 2021  
*Virtual HEP-Astro Seminar, University of Michigan*
2. "Numerical relativity for next-generation gravitational-wave observatories" May 2019  
*Presentation and discussion on invited panel, Physics and Astrophysics at the eXtreme (PAX) workshop, Cascina, Italy*
3. "Numerical relativity in the era of gravitational-wave observations" Jan. 2019  
*High energy and Gravity Seminar, University of California, Santa Barbara  
Santa Barbara, California*
4. "Numerically modeling Brownian thermal noise in crystalline coatings." Jun. 2018  
*Workshop on AlGaAs thermal noise at American University  
Washington, D.C.*
5. "Numerical relativity in the era of gravitational-wave observations." Mar. 2018  
*Center for Astrophysics and Space Sciences Seminar,  
University of California, San Diego,  
San Diego, California*

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| 6.  | “The first observations of gravitational waves from merging black holes”<br><i>Physics and Astronomy Colloquium, Swarthmore College,<br/>Swarthmore, Pennsylvania</i>  | Mar. 2017 |
| 7.  | “Using supercomputers to simulate merging black holes in the era of gravitational-wave astronomy”<br><i>Osher Lifelong Learning Institute Eclectics Seminar,<br/>Fullerton, California</i>   | Mar. 2017 |
| 8.  | “Doing science in the 21 <sup>st</sup> century: colliding black holes and gravitational-wave astronomy”<br><i>Keynote presentation, Better Together: CSU Fullerton EdTalk South—Next Generation Science Standards, Discovery Cube Orange County,<br/>Santa Ana, CA</i> | Feb. 2017 |
| 9.  | “Simulations of binary-black-hole mergers”<br><i>American Physical Society April Meeting, Washington, D.C.</i>   | Jan. 2017 |
| 10. | “The discovery of gravitational waves from merging black holes”<br><i>Scientific Symposium, Society for Advancement of Chicanos/Hispanics<br/>and Native Americans in Science</i>  | Oct. 2016 |
| 11. | “The first observations of gravitational waves from merging black holes”<br><i>Physics and Astronomy Colloquium, University of Oklahoma,<br/>Norman, Oklahoma</i>  | Sep. 2016 |
| 12. | “Observation of gravitational waves from merging black holes”<br><i>Orange County Astronomers General Meeting, Orange, California</i>  | Jul. 2016 |
| 13. | “Modeling merging black holes with numerical relativity in the era of first gravitational-wave observations”<br><i>Center for Astrophysics &amp; Space Sciences Astrophysics Seminar,<br/>University of California, San Diego, San Diego, California</i>               | May 2016  |
| 14. | “Simulating colliding black holes and mirror thermal noise for gravitational-wave astronomy”<br><i>Physics Colloquium, California State University, Northridge, California</i>   | Sep. 2015 |
| 15. | “Numerical simulations of merging black holes and neutron stars for gravitational-wave astronomy”<br><i>Physics Colloquium, Washington State University</i>  | Oct. 2014 |
| 16. | “Numerical simulations of merging black holes for gravitational-wave astronomy”<br><i>American Physical Society April Meeting, Savannah, Georgia</i>   | Apr. 2014 |

### **Selected Contributed Presentations**

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| 1. | “Progress toward simulating merging black holes with SpECTRE”<br><i>Virtual April APS Meeting</i> | Apr. 2021 |
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2. "Progress toward simulating merging black holes with SpECTRE" Apr. 2020  
*Virtual April APS Meeting*
3. "Can LIGO measure the spins of nearly extremal, merging binary black holes?" Apr. 2018  
*American Physical Society April Meeting  
Columbus, Ohio*
4. "Time series projections" Oct. 2017  
*Interactive tutorial on projecting theoretical gravitational waveforms  
onto gravitational-wave detector data in the time domain  
LIGO-Virgo Waveform Research and Development Team  
Face-to-face Meeting, Berlin, Germany*
5. "Numerically modeling Brownian thermal noise in amorphous and crystalline thin coatings" Jul. 2017  
*12<sup>th</sup> Eduardo Amaldi Conference on Gravitational Waves  
Pasadena, California*
6. "Simulations of binary-black-hole mergers" Feb. 2017  
*The Dawning Era of Gravitational-Wave Astrophysics, Aspen Center for Physics  
Winter Conference, Aspen, Colorado*
7. "The Discovery of Gravitational Waves from Merging Black Holes" Oct. 2016  
*Outreach talks to science classes at Dock Mennonite Academy  
Grades 9-12 Campus, Lansdale, PA*
8. "Modeling merging black holes with numerical relativity in the era of first gravitational-wave observations" Jul. 2016  
*21<sup>st</sup> International Conference on General Relativity  
and Gravitation, Columbia University, New York, New York*
9. "Modeling merging, rapidly rotating black holes with numerical relativity for the era of first gravitational-wave observations" Apr. 2016  
*American Physical Society April Meeting, Salt Lake City, Utah*
10. "Modeling crystalline Brownian coating noise with high performance computing" Jul. 2015  
*LIGO monthly coatings teleconference*
11. "Nearly extremal apparent horizons in simulations of merging black holes" Jun. 2015  
*International Conference on Black Holes, Fields Institute, Toronto, Ontario*
12. "Nearly extremal apparent horizons in simulations of merging black holes" Apr. 2015  
*American Physical Society April Meeting, Baltimore, Maryland*
13. "Collisions in Warped Space and Time" Oct. 2014  
*Outreach talk to physics classes at Grand Terrace High School,  
Grand Terrace, California*

14. “Results from numerical simulations of binaries containing nearly extremal black holes” Sep. 2013  
*2013 Numerical Relativity and Data Analysis Meeting, Mallorca, Spain*
15. “Nearly extremal black-hole spin in numerical simulations of compact binaries” Jul. 2013  
*20<sup>th</sup> International Conference on General Relativity and Gravitation and 10<sup>th</sup> Amaldi Conference on Gravitational Waves, Warsaw, Poland*
16. “The tidal disruption of a neutron star by a nearly extremal black hole” Mar. 2013  
*29<sup>th</sup> Annual Pacific Coast Gravity Meeting, Davis, California*
17. “Supercomputer simulations of colliding black holes and neutron stars” Jun. 2012  
*Introductory talk to summer research undergraduates, University of Oklahoma, Norman, Oklahoma*

## Teaching

### Supervision

- Supervision of 14 undergraduate and 5 graduate students for research projects in computational gravitational-wave physics Aug. 2012 – present  
*California State University, Fullerton*
- Co-supervision of 4 undergraduate students and 1 graduate student for computational relativity research projects Jun. 2008 – Jul. 2012  
*Cornell University*

### Courses Taught

- ASTR 101: Introduction to Astronomy Spring 2021  
 PHYS 330B: Electromagnetic Theory II  
 PHYS 499: Independent Study  
 PHYS 599: Independent Graduate Research  
 PHYS 597: Master’s Project
- ASTR 101: Introduction to Astronomy Fall 2020  
 PHYS 330A: Electromagnetic Theory I  
 PHYS 499: Independent Study  
 PHYS 599: Independent Graduate Research  
 PHYS 597: Master’s Project
- ASTR 101: Introduction to Astronomy Spring 2020  
 ASTR 444: Applications of Gravitation — *new course pilot*  
 PHYS 499: Independent Study  
 PHYS 599: Independent Graduate Research  
 PHYS 597: Master’s Project

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ASTR 101: Introduction to Astronomy	Fall 2019
PHYS 499: Independent Study	
PHYS 225: Fundamental Physics: Mechanics — <i>flipped classroom redesign</i>	Spring 2018
ASTR 444: Applications of Gravitation — <i>new course pilot</i>	
PHYS 499: Independent Study	
PHYS 599: Independent Graduate Research	
PHYS 520: Analytical Mechanics	Fall 2017
PHYS 499: Independent Study	
PHYS 225: Fundamental Physics: Mechanics — <i>flipped classroom redesign</i>	Spring 2017
PHYS 300: Survey of Mathematical Physics	
PHYS 499: Independent Study	
PHYS 597: Master's Project	
PHYS 599: Independent Graduate Research	
PHYS 520: Analytical Mechanics	Fall 2016
PHYS 499: Independent Study	
PHYS 597: Master's Project	
PHYS 599: Independent Graduate Research	
PHYS 225: Fundamental Physics: Mechanics — <i>flipped classroom redesign</i>	Spring 2016
ASTR 444: Applications of Gravitation — <i>new course pilot</i>	
PHYS 499: Independent Study	
PHYS 597: Master's Project	
PHYS 599: Independent Graduate Research	
PHYS 499: Undergraduate Independent Study	Fall 2015
PHYS 520: Analytical Mechanics	
PHYS 599: Independent Graduate Research	
PHYS 211: Elementary Physics	Spring 2015
PHYS 211L: Elementary Physics Laboratory	
PHYS 499: Undergraduate Independent Study	
PHYS 499: Undergraduate Independent Study	Fall 2014
PHYS 520: Analytical Mechanics	
PHYS 225: Fundamental Physics: Mechanics — <i>flipped classroom redesign</i>	Spring 2014
PHYS 499: Undergraduate Independent Study	
PHYS 597: Master's Project	
PHYS 599: Independent Graduate Research	
PHYS 499: Undergraduate Independent Study	Fall 2013
PHYS 520: Analytical Mechanics	
PHYS 597: Master's Project	
PHYS 599: Independent Graduate Research	

PHYS 211: Elementary Physics Spring 2013  
 PHYS 499: Undergraduate Independent Study  
 PHYS 597: Master's Project  
 PHYS 599: Independent Graduate Research

PHYS 211: Elementary Physics Fall 2012  
 PHYS 499: Undergraduate Independent Study  
 PHYS 599: Independent Graduate Research

## Other Teaching Accomplishments

Workshop on Gravitational Waves and High-Performance Computing Aug. 2019  
*Introduced 22 students from Citrus College to gravitational-wave science and high-performance computing through a 1-week summer workshop*

Workshop on Gravitational Waves and High-Performance Computing Aug. 2018  
*Introduced 16 students from Citrus College to gravitational-wave science and high-performance computing through a 1-week summer workshop*

Discussion Leader at Gordon Research Conference discussing Jun. 2016  
 "Relativity and Gravitation: Contemporary Research and Teaching of Einstein's Physics"  
*Salve Regina University, Newport, Rhode Island*

Participant in "Proven Course Redesign" eAcademy on Jul. 2013  
 research-based, "flipped classroom" pedagogy  
*California State Polytechnic University, Pomona*

Designed and presented online lecture introducing aspects of Jun. 2011  
 object-oriented programming and the Spectral Einstein Code  
*Cornell University, Ithaca, New York*

## Service

### Professional Leadership

Secretary and Treasurer, American Physical Society Jan. 2017 – Jan. 2021  
 Division of Gravitation

Senior member, Gravitational-Wave Physics and Astronomy Aug. 2012 – present  
 Center (GWPAC) at California State University, Fullerton

Member, Executive Committee of Nov. 2009 – present  
 the Simulating eXtreme Spacetimes (SXS) collaboration

### Professional Membership

Active member, LIGO Scientific Collaboration May 2014 – present

Active member, Simulating eXtreme Spacetimes (SXS) Collaboration Sep. 2007 – present

Active member, American Physical Society, Division of Gravitation Feb. 2006 – present

### **Professional Service**

Member, Classical and Quantum Gravity Editorial Board	Mar. 2021
Member, Classical and Quantum Gravity Advisory Panel	Dec. 2016 – Mar. 2021
Member, American Physical Society LeRoy Apker Award Selection Committee	May 2019 – present
Ph.D. committee member for Rochester Institute of Technology student Jacob Lange	Mar. 2018 – Aug. 2020
National Science Foundation Review Panelist	Feb. 2019
Referee for journal Physical Review Letters, APS publishing	Apr. 2008 – present
Referee for journal Physical Review D, APS publishing	Mar. 2008 – present
Participate in CSU Webinar on grant writing	Feb. 2017
Organize and host 32 <sup>nd</sup> annual Pacific Coast Gravity Meeting	Apr. 2016
Organize and host Theoretical Astrophysics in Southern California conference	Nov. 2015
National Science Foundation Review Panelist	Feb. 2015
Referee, Gravitational Physics Program, National Science Foundation	Jan. 2014 – present
Co-organize and host Numerical and Analytical Relativity and Data Analysis (NARDA) 2014 meeting	Aug. 2014
Reviewer, NASA Postdoctoral Program	May 2013
Reviewer, NSF Physics at the Information Frontier program	Feb. 2013
Referee for journal Classical and Quantum Gravity, IOP publishing	Mar. 2008 – present

### **Department, College, and University Committee Service**

Reviewer, NSM Jr/Sr Intramural Award Committee	Mar. 2020
Chair, Physics Department Faculty Search Committee	Aug. 2019 – Aug. 2020
Discuss NSF CAREER proposal writing with CSUF professors, hosted by the Office of Research Development & College of Engineering	Mar. 2019
Member, Center for Computational and Applied Mathematics Computing Committee	Aug. 2017 – present

Discuss NSF CAREER proposal writing with CSUF professors, hosted by the Office of Research Development	April 2017
Curriculum Committee Chair, Department of Physics, CSUF	Aug. 2015 – Aug. 2018
Member, search committee for high-performance computing system administrator	Aug. 2016 – Oct. 2017
Lab Development Committee, Department of Physics, California State University, Fullerton	Aug. 2015 – Aug. 2016
Curriculum Committee, College of Natural Sciences and Mathematics, California State University, Fullerton	Sep. 2014 – present
Safety Committee, College of Natural Sciences and Mathematics, California State University, Fullerton	Aug. 2013 – Sep. 2014
<b>Outreach, Advocacy, and Fundraising</b>	
Speak and facilitate keynote address by Kip Thorne at the renaming ceremony for the Nicholas and Lee Begovich Center for Gravitational-Wave Physics and Astronomy	Oct. 2019
Outreach seminar at Citrus College, recruiting for a 1-week CSUF summer workshop on high-performance computing	Apr. 2019
Participant in American Physical Society Congressional Outreach Day	Feb. 2019
Interview with Tom Lovelace on local New York radio station WTBQ	Sep. 2018
Guest teaching in introductory calculus courses, demonstrating Monte Carlo integration with dice	Sep. 2018
Present 15-minute public lecture at Dock Mennonite Academy (high school)	Sep. 2018
Outreach seminar at Citrus College, recruiting for a 1-week CSUF summer workshop on high-performance computing	Apr. 2018
Q&A with Joshua Smith at Fullerton Community Center, hosted by Parents' Voice and the Lions Club	May 2017
Supervision of high school volunteer intern for a computational research project	Jun. 2016 – Aug. 2016
Presenter at CSUF fundraising dinner event, "Gravitational Waves: Examining the Universe in a Whole New Way"	Apr. 2016
Discuss gravitational-wave research with CSU Chancellor, CSUF President, GWPAC student researchers and professors	Feb. 2016

Co-lead CSUF press conference announcing the discovery of gravitational waves from merging black holes	Feb. 2016
Contribute to CSUF media relations outreach for gravitational-wave discovery <a href="http://news.fullerton.edu/gravitational-waves/">http://news.fullerton.edu/gravitational-waves/</a>	Feb. 2016
Present, with undergraduate researchers Nick Demos and Alyssa Garcia and Profs. Josh Smith and Josh Der, to California State University, Fullerton Philanthropic Foundation Board of Directors	Nov. 2015
Attend Posters on the Hill with student Haroon Khan to advocate for undergraduate STEM research to members of Congress and their staff in Washington, D.C.	Apr. 2015
Supervision of high school volunteer intern for a computational research project	Jun. 2013 – Aug. 2013
Participant in Discover STEM event, Cyprus College	Apr. 2013
Participant in Welcome to Fullerton Day, California State University, Fullerton	Apr. 2013
Interview with local middle school student	Jan. 2013
Participant in GWPAC opening celebration, California State University, Fullerton	Sep. 2012

## ***Awards and Other Accomplishments***

### **Awards**

Outstanding Untenured Faculty Member, \$2,500, annual award given by the California State University, Fullerton College of Natural Sciences and Mathematics	May 2017
Titan on the Rise: Early Career Investigator Award \$750, award given by the California State University, Fullerton Office of Research Development	May 2017
Special Breakthrough Prize in Fundamental Physics co-recipient \$1,976, portion of \$2 million shared among 1,012 contributors to the LIGO experiment “for the observation of gravitational waves, opening new horizons in astronomy and physics.”	May 2016
Woodward Faculty Research Award \$2,000, annual award given by the California State University, Fullerton Department of Physics	May 2015

## Media

- Appeared with CSUF undergraduate Teresita Ramirez in documentary “LIGO: A Discovery that Shook the World” by Les Guthman Dec. 2019  
<https://vimeo.com/378452738> starting at 3:07
- Quoted in Scientific American article on LIGO observation GW190814 Aug. 2019  
<https://www.scientificamerican.com/article/astronomers-spy-a-black-hole-devouring-a-neutron-star/>
- Visualization of LIGO’s first ten binary-black-hole observations, created by CSUF undergraduate Teresita Ramirez, Geoffrey Lovelace, the SXS Collaboration, and the LIGO Virgo Collaboration, featured in national media Dec. 2018  
<https://youtu.be/gmmD72cFOU4> — 109,000+ views on YouTube  
<https://arstechnica.com/science/2018/12/physicists-detected-gravitational-waves-from-four-new-black-hole-mergers/>  
<https://www.scientificamerican.com/article/has-ligo-seen-galaxy-warped-gravitational-waves/>
- Visualization of GW170814 created by CSUF undergraduate Nicholas Demos, Peter Holderness at Caltech, and the SXS Collaboration featured in the New York Times Jan. 2017  
*Second figure in <https://nyti.ms/2ss9syS>*
- Scientific results from and outreach concerning the discovery of gravitational waves from merging black holes featured in local, national, and international media Feb. 2016  
*(e.g. visualization starting at 00:53 in <https://youtu.be/z7pKXVkcDzs>)*
- Article selected for cover of Phys. Rev. Lett. vol. 116, no. 6 Feb. 2016  
*Contributed to creating cover image*
- Article selected for cover of Phys. Rev. Lett. vol. 106, no. 15 Apr. 2011
- Research on visualizing curved spacetime featured in news media Apr. 2011  
*(e.g. <http://www.universetoday.com/84807/a-new-way-to-visualize-warped-space-and-time/>)*



## Complete Lists of Publications and Presentations

### Peer-Reviewed Publications

California State University, Fullerton Student Co-Authors in ***Bold-Italics***

1. Katerina Chatziioannou, Roberto Cotesta, Sudarshan Ghonge, Jacob Lange, Ken KY Ng, Juan Calderón Bustillo, James Clark, Carl-Johan Haster, Sebastian Khan, Michael Pürner, Vivien Raymond, Salvatore Vitale, ***Nousha Afshari***, Stanislav Babak, Kevin Barkett, Jonathan Blackman, Alejandro Bohé, Michael Boyle, Alessandra Buonanno, Manuela Campanelli, Gregorio Carullo, Tony Chu, ***Eric Flynn***, Heather Fong, ***Alyssa Garcia***, Matthew Giesler, Maria Haney, Mark Hannam, Ian Harry, James Healy, Daniel Hemberger, Ian Hinder, Karan Jani, Bhavesh Khamersa, Lawrence E Kidder, Prayush Kumar, Pablo Laguna, Carlos O Lousto, ***Geoffrey Lovelace***, Tyson B Littenberg, Lionel London, Margaret Millhouse, Laura K Nuttall, Frank Ohme, Richard O’Shaughnessy, Serguei Ossokine, Francesco Pannarale, Patricia Schmidt, Harald P Pfeiffer, Mark A Scheel, Lijing Shao, Deirdre Shoemaker, Bela Szilagy, Andrea Taracchini, Saul A Teukolsky, and Yosef Zlochower. “On the properties of the massive binary black hole merger GW170729.” *Phys. Rev. D* **100**, 104015 (2019). <https://doi.org/10.1103/PhysRevD.100.104015>
2. Michael Boyle, Daniel Hemberger, Dante A.B. Iozzo, ***Geoffrey Lovelace***, Serguei Ossokine, Harald P. Pfeiffer, Mark A. Scheel, Leo C. Stein, Charles J. Woodford, Aaron B. Zimmerman, ***Nousha Afshari***, Kevin Barkett, Jonathan Blackman, Katerina Chatziioannou, Tony Chu, ***Nicholas Demos***, Nils Deppe, Scott E. Field, Nils L. Fischer, ***Evan Foley***, Heather Fong, ***Alyssa Garcia***, Matthew Giesler, Francois Hebert, Ian Hinder, ***Reza Katebi***, ***Haroon Khan***, Lawrence E. Kidder, Prayush Kumar, ***Kevin Kuper***, Halston Lim, Maria Okounkova, ***Teresita Ramirez***, ***Samuel Rodriguez***, Hannes R. Rüter, Patricia Schmidt, Bela Szilagy, Saul A. Teukolsky, Vijay Varma, and Marissa Walker. “The SXS Collaboration catalog of binary black hole simulations.” *Class. Quantum Grav.* **36**, 195006 (2019). <https://doi.org/10.1088/1361-6382/ab34e2>
3. Katerina Chatziioannou, Geoffrey Lovelace, Michael Boyle, Matthew Giesler, Daniel A. Hemberger, ***Reza Katebi***, Lawrence E. Kidder, Harald P. Pfeiffer, Mark A. Scheel, and Béla Szilágyi. “Measuring the properties of nearly extremal black holes with gravitational waves.” *Phys. Rev. D* **98**, 044028 (2018). <https://doi.org/10.1103/PhysRevLett.121.231103>
4. “Assessing the Energetics of Spinning Binary Black Hole Systems.” Serguei Ossokine, Tim Dietrich, ***Evan Foley***, ***Reza Katebi***, and ***Geoffrey Lovelace***. *Phys. Rev. D* **98**, 104057 (2018). <https://doi.org/10.1103/PhysRevD.98.104057>
5. Chaitanya Afle, Anuradha Gupta, Bhooshan Gadre, Prayush Kumar, ***Nick Demos***, ***Geoffrey Lovelace***, Han Gil Choi, Hyung Mok Lee, Sanjit Mitra, Michael Boyle, Daniel A. Hemberger, Lawrence E. Kidder, Harald P. Pfeiffer, Mark A. Scheel, and Béla Szilágyi. “Detection and characterization of spin-orbit resonances in the advanced gravitational wave detectors era.” *Phys. Rev. D* **98**, 083014 (2018). <https://dx.doi.org/10.1103/PhysRevD.98.083014>
6. ***Geoffrey Lovelace***, ***Nicholas Demos***, and ***Haroon Khan***. “Numerically modeling Brownian thermal noise in amorphous and crystalline thin coatings.” *Class. Quantum Grav.* **35**, 025017 (2017). <http://doi.org/10.1088/1361-6382/aa9ccc>.

7. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. "GW170817: Observation of Gravitational Waves from a Binary Neutron Star Inspiral." *Phys. Rev. Lett.* **119**, 161101 (2017). <https://doi.org/10.1103/PhysRevLett.119.161101>
8. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. "GW170814: A three-detector observation of gravitational waves from a binary black hole coalescence." *Phys. Rev. Lett.* **119**, 141101 (2017). <https://doi.org/10.1103/PhysRevLett.119.141101>
9. Jacob Lange, Richard O'Shaughnessy, Michael Boyle, Juan Calderón Bustillo, Manuela Campanelli, Tony Chu, James A Clark, **Nicholas Demos**, Heather Fong, James Healy, Daniel Hemberger, Ian Hinder, Karan Jani, Bhavesh Khamesra, Lawrence E Kidder, Prayush Kumar, Pablo Laguna, Carlos O Lousto, **Geoffrey Lovelace**, Serguei Ossokine, Harald Pfeiffer, Mark A Scheel, Deirdre Shoemaker, Bela Szilagyi, Saul Teukolsky, Yosef Zlochower. "A Parameter Estimation Method that Directly Compares Gravitational Wave Observations to Numerical Relativity." *Phys. Rev. D* **96**, 104041 (2017), <http://doi.org/10.1103/PhysRevD.96.104041>.
10. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. "GW170104: Observation of a 50-Solar-Mass Binary Black Hole Coalescence at Redshift 0.2." *Phys. Rev. Lett.* **118**, 221101 (2017). <https://doi.org/10.1103/PhysRevLett.118.221101>
11. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. "Effects of waveform model systematics on the interpretation of GW150914." *Class. Quantum Grav.* **34**, 104002 (2017). <https://doi.org/10.1088/1361-6382/aa6854>
12. Alejandro Bohé, Lijing Shao, Andrea Taracchini, Alessandra Buonanno, Stanislav Babak, Ian W. Harry, Ian Hinder, Serguei Ossokine, Michael Pürrer, Vivien Raymond, Tony Chu, Heather Fong, Prayush Kumar, Harald P. Pfeiffer, Michael Boyle, Daniel A. Hemberger, Lawrence E. Kidder, **Geoffrey Lovelace**, Mark A. Scheel, and Béla Szilágyi. "An improved effective-one-body model of spinning, nonprecessing binary black holes for the era of gravitational-wave astrophysics with advanced detectors." *Phys. Rev. D* **95**, 044028 (2017). <https://doi.org/10.1103/PhysRevD.95.044028>
13. **Geoffrey Lovelace**, Carlos O. Lousto, James Healy, Mark A. Scheel, **Alyssa Garcia**, Richard O'Shaughnessy, Michael Boyle, Manuela Campanelli, Daniel A. Hemberger, Lawrence E. Kidder, Harald P. Pfeiffer, Béla Szilágyi, Saul A. Teukolsky, and Yosef Zlochower. "Modeling the source of GW150914 with targeted numerical-relativity simulations." *Class. Quantum Grav.* **33**, 244002 (2016). <https://doi.org/10.1088/0264-9381/33/24/244002>
14. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. "GW151226: Observation of Gravitational Waves from a 22-Solar-Mass Binary Black Hole Coalescence." *Phys. Rev. Lett.* **116**, 241103 (2016). <https://doi.org/10.1103/PhysRevLett.116.241103>
15. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. "Directly comparing GW150914 with numerical solutions of Einstein's equations for binary black hole coalescence." *Phys. Rev. D* **94**, 064035 (2016). <https://doi.org/10.1103/PhysRevD.94.064035>

16. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. “An improved analysis of GW150914 using a fully spin-precessing waveform model.” *Phys. Rev. X* **6**, 041014 (2016). <https://doi.org/10.1103/PhysRevX.6.041014>
17. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. “Tests of general relativity with GW150914.” *Phys. Rev. Lett.* **116**, 221101 (2016). <https://doi.org/10.1103/PhysRevLett.116.241101>
18. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. “Properties of the Binary Black Hole Merger GW150914.” *Phys. Rev. Lett.* **116**, 241102 (2016). <https://doi.org/10.1103/PhysRevLett.116.241102>
19. B. P. Abbott et al., for the LIGO Scientific Collaboration and the Virgo Collaboration. “Observation of Gravitational Waves from a Binary Black Hole Merger.” *Phys. Rev. Lett.* **116**, 061102 (2016). <https://doi.org/10.1103/PhysRevLett.116.061102>
20. Prayush Kumar, Kevin Barkett, Swetha Bhagwat, *Nousha Afshari*, Duncan A. Brown, **Geoffrey Lovelace**, Mark A. Scheel, and Béla Szilágyi. “Accuracy and precision of gravitational-wave models of inspiraling neutron star-black hole binaries with spin: Comparison with matter-free numerical relativity in the low-frequency regime.” *Phys. Rev. D* **92**, 102001 (2015). <https://doi.org/10.1103/PhysRevD.92.102001>
21. Mark A. Scheel, Matthew Giesler, Daniel A. Hemberger, **Geoffrey Lovelace**, *Kevin Kuper*, Michael Boyle, Béla Szilágyi, and Lawrence E. Kidder. “Improved methods for simulating nearly extremal binary black holes.” *Class. Quantum Grav.* **32**, 105009 (2015). <https://doi.org/10.1088/0264-9381/32/10/105009>
22. **Geoffrey Lovelace**, Mark A. Scheel, Robert Owen, Matthew Giesler, *Reza Katebi*, Béla Szilágyi, Tony Chu, *Nicholas Demos*, Daniel A. Hemberger, Lawrence E. Kidder, Harald P. Pfeiffer, *Nousha Afshari*. “Nearly extremal apparent horizons in simulations of merging black holes.” *Class. Quantum Grav.* **32**, 065007 (2015). *IOPselect article. Selected for CQG+ Author Insight.* <https://doi.org/10.1088/0264-9381/32/6/065007>
23. The LIGO Scientific Collaboration, the Virgo Collaboration, and the NINJA-2 Collaboration: J. Aasi et al. “The NINJA-2 project: Detecting and characterizing gravitational waveforms modelled using numerical binary black hole simulations.” *Class. Quantum Grav.* **31**, 115004 (2014). <https://doi.org/10.1088/0264-9381/31/11/115004>
24. Andrea Taracchini, Alessandra Buonanno, Yi Pan, Tanja Hinderer, Michael Boyle, Daniel A. Hemberger, Lawrence E. Kidder, **Geoffrey Lovelace**, Abdul H. Mroué, Harald P. Pfeiffer, Mark A. Scheel, Béla Szilágyi, Nicholas W. Taylor, and Anil Zenginoglu. “Effective-one-body model for black-hole binaries with generic mass ratios and spins.” *Phys. Rev. D* **89**, 061502 (2014). <https://doi.org/10.1103/PhysRevD.89.061502>
25. Ian Hinder et al, “Error-analysis and comparison to analytical models of numerical waveforms produced by the NRAR Collaboration.” *Class. Quantum Grav.* **31**, 025012 (2014). <https://doi.org/10.1088/0264-9381/31/2/025012>

26. Abdul H. Mroué, Mark A. Scheel, Béla Szilágyi, Harald P. Pfeiffer, Michael Boyle, Daniel A. Hemberger, Lawrence E. Kidder, **Geoffrey Lovelace**, Serguei Ossokine, Nicholas W. Taylor, Anil Zenginoglu, Luisa T. Buchman, Tony Chu, *Evan Foley*, *Matthew Giesler*, Robert Owen, Saul A. Teukolsky. “A catalog of 174 high-quality binary black-hole simulations for gravitational-wave astronomy.” *Phys. Rev. Lett.* **111**, 241104 (2013). <https://doi.org/10.1103/PhysRevLett.111.241104>
27. Alexandre Le Tiec, Alessandra Buonanno, Abdul H. Mroué, Harald P. Pfeiffer, Daniel A. Hemberger, **Geoffrey Lovelace**, Lawrence E. Kidder, Mark A. Scheel, Béla Szilágyi, Nicholas W. Taylor, and Saul A. Teukolsky. “Periastron Advance in Spinning Black Hole Binaries: Gravitational Self-Force from Numerical Relativity.” *Phys. Rev. D* **88**, 124027 (2013).
28. Tanja Hinderer, Alessandra Buonanno, Abdul H. Mroué, Daniel A. Hemberger, **Geoffrey Lovelace**, Harald P. Pfeiffer, Lawrence E. Kidder, Mark A. Scheel, Béla Szilágyi, Nicholas W. Taylor, and Saul A. Teukolsky. “Periastron advance in spinning black hole binaries: comparing effective-one-body and numerical relativity.” *Phys. Rev. D* **88**, 084005 (2013). <https://doi.org/10.1103/PhysRevD.88.124027>
29. Daniel Hemberger, **Geoffrey Lovelace**, Thomas J. Loredo, Lawrence E. Kidder, Mark A. Scheel, Béla Szilágyi, Nicholas W. Taylor, and Saul A. Teukolsky. “Final spin and radiated energy in numerical simulations of binary black holes with equal masses and equal, aligned or anti-aligned spins.” *Phys. Rev. D* **88**, 064014 (2013). <https://doi.org/10.1103/PhysRevD.88.064014>
30. **Geoffrey Lovelace**, Matthew D. Duez, Francois Foucart, Lawrence E. Kidder, Harald P. Pfeiffer, Mark A. Scheel, and Béla Szilágyi. “Massive disk formation in the tidal disruption of a neutron star by a nearly extremal black hole.” *Class. Quantum Grav.* **30**, 135004 (2013). *Class. Quantum Grav.* 2013-2014 Highlight article. <https://doi.org/10.1088/0264-9381/30/13/135004>
31. Daniel A. Hemberger, Mark A. Scheel, Lawrence E. Kidder, Béla Szilágyi, **Geoffrey Lovelace**, Nicholas W. Taylor, and Saul A. Teukolsky. “Dynamical excision boundaries in spectral evolutions of binary black hole spacetimes.” *Class. Quantum Grav.* **30**, 115001 (2013). <https://doi.org/10.1088/0264-9381/30/11/115001>
32. David A. Nichols, Aaron Zimmerman, Yanbei Chen, **Geoffrey Lovelace**, Keith D. Matthews, Robert Owen, Fan Zhang, and Kip S. Thorne. “Visualizing Spacetime Curvature via Frame-Drag Vortexes and Tidal Tendexes III. Quasinormal Pulsations of Schwarzschild and Kerr Black Holes.” *Phys. Rev. D* **86**, 104028 (2012). <https://doi.org/10.1103/PhysRevD.86.104028>
33. Fan Zhang, Aaron Zimmerman, David A. Nichols, Yanbei Chen, **Geoffrey Lovelace**, Keith D. Matthews, Robert Owen, and Kip S. Thorne. “Visualizing Spacetime Curvature via Frame-Drag Vortexes and Tidal Tendexes II. Stationary Black Holes.” *Phys. Rev. D* **86**, 084049 (2012). <https://doi.org/10.1103/PhysRevD.86.084049>
34. Fan Zhang, Jeandrew Brink, Béla Szilágyi, and **Geoffrey Lovelace**. “A geometrically motivated coordinate system for exploring spacetime dynamics using a quasi-Kinnersley tetrad.” *Phys. Rev. D* **86**, 084020 (2012). <https://doi.org/10.1103/PhysRevD.86.084020>

35. Bryant Garcia, **Geoffrey Lovelace**, Lawrence E. Kidder, Michael Boyle, Saul A. Teukolsky, Mark A. Scheel, and Béla Szilágyi. “Are different approaches to constructing initial data for binary black hole simulations of the same astrophysical situation equivalent?” *Phys. Rev. D* **86**, 084054 (2012). <https://doi.org/10.1103/PhysRevD.86.084054>
36. Andrea Taracchini, Yi Pan, Alessandra Buonanno, Enrico Barausse, Tony Chu, Lawrence E. Kidder, **Geoffrey Lovelace**, Harald P. Pfeiffer, and Mark A. Scheel. “A prototype effective-one-body model for non-precessing spinning inspiral-merger-ringdown waveforms.” *Phys. Rev. D* **86**, 024011 (2012). <https://doi.org/10.1103/PhysRevD.86.024011>
37. Michael Boyle et al. “The NINJA-2 catalog of hybrid post-Newtonian/numerical-relativity waveforms for non-precessing black-hole binaries.” *Class. Quantum Grav.* **29**, 124001 (2012). <https://doi.org/10.1088/0264-9381/29/12/124001>
38. **Geoffrey Lovelace**, Michael Boyle, Mark A. Scheel, and Béla Szilágyi. “High-accuracy gravitational waveforms for binary-black-hole mergers with nearly extremal spins.” *Class. Quantum Grav.* **29**, 045003 (2012). <https://doi.org/10.1088/0264-9381/29/4/045003>
39. David A. Nichols, Robert Owen, Fan Zhang, Aaron Zimmerman, Jeandrew Brink, Yanbei Chen, Jeffrey D. Kaplan, **Geoffrey Lovelace**, Keith D. Matthews, Mark A. Scheel, and Kip S. Thorne. “Visualizing spacetime curvature via frame-drag vortexes and tidal tendexes: General theory and weak-gravity applications.” *Phys. Rev. D* **84**, 124014 (2011). <https://doi.org/10.1103/PhysRevD.84.124014>
40. Stephen R. Lau, **Geoffrey Lovelace**, and Harald P. Pfeiffer. “Implicit-explicit (IMEX) evolutions of single black holes.” *Phys. Rev. D* **84**, 084023 (2011). <https://doi.org/10.1103/PhysRevD.84.084023>
41. Robert Owen, Jeandrew Brink, Yanbei Chen, Jeffrey D. Kaplan, **Geoffrey Lovelace**, Keith D. Matthews, David A. Nichols, Mark A. Scheel, Fan Zhang, Aaron Zimmerman, and Kip S. Thorne. “Frame-dragging vortexes and tidal tendexes attached to colliding black holes: visualizing the curvature of spacetime.” *Phys. Rev. Lett.* **106**, 151101 (2011). *Selected for cover of Phys. Rev. Lett. vol. 106, no. 15.* <https://doi.org/10.1103/PhysRevLett.106.151101>
42. **Geoffrey Lovelace**, Mark A. Scheel, and Béla Szilágyi. “Simulating merging binary black holes with nearly extremal spins.” *Phys. Rev. D* **83**, 024010 (2011). <https://doi.org/10.1103/PhysRevD.83.024010>
43. **Geoffrey Lovelace**, Yanbei Chen, Michael Cohen, Jeffrey D. Kaplan, Drew Keppel, Keith D. Matthews, David A. Nichols, Mark A. Scheel, and Ulrich Sperhake. “Momentum flow in black-hole binaries: II. Numerical simulations of equal-mass, head-on mergers with antiparallel spins.” *Phys. Rev. D* **82**, 064031 (2010). <https://doi.org/10.1103/PhysRevD.82.064031>
44. **Geoffrey Lovelace**. “Reducing spurious gravitational radiation in binary-black-hole simulations by using conformally curved initial data.” *Class. Quantum Grav.* **26**, 114002 (2009). <https://doi.org/10.1088/0264-9381/26/11/114002>

45. **Geoffrey Lovelace**, Robert Owen, Harald P. Pfeiffer, and Tony Chu. “Binary-black-hole initial data with nearly extremal spins.” *Phys. Rev. D* **78**, 084017 (2008). <https://doi.org/10.1103/PhysRevD.78.084017>
46. Chao Li and **Geoffrey Lovelace**. “Generalization of Ryan’s theorem: Probing tidal coupling with gravitational waves from nearly circular, nearly equatorial, extreme-mass-ratio inspirals.” *Phys. Rev. D* **77**, 064022 (2008). <https://doi.org/10.1103/PhysRevD.77.064022>
47. Duncan A. Brown, Jeandrew Brink, Hua Fang, Jonathan R. Gair, Chao Li, **Geoffrey Lovelace**, Ilya Mandel, and Kip S. Thorne. “Prospects for detection of gravitational waves from intermediate-mass-ratio inspirals.” *Phys. Rev. Lett.* **99**, 201102 (2007). <https://doi.org/10.1103/PhysRevLett.99.201102>
48. Harald P. Pfeiffer, Duncan A. Brown, Lawrence E. Kidder, Lee Lindblom, **Geoffrey Lovelace**, and Mark A. Scheel. “Reducing orbital eccentricity in binary black hole simulations.” *Class. Quantum Grav.* **24** S59 (2007). <https://doi.org/10.1088/0264-9381/24/12/S06>
49. **Geoffrey Lovelace**. “The dependence of test-mass thermal noises on beam shape in gravitational-wave interferometers.” *Class. Quantum Grav.* **24**, 4491 (2007). <https://doi.org/10.1088/0264-9381/24/17/014>
50. Hua Fang and **Geoffrey Lovelace**. “Tidal coupling of a Schwarzschild black hole and circularly orbiting moon.” *Phys. Rev. D.* **72**, 124016 (2005). <https://doi.org/10.1103/PhysRevD.72.124016>
51. Chung Kao, **Geoffrey Lovelace**, and Lynne H. Orr. “Detecting a Higgs pseudoscalar with a Z boson at the LHC.” *Phys. Lett. B* **567**, 259 (2003). <https://doi.org/10.1016/j.physletb.2003.06.042>
52. Yun Wang and **Geoffrey Lovelace**. “Unbiased estimate of dark energy density from type Ia supernova data.” *Astrophys. J.* **562** L115 (2001). <https://doi.org/10.1086/338142>

## Thesis

Geoffrey Lovelace. “Topics in gravitational-wave physics.” Ph.D. thesis, California Institute of Technology (2007). URL <http://resolver.caltech.edu/CaltechETD:etd-05232007-115433>.

## Other Products

- i. Matthew Evans, Rana X Adhikari, Chaitanya Afle, Stefan W. Ballmer, Sylvia Biscoveanu, Ssohrab Borhanian, Duncan A. Brown, Yanbei Chen, Robert Eisenstein, Alexandra Gruson, Anuradha Gupta, Evan D. Hall, Rachael Huxford, Brittany Kamai, Rahul Kashyap, Kevin Kuns, Philippe Landry, Amber Lenon, Geoffrey Lovelace, Lee McCuller, Ken K. Y. Ng, Alexander H. Nitz, Jocelyn Read, B. S. Sathyaprakash, David H. Shoemaker, Bram J. J. Slagmolen, Joshua R. Smith, Varun Srivastava, Ling Sun, Salvatore Vitale, Rainer Weiss. “A Horizon Study for Cosmic Explorer: Science, Observatories, and Community.” *Cosmic Explorer Technical Report CE-P2100003* (2021). <https://dcc.cosmicexplorer.org/public/0163/P2100003/005/ce-horizon-study.pdf>

- ii. David Reitze, Rana X. Adhikari, Stefan Ballmer, Barry Barish, Lisa Barsotti, GariLynn Billingsley, Duncan A. Brown, Yanbei Chen, Dennis Coyne, Robert Eisenstein, Matthew Evans, Peter Fritschel, Evan D. Hall, Albert Lazzarini, **Geoffrey Lovelace**, Jocelyn Read, B. S. Sathyaprakash, David Shoemaker, Joshua Smith, Calum Torrie, Salvatore Vitale, Rainer Weiss, Christopher Wipf, and Michael Zucker. “Cosmic Explorer: The U.S. Contribution to Gravitational-Wave Astronomy beyond LIGO.” *Bulletin of the American Astronomical Society* **51**, 034 (2019). <https://arxiv.org/abs/1907.04833>
- iii. Nils Deppe, William Throwe, Lawrence E. Kidder, Nils L. Fischer, François Hébert, Jordon Moxon, Cristóbal Armaza, Gabriel S. Bonilla, Prayush Kumar, Geoffrey Lovelace, Eamonn O’Shea, Harald P. Pfeiffer, Mark A. Scheel, Saul A. Teukolsky, Isha Anantpurkar, Michael Boyle, Francois Foucart, Matthew Giesler, Jason S. Guo, Dante A. B. Iozzo, Yoonsoo Kim, Isaac Legred, Dongjun Li, *Alexandra Macedo*, *Denyz Melchor*, *Marlo Morales*, Kyle C. Nelli, *Teresita Ramirez*, Hannes R. Rüter, *Jennifer Sanchez*, *Sierra Thomas*, Nokias A. Wittek, Tom Włodarczyk. SpECTRE numerical relativity code. 2021. <https://doi.org/10.5281/zenodo.5083825>

## Invited Presentations

1. “Modeling binary black holes with numerical relativity in the era of gravitational-wave observations” Mar. 2021  
*Virtual HEP-Astro Seminar, University of Michigan*
2. “Computational Gravitational-Wave Physics and Astronomy at California State University, Fullerton” Oct. 2020  
*CSU Chancellor’s Office STEM-NET webcast*
3. “Gravitational-Wave Astronomy and Cal State Fullerton” Aug. 2020  
*Virtual CSU Fullerton Emeriti Meeting*
4. “Numerical relativity for next-generation gravitational-wave observatories” May 2019  
*Presentation and discussion on invited panel, Physics and Astrophysics at the eXtreme (PAX) workshop, Cascina, Italy*
5. “Numerical relativity in the era of gravitational-wave observations” Jan. 2019  
*High energy and Gravity Seminar, University of California, Santa Barbara Santa Barbara, California*
6. “Numerically modeling Brownian thermal noise in crystalline coatings.” Jun. 2018  
*Workshop on AlGaAs thermal noise at American University Washington, D.C.*
7. “Numerical relativity in the era of gravitational-wave observations.” Mar. 2018  
*Center for Computational Relativity and Gravitation Seminar, Rochester Institute of Technology, Rochester, New York*

8. "Numerical relativity in the era of gravitational-wave observations." Mar. 2018  
*Center for Astrophysics and Space Sciences Seminar,  
University of California, San Diego,  
San Diego, California*
9. "Undergraduate research in the era of gravitational-wave astronomy." Mar. 2018  
*Society of Physics Students Zone 18 Meeting Keynote,  
Bakersfield, California*
10. "Simulating colliding black holes with the Spectral Einstein Code Nov. 2017  
in the era of gravitational-wave astronomy"  
*Cal Poly Pomona Physics and Astronomy Seminar  
Pomona, California*
11. "Using supercomputers to simulate merging black holes in the era of Apr. 2017  
gravitational-wave astronomy"  
*Osher Lifelong Learning Institute Seminar  
Irvine, California*
12. "The first observations of gravitational waves from merging black holes" Mar. 2017  
*Physics and Astronomy Colloquium, Swarthmore College,  
Swarthmore, Pennsylvania*
13. "Using supercomputers to simulate merging black holes in the era of Mar. 2017  
gravitational-wave astronomy"  
*Osher Lifelong Learning Institute Eclectics Seminar,  
Fullerton, California*
14. "Colliding black holes and the dawn of gravitational-wave astronomy" Feb. 2017  
*California State University, Fullerton Emeriti Association Lunch  
Placentia, California*
15. "Doing science in the 21<sup>st</sup> century: colliding black holes and Feb. 2017  
gravitational-wave astronomy"  
*Keynote presentation, Better Together: CSU Fullerton EdTalk South—Next  
Generation Science Standards, Discovery Cube Orange County,  
Santa Ana, CA*
16. "Simulations of binary-black-hole mergers" Jan. 2017  
*American Physical Society April Meeting, Washington, D.C.*
17. "The discovery of gravitational waves from merging black holes" Oct. 2016  
*Scientific Symposium, Society for Advancement of Chicanos/Hispanics  
and Native Americans in Science*
18. "The first observations of gravitational waves from merging black holes" Sep. 2016  
*Physics and Astronomy Colloquium, California State University, Los Angeles,  
Los Angeles, California*



19. "The first observations of gravitational waves from merging black holes" Sep. 2016  
*Physics and Astronomy Colloquium, University of Oklahoma, Norman, Oklahoma*
20. "Observation of gravitational waves from merging black holes" Jul. 2016  
*Orange County Astronomers General Meeting, Orange, California*
21. "Modeling merging black holes with numerical relativity in the era of first gravitational-wave observations" May 2016  
*Center for Astrophysics & Space Sciences Astrophysics Seminar, University of California, San Diego, San Diego, California*
22. "The discovery of gravitational waves from merging black holes" Apr. 2016  
*Jim Woodward Faculty Research Award Colloquium, California State University, Fullerton, Fullerton, California*
23. "The discovery of gravitational waves from merging black holes" Apr. 2016  
*STEM<sup>2</sup> Seminar, Cypress College, Cypress, California*
24. "The discovery of gravitational waves from merging black holes" Apr. 2016  
*Osher Lifelong Learning Institute Presentation, California State University, Fullerton, Fullerton, California*
25. "Colliding black holes and ripples in space and time" Nov. 2015  
*Public lecture, Santiago Canyon College, Orange, California*
26. "Simulating colliding black holes and mirror thermal noise for gravitational-wave astronomy" Sep. 2015  
*Physics Colloquium, California State University, Northridge, California*
27. "Supercomputer simulations of merging black holes for gravitational-wave astronomy" May 2015  
*Public lecture, Santiago Canyon College, Orange, California*
28. "Simulations of colliding black holes for gravitational-wave astronomy" Mar. 2015  
*Physics Colloquium, Fresno State University, Fresno, California*
29. "Supercomputer simulations of colliding black holes" Mar. 2015  
*College of Natural Sciences and Mathematics Inter-club Council Symposium, Fullerton, California*
30. "Numerical simulations of merging black holes and neutron stars for gravitational-wave astronomy" Oct. 2014  
*Physics Colloquium, Washington State University*
31. "Colliding black holes and ripples in space and time" May 2014  
*Public lecture, Santiago Canyon College, Orange, California*
32. "Einstein's Gravitational Waves: Recent and Future Discoveries" May 2014  
*Town and Gown Series public lecture, co-presented with Jocelyn Read and Joshua Smith, Fullerton Public Library, Fullerton, California*

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| 33. "Collisions in warped space and time"<br><i>Orange County Astronomers General Meeting, Orange, California</i>   | May 2014  |
| 34. "Numerical simulations of merging black holes for<br>gravitational-wave astronomy"<br><i>American Physical Society April Meeting, Savannah, Georgia</i>   | Apr. 2014 |
| 35. "Supercomputer simulations of colliding black holes"<br><i>Physics &amp; Astronomy Colloquium, California State University,<br/>Long Beach, Long Beach, California</i>  | Oct. 2013 |
| 36. "Supercomputer simulations of merging black holes and neutron stars"<br><i>N. D. Pearson Colloquium Series in Physics, California State University,<br/>Dominguez Hills, Dominguez Hills, California</i>  | Sep. 2013 |
| 37. "Supercomputer simulations of colliding black holes and neutron stars"<br><i>Natural Science Seminar, Fullerton College, Fullerton, California</i>  | Nov. 2012 |
| 38. "Simulating compact-binary mergers containing<br>nearly extremal black holes"<br><i>Fall 2012 Meeting of the Eastern Section of the<br/>American Mathematical Society, Rochester, New York</i>  | Sep. 2012 |
| 39. "Numerical simulations of binary black holes in the presence of spins"<br><i>Rattle and Shine: Gravitational Wave and Electromagnetic Studies<br/>of Compact Binary Mergers conference, Santa Barbara, California</i>   | Jul. 2012 |
| 40. "Supercomputer simulations of colliding black holes"<br><i>Physics Department Colloquium,<br/>California State University, Fullerton, California</i>  | Jan. 2012 |
| 41. "Numerical simulations of coalescing black holes with nearly extremal<br>spins: gravitational waveforms and horizon dynamics"<br><i>Center for Computational Relativity and Gravitation Seminar,<br/>Rochester Institute of Technology, Rochester, New York</i> | Sep. 2011 |
| 42. "Simulating merging black holes with spins above the Bowen-York limit"<br><i>Advances and Challenges in Computational General Relativity<br/>Workshop, Providence, Rhode Island</i>   | May 2011  |
| 43. "Implicit-explicit evolutions of black-hole spacetimes"<br>"Selected Topics in Analysis and Numerics for PDEs" session,<br><i>Spring 2010 Meeting of the Western Section of the American<br/>Mathematical Society, Albuquerque, New Mexico</i>                  | Apr. 2010 |
| 44. "Numerical simulations of binary black holes with<br>nearly extremal spins"<br><i>Center for Gravitational Wave Physics Seminar, Penn State University,<br/>University Park, Pennsylvania</i>   | Nov. 2009 |

45. "Numerical simulations of binary black holes with nearly extremal spins" Sep. 2009  
*Canadian Institute for Theoretical Astrophysics Seminar,  
 University of Toronto, Toronto, Ontario*
46. "Momentum flow in numerical simulations of binary black hole mergers" Sep. 2009  
*Canadian Institute for Theoretical Astrophysics  
 20-minute Blackboard Lunch, University of Toronto, Toronto, Ontario*
47. "Momentum flow in numerical simulations of binary black hole mergers" Jun. 2009  
*30-minute seminar, Syracuse University, Syracuse, New York*
48. "Spin and shape in binary-black-hole simulations" Feb. 2008  
*Theoretical Astrophysics and Relativity Seminar,  
 California Institute of Technology, Pasadena, California*
49. "Improving binary-black-hole initial data" Nov. 2007  
*General Relativity and Astrophysics Seminar, University of Illinois  
 at Urbana-Champaign, Urbana, Illinois*