DEPARTMENT OF PHYSICS

CALIFORNIA STATE UNIVERSITY, FULLERTON

PROGRAM PERFORMANCE SELF-STUDY

2021-2022

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I. Department/Program Mission, Goals, and Environment

A. Briefly describe the mission and goals of the unit and identify any changes since the last program review. Review the goals in relation to the University mission, goals, and strategies.

Mission: The Department of Physics strives to be an accessible department where students, faculty and staff create a collegial, collaborative, and supportive environment that values professional relationships, supports learning and teaching, supports scholarship, and encourage professional service. We take pride in preparing and mentoring our students towards careers in science and teaching, both in the courses we teach and through their involvement in our own research. We are committed to teaching a wide range of scientific skills and technologies while developing critical-thinking tools that bridge a variety of industries, including engineering, electronics, communication, defense, and life sciences.

Goals:

1. Provide high quality education for undergraduate and graduate physics major both through class instruction and through research experiences
2. Provide high quality service and general education courses in physics and astronomy.
3. Support inclusion of all students and faculty in their academic endeavors and promote equity, diversity, and justice for all.
4. Provide high quality service to the University, professional and local communities.

The Department of Physics mission and goals are not fundamentally different since our last review. Recently, we focused on our mission to support diversity, inclusion, and equity for all students we serve at CSUF. The Physics Department was one of the first departments within CSUF that clearly stated our goal with an Anti-Racism Statement on our Department webpage.

The Department of Physics mission and goals closely mirror the College and University mission, goals, and strategies. As a department, we continually review and update our mission and goals to better serve our students. Since our last review we have developed and improved our advising strategies to ensure that every one of our undergraduate and graduate physics students graduate on time.

B. Briefly describe changes and trends in discipline and the response of the unit to such changes. Identify if there have been external factors that impact the program (e.g., community/regional needs, placement, and graduate/professional school).

As with every department, the impact of the ongoing global pandemic reverberates through every research group, every major, and the day to day operations of the department. Faculty, staff, and students responded to these challenges creatively and put forth a major effort to move operations online.

There are several trends in the discipline of physics that have the potential to impact the department. Physics, like other disciplines, has been greatly impacted by the advent of cheap

and powerful computing. This affects the work of theoretical physicists as well as experimentalists, for data collection, analysis, as well as simulation. Our newest hire is specialized in computation and most new faculty emphasize technology in their teaching and research. The department has continued to emphasize computation in new and existing courses. PHYS 315 – *Computational Physics* focuses on computation and is now offered every year, and a new course, PHYS 317 – *Data Analysis in the Physical Sciences* focuses on modern computational approaches to data collection and analysis. A new proposed course, PHYS 155 – *Quantum Computing for Everyone*, will relate to quantum computing with the goal to familiarize freshmen students with the basics of quantum mechanics and raise their interest on science and computing.

Interdisciplinary work continues to be increasingly relevant for many subfields of physics; in our department this includes connections to astronomy, chemistry, the life sciences, engineering, and education. Our three most recent hires, in soft matter physics and physics education research, all have important connections across traditional disciplinary boundaries.

Nationwide the number of students majoring in physics has increased significantly over the last ten years. The CSUF major showed signs of mirroring this trend until very recently. Lately upper division courses have showed decreases in enrollment; it is too early to tell whether this is evidence of a longer term trend, the impact of the pandemic, or simply a fluctuation in what is always a relatively small number. This bears attention if and when we move past pandemic conditions.

Another nationwide trend is the increased attention on issues of diversity, equity, and inclusion. Physics as a field is one of the least diverse in terms of gender as well as race and ethnicity. Several faculty have worked to support students from diverse groups. The department has recently applied to be a member institution in the APS Bridge program, which seeks to support students from groups traditionally underrepresented in physics as they pursue graduate education in physics.

Within the university, the greatest tension faced by the department is the ongoing push and pull of enrollment. Physics has a relatively small number of majors and as a result the bulk of enrollment comes from service courses for departments across campus. The three dominant streams of enrollment have been engineering (for Physics 225-226-227), life sciences (for physics 211-212), and general education (for Physics 101 and 301 and Astronomy 101). This dependence means that the physics department can be affected by factors outside its control; if, say, the engineering departments have low enrollments for whatever reason, this impacts physics enrollments as well. We have sought to diversify our enrollment by increasing the number of sections of ASTR 101 and adding a new upper division GE course on the physics of sound, Physics 305.

C. Identify the unit's priorities for the future

The priorities for the Physics Department are listed below. Strategies and outcomes for the general goals are described in Appendix E. Details of the priorities for each goal, along with metrics and accomplishments are detailed in Section VII.

Goal 1. Improve student learning, improve retention, and minimize graduation time

- *Priority 1 – Maintain and improve High Impact Practices (HIPs) through inclusion of undergraduate and graduate students in faculty research activities.*
- *Priority 2 – Continue assessment of undergraduate and graduate programs.*

Goal 2. Improve student access to research activities

- *Priority 1 – Continue and improve student access to faculty research.*
- *Priority 2 – Improve funding opportunities for undergraduate and graduate research.*

Goal 3. Support Faculty Scholarship

- *Priority 1 – Encourage and support faculty to write grants and travel to relevant meetings.*
- *Priority 2 – Promote opportunities for junior faculty to participate in grant writing workshops.*

Goal 4. Stabilize number of majors in the Department

- *Priority 1 – Recruit new majors and graduate students.*
- *Priority 2 – Improve student success.*

Goal 5. Strengthen Graduate Program

- *Priority 1 – Increase financial support to our graduate students.*
- *Priority 2 – Continue to encourage graduate students to pursue Plan BC for graduation.*

Goal 6. Recruit and retain faculty and staff

- *Priority 1 – Recruit high quality faculty dedicated to both teaching and research.*
- *Priority 2 – Support staff excellence.*

D. If there are programs offered in a Special Session self-support mode, describe how these programs are included in the mission, goals and priorities of the department/program (e.g., new student groups regionally, nationally, internationally, new delivery modes, etc.).]

The Department of Physics offers four fundamental introductory physics classes during the Summer Special Session, algebra-based PHYS 211/212 – *Elementary Physics* along with

complementary labs PHYS 211L/212L, and calculus-based PHYS 225/226 – *Fundamental Physics* along with complementary labs PHYS 225L/226L. The main reason for offering these classes is to reduce bottlenecks for life sciences and engineering students, so that they can accelerate their studies at CSUF and graduate within a shorter timeframe.

II. Department/Program Description and Analysis

A. Identify substantial curricular changes in existing programs, new programs (degrees, majors, minors) developed since the last program review. Have any programs been discontinued?

Since the last review, we went through a series of changes in our curriculum for both undergraduate and graduate programs. Here is a list of all changed courses:

Undergraduate Curriculum

- ASTR 101 - *Introduction to Astronomy* — we introduced an online version of the course (Jocelyn Read)
- ASTR 444 - *Applications of Gravitation* — new upper division course that focuses on applications of gravity such as black holes, gravitational waves, and cosmology (Geoffrey Lovelace).
- PHYS 305 - *Physics of Sound* — new GE area B.5. upper division course that focuses on the physics of waves applied to music (Wylie Ahmed)
- PHYS 317 - *Data Analysis in the Physical Sciences*) — new upper division course on data analysis (Leigh Hargreaves)

We retired two courses that were no longer offered: PHYS 115 – *Introductory Physics*, PHYS 460T - *Advanced Topics in Contemporary Physics*. Several courses changed prerequisites to assure a better preparation for our students and to optimized the graduation time: PHYS 300 - *Survey of Mathematical Physics* (the course requires now the completion of PHYS 226 – *Fundamental Physics*), PHYS 310 - *Thermodynamics, Kinetic Theory, and Statistical Physics* (the course requires now the completion of PHYS 226 – *Fundamental Physics*). Several courses are no longer in the University GE category: PHYS 212/212L - *Elementary Physics*, PHYS 226/226L - *Fundamental Physics.*

We changed our undergraduate course requirements: PHYS 455 - *Introduction to Quantum Physics* is now required for undergraduate physics majors, as recommended by the Department's 300-level retreat in January 2019.

We proposed a new introductory class: PHYS 155 - *Quantum Computing for Everyone*; the intention is that the class will be included in the University GE B.1. category and it will give freshmen the possibility to understand the basic tools of quantum mechanics in connection with the quantum computing field (Gina Passante).

Graduate Curriculum

- PHYS 581 - *Advanced Experimental Physics* — we introduced a new advanced experimental course; the course is part of the core program for all graduate students (Greg Childers)

We retired PHYS 530B - *Electromagnetic Theory II* and PHYS 560T - *Advanced Topics in Contemporary Physics* because of low students interest and lack of sufficient faculty members to be able to regularly offer the course.

B. Describe the structure of the degree program (e.g., identify required courses, how many units of electives) and identify the logic underlying the organization of the requirements.

Undergraduate Program

The Physics Department offers a Bachelor of Science degree and a Bachelor of Science degree with Business Emphases. The degrees are structured around supporting the fundamental core ideas of Physics explored in the upper division core Physics courses. The Program requires the completion of a minimum of 120 units. Student preparation varies when they start the program, in particular the math preparation of students at entry level differs based on the high school origin. . Typically, we consider MATH 150A (Calculus 1) as the first program in the Physics major, which we expect students to take in their first semester at CSUF. However, only about half of our incoming freshmen have sufficient math preparation to enroll directly into Calculus 1. The department therefore provides incoming freshmen with one of two recommended programs. Both complete the physics major in 8 semesters, but one assumes the students will spend a semester taking MATH 125 as preparation to take MATH 150A in the second semester. While the second program takes the same amount of time, it loads most of the advanced major classes into the final two semesters, whereas they are spread over 4 semesters if the students can take MATH 150A in the first semester. The tables below provide the ideal path for a 4-year graduation based on math level at program entrance.

The core courses of the Physics Bachelor of Science in Physics focus on developing intellectual literacy, critical thinking, communication, and teamwork. Students develop intellectual literacy through applying the primary physical theories of classical mechanics, thermodynamics, wave phenomena, electricity and magnetism, and modern physics. Students learn to apply appropriate mathematical tools to solve physical problems in these courses, and to clearly explain applications of theory in a variety of scenarios. In experimental courses, students build understanding of scientific inquiry by designing experiments and analyzing experimental data. They work collaboratively to collect and interpret data and draw conclusions, and clearly and concisely report their scientific observations and analysis of experimental data.

The department, in collaboration with the School of Business, offers a Physics Bachelor of Science degree with an emphasis in Business. The Business emphasis replaces standard physics electives with business related classes, offered by the School of Business. This program has existed for some time, but currently has relatively low enrollment, enrolling approximately 1 student every 2 – 4 years.

DEPARTMENT OF PHYSICS

PHYSICS BACHELOR OF SCIENCE

MATH 125 START

TERM 1	TERM 2	TERM 3	TERM 4	TERM 5	TERM 6	TERM 7	TERM 8
GE B1+B3 CHEM 120A 5 units	CHEM 125 3 Units	PHYS 225 + Lab 4 units	PHYS 226 + Lab 4 units	PHYS 227 + Lab 4 units	PHYS 310 3 units	PHYS 330A 3 units	PHYS 330B 3 units
GE B4 MATH 125 5 units	Math 150A 4 units	MATH 150B 4 units	MATH 250A 4 units	PHYS 300 3 units	PHYS 320 3 units	PHYS 340 3 units	PHYS 455 3 units
GE A3 CNSM 101 3 units	GE A2 3 Units	GE C2 3 units	GE C1 or C2 3 units	PHYS 380 3 units	PHYS Elective 3 units	PHYS Elective 3 units	PHYS Elective PHYS 481 3 units
GE A1 3 units	GE B2 3 units	GE D1 3 units	GE D2 3 units	UD Writing Course 3 units	UD GE F 3 units	PHYS Elective 3 units	PHYS Elective 3 units
	GE C1 3 units		Grad. Req. POSC 100 3 units	UD GE C3 3 units	UD GE B5 3 units	GE D3 3 units	GE E 3 units
16 units	16 units	14 units	17 units	16 units	15 units	15 units	15 units

Units	Area
39	GE lower division
3	Graduation requirement
9	GE upper division
3	GE/CNSM required
36	Physics BS required
28	Physics BS related
15	Physics BS elective
133	*Subtotal*
-9	Double counted Major/GE
124	**Total Units**

INSTRUCTIONS FOR COMPLETING THE PHYSICS BACHELOR OF SCIENCE

1. Meet with your assigned faculty advisor each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. Complete GE courses in areas A1, A2, A3 and B4 with a C or better.
4. One course from GE Overlay Z can also fulfill a requirement in another GE category. Check your Titan Degree Audit for courses that appear in both categories.
5. Apply for Graduation through your Student Center at the start of Term 7.

DEPARTMENT OF PHYSICS

PHYSICS BACHELOR OF SCIENCE

MATH 150A START

TERM 1	TERM 2	TERM 3	TERM 4	TERM 5	TERM 6	TERM 7	TERM 8
GE A3 CNSM 101 3 units	PHYS 225 + Lab 4 units	PHYS 226 + Lab 4 units	PHYS 227 + Lab 4 units	PHYS 340 3 units	PHYS 455 3 units	PHYS 330A 3 units	PHYS 330B 3 units
GE B4 MATH 150A 4 units	MATH 150B 4 units	MATH 250A 4 units	PHYS 300 3 units	PHYS 380 3 units	PHYS 320 3 units	UD Writing Course 3 units	PHYS Elective 3 units
GE B1+B3 CHEM 120A 5 units	CHEM 125 3 Units	GE B2 3 units	PHYS 310 3 units	PHYS Elective 3 units	PHYS Elective 3 units	PHYS Elective 3 units	PHYS Elective PHYS 481 3 units
GE A1 3 units	GE A2 3 units	GE C1 3 units	GE C2 3 units	GE C1 or C2 3 units	GE D1 3 units	GE F 3 units	GE D2 3 Units
		Open Elective 1 unit	Grad. Req. POSC 100 3 units	UD GE B5 3 units	UD GE C4 3 units	UD GE D3 3 units	GE E 3 units
15 units	14 units	15 units	16 units	15 units	15 units	15 units	15 units

Units	Area
39	GE lower division
3	Graduation requirement
9	GE upper division
3	GE/CNSM required
36	Physics BS required
23	Physics BS related
15	Physics BS elective
1	Open elective
129	*Subtotal*
-9	Double counted Major/GE
120	**Total Units**

INSTRUCTIONS FOR COMPLETING THE PHYSICS BACHELOR OF SCIENCE

1. Meet with your assigned faculty advisor each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. Complete GE courses in areas A1, A2, A3 and B4 with a C or better.
4. One course from GE Overlay Z can also fulfill a requirement in another GE category. Check your Titan Degree Audit for courses that appear in both categories.
5. A minimum of 120 distinct units complete is required for graduation, regardless of double counted GEs.
6. Apply for Graduation through your Student Center at the start of Term 7.

PHYSICS BACHELOR OF SCIENCE

The Bachelor of Science in Physics is offered for students who are passionate about understanding how things work and enjoy applying broad perspectives to solving problems.

The B.S. in Physics prepares students for a variety of careers such as academic or industrial research and engineering, through to careers that include medicine, education, finance, or public policy.

The following courses are required to complete the B.S. in Physics.

PHYSICS REQUIRED COURSES

Complete all **eight** Lower Division courses listed below:

Course	Course Title	Units
PHYS 225 + Lab	Fundamental Physics: Mechanics + Laboratory	4
PHYS 226 + Lab	Fundamental Physics: Electricity & Magnetism + Laboratory	4
PHYS 227 + Lab	Fundamental Physics: Waves, Optics and Modern Physics + Laboratory	4
CHEM 120A	General Chemistry A	5
CHEM 125	General Chemistry B Lecture	3
MATH 150A	Calculus I	4
MATH 150B	Calculus II	4
MATH 250A	Calculus III	4

Complete all **eight** Physics Upper Division courses listed below:

Course	Course Title	Units
PHYS 300	Survey of Mathematical Physics	3
PHYS 310	Thermodynamics, Kinetic Theory and Statistical Physics	3
PHYS 320	Classical Mechanics	3
PHYS 330A	Electromagnetic Theory 1	3
PHYS 330B	Electromagnetic Theory 2	3
PHYS 340	Modern Physics	3
PHYS 380	Methods of Experimental Physics	3
PHYS 455	Introduction to Quantum Physics	3

Complete at least **14 units** of the Physics electives listed below†:

Course	Course Title	Units
ASTR 444	Applications of Gravitation	3
PHYS 301	Energy and Sustainability	3
PHYS 315	Computational Physics	3
PHYS 411	Modern Optics	3
PHYS 416	Thermal and Statistical Physics	3
PHYS 454	Introduction to the Solid State of Matter	3
PHYS 476	Atomic Physics	3
PHYS 481	Experimental Physics	3
PHYS 499*	Independent Study	1 - 3

*****Instructor approval required. PHYS 499 may be repeated for additional credit, up to a maximum of 6 units

Complete **one** of the Physics Laboratory Electives listed below:

Course	Course Title	Units
PHYS 481	Experimental Physics	3

Complete **one** course listed below to satisfy the University Upper Division GE and Physics Upper Division writing requirement:

Course	Course Title	Units
ENGL 301	Advanced College Writing	3
ENGL 360	Technical Writing	3
ENGL 363	Scientific Writing	3
MATH 380	History of Mathematics	3

GENERAL EDUCATION REQUIREMENTS

• **Area A: Core Competencies**. Complete one course in each subarea for a total of 9 units of lower division.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking (CNSM 101)

• **Area B: Scientific Inquiry and Quantitative Reasoning**. Complete one course in each subarea; the course in B3 must be associated with the course taken to satisfy B1 or B2. Area B courses must include 9 lower division and 3 upper division units.

Subarea	Title
B1	Physical Science
B2	Life Science
B3	Laboratory Experience
B4	Mathematics/Quantitative Reasoning
B5	Implications and Explorations in the Natural Sciences and Mathematics/Quantitative Reasoning (UD)

• **Area C: Arts and Humanities**. Complete one course in each subarea, plus a second course in either C1 or C2, for a total of 9 lower division and 3 upper division units.

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3	Explorations in Arts/Humanities (UD)

• **Area D: Social Sciences**. Complete one course in each subarea for a total of 6 lower division and 3 upper division units.

Area	Title
D1	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3	Explorations in Social Sciences (UD)

• **Area E: Lifelong Learning and Self-Development**. Complete 3 lower division units.

Area	Title
E	Lifelong Learning and Self Development

• **Area F: Ethnic Studies**. Complete 3 units

Area	Title
F	Ethnic Studies

• **Overlay: Cultural Diversity**. Complete 1 course, which can also fulfill a requirement from Area B, C, D or E. (check TDA for courses that satisfy both requirements).

Overlay	Title
Z	Cultural Diversity

Graduation Requirement: An American Government is required for students in this catalog year. Check your TDA

College of Natural Sciences and Mathematics

DEPARTMENT OF PHYSICS

PHYSICS BACHELOR OF SCIENCE

BUSINESS EMPHASIS

Physics B.S.

TERM 1	TERM 2	TERM 3	TERM 4	TERM 5	TERM 6	TERM 7	TERM 8
GE A3 CNSM 101 3 units	PHYS 225 + Lab 4 units	PHYS 226 + Lab 4 units	PHYS 227 3 units	PHYS 340 3 units	PHYS 320 3 units	PHYS 330A 3 units	PHYS 330B 3 units
GE B4 MATH 150A 4 units	MATH 150B 4 units	MATH 250A 4 units	PHYS 300 3 units	PHYS 380 3 units	BAUD 301 3 units	MGMT 340 3 units	MKGT 301 3 units
GE B1+B3 CHEM 120A 5 units	GE A2 3 units	GE B2 3 units	PHYS 310 3 units	ACCT 201A 3 Units	FIN 320 3 units	MGMT 465A 3 units	MGMT 465B 3 units
GE A1 3 units	GE C1 3 units	GE C2 3 units	GE C1 or C2 3 units	GE D1 3 units	GE F 3 units	GE D2 3 Units	PHYS 481 3 units
	Open Elective 1 unit	Open Elective 1 unit	Grad. Req. POSC 100 3 units	UD GE B5 3 units	UD GE C4 3 units	UD GE D3 3 units	GE E 3 units
15 units	15 units	15 units	15 units	15 units	15 units	15 units	15 units

Units	Area
39	GE lower division
3	Graduation requirement
9	GE upper division
3	GE/CNSM required
35	Physics BS required
17	Physics BS related
21	Business elective
2	Open elective
129	*Subtotal*
-9	Double counted Major/GE
120	**Total Units**

INSTRUCTIONS FOR COMPLETING THE PHYSICS BACHELOR OF SCIENCE, BUSINESS EMPHASIS

1. Meet with your assigned faculty advisor each semester to plan and review your academic progress.
2. Visit your College of Natural Sciences and Mathematics Student Success Team in MH 488 to review GE and graduation requirements.
3. Complete GE courses in areas A1, A2, A3 and B4 with a C or better.
4. One course from GE Overlay Z can also fulfill a requirement in another GE category. Check your Titan Degree Audit for courses that appear in both categories.
5. A minimum of 120 distinct units complete is required for graduation, regardless of double counted GEs.
6. Apply for Graduation through your Student Center at the start of Term 7.

PHYSICS BACHELOR OF SCIENCE, BUSINESS EMPHASIS

The Bachelor of Science in Physics with Business Emphasis is offered for students who wish to combine their passion for understanding how things work and problem solving with entrepreneurship, business and marketing.

The following courses are required to complete the B.S. in Physics, Business Emphasis

PHYSICS REQUIRED COURSES

Complete all **eight** Lower Division courses listed below:

Course	Course Title	Units
PHYS 225 + Lab	Fundamental Physics: Mechanics + Laboratory	4
PHYS 226 + Lab	Fundamental Physics: Electricity & Magnetism + Laboratory	4
PHYS 227	Fundamental Physics: Waves, Optics and Modern Physics	3
CHEM 120A	General Chemistry A	5
ACCT 201A	Financial Management	3
MATH 150A	Calculus I	4
MATH 150B	Calculus II	4
MATH 250A	Calculus III	4

Complete all **eight** Physics Upper Division courses listed below:

Course	Course Title	Units
PHYS 300	Survey of Mathematical Physics	3
PHYS 310	Thermodynamics, Kinetic Theory and Statistical Physics	3
PHYS 320	Classical Mechanics	3
PHYS 330A	Electromagnetic Theory 1	3
PHYS 330B	Electromagnetic Theory 2	3
PHYS 340	Modern Physics	3
PHYS 380	Methods of Experimental Physics	3

Complete all **six** Business Elective courses listed below†:

Course	Course Title	Units
FIN 320	Financial Management 1	3
MGMT 340	Organizational Behavior	3
MGMT 465A	New Venture Creation and Funding	3
MGMT 465B*	New Venture Launch	3
MKGT 351	Principles of Marketing	3
PHYS 481	Experimental Physics	3

*May substitute MGMT 461: Entrepreneurial Management (3)

Complete **one** course listed below to satisfy the University Upper Division GE and Physics Upper Division writing requirement:

Course	Course Title	Units
BAUD 301	Advanced Business Communication	3
ENGL 301	Advanced College Writing	3
ENGL 360	Technical Writing	3
ENGL 363	Scientific Writing	3
MATH 380	History of Mathematics	3

GENERAL EDUCATION REQUIREMENTS

• **Area A: Core Competencies**. Complete one course in each subarea for a total of 9 units of lower division.

Subarea	Title
A1	Oral Communication
A2	Written Communication
A3	Critical Thinking (CNSM 101)

• **Area B: Scientific Inquiry and Quantitative Reasoning**. Complete one course in each subarea; the course in B3 must be associated with the course taken to satisfy B1 or B2. Area B courses must include 9 lower division and 3 upper division units.

Subarea	Title
B1	Physical Science
B2	Life Science
B3	Laboratory Experience
B4	Mathematics/Quantitative Reasoning
B5	Implications and Explorations in the Natural Sciences and Mathematics/Quantitative Reasoning (UD)

• **Area C: Arts and Humanities**. Complete one course in each subarea, plus a second course in either C1 or C2, for a total of 9 lower division and 3 upper division units.

Subarea	Title
C1	Introduction to the Arts
C2	Introduction to the Humanities
C3	Explorations in Arts/Humanities (UD)

• **Area D: Social Sciences**. Complete one course in each subarea for a total of 6 lower division and 3 upper division units.

Area	Title
D1	Introduction to the Social Sciences
D2	American History, Institutions, and Values
D3	Explorations in Social Sciences (UD)

• **Area E: Lifelong Learning and Self-Development**. Complete 3 lower division units.

Area	Title
E	Lifelong Learning and Self Development

• **Area F: Ethnic Studies**. Complete 3 units

Area	Title
F	Ethnic Studies

• **Overlay: Cultural Diversity**. Complete 1 course, which can also fulfill a requirement from Area B, C, D or E. (check TDA for courses that satisfy both requirements).

Overlay	Title
Z	Cultural Diversity

Graduation Requirement: An American Government is required for students in this catalog year. Check your TDA

Graduate Program

The Physics Department also offers a Physics Masters degree focused on core applications of mathematical physics, analytical mechanics, electromagnetic theory, quantum physics, and experimental physics. The program requires the completion of 30 units and offers two distinct paths to graduation: Plan A – graduation based on a comprehensive exam and Plan BC – graduation based on a Thesis or Project. Both paths share 15 units of core classes; the remaining 15 units are plan dependent (see Table for the required classes)

The Physics Masters Program is designed to develop intellectual literacy, critical thinking, and communication skills. Students solve problems by applying the primary physical theories: classical mechanics, electrodynamics and quantum mechanics. They engage in scientific inquiry by analyzing advanced physics questions and designing solutions to those questions. Students learn to clearly and concisely report results and analysis from their courses and research.

Required Core Courses (15 Units)	**Plan A (additional 15 units)** **Comprehensive Exam**	**Plan BC (additional 15 units)** **Thesis/Project**
PHYS 510 - Mathematical Physics (3) PHYS 520 - Analytical Mechanics (3) PHYS 530A - Electromagnetic Theory I (3) PHYS 555A - Quantum Physics I (3) PHYS 581 - Advanced Exp. Physics (3)	Additional 500-level (minimum 6 units) PHYS 555B - Quantum Physics II (3) PHYS 516 - Statistical Mechanics (3) PHYS 554 - Solid State Physics (3) 400/500 Electives (additional 9 units)	Additional 500-level (minimum 6 units) PHYS 555B - Quantum Physics II (3) PHYS 516 - Statistical Mechanics (3) PHYS 554 - Solid State Physics (3) PHYS 599 - Independent Grad Research (3) 400/500 Electives (3-8 units) Thesis or Project (1-6 nits) PHYS 597 - Project (3 units max) Phys 598 - Thesis (6 units max)

C. Using data provided by the Office of Assessment and Institutional Effectiveness to discuss student demand for the unit's offerings; discuss topics such as over enrollment, under enrollment, (applications, admissions and enrollments) retention, (native and transfer) graduation rates for majors, and time to degree (see instructions, Appendices A and B).

Enrollment and graduation

In our previous PPR, we admitted on average 69 freshmen each year into physics since 2008, with 12 students per year (17%) ultimately enrolling at CSUF. Similarly, on average 15 upper division transfer students are admitted each year, with five actually coming to campus.

In this period, we increased our admittance numbers to an average of 116 each year. However, our freshmen enrollment rates remained steady at 12.6 students per year, meaning only 11% came to CSUF. An average of 21 upper division transfer students were admitted and 4 joined the Physics program, an increase in acceptance rate but slight decrease in overall numbers from our previous PPR period.

Over the academic years ending in 2017-2021, the department has awarded 14-27 BSc degrees per year (average 18). The number of degrees awarded is steady within the fluctuations of a small degree program. This number can be compared to statistics collected by the American Institute of Physics over 2016-2018, showing that our program graduated 18 Bachelor's degrees in Physics per year in that period. This was second-largest number of all Masters-granting Departments in California (second only to CSU Long Beach) and 7th overall in the country. [AIP] Also over academic years ending in 2017-2021, our graduate program admitted an average of 11 students each year; 8 joined our program, an acceptance rate of 72%.

We awarded an average of 8 Masters degrees per year, with 11 and 7 respectively in the final two years.

Retention, graduation rates and time to degree

Our 4-year graduation rate is steadily increasing with the consistent effort and support of faculty, the College and University. The cohort entering in 2014 had a 7% 4-year graduation rate; the cohort entering in 2016 had nearly double the 4-year graduation rate, at 13.3%. Five-year graduation rates show even stronger increases, from 25.0% for the cohort entering in 2013 to 57.9% for the cohort entering in 2015. Transfer students show overall comparable improvements. These results are still lower than our Department goals; the 8-semester plan outlined in Section II.B. is designed to continue the Department's support for reducing the time-to-degree of Physics majors.

Master's-Granting Departments Averaging 15 or More Physics Bachelor's Degrees Per Year, Classes of 2016 to 2018

	Annual Average
CA State University, Long Beach	40
Appalachian State U (NC)	35
Northern Arizona U	24
Virginia Commonwealth U	21
U of North Carolina, Charlotte	20
U of Texas, Rio Grande Valley	19
CA State University, Fullerton	18
City College (NY)	17
Miami U (OH)	17
Texas State U	17
Towson U (MD)	16
U of Texas at El Paso	16
U of Memphis (TN)	15

List includes only those departments that offered a master's as their highest physics degree in 2018 and contributed degree data for all three years. The departments listed in this table represent 12% of all physics departments that offer a master's as their highest physics degree.

AIP Statistics aip.org/statistics

D. Discuss the unit's enrollment trends since the last program review, based on enrollment targets (FTES), faculty allocation, and student faculty ratios. For graduate programs, comment on whether there is sufficient enrollment to constitute a community of scholars to conduct the program (see instructions, Appendices A and B).

Undergraduate Program

The enrollment trends since the last program review show a slight overall increase in enrollment in physics courses. In 2020-21, lower-division FTES dropped to 373.0 compared to 396.8 in 2016-17, but this drop was compensated by an increase in upper-division FTES from 27.2 to 58.2; the total physics undergraduate FTES grew slightly from 424.0 in 2016-2017 to 431.2 in 2020-21. Our department also offers three Astronomy courses: ASTR 101 – *Introduction to Astronomy*, a corresponding laboratory course ASTR 101L, and an advanced course, ASTR 444 - *Applications of Gravitation*. Astronomy lower-division enrollment increased from 88.9 FTES in 2016-17 to 119.6 in 2020-21; ASTR 444 is offered biannually, and growth in this course led our upper-division Astronomy course FTES to grow from 2.0 to 2.9.

Our number of undergraduate majors fell, from 100 (84.7 FTES) in 2016-17 to 63 (52.9 FTES) in 2020-21, with an especially large drop in lower-division majors (from 37 (32.4 FTES) in 2016-17 to 17 (14.7 FTES) in 2020-21. However, the number of degrees awarded was up, from 15 in 2016-17 to 2020-21; the overall drop in majors follows from a higher number of students graduating than new students entering the program. Applications of first-time freshmen were flat (186 in 2016 vs. 185 in 2020), and an increase in the number of students admitted (107 in 2016 vs. 149 in 2020) did not yield an increase in first-time freshmen enrollment (15 in 2016, 12 in 2020). Upper-division transfer applications increased (from 54 in 2016 to 69 in 2020), as did admissions (25 in 2016 to 31 in 2020), but enrollment fell (from 7 in 2016 to 3 in 2020

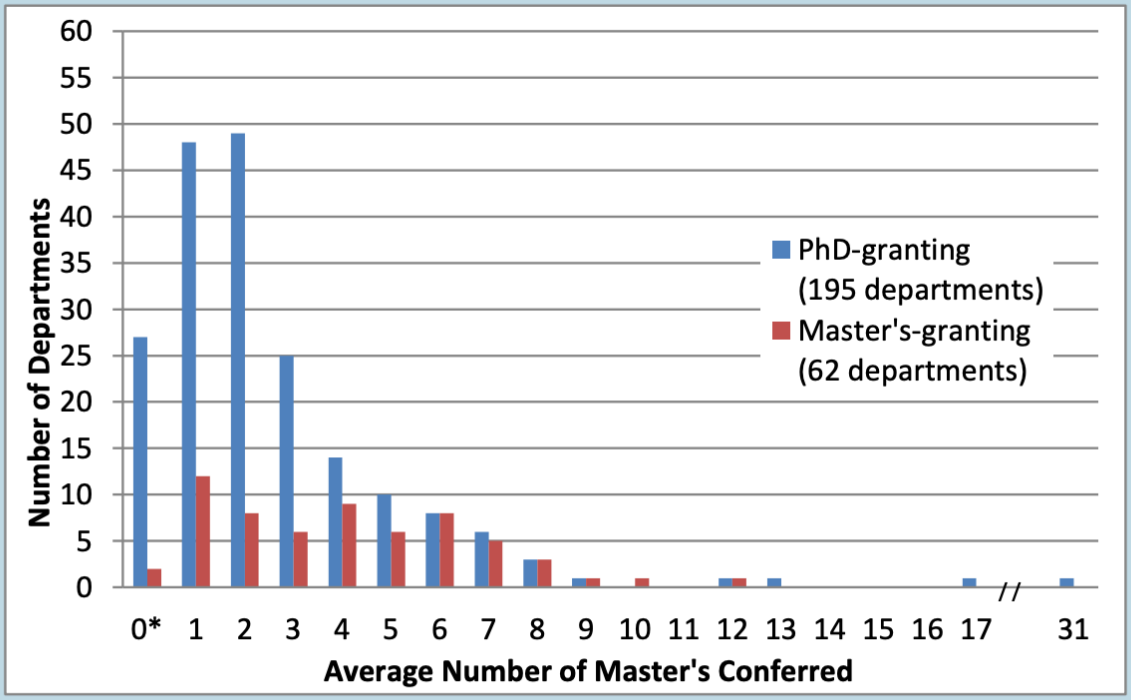
Graduate Program

Our graduate program enrollment grew slightly since the last review. We had 15 students enrolled in 2016-17 (8.6 FTES), compared to 20 in 2020-21 (13.2 FTES). Our graduation rate for the master's program showed improvement, with 71.4% of the 7 students entering fall 2015 graduating in 2 years, vs. 100% of students entering in 2018.

Our Physics Masters program is of sufficient size to maintain a community of scholars. In fact, our recent graduating classes average 8 Masters degrees per year, on the high end of Masters-granting Departments in the United States (cf. the figure below showing statistics from the American Institute of Physics). Our current enrollments are sufficient to engage students in a community of graduate scholars, especially considered as part of the broader CSUF Physics Department community, where senior undergraduate students and master's students often work side by side on research projects.

Our department's full-time faculty is a bit smaller in 2020 (13.0 FTEF) than in 2016 (14.2 FTEF). However, given the decrease in majors, the ratio of undergraduate major FTES to full-time FTEF actually decreased from (100/14.2 = 7.04) in 2016 to (52.9/13.0 = 4.07) in 2020. In terms of our program's total enrollment, the ratio of physics and astronomy FTES to full-time faculty FTEF changed slightly from ((335.2+ 88.9)/14.2 = 29.9) in 2016 to ((311.6+119.6)/13.0 = 33.2) in 2020.

Physics Departments in the U.S. by the Average Number of Exiting Master's Conferred.



***Includes 13 PhD and 1 Master's department that conferred one master's During the 3-year period, classes of 2010, 2011 and 2012 combined.**

Note: Exiting master's are individuals who upon receiving their master's degree leave their current physics department. Exiting master's are conferred at both master's-granting and doctoral-granting departments.

http://www.aip.org/statistics

E. Describe any plans for curricular changes in the short (three-year) and long (seven-year) term, such as expansions, contractions or discontinuances. Relate these plans to the priorities described above in section I. C (unit's future priorities).

Short-term plans

In the short term (next 1 – 3 years), we plan to add several undergraduate courses to extend our presence in campus. The new courses are listed below.

PHYS 155 – *Quantum Computing for Everyone*. The recent advances in quantum computing make use of the most fundamental principles of quantum mechanics. The course will introduce

freshmen to the fundamental tools of quantum mechanics and how they are used to achieved a different level of computing power. This course is intended to be part of the GE category B.1. We are targeting finalizing all approval steps for the course in the 2022 – 2023 academic year and offering the course for the first time in Fall 2023.

Long-term plans

Our long-term plans gravitate around improving our curriculum offers to ensure the proper preparation of our undergraduate and graduate students. In particular, we will continuously review our upper division and graduate level experimental classes to ensure that our students have access to the most recent experimental techniques used in the industry and scientific community.

We also seek to further incorporate computer science into the curriculum, additionally supporting developing the physics student career pathway with mathematical modeling, data engineering, and data science; these skills are relevant for in-demand data science positions in industry following graduation.

In addition to a constant improvement of our curriculum offers we would like to some additional courses. Here is a list of the long-term course proposals

PHYS 3xx – *Physics of Sports*. The new CSU curriculum requires that all CSUF students need to complete an upper division introductory science class (GE category B.5). This class is design with the Department of Kinesiology students in mind, to give them the opportunity to understand the fundamental scientific laws behind the mechanics of human body in the context of various athletic activities.

ASTR 301 – *Introduction to Astrophysics*. This course is design as an introductory survey in astrophysics, focusing on the application of mathematical and physical principles to astronomical problems. Topics include: orbital mechanics, stellar physics and evolution, galaxies, cosmology, and gravitational waves.

F. Include information on any Special Sessions self-support programs offered by the department/program.

The department offers a small summer session, with an emphasis on algebra bases (PHYS 211/212 – *Elementary Physics* & corresponding labs PHYS 211L/212L) and calculus-based (PHYS 225/226 – Fundamental Physics & corresponding labs PHYS 225L/226L) introductory physics classes. Enrollment in our Summer Session program is relatively constant over the years and is mainly limited to 24 students/class due to the lab section limits imposed by specialized laboratory rooms (theoretical class and corresponding lab class are co-requisites).

III. Documentation of Student Academic Achievement and Assessment of Student Learning Outcomes

Because student learning is central to our mission and activities, it is vital that each department or program includes in its self-study a report on how it uses assessment to monitor the quality of student learning in its degree program(s) and/or what plans it has to build systematic assessment into its program(s). Please provide information on the following aspects, and if applicable, please feel free to include relevant documents in the appendices.

A. Describe the department/program assessment plan (e.g., general approach, time table, etc.) and structure (e.g., committee, coordinator, etc.), and if applicable, how the plan and/or structure have changed since the last PPR.

Since the last PPR, the Department implemented the six-step assessment process championed by the Office of Assessment and Institutional Effectiveness (OAIE). The assessment for both the B.S. and M.S. programs are led by a department assessment coordinator that oversees the process. The coordinators have been Dr. Hargreaves (2015 – 2016), Dr. Passante (2016 – 2021), and Dr. Childers (2021 – current).

The department, led by the coordinator, rewrote assessable, student-centered programmatic student learning outcomes for both programs and implemented an assessment process and criteria for success for each outcome.

Each year the assessment coordinator plans the assessment for each program for the current academic year and reaches out to faculty that may be able to assist in carrying out the evaluations. For example, if a conceptual survey is to be given in a course, the assessment coordinator will meet with the faculty member teaching that class to administer the survey.

Reports of progress are provided to the department during department meetings. The assessment coordinator collects all data, performs the analysis, and prepares and submits the assessment report to the department chair and the OAIE. Assessment results are shared in a department meeting and any actions to be taken are discussed.

B. For each degree program, provide the student learning outcomes (SLOs); describe the methods, direct or indirect, used to measure student learning; and summarize the assessment results of the SLOs.

The BS and MS SLOs and methods of assessment are listed in the table below. In each assessment performed, the criteria for success have been met.

BS Physics SLOs:

Learning Outcome	Description	Years Assessed	Criteria for Success
Intellectual Literacy	Students will solve problems by applying the primary physical theories: classical mechanics, thermodynamics, wave phenomena, electricity and magnetism, and modern physics.	2017-2018 2020-2021	Direct: Students will be administered the Quantum Mechanics Conceptual Assessment in the required senior-level quantum mechanics class. Student performance on this validated assessment is expected to be within 5% of the national average.
Critical Thinking	Students will apply appropriate mathematical tools to solve physical problems.	2015-2016	Direct: Students will be administered the "Colorado Upper-Division Electrodynamics" (CURrENT) test, both at the start and end of tuition in PHYS 330B (Senior level course). Student gain for the course is expected to exceed 0.15.
Experimental Process	Students will demonstrate understanding of scientific inquiry by designing experiments and analyzing experimental data.	2018-2019	Direct: Students will extract meaningful data from physical systems and construct conclusions through data analysis.
Communication	Students will clearly and concisely report scientific observations and analysis of experimental data.	2014-2015 2019-2020	Direct: Student oral presentations will be assessed in 6 categories, each category scored on a scale of 0 - 3 points. Students will be assessed by 3 independent assessors, each offering their own scores. Overall percentage of scores at the 2 (meets expectations) or 3 (exceeds expectations), summed across all three assessors, to be greater than or equal to 80%.
Teamwork	Students will demonstrate the ability to work collaboratively to collect and interpret data and draw conclusions.	2016-2017	Direct: Students teamwork skills will be assessed in our capstone laboratory course using a rubric (modified from the AACU Teamwork VALUE Rubric) on a scale of 1-4. • Students will be assessed by the instructor of the course. • Students will self-assess their teamwork skills near the end of the semester.

MS Physics SLOs:

Learning Outcome	Description	Year Assessed	Criteria for Success
Intellectual Literacy	Students will solve problems by applying the primary physical theories: classical mechanics, electrodynamics and quantum mechanics.	2017-2018 2019-2020	Select items from student final exams from the courses in the core physics content areas will be assessed.
Critical Thinking	Students will demonstrate engagement in scientific inquiry by analyzing advanced physics questions and designing solutions to those questions	2016-2017 2020-2021	Direct: Two measures: Rubric on 4 elements of critical thinking were given to the research advisors to assess their graduating MS students. All students who present an MS research presentation are also evaluated using a similar rubric on the critical thinking apparent in their presentations.
Communication	Students will clearly and concisely report results and analysis from their research	2015-2016 2018-2019	Direct: Student oral presentations will be assessed in 6 categories, each category scored on a scale of 0 - 3 points. Students will be assessed by 3 independent assessors, each offering their own scores. Overall percentage of scores at the 2 (meets expectations) or 3 (exceeds expectations), summed across all three assessors, to be greater than or equal to 80%

C. Describe whether and how assessment results have been used to improve teaching and learning practices, and/or overall departmental effectiveness. Please cite specific examples.

The criteria for success have been met each time an SLO has been assessed. However, the department considers possible actions each year. There have been instances where it is clear that the SLO is not easily assessed by current departmental practices. An example of this is the MS Critical Thinking SLO. The description of this SLO states: Students will demonstrate engagement in scientific inquiry by analyzing advanced physics questions and designing solutions to those questions. This is not an outcome that can be measured in a traditional instructional course but is rather something present in research. For the past two assessment periods (2016-2017 and 2020-2021 academic years), assessment has been primarily by the

research advisor completing a rubric on how well a graduating student meets the criteria. However, we recognize that this is not an ideal way to measure critical thinking.

In 2017-2018, the department developed an experimental physics course for the graduate program, PHYS 581. This course may be a more natural avenue for assessing this outcome. However, in 2020-2021 when this SLO was last assessed, this course was not offered because it cannot be taught effectively in an online format during the COVID-19 pandemic.

D. Describe other quality indicators identified by the department/program as evidence of effectiveness/success other than student learning outcomes (e.g., graduation rate, number of students attending graduate or professional school, job placement rates, etc.).

Our students successfully go into teaching, industry, or PhD/Masters programs. To understand this further, we plan to work with OAIE to best take advantage of the data in the newly available Alumni Workforce Outcomes dashboard.

E. Many department/programs are offering courses and programs via technology (e.g., online, etc.) or at off-campus sites and in compressed schedules. How is student learning assessed in these formats/modalities?

Our department offers all required major courses in-person at the Fullerton campus. The only approved, online course offered by the department is PHYS 301, Energy & Sustainability. It is a GE course offered in Area B.5 and may be used as an upper-division elective for Physics BS students. Multiple measures of student performance are used in the class, including student performance on short, multiple-choice exams, participation in weekly discussion posts, completion of weekly homework assignments, and performance on a written project.

IV. Faculty

A. Describe changes since the last program review in the full-time equivalent faculty (FTEF) allocated to the department or program. Include information on tenure and tenure track faculty lines (e.g., new hires, retirements, FERP's, resignations), and how these changes may have affected the program/department's academic offerings. Describe tenure density in the program/department and the distribution among academic rank (assistant, associate, professor) [see instructions, Appendix C]. Attach faculty vitae (see Appendix D).

Since the last PPR in 2015 the Department has seen several shifts in the composition of its instructional personnel. Retirements and resignations account for the loss of three full-time

faculty members and eight part-time faculty members. Although the Department has been successful in hiring new full-time faculty members to compensate for retirements, attracting new part-time faculty members has proven more difficult.

Based on our enrollment numbers that averaged around 400 FTES per semester for the past five years, the Department should have 19.3 faculty members (based on the current average SFR for the College of NSM of 20.7). Currently, including the Department Chair, the department has ten tenured faculty members (six full and four associate professors) and two tenure-track faculty members (one assistant and one associate professor), for a total of 12 full-time faculty members. Additionally, we have two faculty members in the Faculty Early Retirement Program (FERP) expected to fully retire in the 2022-2023 academic year. Compared to our last PPR when the Department had 13 full-time faculty members, we have lost one net faculty member to retirement. Since the last PPR the Department was very successful in hiring new faculty members. We had two successful searches, with one position allocated based on our FTES increase and another one allocated to replace a retired faculty member. The first search, for an experimental soft-matter physicist, was completed in the 2015-2016 academic year - Dr. Wylie Ahmed started his career at CSUF in Fall 2016. The second search was in the field of theoretical/computational materials physics and it was completed in the 2019-2020 academic year – Dr. Meng (Stephanie) Shen started her career at CSUF in Fall 2020. During the 2021-2022 academic year we have an anticipated, active search to replace one of our FERP faculty. The position is for an experimental physicist in the field of condensed matter/material science or optics/atomic. The biggest change relative to our last PPR is the number of part-time faculty instructors. In Spring 2015 we had nine part-time instructors, which peaked at 14 in 2016, but has since declined to where currently we have only six part-time instructors. In addition, historically several of these part-time instructors had PhD's in Physics or a related discipline. In the current academic year none of the part-time instructors has a PhD. The lack of part-time instructors, and in particular PhD part-time instructors, has become problematic.

B. **Describe priorities for additional faculty hires. Explain how these priorities and future hiring plans relate to relevant changes in the discipline, the career objectives of students, the planning of the University, and regional, national and global developments.**

The most critical aspect of a career in our department is that faculty are expected to balance teaching and research duties. Accordingly, we prioritize candidates that show both potential and, more importantly, enthusiasm for working in that sort of environment (not candidates that heavily prioritize either teaching or research, with the other discipline considered only to the minimal extent required). We further prioritize candidates that show potential and enthusiasm for involving undergraduate students in all aspects of their research programs, and/or potential and enthusiasm for employing student-centered learning approaches in their classes. These two principles are the departments "guiding lights" for searches. The above considerations are

overarching (and overriding) considerations that guide every search in the department. However, individual searches typically have secondary interests that are specific to the search in question. Such considerations usually attempt to balance interests between the current state of the field and the needs of the department. Examples can include:

- Targeting candidates whose research specialty is in a current research "hot topic".
- Targeting candidates whose research specialty is something that the Department, College and University can reasonably support
- Targeting candidates that can address gaps in the department's sub-fields of expertise, particularly with respect to teaching upper division and graduate classes.

The Department further aims to maintain a balance of faculty with experimental and theoretical expertise, with a preference to be slightly heavy on the experimental side.

At the time of the last PPR, the department had recently just successfully completed a 5-year hiring plan. Since that time, our previous 2 hires were an experimental biophysicist (Dr. Ahmed), who was hired soon after completion of said plan, primarily as a "hot topic" hire, and a theoretical soft matter physicist (Dr. Shen), who was hired as a combination of a need to expand condensed matter expertise in our department in order to most effectively offer some upper division and graduate courses, coupled with our view that the needs of a theoretical physicist were more likely something the department and college could realistically support. The department is currently in the process of considering a new 5-year hiring plan.

Current Hiring Constraints

The Physics Department's ability to run experimental searches is currently heavily constrained by two factors, laboratory space and start-up funds. The issue of limited space is a long-standing issue within NSM and affects all departments within the college. With the anticipated retirements of two experimental faculty members (both currently in FERP), the Physics Department expects that some space will be available within Dan Black Hall. However, including the currently active hire, the department has already earmarked uses for all such space. We therefore have no further space to accommodate further new experimental hires.

The debatably larger issue, however, is the lack of appropriate start-up funds. In addition to physical space, a functioning experimental program requires sophisticated research equipment that is generally priced well outside of the typical startup packages that we have historically been able to offer. We offer startup packages in the range of $100k, down from a peak value of $150k that we were able to offer Dr. Ahmed. The department has attempted to work around some of these constraints by using philanthropic funds (particularly from the Black Family Trust award) to help fund research students for new hires, so that they do not have to be funded from startup funds. However, such measures are largely band-aid solutions. Our own review of startup funds for experimental hires at comparable institutions to CSUF, including another CSU in Southern California, suggests that $250k - $300k is a more typical startup figure. The inability of our department to offer anything competitive with this figure is an impediment both to the ability of our new hires to be successful, and to our ability to attract high quality faculty.

The constraints around hiring experimental faculty are one of the biggest issues facing the department at present. Experimental faculty have obvious appeal. As a (VERY general) rule, experimental grants are somewhat larger than theoretical ones, to accommodate operating a lab, in turn generating more overhead revenue for the university and department. An operating lab is a very useful advertising mechanism for the activities of the department (and, by extension, the college and university), and experimental scientists are (sometimes) able to offer research opportunities to undergraduate students at an earlier stage of their degrees, compared with theoretical faculty.

On the theoretical side, budgetary constraints are somewhat less of a factor, as the lack of laboratory equipment is a major saving for theoretical physicists. Having said that, however, our most recent theoretical hires have cited need for powerful local computational resources, in particular on-site computing clusters. While CNSM maintains its own computing cluster, the cluster is now fully utilized, and the expectation seems to be that new hires who have an interest in that resource will fund its expansion to accommodate that interest. These requirements are fast eroding the competitiveness of a $100k startup, even for theoretical hires.

Additionally, for both experimental and theoretical hires, a final constraint is lack of office space. The department simply has no more ability to offer office space (save for faculty retirements). We additionally are no longer able to offer (even communal) office space to part time faculty for conducting office hours. Office space is thus a major constraint to the department's activities.

Diversity in Hiring Practices

Since the last PPR, the department has made improving the diversity gap a priority in our search and hiring procedures. Physics as a discipline is traditionally noted for lacking in diversity. About 80% of PhD awards in the United States are conferred to men, 45% are conferred to white candidates (among degrees conferred to US citizens, this figure jumps to 84%). Around 2% of US PhD's are conferred to Hispanic candidates, and less than 1% to Black candidates. These figures highlight the department's opportunity to take a leadership role in closing the diversity gap.

The department has implemented several initiatives to improve hiring diversity. One such change since the last PPR has been to implement a diversity statement requirement to its list of required documentation. In addition, the department has made several revisions to its advertising and screening protocols. Our overarching philosophy is that any constraint imposed upon the search will tend to have the effect of homogenizing the pool, as URM candidates are more likely than over-represented candidates to consider their achievements as not in line with stated constraints. Consistent with this philosophy, our previous search was completely open-ended (save for focusing on a theoretical physicist), while the current search lists 3 sub-disciplines of physics that we would consider experimental candidates from. We do not take this to mean that any constraint on searches is inappropriate. Rather, recent search committees have endeavored to critically consider the merits of traditional search constraints, and to avoid applying constraints that primarily just limit the candidate pool.

Further consistent with this philosophy, our two most recent search advertisements (see Appendix X) now list 16 different categories against which candidates can demonstrate achievements that can be considered positively by the search committee. Included categories include achievements in mentorship, outreach, implementation of innovative pedagogies, etc. Moreover, the ad stresses that candidates are not expected to be able to make claims against all such criteria, and moreover that the department values claims against any listed criteria equally. We feel this increases the opportunities for candidates to compete asymmetrically for our positions, increasing the range of candidates that can apply, versus traditional criteria, which are very heavily weighted towards publication counts. Most importantly, the expanded criteria are not simply additional criteria included to create arbitrary opportunities for some candidates to respond to. Rather, they recognize that neither a successful researcher, nor a successful teacher, are inherently likely to be a successful faculty member. Either are just aspects of what makes such a person, but other qualities are equally as important. We therefore feel that our current job ad simply makes explicit that we are searching for someone that will be an effective faculty member in our department.

C. Describe the role of full-t0me or part-time faculty and student assistants in the program/department's curriculum and academic offerings. Indicate the number and percentage of courses taught by part-time faculty and student teaching assistants. Identify any parts of the curriculum that are the responsibility of part-time faculty or teaching assistants.

In general, we ensure that all our upper-division and graduate program classes are assigned instructors with a PhD degree. We further try to ensure these instructors are tenured or tenure-track faculty. However, periodically we need to use part time faculty in our upper division classes. Usually this is to compensate for faculty unavailability due to either sabbatical or where faculty request to use teaching buy-out from a grant. However, the current lack of PhD qualified part time faculty has meant that, in several instances, the Physics Department Chair has been forced to decline faculty requests to use buy-out from a grant, to make sure the program is fully offered to the highest standard possible. This has frustrated both the Department Chair and the faculty involved, there have been several instances where faculty grants have been left with surplus funds owing to the departments inability to accommodate budgeted release time, but for the moment is unavoidable.

In the lower division classes, the Department has compensated, to an extent, for the lack of instructional personnel by primarily appointing teaching assistants to instruct our introductory laboratories. This strategy seems to work well, and additionally allows our graduate students both an avenue to earn extra income, as well as gain teaching experience. However, this approach also exposes the department to some risks. While our graduate enrollment has been consistently healthy over the last few years, we have seen some years with smaller cohorts of graduate students. Such a circumstance would risk an instructor shortage for the introductory labs. As the labs are generally constrained to 24 students or fewer per section, due to room

capacity limits imposed by the fire marshal, such an eventuality could not easily be solved by simply running larger lab sections. Additionally, the frequent turnover of graduate students (who in general are available for 4 semesters before graduating) adds important challenges, as new teaching assistants has to be trained and supervised.

Teaching assistants are usually selected from our graduate students – about 90% of graduate students work as teaching assistants during their graduate studies. Their teaching assignments consist of introductory physics and astronomy laboratories. Teaching assistants are closely supervised by full-time faculty. They are subject to evaluation visits once a semester and their performance is closely monitored by the Department.

	Total WTU	FT WTU	PT WTU	TA WTU
Fall 2021	210	74	48	88
2020-2021	404	156	130	118
2019-2020	388	140	146	102
2018-2019	426	137	156	133
2017-2018	473	160	162	151

Table IV.1 WTU's distribution between full-time and part-time faculty and teaching assistants.

The distribution of teaching WTU's across different groups of instructors is summarized in Table IV.1. Note that research supervision units and teaching assistant supervision units are not included for full-time faculty members. Although the assigned number of units for full-time faculty is fairly constant across semesters, more recently a shift in assigned units from part-time faculty to teaching assistants is clear.

D. Include information on instructor participation in Special Sessions self-support programs offered by the department/program

The Department usually offers one section and one lab from each introductory physics classes for engineers and life science majors during the first self-supported session in the Summer Semester. The role of these classes is to reduce possible graduation bottlenecks or to accommodate students that want to accelerate their studies. The classes are mainly taught by full-time and part-time faculty members. Summer assignments are usually dictated by instructor availability. Since the introduction of our summer classes all teaching assignments are made on a voluntary basis.

V. Student Support and Academic Advising

A. Briefly describe how the department advises its majors, minors and graduate students.

Undergraduate Student Advising

All undergraduate Physics Majors receive mandatory department advising each semester to approve their study plans. All undergraduate student advising, including incoming freshmen and transfer student advising, is handled by the department's Undergraduate Advisor (UA), Dr. Leigh Hargreaves. Centralizing advising through a common advisor is critical to ensure a consistent advising experience for our students. As advising the entire major each semester is a significant undertaking, the Physics Department supports the UA with 3 WTU's of workload credit, per semester.

Advising is facilitated using the CSUF LMS, Canvas. At the start of semester, all Physics majors (and minors) are added to a custom Canvas page. Students can book an advising session using their calendars in Canvas. Advising appointments are available two days a week. Students may request an advising appointment at any point during the semester but must complete this requirement before they can register for classes for the upcoming semester (the UA clears each student's hold immediately following their advising session). The Canvas page also allows the UA to readily communicate information to the major. This includes periodic reminders about advising, disseminating information about research, departmental scholarships and any other opportunities of potential interest to the student body.

Graduate Student Advising

Graduate advising is handled by the department's Graduate Advisor (GA), Dr. Wylie Ahmed. Graduate students meet with the Department Chair and the GA at the beginning of every semester in connection with their study plans and teaching assignments. Per University rules, once each students completes 12 units an official Study Plan is submitted to the Graduate School for approval. Our graduate program offers three possible graduation paths: thesis, research project or comprehensive exams. Since our last PPR, all of our graduate students completed their studies via the research project path. Additional advising meetings are generally setup by direct contact (email) from the GA, or at student's request. Beyond the second semester, both the GA and Department Chair monitor each master's student to ensure they are progressing as per their agreed study plan and may request additional advising meetings if required. Otherwise, graduate students are free to contact the GA at any time to request a meeting, whenever they feel it necessary. As advising the entire graduate body each semester is a significant undertaking, that is critical to the success of our students, the Physics Department supports the GA with 3 WTU's of workload credit, per semester.

Formal advising is handled by the two department advisors, but it is worth noting that Physics Department takes great pride in its faculty acting as research mentors to the students. Essentially

the entire faculty advise students at least through this mechanism, particularly with regards to career planning, and most are available for informal advising discussions with any student that requests one.

B. Describe opportunities for students to participate in department honors programs, undergraduate or graduate research, collaborative research with faculty, service learning, internships, etc. How are these opportunities supported? List the faculty and students participating in each type of activity and indicate plans for the future.

Student Research Opportunities

The Physics Department has a very active research faculty across several physics sub-disciplines. Participation in undergraduate research is voluntary but widely encouraged. Students are generally counselled by the UA during their advising sessions to consider becoming involved in research during their sophomore year. The wider faculty also actively encourage research involvement and seek out research students for their respective groups.

Essentially the entire Physics Faculty are involved in student research, at least to some degree. To support faculty mentoring students, faculty receive workload credit at a (per semester) rate of 0.33 WTU's per student enrolled in PHYS 499 (Undergraduate Independent Study), and 0.5 WTU's for students enrolled in either PHYS 597 (Graduate Research Project) or PHYS 599 (Graduate Independent Study). Faculty may receive up to 3 WTU's per semester for student research supervision. The department has a long standing and proud tradition of including students as co-authors on research output, including peer-reviewed publications or on conference presentations, to which students regularly travel to present their work.

Undergraduate Research

The Physics Department does not have a formal thesis or research requirement as a part of our program. Undergraduate students that are interested in research may elect to enroll in 1 – 3 units of Independent Study (PHYS 499) per semester, repeatable to a maximum of 6 units. PHYS 499 enrollment is counted towards the student's (required) 14 units of Upper Division Physics Electives. Independent Study opportunities, and expected qualifications, are dependent on the needs of the research mentor and the capability of the student. The conventional model is for students to become involved in Independent Study during their Junior year (at which time they have completed the introductory physics sequence), but there have been cases of students becoming involved in research as early as their freshman year.

The department uses a variety of mechanisms to advertise student research opportunities. For undergraduate students, research advisors periodically request the undergraduate advisor to advise the student body of a research opportunity. More commonly, however, faculty member's directly recruit students into their programs (e.g., via their teaching classes, or by directly advertising opportunities). Finally, students may seek research opportunities by contacting

faculty members directly. The UA generally counsel's students in their sophomore year to contact faculty to investigate research opportunities, if that is something they are interested in.

The department currently has 18 undergraduate students involved in faculty-mentored research (all Junior/Senior level), from a total of 50 majors, including 35 majors at Junior/Senior level. Accordingly, we estimate approximately half of the Physics Majors do research during the course of their degree.

Graduate Research

Graduate students may participate in student research through Independent Study (PHYS 599) and/or Research Project (PHYS 597). Graduate students are responsible for identifying potential research advisors and gaining access to a research project. Graduate students may elect to graduate via the thesis/research project path, which requires up to nine of the required 30 units for the degree come from our specific research graduate classes PHYS 597/599 (maximums of 6 units of 599 and 3 units of 597). Essentially the entirety of the graduate student body pursues this track and hence is involved in research.

Research Support

At this time, the Physics Department does not have sufficient funds to directly support student research, either by means of direct student payments or supporting research opportunities that students may work on. This has generally been the case for the Department for many years. Occasionally there have been instances where the department has directly supported student travel, but this has been on a case-by-case basis in exceptional circumstances. Rather, student research (undergraduate or graduate) is supported by external avenues. The primary means of financial support for student research activities is via faculty grants. Faculty are counselled to include student support as an expected line item in their grant proposals.

The department also has an annual scholarship program that supports up to 10 students to conduct research activities with a faculty member. This program (The Black Family Trust Award) is sponsored by the ongoing philanthropic donation of the Black Family Trust, with whom the department has a long-standing relationship. Awardees receive up to $5000 in research salary to work on a faculty mentored research project, and up to $1000 in support for research activities (e.g., purchase supplies, support travel, etc.).

As noted, students working on faculty mentored research programs may receive academic credit (PHYS 499/597/599) as a non-financial means of supporting student research.

A breakdown of student support mechanisms is shown in Figures 1 and 2 below. Clearly the most common mechanism of student support in the department is through external grants, with around 2/3rds of undergraduate research students funded solely through an external grant. Note that "multiple sources" indicates a student is financed through more than indicated source, with (far and away) the most common arrangement being funds through a Black Family Trust

Fellowship, further supplemented by external grant funds. Combined, almost 80% of undergraduate research students and almost 60% of graduate research students receive some support from an external grant.

Teaching Assistants*:*

Most of our graduate students are employed by the department to act as TAs in the department's introductory lab courses. This provides students with the opportunity to earn money and gain valuable teaching experience. The department strives to ensure that any graduate student who wants to teach a lab can teach at least one section (some students may teach multiple sections, depending on lab availability). Each graduate TA is also assigned a faculty mentor to assist with any issues that might arise in their labs.

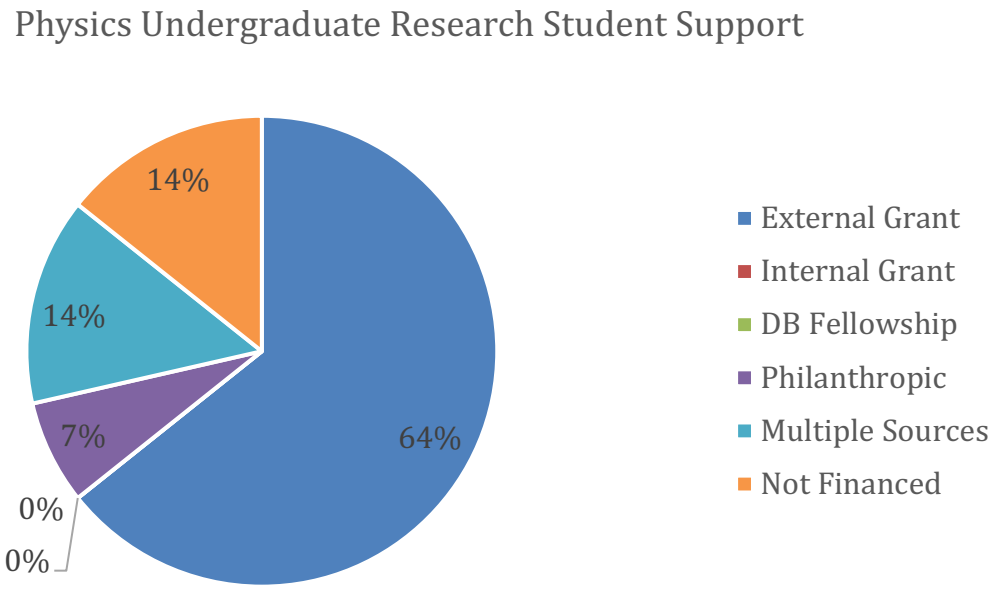


Figure V.1: Undergraduate research student support mechanisms in the physics department. "External grants" denotes students supported from faculty grants funded by external agencies (e.g. National Science Foundation Single Investigator Awards), "Internal Grant" denotes funding from CSUF programs (e.g. Junior/Senior Faculty Intramural Award, McNair/MacKenzie Scholarship, etc). "DB Fellowship" denotes students funded by the Black Family Trust Fellowship. "Philanthropic" denotes students funded by any award administered through Philanthropic (other than a Black Family Trust Fellowship). "Multiple sources" denotes students funded by more than one of the above sources (essentially students receiving support from external grants and a DB Fellowship). "Not financed" denotes students doing research for 499/597/599 credit only, with no financial support.

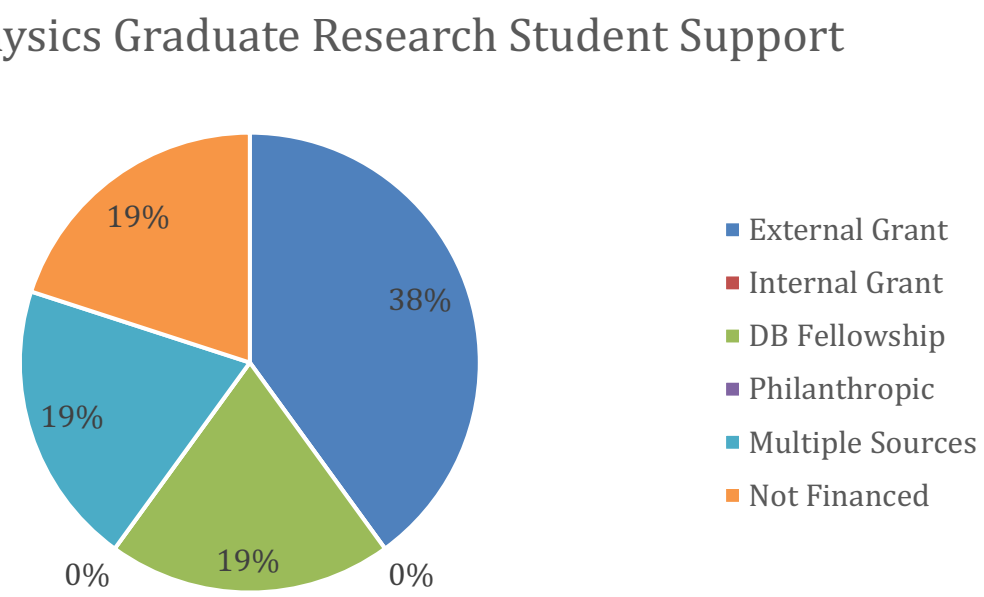


Figure V.2: Graduate research student support mechanisms in the physics department. Categories are the same as in Figure 1.

Supplemental Instruction

Undergraduate students (at junior or senior level) interested in pursuing mentoring opportunities may become involved in Supplemental Instruction (SI), leading small groups of introductory physics student in tutorial-based activities related to their introductory physics class. SI Instructors are paid a salary at the university award rate. The SI program is supported by a faculty member that coordinates the program and acts as coordinator/advisor to the SI leaders. The University SI Program supports this person with 3 WTUs of workload credit, per semester.

Physics Club

The department has an active student-run club. Club officers are elected annually, and the club sponsors student events that foster social interactions and promote student research.

Colloquium

The department has a weekly colloquium (depending on speaker availability) where professionals in various fields of physics (including academic and industrial fields) are invited to give talks and interact with students and faculty. The department provides lunch (pizza) for the speaker and students. The colloquium is organized and coordinated by one of the department faculty members (currently Dr. Meng Shen).

VI. Resources and Facilities

A. Itemize the state support and non-state resources received by the program/department during the last five years (see instructions, Appendix E).

Appendix [E] provides a table showing for the past five years all department resources and the extent to which each is from the state-supported budget or from other sources, such as self-support programs, research, contracts and/or grants, development, fund-raising, or any other sources or activities.

The department has severely outgrown its historic allotment of OEE. Our baseline OEE has remained roughly fixed for the past five years despite growth in metrics such as FTES compared with historic trends.

Students and faculty in the department are benefiting from philanthropic awards made to the college and to centers, even if they are not to the department directly. During this five-year period, faculty were awarded $5,394,102 (over $1M per year) in external funding for research. The department is also home to The Nicholas and Lee Begovich Center for Gravitational-Wave Physics and Astronomy, which received one of the largest gifts in the history of CSUF (~$7M) from Nick and Lee Begovich and has an endowed center director line ($75k/year) from Dan Black and Family and a graduate student fellowship funded by Nancy Goodhue-McWilliams ($12,500 this year, $10k before that).

B. Identify Any Special Facilities/equipment used by the program/department such as laboratories, computers, large classrooms, or performance spaces. Identify changes over the last five years and prioritize needs for the future.

The physics department is centered on the 6th floor of McCarthy hall with the majority of faculty offices, lower-division labs, upper-division lecture and laboratory classrooms, and faculty research labs and centers also located on the 6th floor. Four more research labs are located in Dan Black Hall, and one in the basement of McCarthy Hall. The department makes use of three supercomputers, the CCAM-operated Kepler and GWPAC-operated Orca and Shen's new cluster under construction, all in the university data center in the basement of Pollak Library. Orca and Kepler benefit from the expertise of the CNSM computing system administrator, Emerio Martinez. The department further makes use of the engineering machine shop. Physics usually has access, through reservations each semester, to a small number of large classrooms in McCarthy Hall and across campus for K2-sized classes. Changes and priorities associated with some of these facilities and equipment are discussed in more detail below.

Infrastructure

Over the past five years we have renovated several spaces to accommodate our needs. With philanthropic support from Nick Begovich's gift to GWPAC, the following changes were made:

- Renovated MH690 to be a modern upper-division teaching lab with a new design, new desks and furniture, and suitable workstations for up to 30 students
- Currently renovating DBH168, which was formerly a teaching lab, to be the GWPAC research lab with new facilities for lasers and optics, cryogenic measurements, and ovens for materials science
- Since offices are a major need, we are working on transforming MH675, formerly a cremation room, in an office space

Other recent space changes include:

- Renovated MH612A, to become an office for newest tenure-track faculty hire, Dr. Meng Shen
- Converted part-time lecturer office space MH-612B into student-faculty research space associated with DynSS (Shen's only space for students)
- One faculty office MH-665A was converted into an office for part-time lecturers

Priorities for the next five years include

- Office Space and quality laboratory for two new experimental hires
- Startup packages in the $250-500k range for new experimental hires
- A third instructional tech
- A fairer access policy for large classrooms

New hire space needs

Two experimental hires have recently been made to replace two long time experimental faculty that will retire during the 2022/23 academic year (Khakoo and Wanser). Both hires will require faculty office space and quality laboratory space to build their research programs. Smith's current space DBH167 will serve as one of these spaces, with Smith moving to occupy DBH 168 (which includes Wanser's current space). Hargreaves will be taking over the space currently occupied by Khakoo and the second hire assuming Hargreaves current space. With this reshuffle, however, the department has no further spaces to accommodate new hires.

Faculty startup needs

Our most recent full-time faculty hire in theoretical/computational physics accepted $90 k in startup, including a shared student research space and four semesters of 3 WTU/semester teaching release. Our most recent experimental hire accepted $150k in startup including a laboratory space and similar teaching release. In stark contrast, physics departments at nearby CSU sister campuses have recently hired experimental physicists with startup packages of more than $250k. This puts our faculty at a significant disadvantage when competing for federal

funding because it shows a lack of institutional support and commitment to research. With hires of experimental faculty anticipated in the coming five years, the department requests competitive startup packages. Modern experimental physics requires laboratory startups in the $250-500K range. Identifying ways to fund startup at appropriate levels is crucial if CSUF is to remain competitive in STEM.

Addition of instructional technicians

The department has severely outgrown its historic allotment of just two instructional techs. Shovit Bhari and Robert Wright were charged with the maintenance and weekly setup of the introductory physics labs across the department. Besides lab development, they also help to maintain computers, printers, and computer networks throughout the department. They curate the department's lecture demo collection and deliver the lecture demos for faculty, which could be a classroom anywhere on campus, along with managing the portable planetarium and outreach. They also order and track all of the equipment purchased in the department including faculty grant purchases. The department recently lost Wright to another department on campus and is struggling to cover its core mission. Even a replacement tech for Wright will still not be adequate to allow the department to fulfill its core mission with a reasonable workload on each tech. The department very recently also lost Bhari to an external company, placing further pressure on our already overburdened technical staff.

Fair access to large classrooms

To meet demand better across our introductory physics sequences, we have been offering large K2 lecture sections (> 90 enrollment) - *when we have been able to secure large enough lecture rooms*. This is of course a growing challenge across campus but key to avoiding bottlenecks in our astronomy, life-science, and engineering physics offerings. Currently, we have access to a handful of timeslots in just *two* classrooms MH682 (cap 88) and SGMH 1406 (cap 120), whereas the other departments in the college share access to several large lecture rooms in our building MH. This shared access among the other departments is historical and has evolved little in the past 20 years.

We are requesting that the Dean and the college review the classrooms 'owned' by the departments to devise a fairer policy for accessing classrooms across the college.

Machine-shop access

Our experimental-physics research labs rely on access to a ma- chine shop for fabricating custom equipment. A machine shop is thus fundamental to the function of our labs and a key element to attracting future faculty in experimental physics. According to a previous MOU between CNSM and CECS, the physics department has access to the CECS/CNSM machine shop. This facility, led by Jon Woodland, does excellent work. With Wright as a physics tech, having a strong relationship with the machine shop, we saw an improvement in machining times over the previous PPR period. Building a new relationship with a physics tech will be important to maintain this. We estimate that the machining requirements of the physics department as a

whole are one or two 8-16 hour custom jobs per month from faculty, student, and staff projects.

Having productive access to the campus machine shop is critical for the long-term well being of the department.

C. Describe the current library resources for the program/department, the priorities for acquisitions over the next five years and any specialized needs such as collections, databases etc.

Included below is a statement from Pollak Library regarding physics-related library resources. In addition to this statement, physics faculty have noted difficulty in accessing articles in the following journals: Nature Physics, Nature Materials, Nature Photonics, Soft Matter, Journal of Chemical Physics Archives, Journal of Applied Physics, Science Robotics, Annals of Physics, The European Physical Journal Applied Physics, Measurement Science and Technology, Journal of Sound and Vibration, Reports on Progress in Physics, Journal of Optical Society of America, Journal of Applied Mechanics, Journal of Acoustical Society of America, Annual Review of Fluid Mechanics, Advances in Physics, Applied Optics, Journal of Mathematics and Physics, Applied Mechanics Reviews, Applied Physics Letters, Small, Journal of the Physical Society of Japan, Computer Physics Communications, Nanoscale, Chaos.

VII. Long-term Plans

A. Summarize the unit's long-term plan, including refining the definitions of the goals and strategies in terms of indicators of quality and measure of productivity (see instructions, Appendix F).

B. Explain how the long-term plan implements the University's mission, goals and strategies and the unit's goals

C. Explain what kind of evidence will be used to measure the unit's results in pursuit of its goals, and how it will collect and analyze such evidence

Since our last performance review, we continued to strengthen and expand our presence in the campus course offerings. Although we are a small Department, our service courses are fundamental to life sciences and engineering. We strive to eliminate all possible bottlenecks in our curriculum so that we can actively contribute to shorter student graduation times.

Although we worked hard and increased our class and laboratory offerings it is important to emphasize several items that can lead to improvements.

a) Enrollment uncertainty. Each semester the efficiency of our class offerings is seriously affected by the lack of planning in campus. In particular, with laboratory rooms caped at 24 seats, it is very difficult to predict number of lab sections offered in connection with

our introductory physics sequences. The situation is not much better for course offerings: the number of sections for introductory physics classes vary from semester to semester influenced by the lack of planning, but also by the reduced availability of rooms in MH building.

b) Reduced budget. For the last 7 years the Physics OEE budget has been stagnant around 100k/year. In the era of analogic equipment, replacing old equipment was not a priority as most of the problems were relatively easy and inexpensive to fix. However, today, most of the available equipment is digital, making any repairs impossible, so we need to often replace expensive laboratory equipment in our introductory physics classes. Additionally, experimental data collection is now automatic, meaning that each bench in our experimental labs is in need of computer equipment; with a life cycle of about 6 years, we are in need to acquire annually about 15 new computers for our labs. Finally, this budget does not reflect the fact that Physics contributes a much greater fraction of the total teaching effort within CNSM, compared with 10 years ago, yet for essentially the same share of college OEE.

c) Personnel shortage. Although we were pretty successful in hiring new faculty members, we are in need of technical support staff. For years, the Physics Department was served by two staff members focusing on supporting our class experimental demos and laboratory activities. We are in need of additional staff to support our Astronomy activities and to support our experimental physics faculty members in running their research labs.

The Department's goals and priorities along with general metrics of accomplishment are identified below.

Goal 1. Improve student learning, improve retention, and minimize graduation time

Priority 1 – Maintain and improve High Impact Practices (HIPs) through inclusion of undergraduate and graduate students in faculty research activities.
Our Department has a history of strong commitment to HIPs; currently about 50% of our undergraduate students and 100% of our graduate student are involved in research activities along with our faculty members. For the future, we hope to increase undergraduate student participation in research activities and to diversity opportunities for graduate students.

Metrics: Continue to encourage all graduate students in the program to adopt Plan BC for graduation. Improve opportunities for undergraduate students to join research groups; develop procedures to encourage all faculty members to actively involve students in their research.

Priority 2 – Continue assessment of undergraduate and graduate programs.
During the past review cycle, we introduce assessment tools for our program. The initial focus was on the undergraduate program and we used our upper division PHYS 481 – *Experimental Physics* class. More recently, we extended assessment to our graduate program and we used our Department Colloquium for student end of program project presentations.

Metrics: Continue to improve our student learning outcomes (SLOs) and correct any SLOs that do not meet expectations over a period of two years.

Goal 2. Improve student access to research activities

Priority 1 – Continue and improve student access to faculty research.
As mentioned before, 50% of our undergraduate students and 100% of our graduate students are involved in research activities. One shortcoming is that currently, the distribution of students in research groups is somewhat uneven across the department faculty members.

Metrics: Encourage all undergraduate students to complete research projects. All graduate students complete graduation via Plan BC, i.e, based on a final project/thesis. Develop procedures to even research mentoring among faculty members.

Priority 2 – Improve funding opportunities for undergraduate and graduate research.
Funding for student research support is very limited. The Department will work to inform students and faculty of funding opportunities and it will priorities grant submission that include student support. The Department will enhance philanthropic efforts to provide additional support to student research activities.

Metrics: Increase the number of grants submitted by faculty that emphasize student research support. Diversify philanthropic fund-raising focused on student research support.

Goal 3. Support Faculty Scholarship

Priority 1 – Encourage and support faculty to write grants and travel to relevant meetings.
Given the current funding situation it is essential that faculty members continuously pursue additional funding support from grant agencies. The current level of grant activity in the Department is fairly high. The Department continues to support faculty in a "between" grants situation to be able to develop new research opportunities and to participate in national and international conferences.

Metrics: Work with the Research Office to identify grant opportunities for faculty members. Promote collaboration between faculty members and grant writing mentorship.

Priority 2 – Promote opportunities for junior faculty to participate in grant writing workshops.
It is essential to support new hires in their efforts to obtain external funding and to support their research efforts. The Department is committed to provide funding to junior faculty to

participate in grant writing workshops or in meetings with grant officers from major national grant agencies.

Metrics: Use Department funding for participation in grant writing workshops. Ensure that each new junior faculty has at least one opportunity to participate in a grant related meeting/workshop.

Goal 4. Stabilize number of majors in the Department

Priority 1 – Recruit new majors and graduate students.
Since our last review, the number of undergraduate physics majors decreased. At the same time, the number of graduate students stabilized. The success of our students after graduation represents an opportunity for growth.

Metrics: Expand our outreach efforts to Community Colleges and high schools.

Priority 2 – Improve student success.
The Department has a very good advising system that strives to optimize student graduation times. Unfortunately, physics majors arrive at CSUF with different levels of preparation and many times they drop our major even before taking classes within the Department.

Metrics: Continue to support effective advising efforts. Continue to identify academic barriers and offer options to address these shortcomings. Reach out to accepted students in their first semester at CSUF.

Goal 5. Strengthen Graduate Program

Priority 1 – Increase financial support to our graduate students.
The financial support for graduate students at CSUF is almost inexistent. Physics Departments at R1 institutions provide consistent stipends and free tuition to all graduate students. TA salaries for graduate students at CSUF are among the lowest in the region, creates a financial hardship for our students, and strongly impacts our ability to recruit graduate students.

Metrics: Continue to push the implementation of free tuition for TAs. Expand financial support for graduate students using philanthropic donations.

Priority 2 – Continue to encourage graduate students to pursue Plan BC for graduation.
Currently, 100% of our graduate students choose Plan BC for their graduation and complete their studies with a Project. This path allows students to fulfill a three semester research experience and a gain skills that ultimately place them in industry or PhD programs at R1 Universities.

Metrics: Continue to support effective Graduate Advising in the Department. Encourage all faculty members to work with graduate students in their research activities.

Goal 6. Recruit and retain faculty and staff

Priority 1 – Recruit high quality faculty dedicated to both teaching and research.
The Department was successful in hiring new faculty members interested in both teaching a diverse population of students and research excellence. Currently, we just finalized a search for an Experimental Physics tenure track position and we made two offers to replace our two faculty that will end their FERP in Fall 2022. In the following years we expect an additional one or two replacement hires. We will address the needs of our programs as well as the relevant trends in the field of physics to ensure that both our teaching and research needs will be met.

Metrics: Stay connected with the national physics community and assess new trends in research. Develop a realistic hiring plan that addresses the needs of the Department.

Priority 2 – Support staff excellence.
Currently, the Department has four staff members, two office assistants and two technicians that support our class demos and laboratory courses. We rely heavily on our staff members for an efficient running Department. Staff retention is very important and we will continue to look for ways to support our staff and distribute their work load to ensure an efficient operation of our Department.

Metrics: Continue to support staff development. Look for ways to retain and reward staff members of the Department.

D. Develop a long-term budget plan in association with the goals and strategies and their effectiveness indicators. What internal reallocations may be appropriate? What new funding may be requested over the next seven years?

Goal 1. Improve student learning, improve retention, and minimize graduation time

Priority 1 – Maintain and improve High Impact Practices (HIPs) through inclusion of undergraduate and graduate students in faculty research activities.

- Maintain the research infrastructure – costs unknown.

Priority 2 – Continue assessment of undergraduate and graduate programs.

- Continue to provide 3wtu/year for Assessment Coordinator

Goal 2. Improve student access to research activities

Priority 1 – Continue and improve student access to faculty research.

- No anticipated costs to the department.

Priority 2 – Improve funding opportunities for undergraduate and graduate research.

- $4,000/year/student for undergraduate and graduate research fellowships. This program will be funded through philanthropic donations.

Goal 3. Support Faculty Scholarship

Priority 1 – Encourage and support faculty to write grants and travel to relevant meetings.

- No anticipated costs to the department.

Priority 2 – Promote opportunities for junior faculty to participate in grant writing workshops.

- $2,500/year for junior faculty workshop participation.

Goal 4. Stabilize number of majors in the Department

Priority 1 – Recruit new majors and graduate students.

- $2,000/year for High School and Community College Science Fairs.

Priority 2 – Improve student success.

- Continue to provide 3wtu/semester for Undergraduate Advisor.
- Continue to provide 3wtu/semester for the Department SI Coordinator.

Goal 5. Strengthen Graduate Program

Priority 1 – Increase financial support to our graduate students.

- Provide TAs with full tuition packages ~ $8,000/year/TA.
- Improve graduate students support via external grants and philanthropic donations.

Priority 2 – Continue to encourage graduate students to pursue Plan BC for graduation.

- Continue to provide 3wtu/semester for the Graduate Advisor.
- $1,000/year for Department Colloquium.

Goal 6. Recruit and retain faculty and staff

Priority 1 – Recruit high quality faculty dedicated to both teaching and research.

- $10,000/search. Currently the University provides $5000/search - with the increased costs of advertising and campus visits this amount is totally insufficient.

Priority 2 – Support staff excellence.

- $1,000/year. Staff workspace improvements.

VIII. Appendices Connected to the Self-Study (Required Data)

- **A. Undergraduate Degree Programs**
- **B. Graduate Degree Programs**
- **C. Faculty**
- **D. Resources**
- **E. Long-Term Planning**
- **F. *Curriculum Vitae* of faculty (which should include recent scholarly/creative activity and any research funding)**

APPENDIX A. UNDERGRADUATE DEGREE PROGRAMS

Table 1. Undergraduate Program Applications, Admissions, and Enrollments

Table 1-A. First-Time Freshmen: Program Applications, Admissions, and Enrollments

Fall	# Applied	# Admitted	# Enrolled
2016	186	107	15
2017	212	110	15
2018	206	118	14
2019	153	96	7
2020	185	149	12

Table 1-B. Upper-Division Transfers: Program Applications, Admissions, and Enrollments

Fall	# Applied	# Admitted	# Enrolled
2016	54	25	7
2017	58	12	5
2018	59	18	3
2019	56	19	2
2020	69	31	3

Table 2. Undergraduate Program Enrollment in FTES

Table 2-A. Undergraduate Program Enrollment by Course-Based FTES

Academic Year (Annualized)	Enrollment in FTES		
	Lower-Division FTES[1]	**Upper-Division FTES**[2]	**Total FTES**
2016-2017	396.8	27.2	424.0
2017-2018	391.5	32.8	424.3
2018-2019	340.9	33.5	374.4
2019-2020	332.1	52.0	384.1
2020-2021	373.0	58.2	431.2

[1] All students' FTES enrolled in lower-division courses of the program, regardless of student major.

[2] All students' FTES enrolled in upper-division courses of the program, regardless of student major.

Table 2-B. Undergraduate Program Enrollment by Course-Based FTES: **Astronomy**

Academic Year (Annualized)	Enrollment in FTES		
	Lower-Division FTES[1]	**Upper-Division FTES**[2]	**Total FTES**
2016-2017	88.9	0.0	88.9
2017-2018	98.7	2.0	100.7
2018-2019	92.1	0.0	92.1
2019-2020	95.2	2.9	98.1
2020-2021	119.6	0.0	119.6

[1] All students' FTES enrolled in lower-division courses of the program, regardless of student major.

[2] All students' FTES enrolled in upper-division courses of the program, regardless of student major.

Table 2-C. Undergraduate Program Enrollment (Headcount & FTES by Major Only)

Academic Year (Annualized)	Majors						
	Lower-Division		**Upper-Division** (Including Post-Bac & 2nd Bac)		**Total**		
	Headcount	**FTES**[1]	**Headcount**	**FTES**[2]	**Headcount**	**FTES**[3]	**FTES per Headcount**
2016-2017	37	32.4	64	52.2	100	84.7	0.85
2017-2018	32	29.6	66	54.3	98	83.9	0.86
2018-2019	26	23.7	69	55.8	95	79.5	0.84
2019-2020	16	14.3	59	51.9	75	66.2	0.89
2020-2021	17	14.7	47	38.3	63	52.9	0.84

[1] FTES of the lower division students who are majoring in the program.

[2] FTES of the upper division students who are majoring in the program.

[3] FTES of all students who are majoring in the program.

Table 3. Graduation Rates for Degree Program

Table 3-A. First-Time, Full-Time Freshmen Graduation Rates

Entered in Fall	Cohort	% Graduated			Equity Gap*	
		In 4 Years	**In 5 Years**	**In 6 Years**	**By Pell Status**	**By UR Status**
2013	20	0.0%	25.0%	40.0%	25.0%	20.0%
2014	14	7.1%	35.7%	57.1%	-54.5%	12.5%
2015	19	10.5%	57.9%	73.7%	-7.8%	-23.9%
2016	15	13.3%	46.7%	N/A	N/A	N/A
2017	15	20.0%	N/A	N/A	N/A	N/A

**Note: Equity gap is calculated as the percentage point difference in six-year graduation rates between two sub-populations of each cohort year (e.g., 2013 non-UR six-year graduation rate – 2013 UR six-year graduation rate). Please consider cohort sizes when interpreting the equity gap data.*

Table 3-B. Transfer Student Graduation Rates*

Entered in Fall	Cohort	% Graduated		
		In 2 Years	**In 3 Years**	**In 4 Years**
2015	6	16.7%	50.0%	66.7%
2016	7	14.3%	71.4%	71.4%
2017	5	0.0%	40.0%	80.0%
2018	3	66.7%	66.7%	N/A
2019	2	50.0%	N/A	N/A

**Note: Starting with the Fall 2019 cohort, both state-support and self-support matriculated students are included in the cohorts.*

Table 4. Degrees Awarded

Table 4. Degrees Awarded

College Year	Degrees Awarded
2016-2017	15
2017-2018	14
2018-2019	19
2019-2020	17
2020-2021	27

APPENDIX B. GRADUATE DEGREE PROGRAMS

Table 5. Graduate Program Applications, Admissions, and Enrollments

Table 5. Graduate Program Applications, Admissions, and Enrollments

Fall	# Applied	# Admitted	# Enrolled
2016	16	7	7
2017	35	14	11
2018	22	8	4
2019	31	10	7
2020	29	17	12

Table 6. Graduate Program Enrollment by Headcount and FTES

Table 6. Graduate Program Enrollment by Headcount and FTES

Academic Year (Annualized)	Headcount	FTES	FTES per Headcount
2016-2017	15	8.6	0.58
2017-2018	21	12.8	0.61
2018-2019	22	12.8	0.58
2019-2020	15	9.7	0.67
2020-2021	20	13.2	0.68

Table 7. Graduate Student Graduation Rates

Table 7-A. Graduation Rates for Master's Programs

All Master's Entered in Fall:	Cohort	% Graduated		
		In 2 Years	**In 3 Years**	**In 4 Years**
2015	7	71.4%	71.4%	85.7%
2016	7	42.9%	57.1%	71.4%
2017	11	81.8%	81.8%	81.8%
2018	4	100.0%	100.0%	100.0%
2019	7	100.0%	100.0%	100.0%

Table 8. Master's Degrees Awarded

Table 8. Graduate Degrees Awarded

College Year	Degrees Awarded
2016-2017	5
2017-2018	4
2018-2019	12
2019-2020	11
2020-2021	7

APPENDIX C. FACULTY

Table 9. Full-Time Instructional Faculty, FTEF, FTES, SFR

Table 9. Faculty Composition[1]

Fall	Tenured	Tenure-Track	Sabbaticals at 0.5	FERP at 0.5	Full-Time Lecturers	Actual FTEF
2016	9	4	0.5	0.0	1	14.2
2017	9	5	0.0	0.5	0	13.5
2018	10	3	0.0	1.0	1	13.5
2019	9	3	0.5	0.5	1	13.0
2020	10	3	1.0	0.5	0	13.0

[1] Headcount of tenured, tenure-track, sabbaticals at 0.5, and FERP at 0.5 includes full-time and part-time faculty. Headcount of lecturers only includes full-time faculty.

APPENDIX D. RESOURCES

Data shown is for the past five years for all department resources, and the extent to which each is from the state-supported budget or from other sources, such as self-support programs, research, contracts and/or grants, development, fund-raising, or any other sources or activities. Amounts in US Dollars ($).

Table 1A. Summary of State Support and amount spent on salaries and OEE.

State	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
FT Faculty Salaries	1,209,515	1,303,728	1,379,068	1,233,288	1,307,686
PTF Salaries	478,988	500,657	468,580	460,845	441,743
Staff Salaries	198,432	202,401	220,020	220,020	225,072
OEE	119,502	112,500	103,144	124,581	118,619

Table 1B. Philanthropic and Extramural Grant funding obtained by the department 2016-2021.

Non-state	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Donations to Department	40,625	61,019.49	130,175	81,600	98,500.46
Donations to Centers	10,000	10,000	10,000	6,402,500	87,500
External Grants (applied)	3,402,808	2,719,185	1,663,140	1,979,770	2,015,588
External Grants (awarded)	1,780,349	912,623	800,977	856,066	1,044,087
% success (amount)	52.32	33.56	40.46	43.24	51.80
% success (count)	50	53.85	28.57	57.14	40

APPENDIX E. LONG-TERM PLANNING

Table 1-A. Physics Department Goals, Including Student Learning Goals, Scholarly and Creative Activities Goals, and Service Goals.

Physics PPR Goal/Priority	**Goal Description**	**Metric**
G1	Improve student learning, improve retention, and minimize graduation time	
G1P1	Maintain and improve High Impact Practices (HIPs) through inclusion of undergraduate and graduate students in faculty research activities	• Continue to encourage all graduate students in the program to adopt Plan BC for graduation. • Improve opportunities for undergraduate students to join research groups. • Develop procedures to encourage all faculty members to actively involve students in their research.
G1P2	Continue assessment of undergraduate and graduate programs	• Continue to improve our student learning outcomes (SLOs) and correct any SLOs that do not meet expectations over a period of two years.
G2	Improve student access to research activities	
G2P1	Continue and improve student access to faculty research	• Encourage all undergraduate students to complete research projects. • All graduate students complete graduation via Plan BC, i.e, based on a final project/thesis. • Develop procedures to even research mentoring among faculty members.
G2P2	Improve funding opportunities for undergraduate and graduate research	• Increase the number of grants submitted by faculty that

		emphasize student research support. • Diversify philanthropic fund-raising focused on student research support.
G3	Support Faculty Scholarship	
G3P1	Encourage and support faculty to write grants and travel to relevant meetings	• Work with the Research Office to identify grant opportunities for faculty members. • Promote collaboration between faculty members and grant writing mentorship.
G3P2	Promote opportunities for junior faculty to participate in grant writing workshops.	• Use Department funding for participation in grant writing workshops. • Ensure that each new junior faculty has at least one opportunity to participate in a grant related meeting/workshop.
G4	Stabilize number of majors in the Department	
G4P1	Recruit new majors and graduate students	• Expand our outreach efforts to Community Colleges and high schools.
G4P2	Improve student success	• Continue to support effective advising efforts. • Continue to identify academic barriers and offer options to address these shortcomings. • Reach out to accepted students in their first semester at CSUF.
G5	Strengthen Graduate Program	
G5P1	Increase financial support to our graduate students	• Continue to push the implementation of free tuition for TAs.

		• Expand financial support for graduate students using philanthropic donations.
G5P2	Continue to encourage graduate students to pursue Plan BC for graduation	• Continue to support effective Graduate Advising in the Department. • Encourage all faculty members to work with graduate students in their research activities.
G6	Recruit and retain faculty and staff	
G6P1	Recruit high quality faculty dedicated to both teaching and research	• Stay connected with the national physics community and assess new trends in research. • Develop a realistic hiring plan that addresses the needs of the Department.
G6P2	Support staff excellence	• Continue to support staff development. • Look for ways to retain and reward staff members of the Department.

APPENDIX F. CURRICULUM VITAE OF FACULTY

Wylie W. Ahmed

Contact Information	California State University, Fullerton College of Natural Sciences & Mathematics Department of Physics 800 N. State College Blvd. Fullerton, CA 92831	*Office:* MH-661 *Phone:* (657) 278-2188 *E-mail:* wahmed@fullerton.edu *WWW:* www.SLAM-Lab.com

Professional Appointments

Associate Professor, California State University, Fullerton, California — **2021 - present**
Assistant Professor, California State University, Fullerton, California — **2016 - 2021**
Faculty, Department of Physics
Member, Center for Computational and Applied Mathematics (CCAM)
Member, Center for Applied Biotechnology Studies (CABS)
Member, Group for Dynamics of Small-scale Systems (DynSS)
Mentor, Maximizing Access to Research Careers (MARC)

Marie Skłodowska-Curie Research Fellow, Institut Curie, Paris, France — **2014 - 2016**
Department of Physical Chemistry (UMR168)

Instructor, Université Paris Descartes, Paris, France — **2014 - 2016**
Center for Interdisciplinary Research (CRI)

Pierre-Gilles de Gennes Fellow, Institut Curie, Paris, France — **2013 - 2014**
Department of Physical Chemistry (UMR168)

Researcher, Max Planck Institute, Stuttgart, Germany — **2008**
Department of New Materials and Biosystems

Education

University of Illinois, Urbana, IL USA — **2008 - 2013**
Ph.D., Department of Mechanical Sciences and Engineering

University of Illinois, Urbana, IL USA — **2003 - 2008**
B.S., Department of Mechanical Sciences and Engineering

Research Interests

Soft and active matter, non-equilibrium and nonlinear dynamics, biological physics, materials science, statistical physics, mechanics of materials, microscopy, laser tweezers, rheology

Grants & Fellowships

NSF Grant - Active noise in the dynamics of self-propelled particles (co-PI, $364,582)	2020-2023
NSF Grant - Enzyme-Powered, Programmable Active matter (PI, $253,117)	2020-2023
CSUF RSCA Grant - Extracting the signature of life from noise (PI, $15,000)	2019
LSAMP International REU Collaborative Research Initiation Award ($5000)	2018
CSUF RSCA Grant - Microscopic jiggling, schools of fish, and flocks of birds (Co-PI, $15,000)	2018
CSUF RSCA Grant - A microfluidic negative pressure device (Co-PI, $15,000)	2018
CSUF FEID Grant - Physics for the life sciences (PI, $4,500)	2017
CSUF RSCA Grant - Defining the properties of living matter (PI, $7,500)	2017
Marie Skłodowska-Curie Actions Research Fellowship (€195,000)	2014-2016
Pierre-Gilles de Gennes Foundation Postdoctoral Fellowship (€55,000)	2013
Mavis Future Faculty Fellowship for Excellence in Engineering Education ($5,000)	2012
Beckman Institute Graduate Research Fellowship ($30,000)	2010

Honors & Awards

Outstanding Achievements in Teaching, CSUF	2019
Faculty Advisor of Distinction, CSUF	2019
Woodward Faculty Acheivement Award	2018
Labex CelTisPhyBio Oral Presentation Award	2015
Lindau Nobel Laureate, 65th Annual Meeting - Selected Young Scientist	2015
Institut Curie - Young Investigator Travel Award	2014
Institute for Energy Technology - Geilo Soft Matter Confinement Travel Award	2013
Institute for Complex Adaptive Matter - PhysCell: Soft and Living Matter Travel Award	2012
BMES-SPRBM Cellular and Molecular Bioengineering Conference Travel Award	2012
BMES Outstanding Paper in Cellular and Molecular Engineering	2011
Shu Chien NSF-BMES Award for Excellence in Mechanobiology and Mechanotransduction	2011
National Science Foundation Graduate Research Fellowship Honorable Mention	2010
Excellence in Bioengineering Award, University of IL	2010
Carl Zeiss Microscopy and Digital Imaging Application Library - *Drosophila* Embryo Axons	2010
Institute of Genomic Biology - Microscopy and Imaging Facility - Image of the Month	2009
NSF International Research and Education in Engineering (IREE) Travel Grant	2008

Teaching

Instructor, Phys 380 - Methods of Experimental Physics (Cal State Fullerton) **F19, S21**
Developing content and teaching an intermediate course on experimental physics covering analog, digital, integrated circuits, and their applications. Revamped class for virtual learning.

Instructor, Phys 320 - Classical Mechanics (Cal State Fullerton) **S19, S20, F20, S22**
Developing content and teaching an intermediate course on classical mechanics covering Newtonian, Lagrangian, and Hamiltonian formulations. Revamped class for virtual learning.

Instructor, CNSM 101 - Think Like Einstein (Cal State Fullerton) **F18**
Developing content and teaching an introduction to critical thinking in science course. Leading the case study on the physics of Brownian motion.

Instructor, Phys 225L - Mechanics (Cal State Fullerton) **S20, F20**
Lab section of introductory calculus based physics course on mechanics.

Instructor, Phys 225 - Mechanics (Cal State Fullerton) **F16, S17, F17, S18, S19**
Developing content and teaching an introductory calculus based physics course on mechanics.

Instructor/Coordinator, Scientific Communication (Univ. Paris Descartes) **Sep. - Dec. 2015**
Developed content and taught a course on scientific writing, presentation, and communication to undergraduate students at the Center for Research and Interdisciplinarity.

Instructor, Bootcamp in Quantitative Biology (Univ. Paris Diderot) **Sept. 2015**
Developed content and taught a course on physics and chemical kinetics for Masters level students at the Center for Research and Interdisciplinarity.

Instructor, Bootcamp in Quantitative Biology (Univ. Paris Diderot) **Sept. 2014**
Developed content and taught a course on physics for Masters level students at the Center for Research and Interdisciplinarity.

Teaching Assistant, ME370 - Mechanical Design I (Univ. of Illinois) **Jan. - May 2013**
Instructed an undergraduate laboratory course on kinematics and dynamics of machinery.

Instructor, Introduction to Biomechanics (Univ. of Illinois) **Jul. 2011**

Taught a course on the relationship between structures and biomechanics in a summer camp for high-school girls interested in science.

Advising & Mentorship

Undergraduate Researcher, Bryan Gworek (Physics) **Jan 2022 - present**
Fluctuations and dissipation in enzyme baths.

Graduate Researcher, Tyler Ulinskas (Physics) **Aug 2021 - present**
Modeling and analysis of stochastic signals.

Graduate Researcher, Alistair Dumaup (Physics) **Aug 2021 - present**
Non-equilibrium dynamics of interfacial surfers.

Undergraduate Researcher, Erick Leyva (Physics) **May 2021 - present**
Fluctuations and dissipation in enzyme baths.

Undergraduate Researcher, Farbod Movagharnemati (Physics) **Sept 2020 - present**
Non-equilibrium dynamics of centimeter-scale active matter.

Undergraduate Researcher, Mauricio Gomez (Physics) **June 2017 - present**
Active microrheology with optical tweezers.

Undergraduate Researcher, Alistair Dumaup (Physics) **Jan 2020 - Aug 2021**
Non-equilibrium dynamics of millimeter-scale active matter.

Graduate Researcher, Ryan Muoio (Physics) **May 2019 - Aug 2021**
Entropy production in non-equilibrium systems.

Undergraduate Researcher, Anthony Estrada (Physics) **May 2019 - Aug 2021**
Non-equilibrium dynamics of centimeter-scale active matter.

Graduate Researcher, Hunter Seyforth (Physics) **May 2019 - Aug 2021**
Active baths of bacteria and enzymes.

Undergraduate Researcher, Lauren Nguyen (Chemistry) **May 2019 - May 2020**
Non-equilibrium dynamics of millimeter-scale active matter.

Graduate Researcher, Sara Al Bassri (Physics) **Jul 2018 - May 2020**
Non-equilibrium dynamics of self-propelled colloids.

Undergraduate Researcher, Alex Vidal (Computer Science) **Jan 2018 - May 2020**
Digital image analysis of microscopic dynamics.

Undergraduate Researcher, Corbyn Jones (Physics and Engineering) **Aug. 2016 - May 2020**
Developing and calibrating optical-mechanical measurements for biophysical studies.

Undergraduate Researcher, Lovell Willmore (Computer Science) **Nov 2016 - Dec 2019**
Computational modelling of active matter.

Undergraduate Researcher, Monika Tadrous (Mechanical Engineering) **Sept 2016 - Dec 2019**
Low-cost rapid fabrication of microfluidic systems.

High School Internship, Maria Alexandrescu and Karin Sherb **June - Aug 2018**
Macroscopic active matter made from camphor swimmers.

Undergraduate Researcher, Abi Mendez (Biomedical Engineering) **June - Aug 2017**
Low-cost rapid fabrication of microfluidic systems (Project RAISE student).

Undergraduate Researcher, Nicole La (Chemistry) **June - Aug 2017**

Nonequilibrium dynamics of self-propelled colloids (Project RAISE student).

Undergraduate Researcher, Hunter Seyforth (Physics) **May 2017 - 2019**
Developing a custom microscope to study Brownian motion.

Undergraduate Researcher, Paris Pijuan (Physics) **Apr 2017 - Aug 2018**
Nonequilibrium dynamics of self-propelled colloids.

Undergraduate Researcher, Sara Al Bassri (Biochemistry) **Mar 2017 - May 2018**
Fluid physics of swimming micro-organisms.

Undergraduate Researcher, Danielle Posey (Biology) **Aug 2016 - May 2018**
Nonequilibrium vesicle dynamics in fibroblasts.

Graduate Researcher, Samantha Knoll (Applied Mechanics) **Aug. 2011 - May 2016**
Investigating nanoscale oscillations of cellular motion on soft deformable hydrogels.

Senior Thesis Project, Aaron Silver (Biology) **May 2010 - Jul. 2012**
Investigated subcellular dynamics of neurons using nanometer precision particle tracking.

Undergraduate Researcher, Julia Belopolsky (Biology) **Jan. - Jul. 2011**
Investigated the role of mechanical signal transduction in cancer cell metastasis.

High School Student, Han Raut (High School Student) **Summer 2010 - 2011**
Investigated the beating dynamics of *in vitro* cardiac cells using high-speed video microscopy.

Graduate Researcher, Shabana Afsar (Nanotechnology) **Mar. - May 2010**
Investigated the beating dynamics of *in vitro* cardiac cells using high-speed video microscopy.

Undergraduate Researcher, Emily Havansek (Biology) **Dec. 2009 - May 2010**
Investigated growth and development of *in vitro* neuron-myocyte co-cultures on various surfaces.

Undergraduate Researchers, Phil Bell and Jana DiDomenico (Biology) **Dec. 2009 - May 2010**
Investigated the mechanical sensitivity of cancer cells on hydrogels of varying stiffness.

Graduate Researcher, Mehmet Kural (Physics) **May - Aug. 2009**
Investigated actin dynamics in transfected fibroblasts in response to applied mechanical strain.

Graduate Researcher, Wagner Nishitani (Bioengineering) **Sept. 2007 - Jan. 2008**
Trained in embryonic dissection, immunocytochemical staining, and fluorescent imaging.

Outreach

BuzzFeed Science Section **Jan. 2017**
Served as the physics expert for a popular science video created about floating on mashed potatoes. (https://www.buzzfeed.com/kater11/can-you-float-on-mashed-potatoes)

Science Magazine (AAAS) - Science in the Classroom **2014 - 2015**
Developed annotated research papers and teaching materials designed to help students understand the structure and workings of professional scientific research. (http://scienceintheclassroom.org/research-papers/cells-mix-things-actively-stirring-their-insides/university)

Institut Curie Integration Day Demonstration **Nov. 2014**
Presented introductory concepts of biophysical research with a demonstration of optical tweezers to incoming non-research hospital staff.

Ecole Polytechnique Student Demonstration **Nov. 2013**
Presented introductory biophysical concepts and an experimental demonstration to M1 students from Ecole Polytechnique to introduce them to scientific research at the Institut Curie.

S.W.E. Graduate Education Seminar **Feb. 2013**
Co-lectured a seminar to teach research skills and techniques for effective literature review.

S.W.E. Undergraduate Education Seminar **Oct. 2011**
Co-lectured a seminar organized by the Society of Women Engineers (SWE) to provide guidance on obtaining an undergraduate research position.

G.A.M.E.S. Camp Lab Instructor **Jul. 2011**
Designed, coordinated, and instructed a course on the interface of biomechanics and structural mechanics to promote engineering and science among young women.

S.W.E. Graduate Education Panel **Apr. 2011**
Participated in a panel organized by the Society of Women Engineers (SWE) to promote graduate education among women and minorities.

The Art of Science **Mar. 2011**
Presented an artistic microscopy image of a *Drosophila* embryo at an art gallery in downtown Champaign to promote science in the community. The image is currently on public display at Willard Airport in Champaign, IL.

G.A.M.E.S. Camp Student Recruitment **Feb. 2011**
Recruited students for Girls Adventures in Math, Engineering, and Science summer camp run by the Women in Engineering (WIE) Program.

Grants Awarded

NSF DMS AM - Collaborative Proposal **2020-2023**
Active noise in the dynamics of self-propelled particles — stochastic modeling and experiment
Co-PI on a collaborative grant (w/ N. Brubaker at CSUF) to develop a mathematical framework to model active noise in self-propelled particles and its connection to physical law. Active self-propelled particles that consume energy to drive persistent motion are a model building block of many complex dynamical systems. Investigating how active noise drives dynamics holds promise to revolutionize our understanding of non-equilibrium systems and the associated mathematical techniques, much like our mathematical understanding of thermal noise revolutionized thermodynamics and material science. ($364,582 to CSUF)

NSF DMR CMP - Collaborative Proposal **2020-2023**
Enzyme-Powered, Programmable Active Matter
PI on a collaborative grant (w/ J. Ross at Syracuse Univ. and B. Rogers at Brandeis Univ.) to create a series of active matter particles, powered by enzymes that span the nanoscale to mesoscale. The particles will be characterized individually and serve as an active bath to understand how energy is used and dissipated to gain work from noise in non-equilibrium systems. ($824,208 total, $253,117 to CSUF)

CSU Fullerton - RSCA Award **2019**
Extracting the signature of life from noise
PI on an intramural grant (Research Scholarly and Creative Activities) to investigate the non-equilibrium energetics of a micro-swimmer and generate preliminary data for external grant applications. ($15,000)

CSU Fullerton - RSCA Award **2018**
Making the connection between microscopic jiggling, schools of fish, and flocks of birds
Co-PI on an intramural grant (Research Scholarly and Creative Activities) to investigate a model for active matter via computational and experimental approaches and generate preliminary data for external grant applications. ($15,000)

CSU Fullerton - RSCA Award **2018**
Development of a microfluidic negative pressure device
Co-PI on an intramural grant (Research Scholarly and Creative Activities) to investigate how plants can create negative pressure to drive fluid motion and generate preliminary data for external grant applications. ($15,000)

CSU Fullerton - FEID Award **2017**
Physics for life and health sciences
PI on an intramural grant (Faculty Enhancement and Instructional Development) to develop educational materials for PHYS211 - Mechanics targeted towards example relevant in the life and health sciences. ($4,500)

CSU Fullerton - RSCA Award **2017**
Defining the properties of living matter
PI on an intramural grant (Research Scholarly and Creative Activities) to investigate defining the nonequilibrium properties of living matter and generate preliminary data for external grant applications. ($7,500)

Research Executive Agency - European Union **2014-2016**
The mechanics and transport of the active cytoskeleton in biomimetic and living cellular systems
Wrote a Marie Curie Actions research fellowship proposal (Physics division) to investigate the role of non-equilibrium activity in determining the mechanics and transport occurring in biological systems by utilizing minimal biomimetic model systems and living cells. (€194,047)

Pierre-Gilles de Gennes Fondation **2013**
The mechanics of the actin cortex in cancer cells
Collaborated with team leader to write a research proposal for postdoctoral funding to investigate membrane cortex interactions in living cells. (€55,000)

NSF Equipment Proposal **2011**
Towards a Neuro-mechanical Memory Element
Wrote a supplemental equipment proposal for an EM-CCD camera and high-resolution oil immersion optics for investigating subcellular dynamics using fluorescent biosensors. ($32,000)

NSF International Research and Education in Engineering **2008**
Thermomechanical studies of cells with nano-probes
Participated in the proposal process to obtain funding for a 6 month international research collaboration with the Max Planck Institute in Germany. ($20,000)

Workshops & Schools

UCSF-QCB Cell Modeling Hackathon (Half Moon Bay, California) **Jan 2020**
A workshop funded by NSF designed to bring together experimentalists and modelers to develop collaborations. Selected as one of 30 participants.

NSF-MPS New Investigators Workshop (Alexandria, VA) **Sept 2019**
A workshop for new PI's to introduce the funding initiatives at the National Science Foundation.

Negative pressure in Multiphase Environments (Ulm, Germany) **Apr 2019**
An interdisciplinary workshop to discuss the physics and chemistry of negative pressure systems with multiple phases with the motivation of developing new ways to understand water transport in plants.

UCSF-QCB Cell Modeling Hackathon (Half Moon Bay, California) **Jan 2019**
A workshop funded by NSF designed to bring together experimentalists and modelers to develop collaborations. Selected as one of 30 participants.

France/USA Workshop in Translational Chemistry (Toulouse, France) **Jun 2018**
A workshop funded by NSF, Fulbright, and LSAMP, to promote interdisciplinary undergraduate research. Attended as LSAMP iREU mentor.

AAAS Science in the Classroom (Washington, DC) **Sept 2017**
A workshop developed by the American Association for Advancement of Science to use their SitC platform to bring primary literature into high-school and university classrooms. Selected as one of 28 participants.

Lindau Nobel Laureate Meeting (Lindau, Germany) **June 2015**
The 65th meeting highlighted Nobel Laureates and young scientists in the fields of physiology and medicine, physics, and chemistry. The meeting was an informal venue for discussion between current and future scientific leaders.

Weizmann-Curie Biological Physics Workshop (Rehovot, Israel) **Apr. 2015**
A workshop to develop interdisciplinary collaborations between Institut Curie and the Weizmann Institute on topics in physics of biological systems.

Circle Meeting on Biological Physics (AMOLF Amsterdam, Netherlands) **Apr. 2015**
A meeting to bring together students, postdocs, and PIs centered around cytoskeletal architecture, multicellular systems, and cell signaling. Acted as a session chair.

Modeling Cellular Processes in Space and Time (EMBL - Porquerolles, France) **Oct. 2014**
A workshop on mathematical modeling of biological systems with a focus on practical work in small groups to cover modern modeling methods and advanced computational tools.

Forces in Tissues (Universite Paris 7 Diderot, France) **May 2014**
A workshop focused on 'chalk talks' on measuring forces and stresses in-situ in living tissues to understand the interplay between genetics and mechanics. Resulted in joint publication.

Leadership and Management Course (Institut Curie Paris, France) **May 2014**
A course focused on developing leadership, management, and communication skills to minimize conflict and maximize productivity in a teamwork-oriented environment.

Circle Meeting on Biological Physics (MPI-PKS Dresden, Germany) **Apr. 2014**
A meeting to bring together students, postdocs, and PIs that apply experimental and theoretical approaches in physical biology ranging from the molecular, cellular, and tissue level.

CRI Teaching Leadership Workshop (CRI Paris, France) **Mar. 2014**
A leadership program focused on bringing together world leaders in education with young teachers and researchers to develop innovative approaches to "Learning and Teaching Through Research". Featured in video: https://vimeo.com/118113927

P-G. de Gennes Advanced School on Cellular Biophysics (Hyeres, France) **Sept. 2012**
An advanced summer school aimed at researchers at the interface of biology and physical science.

Nano-biophotonics Summer School (Urbana, IL) **Oct. 2009**
Principles of nano-biophotonics with a emphasis on technologies used in bimolecular sensing.

GEM4 Summer School - Cellular and Molecular Mechanics (Urbana, IL) **Jun. 2009**
Introduction for young researchers to mechanics and thermodynamics of biological systems through experiment and theory with a focus on enabling technologies.

Center for Cell Mechanics Course Summer School (Urbana, IL) **Jul. 2007**

Introduction for young researchers to basics of cell mechanosensitivity through lectures and hands-on experiments with nano fabrication and cell culture.

Peer-reviewed Publications

* indicates equally contributing 1st authorship
† indicates corresponding author
CSUF student researchers are underlined

20. C. Jones*, M. Gomez*, R. Muoio*, A. Vidal, N. Brubaker, **W. Ahmed**†. "Stochastic force dynamics of the model micro-swimmer *Chlamydomonas Reinhardtii*: Active forces and energetics". *Physical Review E.* 2021 (DOI: 10.1103/PhysRevE.103.032403)
19. M. Leoni*, M. Paoluzzi*, S. Eldeen, A. Estrada, L. Nguyen, M. Alexandrescu, K. Sherb, **W. Ahmed**†. "Surfing and crawling macroscopic active particles under strong confinement — inertial dynamics". *Physical Review Research.* 2020 (DOI: 10.1103/PhysRevResearch.2.043299)
18. S. Eldeen, R. Muoio, P. Blaisdell-Pijuan, N. La, M. Gomez, A. Vidal, **W. Ahmed**†. "Quantifying the non-equilibrium activity of an active colloid". *Soft Matter.* 2020 (DOI: 10.1039/D0SM00398K)
17. A. Colin, G. Letort, N. Razin, M. Almonacid, **W. Ahmed**, T. Betz, M-E. Terret, N. Gov, R. Voituriez, Z. Gueroui, M-H Verlhac. "Active diffusion in oocytes nonspecifically centers large objects during prophase I and meiosis I". *Journal of Cell Biology*, 219(3). 2020 (DOI:10.1083/jcb.201908195)
16. D. Posey, P. Blaisdell-Pijuan, S. Knoll, T. Saif, **W. Ahmed**†. "Small-scale displacement fluctuations of vesicles in fibroblasts". *Scientific Reports 8*,13294. 2018 (DOI: 10.1038/s41598-018-31656-3)
15. **W. Ahmed***,†, E. Fodor*, M. Almonacid*, M. Bussonnier, M-H. Verlhac, N. Gov, P. Visco, F. van Wijland, T. Betz. "Active mechanics reveal molecular-scale force kinetics in living oocytes". *Biophysical Journal.* 2018 (DOI: 10.1016/j.bpj.2018.02.009)
14. E. Fodor*, **W. Ahmed***, M. Almonacid*, M. Bussonnier, N.S. Gov, M-H. Verlhac, T. Betz, P. Visco, F. van Wijland. "Nonequilibrium dissipation in living oocytes". *Europhysics Letters.* 2016 (DOI: 10.1209/0295-5075/116/30008)
13. M. Almonacid*, **W. Ahmed***, M. Bussonnier, P. Mailly, T. Betz, R. Voituriez, N. Gov, M-H. Verlhac. "Active diffusion positions the nucleus in mouse oocytes". *Nature Cell Biology.* 2015 (DOI: 10.1038/ncb3131)
12. **W. Ahmed**, T. Betz. "Dynamic cross-links tune the solid-fluid behavior of living cells". *Proceedings of the National Academy of Sciences USA*. 2015 (DOI: 10.1073/pnas.1507100112)
11. **W. Ahmed**†, E. Fodor, T. Betz. "Active cell mechanics - measurement and theory". *Biochimica et Biophysica Acta - Molecular Cell Research.* 2015 (DOI: 10.1016/j.bbamcr.2015.05.022)
10. S. G. Knoll, **W. Ahmed**, T. A. Saif. "Contractile dynamics change before morphological cues during fluorescence illumination". *Scientific Reports 5.* 2015 (DOI: 10.1038/srep18513)
9. **W. Ahmed**, T. A. Saif. "Active transport of vesicles in neurons is modulated by mechanical tension" *Scientific Reports 4*, 4481. 2014 (DOI: 10.1038/srep04481)
8. C. Cha, E. Antoniadou, M. Lee, J. Jeong, **W. Ahmed**, T. A. Saif, S. A. Boppart, H. Kong. "Tailoring hydrogel adhesion to polydimethylsiloxane substrates using polysaccharide glue" *Angewandte Chemie IE.* 2013 (DOI: 10.1002/anie.201302925)
7. **W. Ahmed**, B. Williams, A. Silver, T. A. Saif. "Measuring non-equilibrium vesicle dynamics in neurons under tension" *Lab on a Chip.* 2013 (DOI:10.1039/C2LC41109A)
6. E. de Souza, **W. Ahmed**, V. Chan, R. Bashir, T. A. Saif. "Cardiac myocytes' dynamic behavior differs depending on heart segment" *Biotechnology and Bioengineering.* 2012 (DOI: 10.1002/bit.24725)

5. **W. Ahmed**, J. Rajagopalan, A. Tofangchi, T. A. Saif. "Neuromechanics: The role of tension in neuronal growth and memory" *Nano and Cell Mechanics.* 2012 (DOI: 10.1002/9781118482568.ch3)
4. **W. Ahmed**, T. Li, S. Rubakhin, A. Chiba, J. Sweedler, T. A. Saif. "Mechanical tension modulates local and global vesicle dynamics in neurons" *Cellular and Molecular Bioengineering.* 2012 (DOI: 10.1007/s12195-012-0223-1)
3. **W. Ahmed**, T. Li, S. Rubakhin, A. Chiba, J. Sweedler, T. A. Saif. "The mechanical sensitivity of vesicle dynamics of *in-vitro* and *in-vivo* neurons" *Technical Proceedings of the 2011 NSTI Nanotechnology Conference and Expo, NSTI-Nanotech*, 3 : 436-439. 2011
2. **W. Ahmed**, M. H. Kural, T. A. Saif. "A novel platform for *in-situ* investigation of cells and tissues under mechanical strain" *Acta Biomaterialia*, 6: 2979-90. 2010 (DOI: 10.1016/j.actbio.2010.02.035)
1. **W. Ahmed**, T. Wolfram, A. Goldyn, K. Bruellhoff, B. Aragues Rioja, M. Moller, J. P. Spatz, T. A. Saif, J. Groll, R. Kemkemer. "Myoblast morphology and organization on biochemically micro-patterned hydrogel coatings under cyclic mechanical strain" *Biomaterials*, 31: 250-8. 2010 (DOI: 10.1016/j.biomaterials.2009.09.047)

Publications in progress

* indicates equally contributing 1st authorship
† indicates corresponding author
CSUF student researchers are underlined

3. M. Xu, W.B. Rogers, **W. Ahmed**, J.L. Ross. "Comparison of different approaches to single-molecule imaging of enhanced diffusion of enzymes". (*under review*)
2. H. Seyforth, M. Gomez, W.B. Rogers, J.L. Ross, **W. Ahmed**†. "Non-equilibrium fluctuations and nonlinear response of an active bath". (*under review*)
1. L. Willmore, N. Brubaker†, **W. Ahmed**†. "A GUI to study active matter". (*in preparation*)

Invited Seminars

30. Materials Research Science and Engineering Center (MRSEC), Brandeis University. "Pushing and pulling through an active fluid", Nov. 2021
29. Physics of Living Matter Workshop, Princeton Center of Theoretical Sciences (PCTS), Princeton University. "Extracting non-equilibrium force flucuations to understand living matter", Jan. 2021
28. Biological Physics and Physical Biology Virtual Seminar Series, University of Colorado, Boulder. "Non-equilibrium fluctuations in living matter", Dec. 2020
27. Colorado State University, Fort Collins, CO, Department of Chemical and Biological Engineering. "Using non-equilibrium physics to learn about living matter", Feb. 2020
26. Southern California Mechanobiology Day, University of California, Irvine, CA. "Using non-equilibrium physics to learn about living matter", Oct. 2019
25. California State University, Pomona, CA, Department of Physics. "Using non-equilibrium physics to learn about living matter", Oct. 2019
24. Frontiers in Soft Matter and Macromolecular Networks, University of San Diego, San Diego, CA. "Extracting activity from the non-equilibrium fluctuations of a micro-swimmer", Sept. 2019
23. University of San Diego, San Diego, CA, Department of Physics. "Active mechanics and the forces that keep our cells alive", Feb. 2019
22. Gordon Research Conference - Stochastic Physics in Biology, Ventura, CA. "Quantifying non-quilibrium fluctuations in living matter", Jan. 2019
21. Harvey Mudd College, Claremont, CA, Department of Physics. "Active mechanics - The forces that keep our cells alive", Oct. 2018
20. American Physical Society Far West Section, Plenary Lecture. "Active mechanics - The forces that keep our cells alive", Oct. 2018

19. California State University, Los Angeles, CA, Department of Physics. "Active mechanics - The forces that keep our cells alive", Oct. 2018
18. World Congress of Biomechanics, Dublin, Ireland. "Nonequilibrium dissipation in living oocytes", July 2018
17. Universite Grenoble Alpes, Laboratoire Interdisciplinaire de Physique . "Active mechanics - The forces that keep our cells alive", July 2018
16. California Institute of Technology, Pasadena, CA. Condensed Matter Physics. "Nonequilibrium dissipation in living oocytes", May 2017
15. California State University, Fullerton, CA. Center for Computational and Applied Mathematics. "Active mechanics keeps our cells alive", Apr. 2017
14. California State University, Fullerton, CA. Department of Biological Science. "Active mechanics keeps our cells alive", Nov. 2016
13. Max Planck Institute for Intelligent Systems, Stuttgart, Germany. "Active mechanics reveal molecular-scale kinetics in living oocytes", Jul. 2016
12. Materials Research Society, Phoenix, AZ. "Quantifying active mechanical properties and molecular-scale driving forces in living cells", Mar. 2016
11. California State University, San Luis Obispo, CA. Department of Physics. "Active mechanics keeps our cells alive", Feb. 2016
10. Lehigh University, Bethlehem, PA. Department of Physics. "Active mechanics keeps our cells alive", Feb. 2016
9. Boston University, Boston, MA. Department of Mechanical Engineering. "Active mechanics keeps our cells alive", Feb. 2016
8. University of California, Davis, CA. Department of Materials Science. "Active mechanics keeps our cells alive", Feb. 2016
7. California State University, Fullerton, CA. Department of Physics. "Active mechanics keeps our cells alive", Feb. 2016
6. Brandeis University, Waltham, MA. Department of Physics. "Active mechanics reveal molecular-scale kinetics in living oocytes", Feb. 2015
5. Institut Curie, Paris, France. Department of Physical Chemistry (UMR168) "Neurons under tension", Jun. 2013
4. University of California, Berkeley, CA."Neurons under tension: An active matter approach", Feb. 2013
3. Stanford University, Stanford, CA. "Cells under tension: A study of mechanical sensitivity", Jan. 2013
2. University of Illinois at Urbana-Champaign, Urbana, IL. Department of Mechanical Engineering. "Neurons under tension", Oct. 2011
1. Beckman Institute for Advanced Science and Technology, Urbana, IL. "The mechanical sensitivity of vesicle dynamics in neurons", Feb. 2011

Research Presentations & Posters

CSUF student researchers are underlined

54. **W. Ahmed**. "Surfing and crawling macroscopic particles under strong confinement", American Physical Society Meeting, Mar. 20121, Virtual Meeting.
53. **W. Ahmed**. "The active force spectrum of a microswimmer - modeling and experiments", American Physical Society Meeting, Mar. 2019, Boston, MA.
52. M. Gomez, C. Jones, **W. Ahmed**. "Optical tweezer measurements in Chlamydomonas", American Physical Society Meeting, Mar. 2019, Boston, MA.

51. H. Seyforth, **W. Ahmed**. "Building a custom microscope to study Brownian motion and active matter", American Physical Society Meeting, Mar. 2019, Boston, MA.
50. C. Jones, M. Gomez, **W. Ahmed**. "The stochastic force spectrum of a micro-swimmer", American Physical Society Meeting, Mar. 2019, Boston, MA.
49. **W. Ahmed**. "Nonequilibrium Dissipation in Living Oocytes", American Physical Society Meeting, Mar. 2018, Los Angeles, CA.
48. P. Blaisdell-Pijuan, M. Gomez, N. La **W. Ahmed**. "Nonequilibrium Dynamics of Active Colloids", American Physical Society Meeting, Mar. 2018, Los Angeles, CA.
47. D. Posey, P. Blaisdell-Pijuan, **W. Ahmed**. "Small-scale fluctuations of cytoplasmic vesicles", American Physical Society Meeting, Mar. 2018, Los Angeles, CA.
46. M. Tadrous, A. Mendez, **W. Ahmed**. "A Low-cost Microfluidic Device to Study Nonequilibrium Physics of Colloids", American Physical Society Meeting, Mar. 2018, Los Angeles, CA.
45. S. Al Bassri, A. Vidal, **W. Ahmed**. "Visualizing Fluid Physics of Microswimmers", American Physical Society Meeting, Mar. 2018, Los Angeles, CA.
44. L. Willmore, N. Brubaker, **W. Ahmed**. "A GUI to study Active Matter", American Physical Society Meeting, Mar. 2018, Los Angeles, CA.
43. C. Jones, **W. Ahmed**. "Optical Tweezers for Force Measurement in Living Cells", American Physical Society Meeting, Mar. 2018, Los Angeles, CA.
42. H. Seyforth, A. Vidal, **W. Ahmed**. "Building a Custom Microscope - An advanced lab to study Brownian motion", American Physical Society Meeting, Mar. 2018, Los Angeles, CA.
41. **W. Ahmed**. "Soft, Living and Active Matter Lab", Aspen Center for Physics - Fundamental Problems in Active Matter, Feb. 2018, Aspen, CO.
40. A. Mendez, M. Tadrous, **W. Ahmed**. "Quantifying forces and flows in a microfluidic device for biophysical studies", CSUF Project RAISE Symposium, Aug. 2017, Fullerton, CA.
39. A. Mendez, M. Tadrous, **W. Ahmed**. "Low-cost microfluidic device for biophysical measurements", CSUF Project RAISE Symposium, Aug. 2017, Fullerton, CA.
38. N. La, **W. Ahmed**. "Nonequilibrium dynamics of light-activated colloids", CSUF Project RAISE Symposium, Aug. 2017, Fullerton, CA.
37. L. Willmore, **W. Ahmed**, N. Brubaker. "Computational studies of active matter", CSUF Student Creative Activities Research Day, Apr. 2017, Fullerton, CA.
36. L. Willmore, **W. Ahmed**, N. Brubaker. "Computational studies of active matter", CSUF NSM ICC Symposium, Mar. 2017, Fullerton, CA.
35. **W. Ahmed**. "Nonequilibrium dissipation in living oocytes", Gordon Research Conference - Complex Active and Adaptive Material Systems, Jan. 2017, Ventura, CA.
34. **W. Ahmed**, T. Betz. "Active mechanics reveals molecular-scale force kinetics in living oocytes", American Physical Society Meeting, Mar. 2016, Baltimore, MD.
33. **W. Ahmed**, T. Betz. "Active mechanics reveals molecular-scale force kinetics in living oocytes", Biophysical Society Meeting, Feb. 2016, Los Angeles, CA.
32. S. Knoll, **W. Ahmed**, T. Saif. "Time Evolution of Photodamage in Fibroblasts as a Measure of Cell Contractility", Biomedical Engineering Society Conference, Oct. 2015, Tampa, FL.
31. **W. Ahmed**, T. Betz. "Active mechanics in living oocytes reveals molecular-scale kinetics", PhysCell2015 - From molecules to systems, Sept. 2015, Bad Staffelstein, Germany.
30. **W. Ahmed**, T. Betz. "Active mechanics in living oocytes reveals molecular-scale kinetics", Gordon Research Conference - Motile and Contractile Systems, Jul. 2015, New London, NH.
29. **W. Ahmed**, T. Betz. "Active mechanics in living oocytes reveals molecular-scale kinetics", Aspen Center for Physics - Single Molecule Biophysics, Jan. 2015, Aspen, CO.

28. E. Fodor, **W. Ahmed**, T. Betz, M. Bussonnier, N. S. Gov, M. Guo, V. Mehandia, D. Riveline, P. Visco, D. Weitz, F. van Wijland. "Modeling active fluctuations in living matter", Condensed Matter in Paris, Aug. 2014, Paris, France

27. **W. Ahmed**, T. Betz. "Active mechanics and learning", Gordon Research Conference - Physics Research and Education, Jun. 2014, South Hadley, MA.

26. **W. Ahmed**, M. Bussonnier, T. Betz. "Nonequilibrium mechanics in living oocytes", Max Planck Institute for Physics of Complex Systems - Circle Meeting, Apr. 2014, Dresden, Germany.

25. **W. Ahmed**, M. Bussonnier, T. Betz. "Nonequilibrium activity softens the sparse actin meshwork and facilitates vesicle motion in oocytes", Institut Curie - Physico-Chimie Department Seminar, Apr. 2014, Paris, France.

24. **W. Ahmed**, M. Bussonnier, T. Betz. "Living cells: Active at long times but passive at short times", German Physical Society - Biological Physics, Apr. 2014, Dresden, Germany.

23. **W. Ahmed**, T. A. Saif. "Axonal force and transport in Aplysia neurons", Global Congress on NanoEngineering for Medicine and Biology, Feb. 2014, San Franciscio, CA.

22. **W. Ahmed**, T. A. Saif. "Active transport of vesicles in neurons is modulated by mechanical tension", Biomedical Engineering Society Conference, Sept. 2013, Seattle, WA.

21. S. Knoll, **W. Ahmed**, T. A. Saif. "Active nanoscale fluctuations in cellular mechanosensing", Biomedical Engineering Society Conference, Sept. 2013, Seattle, WA.

20. T. A. Saif, **W. Ahmed**. "Neuromechanics of neuronal transport", Society of Engineering Science, Jul. 2013, Providence, RI.

19. **W. Ahmed**, A. Tofangchi, T. A. Saif. "Vesicle transport in in vivo neurons in response to mechanical stretch", ASME International Mechanical Engineering Congress, Nov. 2012, Houston, TX.

18. **W. Ahmed**, B. Williams, A. Silver, T. A. Saif. "Mechanical strain affects local dynamics of vesicles in neurons", Biomedical Engineering Society Conference, Oct. 2012, Atlanta, GA.

17. **W. Ahmed**, B. Williams, A. Silver, T. A. Saif. "Vesicle dynamics in neurons under tension: Exploration via experiments and modeling", Physics of Cells - From Soft to Living Matter, Sept. 2012, Hyeres, France.

16. **W. Ahmed**, T. A. Saif. "Tension modulates vesicle dynamics in neurons", BMES-SPRBM Inaugural Conference on Cellular and Molecular Bioengineering, Jan. 2012, San Juan, Puerto Rico.

15. **W. Ahmed**, T. Li, S. Rubakhin, A. Chiba, J. Sweedler, T. A. Saif. "Mechanical tension modulates local and global vesicle dynamics", Society for Neuroscience Conference, Nov. 2011, Washington, DC.

14. **W. Ahmed**, T. Li, S. Rubakhin, A. Chiba, J. Sweedler, T. A. Saif. "Mechanical tension modulates local and global vesicle dynamics", Biomedical Engineering Society Conference, Oct. 2011, Hartford, CT.

13. **W. Ahmed**, T. Li, S. Rubakhin, A. Chiba, J. Sweedler, T. A. Saif. "The mechanical sensitivity of vesicle dynamics of *in-vitro* and *in-vivo* neurons", Nanotech 2011 Conference, Jun. 2011, Boston, MA.

12. **W. Ahmed**, S. Rubakhin, T. Li, A. Chiba, J. Sweedler, T. A. Saif. "Mechanical stimulation perturbs vesicle dynamics in *in-vitro* and *in-vivo* neurons", ASME Applied Mechanics and Materials Conference, May 2011, Chicago, IL.

11. T. Li, F. Carrero-Martnez, S. Siechen, J. Sun, **W. Ahmed**, T. A. Saif, A. Chiba. "Mechanical force initiates the neuromuscular synapse", Drosophila Research Conference, Mar. 2011, San Diego, CA.

10. **W. Ahmed**, T. Li, A. Chiba, T. A. Saif. "The mechanical sensitivity of neurotransmitter accumulation at *in vivo* synapses", Society for Neuroscience Conference, Nov. 2010, San Diego, CA.
9. **W. Ahmed**, S. Rubakin, J. Sweedler, T. A. Saif. "Compressive force disrupts vesicle dynamics in neuronal growth cones", Society for Neuroscience Conference, Nov. 2010, San Diego, CA.
8. **W. Ahmed** and T. A. Saif. "*In-situ* high resolution optical imaging of cells and tissues on a stretchable substrate", 6th World Congress of Biomechanics (WCB 2010), Aug. 2010, Singapore.
7. **W. Ahmed**, T. A. Saif. "*In-situ* investigation of cells under applied mechanical strain", Center for Nanoscale Science and Technology Workshop, May. 2010, Urbana, IL.
6. **W. Ahmed**, M. H. Kural, T. A. Saif. "Live-imaging of cells and tissues under applied mechanical strain", Institute for Genomic Biology (IGB) Fellows Symposium, Apr 2010, Urbana, IL.
5. **W. Ahmed**, M. H. Kural, T. A. Saif. "Live-imaging of cells and tissues under applied mechanical strain", Bioengineering @ Illinois Day, Apr. 2010, Urbana, IL.
4. **W. Ahmed**, T. A. Saif. "A study of myoblast mechanosensing", NSF STC Site Visit for Emergent Behavior of Integrated Cellular Systems (EBICS) at MIT, Oct. 2009, Boston, MA.
3. **W. Ahmed**, T. A. Saif. "*In-vivo* live imaging of motor neurons in Drosophila embryos under applied mechanical strain", Biomedical Engineering Society Conference, Oct 2009, Pittsburgh, PA.
2. **W. Ahmed**, R. Kemkemer, T. A. Saif. "A study of myoblast mechanosensing - An Undergraduate Research Experience", NSF EEC Awardees Conference, Feb. 2009, Reston, VA.
1. **W. Ahmed**, T. A. Saif. "Thermo mechanical studies of cells with nano probes on Si Substrate", NSF IREE 2008 Grantees Conference, May 2008, Washington, D.C.

University Service

SI (Supplemental Instruction) Liaison, CSUF Department of Physics **2021 - present**
Serve as the Department liaison to run the SI program for introductory courses.

Faculty Advisory Board for Vice President for Student Affairs, CSUF **2021 - present**
Serve as faculty advisory member to VP of SA, representing the College of Natural Science and Mathematics.

MS Program advisor, CSUF Department of Physics **2019 - present**
Serve as academic advisor for students in the Masters of Physics program.

Co-organizer, CSUF Center for Applied Biotechnology Conference **2017 - present**
Co-organizing a conference to bring experts in biotechnology to the CSUF campus.

Safety Officer, CSUF - College of Natural Sciences and Mathematics **2016 - present**
Served as the Safety Officer for the Department of Physics.

Deans Business Council **Oct. 2011**
Presented Illinois Business Consulting (IBC) to business executives to share success stories, promote the organization, and solicit advice for future engagements and growth of the organization.

Illinois Business Consulting Advisory Board **Oct. 2011**
Presented a project success story and participated in discussions with business executives to define the growth of the organization.

MechSE Department Student Recruitment **Feb. 2011**
Presented "Cell mechanics, and some neuroscience" to potential graduate students.

MechSE Department Student Recruitment **Mar. 2010**
Presented "Mechanics of muscles and neurons" to potential graduate students.

MechSE Department Head Search Committee **Apr. 2009**
Participated in a committee to interview and recommend a candidate for MechSE Department Head

MechSE Department Student Recruitment **Mar. 2009**
Presented "Mechanics of the small" to potential graduate students.

Professional Service

Co-organizer, Biological Physics and Physical Biology Seminar series	2021
Grant Proposal Reviewer, National Science Foundation (NSF)	2021
Grant Proposal Reviewer, Agence Nationale de la Recherche (ANR)	2020, 2021
Grant Proposal Reviewer, Marie Sklodoska-Curie Actions (MCA)	2020
Reviewer, American Journal of Physics (AAPT)	2021 - present
Reviewer, Communications Biology (Nature Publishing Group)	2021 - present
Review Editor, Frontiers in Physics — Soft Matter Physics	2020 - present
Member, Biophys. Soc. Committee for Prof. Opportunities for Women (CPOW)	2018 - 2020
Reviewer, Soft Matter (Royal Society of Chemistry)	2019 - present
Reviewer, Nature Physics (Nature Publishing Group)	2019 - present
Reviewer, Journal of Chemical Physics (American Institute of Physics)	2018 - present
Reviewer, Experimental Mechanics (Society for Experimental Mechanics)	2018 - present
Reviewer, Biophysical Journal (Cell Press)	2014 - present
Reviewer, Scientific Reports (Nature Publishing Group)	2014 - present
Reviewer, Review of Scientific Instruments (American Institute of Physics)	2013 - present
Member, Biophysical Society	2013 - present
Member, American Physical Society	2013 - present

Professional Experience

Entrepreneurship Bridge Initiative **Jun. 2012 - 2013**
Managing Partner
Developed strategies to promote communication between engineering and business students to collaborate in entrepreneurship. Focused on connecting research, technology, and business to solve interdisciplinary problems.

Healthcare Technology Startup **Jul. 2011 - 2012**
Project Manager
Oversaw the development of a new technology venture in the field of telemedicine. Managing a team of students in analysis of the competition, regulations, and the technology infrastructure.

Glebe Electronics Inc., Arlington, VA USA **Aug. 2008 - Present**
Technical Consultant
Provided technical expertise on a variety of topics including electromechanical design, circuit board manufacturing, and new technology ventures.

Illinois Business Consulting, Urbana, IL USA **Mar. 2011 - Jun. 2012**
Student Leadership Team
Served as a team member to define the culture of the organization and develop strategies to ensure growth and success.

Senior Manager

Led three teams of project managers and consultants to complete projects in nanotechnology, metal mining, and biopharmaceuticals. (projects ranged from *pro-bono* to $25k)

Development Manager
Developed a metric to quantify performance of consultants and project managers. Streamlining the flow of talent through the organization. Defining strategic goals for future growth.

Project Manager
Led a team of seven consultants to research technology needs among target demographics and developed strategies for market penetration for a large international mobile communications company.

Consultant
Collaborated with a team of 7 consultants to conduct a market analysis and projected revenue model of emerging technologies for a Fortune 500 company.

Congressional Federal Credit Union, Oakton, VA USA **May 2004 - Aug. 2004**
Information Systems Intern
Simulated and deployed Microsoft Project Server and SQL Server for large scale management and backup of databases.

Glebe Electronics Inc., Arlington, VA USA **May 2000 - 2003**
Technical Service Assistant
Conducted electromechanical maintenance and service, alarm installation and preventative maintenance, and refurbished business equipment.

Curriculum Vita

Patricia (Kwang-Ping) Cheng
Email Address: kcheng@fullerton.edu; Phone Number: (657) 278-2551

Educational Background:

Graduate Degrees	**Major**	**Degree/Year**
Catholic University of America	Astrophysics	Ph.D. /1990
University of Maryland at College Park	Physics	MS/1985
Undergrad Degree	**Major**	**Degree/Year**
National Taiwan Normal University	Physics	BS/1981

Professional Experience:

Positions	**Employment Dates**
Professor of Physics, California State University at Fullerton	Aug 2003-present
Associate Professor of Physics, CSUF	Jul 1998-Jul 2003
Assistant Professor of Physics, CSUF	Aug 1994-Jun 1998
Senior Scientist, Hughes STX Corporation/NASA	Sep 1993-Aug 1994
Postdoctoral Research Fellow	Dec 1990-Aug 1993
(National Academy of Science/National Research Council Fellowship)	
Postdoctoral Research Fellow, NASA's Goddard Space Flight Center	Feb-Nov 1990
Research Assistant, The Catholic University of America	Sep 1985-1989
Data Analyst, space physics group, University of Maryland	Jan-Aug 1985
Teaching Assistant, University of Maryland	Aug 1982-1984
Physics instructor, National Central University in Taiwan	Jun 1981- Jun 1982
Physics Teacher, Nan-Kong High School in Taiwan	Jun 1980- Jun 1981

Publications: 130 publications (including 53 papers in refereed journals and 77 conference proceedings/meeting posters) and 2 CD-ROM sets of ground-based images in support of NASA's ASTRO/Ultraviolet Imaging Telescope missions

Five Most Recent Peer-reviewed Publications – *indicate CSUF undergraduate student authors in **bold** and CSUF graduate student authors with underline*

1. Cheng, Kwang-Ping; Tarbell, Erik S.; Giacinto, Anthony J.; Neff, James E.; Romo, Christopher A.; Gray, Richard O.; Corbally, Christopher J.; Johnson, Dustin M., "*Validating the C I 5052.17 Å/Mg II 4481 Å Equivalent Width Ratio as a Diagnostic for F-type Lambda Boo Stars"* The Astronomical Journal, Volume 157, Issue 1, article id. 7, 16 pp. (2019)

2. Gray, R. O.; Riggs, Q. S.; Koen, C.; Murphy, S. J.; Newsome, I. M.; Corbally, C. J.; Cheng, K.-P.; Neff, J. E. *"The Discovery of λ Bootis Stars: The Southern Survey I*" The Astronomical Journal, Volume 154, Issue 1, article id. 31, 11 pp. (2017)

3. Cheng, Kwang-Ping; Neff, James E.; Johnson, Dustin M.; **Tarbell, Erik S.; Romo, Christopher A.**; Gray, Richard O.; Corbally, Christopher J. *"Utilizing Synthetic Visible Spectra to Explore the Physical Basis for the Classification of Lambda Boötis Stars"* The Astronomical Journal, Volume 153, Issue 1, article id. 39, 15 pp. (2017)

4. Cheng, Kwang-Ping; Neff, James E.; Johnson, Dustin M.; **Tarbell, Erik S.; Romo, Christopher A.;** Prabhaker, Arvind; Steele, Patricia A.; Gray, Richard O.; Corbally, Christopher J. *"Utilizing Synthetic UV Spectra to Explore the Physical Basis for the Classification of Lambda Boötis Stars"* The Astronomical Journal, Volume 151, Issue 4, article id. 105, 17 pp. (2016).

5. Murphy, Simon J.; Corbally, Christopher J.; Gray, Richard O.; Cheng, Kwang-Ping; Neff, James E.; Koen, Chris; Kuehn, Charles A.; Newsome, Ian; Riggs, Quinlin *"An Evaluation of the Membership Probability of 212 λ Boo Stars. I. A Catalogue"* Publications of the Astronomical Society of Australia, Volume 32, id.e036 43 pp. (2015)

Five Most Recent Conference Papers and Presentations – *indicate CSUF undergraduate student authors in **bold** and CSUF graduate student authors with underline.*

1. Cheng, Kwang-Ping; Neff, James E; Giacinto, Anthony J; Johnson, Dustin M.; Saar, S., "*Synthetic Spectra of TiO Bands to Identify Diagnostics of Starspot Properties*" 2021, American Astronomical Society, AAS Meeting #237, id. #550.03

2. Cheng, Kwang-Ping; Tarbell, Erik S.; Giacinto, Anthony J.; Romo, Christopher A.; Neff, James E.; Gray, Richard O.; Corbally, Christopher J.; Johnson, Dustin M., "*Validating the C I 5052.17 Å/Mg II 4481 Å Equivalent Width Ratio as a Diagnostic for F-type Lambda Boo Stars"* 2019, American Astronomical Society, AAS Meeting #233, id. #259.07

3. Cheng, Kwang-Ping; Neff, James E.; **Johnson, Dustin**; **Tarbell, Erik; Romo, Christopher**; Steele, Patricia; Gray, Richard O.; Corbally, Christopher J. *"Utilizing Synthetic Spectra to Refine Lambda Boo Stars' UV Classification Criteria"* 2016, American Astronomical Society, AAS Meeting #227, id. #143.07

4. Cheng, Kwang-Ping; Neff, James E.; Gray, Richard O.; Corbally, Christopher J.; **Johnson, Dustin; Tarbell, Erik** *"Ultraviolet Synthetic Spectra for Three Lambda Bootis Stars"* 2015, American Astronomical Society, AAS Meeting #225, id. #342

5. Cheng, Kwang-Ping; Corbally, C. J.; Gray, R. O.; Murphy, S.; Neff, J. E.; Desai, A.; Newsome, I.; Steele, P. *"Reinvestigating the Lambda Boo Stars"* 2014, American Astronomical Society, AAS Meeting #223, id.#151.02

Grants: 65 PI grants awarded (more than1 million dollars in total) since joining CSUF in 1994

Five Most Recent Research Grants:

1. 12/09/2019-12/31/2020 Sub-award from the Harvard-Smithsonian Center for Astrophysics in support of *"Observational Constraints and Tests for Dynamos in Solar-like Stars"* $14,903
2. 05/01/2018-10/31/2019 Sub-award from the Harvard-Smithsonian Center for Astrophysics in support of *"Observational Constraints and Tests for Dynamos in Solar-like Stars"* $19,981
3. 08/15/2012-7/31/2017 NSF grant *"RUI/Collaborative Research: A Spectroscopic Survey*

of Circumstellar Gas in Lambda Boo Stars" $162,689

4. 6/3/2016-7/31/2017 Sub-award from the College of Charleston in support of *"RUI/Collaborative Research: A Spectroscopic Survey of Circumstellar Gas in Lambda Boo Stars"* $48,804
5. 7/1/2012-6/30/2013 NASA grant *"Studying the Dynamics of Stellar Atmospheres Through Ultraviolet Spectroscopy"* $43,195

Awarded Ground-based Observing Time: 45 ground-based observing proposals (234 nights in total at National Solar Observatory/Kitt Peak, Cerro-Tololo Interamerican Observatory, McDonald Observatory, and Mount Stromlo Observatory.)

Professional Awards:

- 2017 Jim Woodward Physics Faculty Achievement Award
- 2013 Jim Woodward Physics Faculty Achievement Award
- 2003 NASA/JPL Faculty Fellowship
- 2000 NASA-ASEE Summer Fellowship
- 1999 NASA-ASEE Summer Fellowship
- 1997 California State University Fullerton NSM Outstanding Untenured Faculty Award
- American Association of University Women Fellow for the 1995-1996 year.
- 1996 NASA Group Achievement Awards to Ultraviolet Imaging Telescope Science Team.
- 1993 NASA Group Achievement Awards to Ultraviolet Imaging Telescope Science Team.
- 1992 NASA Group Achievement Awards to Ultraviolet Imaging Telescope Science Team.

Professional Affiliations:

- American Astronomical Society 1986-present.
- International Astronomical Union 1994-present.

CURRICULUM VITAE

Dr. James Gregory Childers
Associate Professor
Dept. of Physics
California State University, Fullerton
Fullerton, CA 92834
(657) 278-2159
(657) 278-1458 (fax)
gchilders@fullerton.edu
https://orcid.org/0000-0001-5645-646X

Education

1995	Union College Barbourville, Kentucky B.A., summa cum laude, Physics and Mathematics
2001	University of Kentucky Lexington, Kentucky M.S., Physics
2001	University of Kentucky Lexington, Kentucky Ph.D., Atomic Physics Advisor: Dr. Nicholas L. S. Martin Dissertation: A study of autoionizing resonances in noble gases using (e,2e) spectroscopy

Research interests

Experimental atomic physics, especially low-energy electron scattering from atoms and simple molecules

Development of publicly-available software for large integer factorization

Professional experience

Associate Professor, California State University, Fullerton, 2009–present

Assistant Professor, California State University, Fullerton, 2003–2009

Postdoctoral Research Fellow, California State University, Fullerton, 2002–2003

Part-time Faculty, California State University, Fullerton, 2002–2003

Research Assistant, University of Kentucky, 1997–2001

Teaching Assistant, University of Kentucky, 1995–1997, 1998–1999

Courses taught

University of Kentucky:
- Introductory algebra-based classical mechanics and electromagnetism recitation and laboratories
- Physics for pre-service elementary school teachers

California State University Fullerton:
- Introductory algebra-based and calculus-based electromagnetism, optics, and modern physics lectures
- Introductory mechanics, electromagnetism, optics, and modern physics laboratories
- Advanced electronics laboratory
- Advanced physics laboratory
- Physics for pre-service elementary school teachers
- Computational physics
- Atomic physics
- Energy and Sustainability

Scholastic and professional honors

CSUF Faculty Recognition for Excellence in Service, 2015

CSU Quality Online Learning and Teaching program, Top 5 Online or Hybrid Course at CSUF, 2012

CSUF College of Natural Sciences and Mathematics Outstanding Untenured Faculty Member, 2009

CSUF Outstanding Teacher/Scholar, 2005

Kentucky Opportunity Fellowship, 2000–2001

American Association of Physics Teachers Outstanding Teaching Assistant, 1999

U.S. Dept. of Education Areas of National Need Fellowship, 1995–1998

Professional affiliations

American Physical Society, 1996-present

American Association of Physics Teachers, 1999-2000

Grants

Institute for Advanced Computational Science at Stony Brook University, *Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, 10,000 Node-hours on the Ookami computing system, 2021-2022

National Science Foundation XSEDE Project, *Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, 13,334 Node-hours, 2018-2022

National Science Foundation XSEDE Project, *Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, 18,233 Node-hours & 5,000 GPU-hours, 2017-2018

National Science Foundation XSEDE Project, *Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, 301,783 CPU-hours, 2016-2017

National Science Foundation XSEDE Project, *Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, 278,851 CPU-hours, 2015-2016

National Science Foundation XSEDE Project, *Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, 519,228 CPU-hours, 2014-2015

National Science Foundation XSEDE Project, *Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, 661,238 CPU-hours, 2013-2014

National Science Foundation XSEDE Project, *Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, 1,066,912 CPU-hours, 2012-2013

California State University Fullerton Faculty Enhancement and Instructional Development Grant, *Enhancing student learning with improved manuals for advanced physics laboratory classes*, $2,373, 2012

National Science Foundation XSEDE Project, *Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, 445,253 CPU-hours, 2011-1012

California State University Fullerton Faculty Research Award, *Cluster Enhancements to Facilitate the Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, $5,000, 2011-2012

National Science Foundation Teragrid Project, *Analysis of the Linear Algebra in the Number Field Sieve Algorithm*, 240,000 CPU-hours, 2010-2011

National Science Foundation Teragrid Project, *Analysis of the linear algebra step in the factorization of large integers by the Number Field Sieve algorithm*, 50,000 CPU-hours, 2010-2011

National Science Foundation Teragrid Project, *Analysis of publicly available code for large integer factorization*, 30,000 CPU-hours, 2008-2009

California State University Fullerton Untenured Faculty Development Program Grant, *Design and installation of a Magnetic Angle Changer*, $1000 plus three units release time, 2006-2007

California State University Fullerton State Special Fund for Research, Scholarship, and Creative Activity, *Theoretical study, construction, and optimization of a Magnetic Angle Changer for use in a low-energy high-resolution electron spectrometer*, $5,000, 2006-2007

National Science Foundation (co-PI with Dr. Murtadha Khakoo), *Electron impact excitation and ionization of fundamental targets—helium and the noble gases*, $268,061, 2004-2007

California State University Fullerton State Special Fund for Research, Scholarship, and Creative Activity, *Construction and optimization of a high-resolution electron spectrometer*, $5,000, 2003-2004

California State University Fullerton Untenured Faculty Development Grant, *Construction and optimization of a high resolution electron spectrometer*, $980, 2003-2004

Publications

S. Swarat, P. H. Oliver, L. Tran, J. G. Childers, B. Tiwari, and J. L. Babcock, "How disciplinary differences shape student learning outcome assessment: a case study," *AERA Open*, **3**, 2332858417690112 (2017).

J. G. Childers, "Factorization of a 1061-bit number by the Special Number Field Sieve," *IACR Cryptology ePrint Archive*, 2012/444 (2012), http://eprint.iacr.org/2012/444.

B. A. deHarak, J. G. Childers, and N. L. S. Martin, "Ejected electron spectrum of He below the $N = 2$ threshold," *Phys. Rev. A* **74**, 032714 (2006).

J. Colgan, M. S. Pindzola, J. G. Childers, and M. A. Khakoo, "Low-energy electron-impact single ionization of helium," *Phys. Rev. A* **73**, 042710 (2006).

E. Schow, K. Hazlett, J. G. Childers, C. Medina, G. Vitug, I. Bray, D. V. Fursa, and M. A. Khakoo, "Low-energy electron-impact ionization of helium," *Phys. Rev. A* **72**, 062717 (2005).

J. G. Childers and M. A. Khakoo, "Measurements of low energy electron scattering from atomic hydrogen," *AIP Conf. Proc.* **811**, 24 (2005).

B. A. deHarak, J. G. Childers, and N. L. S. Martin, "Non dipole effects in $(e, 2e)$ and photoelectron experiments: a comparison," *J. Elect. Spect. Rel. Phenom.* **141**, 75 (2004).

M. A. Khakoo and J. G. Childers, "Measurements of differential and doubly-differential cross-sections for electron impact elastic scattering, excitation, and ionization of atomic hydrogen," *Physica Scripta* **T110**, 222 (2004).

J. G. Childers, B. A. deHarak, and N. L. S. Martin, "Ejected electron spectrum of Xe between the $^2P_{3/2}$ and $^2P_{1/2}$ ionic limits," *Phys. Rev. A* **69**, 042713 (2004).

K. E. James, Jr., J. G. Childers, and M. A. Khakoo, "Low energy electron scattering from atomic hydrogen. II. Elastic and inelastic scattering," *Phys. Rev. A* **69**, 022710 (2004).

J. G. Childers, K. E. James, Jr., Igor Bray, M. Baertschy, and M. A. Khakoo, "Low energy electron scattering from atomic hydrogen. I. Ionization," *Phys. Rev. A* **69**, 022709 (2004).

M. A. Khakoo, P. Vandeventer, J. G. Childers, I. Kanik, C. J. Fontes, K. Bartschat, V. Zeman, D. H. Madison, S. Saxena, R. Srivastava, and A. D. Stauffer, "Electron impact excitation of the argon $3p^5 4s$ configuration: differential cross-sections and cross-section ratios," *J. Phys. B* **37**, 247 (2004).

J. G. Childers, K. E. James, Jr., M. Hughes, Igor Bray, M. Baertschy, and M. A. Khakoo, "Electron-impact ionization of atomic hydrogen at incident electron energies of 15.6, 17.6, 25, and 40 eV," *Phys. Rev. A* **68**, 030702(R) (2003).

M. Hughes, K. E. James, Jr., J. G. Childers, and M. A. Khakoo, "Accurate determination of background scattered electrons in crossed electron- and gas-beam experiments using a movable gas beam source," *Meas. Sci. Technol.* **14**, 841 (2003).

J. G. Childers and N. L. S. Martin, "Investigation of complex ionization amplitudes in xenon by $(e, 2e)$ spectroscopy," *Phys. Rev. A* **66**, 012709 (2002).

J. G. Childers, D. B. Thompson, and N. L. S. Martin, "$(e, 2e)$ experiments on the autoionizing levels of Xe between the $^2P_{3/2}$ and $^2P_{1/2}$ ionic limits," *Phys. Rev. A* **64**, 062703 (2001).

Student Master's Degree Projects

Eric Tran, GPU Implementation of the Number Field Sieve Linear Algebra, 2018-2021

Ongoing software development

MSIEVE factoring library porting and extensions, https://github.com/gchilders/msieve_nfsathome

BOINC for NFS@Home, https://github.com/gchilders/boinc

Invited presentations

D. Bowman and J. G. Childers, "Nuclear Power Plants in Earthquake Country," presented Saturday, January 28, 2012, at Johns Hopkins University Center for Talented Youth, Fullerton, CA.

D. Bowman, B. Tiwari, and J. G. Childers, "Earthquake Watch 2011: Nuclear Power Plants in Earthquake Country," presented Tuesday, Sept. 27, 2011, at the CSUF College of Natural Sciences and Mathematics Colleagues Colloquium, Fullerton, CA.

J. G. Childers, "Nuclear Power and Earthquakes," presented Saturday, April 30, 2011, at Ladera Vista Jr. High School, Fullerton, CA.

D. Bowman, B. Tiwari, and J. G. Childers, "The 9.0 Japan Earthquake: Could it happen here?," presented Wednesday, March 30, 2011, at the Fullerton Public Library, Fullerton, CA.

D. Bowman and J. G. Childers, "M=9.0 Honshu Japan Earthquake, What happened? Could it happen here?," presented Wednesday, March 16, 2011, at CSUF, Fullerton, CA.

J. G. Childers, "Green Technologies," presented Tuesday, November 2, 2010, at the CSUF Osher Lifelong Learning Institute, Fullerton, CA.

J. G. Childers, "The Physics of Cancer," presented Thursday, November 15, 2007, at the CSUF College of Natural Sciences and Mathematics Colleagues Colloquium, Fullerton, CA.

J. G. Childers, "Low-energy electron scattering from fundamental atoms and molecules," presented July 13, 2006, to the T-4 Theoretical Division, Los Alamos National Laboratory, Los Alamos, NM.

J. G. Childers, "Low energy electron impact ionization of helium," *Bull. Am. Phys. Soc.* **50** (7), 33 (2005).

J. G. Childers and Murtadha A. Khakoo, "Low energy electron scattering from atomic hydrogen," *XXIII ISPCEAC Conference Programme*, Talk 8 (2005).

Service activities

General Education Committee, 2012-present (Chair 2014-2015, 2020-present)
During my time on the GE Committee I participated in the development of the GE Goals and Outcomes and the implementation of their annual assessment, and led multiple revisions of the GE program as required by the Chancellor's Office including working closely with impacted programs to adjust GE waivers.

NSM Assessment Liaison, 2014-present
As the NSM Assessment Liaison I chaired the NSM Assessment Committee, led the implementation of annual assessment of all undergraduate and graduate programs in the College using the six-step assessment process, and worked to establish an ongoing culture of assessment in the College.

Ethnic Studies Requirement Committee, 2019-present

Academic Senate, 2017-present

Academic Standards Committee, 2019-present

Tenure-track Faculty Search Committee, Physics Dept., 2007-2009, 2011-2013 (Chair), present

Department Personnel Committee, Physics, 2018-present

Curriculum Committee, Physics Dept., 2003-present

Associate Vice President of Undergraduate Academic Programs Search Committee, present

Vice Provost Search Committee, 2021

Associate Director of Assessment Search Committee, 2021

High Impact Practices NSM Coordinator, 2019-2021

WSCUC Curriculum, Learning, and Assessment Subcommittee and WSCUC Report Writing Team, 2017-2019

Center for Computational and Applied Mathematics Computational Committee, 2016-2019 (Chair 2017-2019)

Academic Senate General Education Task Force, 2018

Assistant to Academic Programs for Implementation of EO 1100/1110, 2018
I assisted with extensive edits to pamphlets, the Academic Programs website, and the catalog as necessitated by the new Executive Orders.

ASCSU Representative for the Western Interstate Commission for Higher Education Passport Project, 2015

Planning Committee for the Fall Academic Senate Retreat, WSCUC Core Competencies, 2015

NSM NSO/TSO Planning Committee, 2015

Physics Vice Chair, 2012-2015

Science Credential Preparation Advisory Committee, 2011-2015

Physics Undergraduate Advisor, 2011-2015

Physics PPR Steering Committee, 2014

Applied Suicide Intervention Skills Training (ASIST), 2014

Academic Technology Center Advisory Board member, 2011-2013

New Student Orientation Reinvention Focus Group, 2013

Dean's Faculty Awards Selection Committee, College of Natural Sciences and Mathematics, 2004-2005, 2010

University Gables Homeowners Advisory Council, 2004-2010

Computer Services Committee, Physics Dept., 2006-2009

Student Services Committee, Physics Dept., 2007-2009

Developer and contributor to the NFSNet Factorization Group, 2001-2009

College Curriculum Committee, College of Natural Sciences and Mathematics, 2005-2008

College Intramural Grant Review Committee, College of Natural Sciences and Mathematics, 2007

Instructional Support Technician Search Committee, Physics Dept., 2007

Organizer, U. Kentucky Dept. of Physics and Astronomy Graduate Student/ Post-Doc seminar series, 2001

Student representative, U. Kentucky Dept. of Physics and Astronomy Chair Search Committee, 2001

Session leader, U. Kentucky Dept. of Physics and Astronomy Teaching Assistant Orientation, 1999-2001

Group leader, U. Kentucky Teaching Assistant Orientation Workshop, 2000

Reviewer for Physical Review Letters, Physical Review A, Measurement Science and Technology, and Physics Letters A

Curriculum Vita/Biosketch

Dr. Hal Fearn
Professor Department of Physics, California State University Fullerton
hfearn@fullerton.edu/ (657) 278 2767

Educational Background

Graduate Degrees (Ph.D) Quantum Optics, supervisor R. Loudon FRS. Essex. Degree/Year 1989
Undergrad Degree (BSc. hons.) Major: Theoretical Physics, Essex Univ. UK. Degree/Year 1986

Professional Experience

Academic Positions: Max Planck Institute, Post doc Research Fellow 1989 summer.
University of New Mexico and University of Arizona joint position Research Post doc: 1989-1991.
CSUF Employment Dates : Assistant Professor 1991-95, Associate Prof 95-2001, Full Prof 2001-present

Collaborations (*External*) LANL; Dr. Peter Milonni 1992-2006 and Dr. Daniel James 2003-6, Dr José Rodal, Paul March, Michelle Broyles, present. (*Internal)*, 2012-present, Dr. James Woodward, Curtis Horn, volunteer.

Selected Publications: Mach effect propulsion related

1. H. Fearn and J. Woodward ``*Experimental null test of a Mach Effect Thruster",* in J. of Space Exploration, Vol. 2 (2) p98-105 (2013). Mehta Press June.
2. H. Fearn and K. Wanser ``*Experimental tests of a Mach Effect Thruster*", in J. of Space Exploration, Vol. 3, (3) 197-205 (2014). Mehta Press Dec.
3. H. Fearn ``*Mach's principle, Action at a Distance and Cosmology*", J. Mod. Phys. **6,** 260-272, (2015). Special issue on Gravitation, Astrophysics and Cosmology.
4. H. Fearn et al., "Theory of a Mach Effect Thruster I", J. Mod. Phys. **6** (11), 1510-1525 (2015).
5. H. Fearn et al. "Theory of a Mach Effect Thruster II", J. Mod. Phys. **6** (13), pp1868-1880 (2015).

Selected Conference Papers and Presentations *relevant to propulsion above.*

1. H. Fearn, & J. Woodward, ``*Recent Results of an Investigation of the Mach Effect Thruster",* 48th Joint Propulsion Conference, Atlanta Georgia, 29th July- 1st August 2012. Conference proceedings published online by the American Institute of Aeronautics and Astronautics AIAA.
2. H. Fearn*, ``Recent Results of an Investigation of Mach Effect Thrusters",* Advanced Space Propulsion Workshop (ASPW2012) November, Hunstville AL, 2012. Talk online at NASA site.
3. H. Fearn, K. Wanser and J. Woodward, IAC-13-C4.8.4 ``*Experimental tests of a Mach effect thruster",* Paper and talk given by Fearn at the 64th International Astronautical Congress, Beijing, China. Sept 2013, online proceedings.
4. H. Fearn, A. Zachar, J. F. Woodward and K. Wanser, ``*Theory of a Mach Effect Thruster",* AIAA Joint Propulsion conference, Propulsion and Energy Forum: Nuclear and Future Flight

Propulsion. Cleveland, Ohio, July 2014. Published in online conference proceedings.
5. H. Fearn, ``*Mach effect thruster development*'', 20th Advanced Space Propulsion Workshop (ASPW2014) Cleveland Ohio, Nov 17th through 20th 2014. Online talk.
6. Estes Park Advanced Propulsion workshop, Estes Park CO, September 2016. Proceedings edited by H Fearn online pdf and book available. http://ssi.org.
7. Estes Park Advanced Propulsion workshop, 2017 at Aerospace Corp. El Segundo CA, Nov 1-3, 2017. Proceedings Published in JBIS vol 70, in a double issue, Nos. 10-11 in Oct-Nov 2017.
8. Estes Park 2020, ZOOM Meeting due to CORVID-19. Online talks http://ssi.org/apw2020/ Video's are available on YouTube.

9. **Other Significant Publications (up to 5):**

1. H. Fearn, ``*A delayed Choice quantum eraser explained by the transactional interpretation of quantum mechanics*'', arXiv:1501.00970 [quant-ph], Found. of Physics **46** (1), pp44-69 (2016).
2. H. Fearn, ``Russian Conference Proceedings paper CCFP'06, ``Can signals travel faster-than-c in a non-trivial vacua in flat spacetime? Relativistic Causality II." Published in Laser Physics **17,** No. 5, pp1-5 (2007).
3. H. Fearn, ``*Dispersion relations and Causality; Does Relativistic Causality require* n(w) ->1 *as* w−> ∞*"*. Journal of Modern Optics **53**, Nos. 16-17 pp2569-2581 (2006). *Relativistic Causality paper I.*
4. H. Fearn, G.Maclay and P. W. Milonni, ``*Of some theoretical significance: Implications of Casimir Effects"*, Eur. Journal of Physics, **22**, pp463-469 (2001).
5. H. Fearn, P. W. Milonni and A. Zeilinger ``*Theory of two-photon down conversion in the presence of mirrors"*, Phys. Rev**. A53**, 4556 (1996).

Grants

Internal Grants: Several Intramural awards over many years and award for students Pre doctoral awards for graduate students.

External Grants: Associated Western Universities awards and government grants for visiting LANL 1994-2005, over several years and helping out with their AMO (atomic molecular and optics) summer schools. Primarily a theorist, grant money was not needed for research as much as small finances for travel, lodging and invites to do research and collaborate elsewhere.

NASA, NIAC Phase I award 20017 $125k for 9 months,

NASA, NIAC Phase II award 2018 $500k for 2 years.

Teaching

I have been the graduate adviser for 7 years, 2000-07. I teach a total of 18 different subjects and a lab: undergrad PHYS 225, 226, 227/Lab, 320, 330A/B, 340, 411, 416, 455, 476, grad PHYS 510, 516, 520, 530A/B and 555A/B. I have mentored 7 Masters theses (597), more than 15 MS projects (598) and

numerous independent studies (599/499). http://physics.fullerton.edu/~hal

Professional Awards

- Fellow of the Institute of Physics (IOP) from 2013.
- Distinguished Visiting Professor of physics USAF Academy 2007-9.
- CSUF NSM award in recognition of outstanding service 2005-06. Regarding graduate program.
- Kavli Institute of Physics (KITP) scholar, Santa Barbara CA. 2003-05. String theory and QED.
- CSUF Outstanding faculty recognition for scholarship**,** work in highest peer reviewed journals 2000-01. Also, Difference in pay leave, paid visit to LANL Spring 2001.
- Sabbatical Leave with pay, Fall 2011. (GR and the Mach Effect Thruster with Woodward.)

Dr. Leigh Randall Hargreaves

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California State University Fullerton
800 N State College Blvd
Fullerton, CA, 92831

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Tel: (657) 278 2261
Fax: (657) 278 2555
Email: lhargreaves@fullerton.edu

Website: http://scholar.google.com/citations?user=nI2nOsMAAAAJ&hl=en

Education

PhD: Flinders University, Adelaide, Australia (2004-2008)
Dissertation: "*Absolute Electron Scattering Cross Sections for the CF_2 Radical*"
Advisors: Dr. Todd Maddern and Prof. Michael Brunger

BSc (Hons): Flinders University, Adelaide, Australia (2000 - 2004)
Major in Physics and Mathematics, April 2004
Honors Dissertation: "*Cross Sections for technological molecules and radicals*"
Honors Advisor: Dr. Todd Maddern

Employment History

2017 – Present: Associate Professor
Department of Physics
California State University Fullerton

2014 – 2017: Assistant Professor
Department of Physics
California State University Fullerton

2011 – 2014: Visiting Professor
Department of Physics
California State University Fullerton

2008 – 2011: Australia Research Council Research Associate (part time in 2010)
School of Physical Sciences
Adelaide University (Australia)

2010 – 2011: Australian Research Council Research Associate (part time)
School of Chemistry and Physics
Flinders University (Australia)

Publication Summary:

Peer Reviewed Publications: 40
Refereed Conference Proceedings: 5
Invited Oral Conference Papers: 9
Contributed Conference Papers: 47

Extramural Grants

2016 (co-PI) Royal Society of Chemistry Research Mobility Grant, "Electron Spectroscopy of Platform Molecules of Biomass" (UK)
£5,000 ($6,915), funded on 07/13/2016

2015 (PI) National Science Foundation, Experimental Atomic, Molecular and Optical Physics Divisions, "RUI: Low-Energy Electron Scattering from Uracil and Thymine"
$275,011, funded on 09/08/2015

Intramural Grants

2016 (PI) California State University Fullerton, "Undergraduate experiment for electron scattering from atoms and molecules"
$4,954, funded on 04/19/2016

Highlight Publications (denotes undergraduate student co-author):*

1. L.R. Hargreaves, K. Ralphs*, G. Serna*, M.A. Khakoo, C. Winstead and V. McKoy, "Excitation of the a^3B_1 and A^1B_1 state of H_2O by low-energy electron impact", *J. Phys. B: At. Mol. Phys.*, **45**, 201001 (2012)

2. L.R. Hargreaves, C. Campbell*, M.A. Khakoo, O. Zatsarinny and K. Bartschat, "Unusual angular momentum transfer in electron-impact excitation of neon", *Phys. Rev. A*, **85**, 050701(R) (2012)

3. L.R. Hargreaves, M.A. Stevenson and B. Lohmann, "Absolute triple differential cross sections for intermediate energy electron impact ionization of neon and argon*", J. Phys. B: At. Mol. Phys.*, **43**, 205202 (2010) (Featured Article)

4. L.R. Hargreaves, J.R. Brunton, M.J. Brunger and S.J. Buckman, "Electron interaction cross sections for a low temperature 'plasma-like' gas mixtures", *Plasma Sources Sci. Tech.*, **19**, 065201 (2010)

5. T.M. Maddern, L.R. Hargreaves, J.R. Francis-Staite, M.J. Brunger, and S.J. Buckman, "Low energy electron collisions with CF_2 radicals", *Phys. Rev. Lett.*, **100**, 063202, (2008)

Detailed publication list:

Invited Talks:

1. "Electronic excitation of molecular hydrogen by low-energy electrons", 69th Gaseous Electronics Conference, Bochum, Germany (2016)

2. "Collisions between low-energy electrons and small polyatomic targets of biological relevance", 47th Annual Meeting of the American Physical Society Division of Atomic, Molecular and Optical Physics, Providence, Rhode Island (2016)

3. "Unusual angular momentum transfer in electronic excitation of atoms and molecules", 30th International (e,2e) Symposium, San Sebastian, Spain (2015)

4. "Low-energy electron scattering by polar molecules", 28th International Conference on Photonic, Electronic and Atomic Collisions, Lanzhou, China (2013)

5. "Low energy electron interactions with H_2O and simple alcohols", 65th Gaseous Electronics Conference, Austin, Texas (2012)

6. "Electron scattering cross sections for atomic and molecular species of technological relevance", 17th Symposium on electron-molecule collisions and swarms, Maynooth, Republic of Ireland (2011)

7. "(e,2e) in Australia, recent achievements and future prospects", 1st International workshop on frontiers in EMS, Sendai, Japan (2010)

8. "Ionization of Molecular Nitrogen by Electron Impact", 16th Symposium on electron-molecule collisions and swarms, Toronto, Canada (2009)

9. "Electron scattering from jet cooled CF_2 radicals", 25th International conference on electron, atom and photonic collisions, Freiburg, Germany (2007)

Peer Reviewed Publications (denotes undergraduate student co-author):*

1. L.R. Hargreaves, S. Bhari*, B. Adjari*, X. Liu, R. Laher, M. Zammit, J.S. Savage, D.V. Fursa, I. Bray and M.A. Khakoo, "Differential cross sections for excitation of H2 by low-energy electron impact", *J. Phys. B: At. Mol. Opt. Phys*, (2017)

2. A. Sakaamini, S.M. Khakoo, L.R. Hargreaves, M.A. Khakoo, D.R. Pastega and M.H.F. Bettega, "Elastic electron scattering from ortho-, meta- and paraxylenes, C_8H_{10}", *Phys. Rev. A*, **95**, 022702 (2017)

3. L.R. Hargreaves, M.A. Khakoo, C. Winstead and V. McKoy, "Excitation of the lowest electronic transitions in ethanol by low-energy electrons", *J. Phys. B: At. Mol. Opt. Phys.*, **49**, 18 (2016)

4. A. Saakamini*, L.R. Hargreaves, M.A. Khakoo, D.F. Pastega, M.H.F. Bettega, "Elastic scattering of low-energy electrons from toluene", *Phys. Rev. A*, **93**, 042704 (2016)

5. M.A. Khakoo, S.M. Khakoo*. A. Saakamini*, B.A. Hlousek*, L.R. Hargreaves, J. Lee, R Murase, "Low-energy elastic scattering from ethylene: Elastic scattering and vibrational excitation", *Phys. Rev. A*, **93**, 012710 (2016)

6. A. Sakaamini*, C. Navarro*, J. Cross*, L.R. Hargreaves, M.A. Khakoo, K. Fedus, C. Winstead and V. Mckoy, "Low-energy elastic scattering from chloroethane, C_2H_5Cl", *J. Phys. B: At. Mole. Phys.*, **48**, 205202 (2015)

7. C. Navarro*, A. Sakaamini*, J. Cross*, L.R. Hargreaves, M.A. Khakoo, K. Fedus, C. Winstead and V. McKoy "Low-energy elastic electron scattering from chloromethane, CH_3Cl", *J. Phys. B: At. Mol. Opt. Phys.*, **48**, 195202, (2015)

8. L.R. Hargreaves, R. Wright*, M.A. Khakoo, O. Zatsarinny, K. Bartschat, R. Srivastava and A.D. Stauffer, "Polarization correlations for electron-impact excitation of neon at 50 eV", *J. Phys. B: At. Mol. Opt. Phys*, **48**, 185201 (2015)

9. K. Varela*, L.R. Hargreaves, K. Ralphs, M.A. Khakoo, C. Winstead, V. McKoy, T.N. Rescigno, A.E. Orel, "Excitation of the 4 lowest electronic transitions in methanol by low-energy electrons", **48**, 115208 (2015)

10. K. Fedus, C. Navarro*, L.R. Hargreaves, M.A. Khakoo, A.S. Barbosa and M.H.F. Bettega, "Differental elastic electron scattering by pentane", **91**, 042701, (2015)

11. L.R. Hargreaves, J.R. Brunton, T.M. Maddern and M.J. Brunger, "Low energy elastic electron scattering from CF_3Br molecules", *J. Chem. Phys.*, **142**, 124310 (2015)

12. K. Fedus, C. Navarro, L.R. Hargreaves, M.A. Khakoo, F.M. Silva, M.H.F. Bettega, C. Winstead and V. McKoy, "Low-energy elastic electron scattering from isobutanol and related alkyl amines", *Phys. Rev. A*, **90**, 032708 (2014)

13. A. Gauf*, C. Navaroo*, G. Balch*, L.R. Hargreaves, M.A. Khakoo, C. Winstead and V. McKoy, "Low-energy elastic electron scattering by acetaldehyde", **89**, 022708 (2014)

14. J.R. Brunton, L.R. Hargreaves, T.M. Maddern, S.J. Buckman, G. Garcia, F. Blanco, O. Zatsarinny, K. Bartschat, D.B. Jones, G.B. da Silva and M.J. Brunger, "Differential cross sections for low-energy elastic electron scattering from the CF_3 radical", *J. Phys. B: At. Mol. Phys*, **46**, 245203 (2013)

15. J.M. Feagin and L.R. Hargreaves, "Loss of wave-packet coherence in stationary scattering experiments", *Phys. Rev. A*, **88**, 032705 (2013)

16. M.A. Khakoo, D. Orton*, L.R. Hargreaves and N Meyer*, "Electron-impact vibrational excitation of tetrahydrofuran", *Phys. Rev. A*, **88**, 012705 (2013)

17. K.Ralphs, G. Serna, L.R. Hargreaves, M.A. Khakoo, C. Winstead and V. McKoy, "Excitation of the 6 lowest electronic transitions in water by 9 – 20 eV electrons", *J. Phys. B: At. Mol. Phys*, **46**, 125201 (2013)

18. J.R. Brunton, L.R. Hargreaves, S.J. Buckman, G. García, F. Blanco, O. Zatsarinny, K. Bartschat, M.J. Brunger, "Anomalously large cross sections for elastic scattering from CF_3 radicals", *Chem. Phys. Lett.* , **55**, 568-569 (2013)

19. L.R. Hargreaves, C. Campbell*, M.A. Khakoo, J.W. McConkey, O. Zatsarinny and K. Bartschat, "Polarization correlations for electron-impact excitation of the resonant transitions of Ne and Ar at low incident energies", *Phys. Rev. A*, **87**, 022710 (2013)

20. A. Gauf*, C. Navarro*, G. Balch*, L.R. Hargreaves, M.A. Khakoo, C. Winstead and V. McKoy, "Low-energy electron scattering by acetylene", *Phys. Rev. A,* **87**, 012710 (2013)

21. L.R. Hargreaves, K. Ralphs*, G. Serna*, M.A. Khakoo, C. Winstead and V. McKoy, "Excitation of the a^3B_1 and A^1B_1 state of H_2O by low-energy electron impact", *J. Phys. B: At. Mol. Phys.*, **45**, 201001 (fast track communication) (2012)

22. R.F. da Costa, M.H.F. Bettega, M.A.P. Lima, M.C.A. Lopes, L.R. Hargreaves, G. Serna* and M.A. Khakoo, "Electronic excitation of gas phase furan molecules by electron impact", *Phys. Rev. A*, **85**, 062706 (2012)

23. L.R. Hargreaves and S.E. John, "Modelling ordinal electoral systems: The uniqueness of South Australian electoral systems", *Aust. J. Pol. Sci.*, **47**, 273 (2012)

24. L.R. Hargreaves, C. Campbell*, M.A. Khakoo, O. Zatsarinny and K. Bartschat, "Unusual angular momentum transfer in electron-impact excitation of neon", *Phys. Rev. A*, **85**, 050701 (rapid communication) (2012)

25. A. Gauf*, L.R. Hargreaves, A. Jo*, J. Tanner*, M.A. Khakoo, T. Walls*, C. Winstead and V. McKoy, "Low energy electron scattering by tetrahydrofuran", *Phys. Rev. A*, **85**, 052717 (2012)

26. L.R. Hargreaves, R. Albaridy*, G. Serna*, M.C.A Lopes and M.A. Khakoo, "Electron-impact vibrational excitation of furan", *Phys. Rev. A*, **84**, 062705 (2011)

27. M.H.F. Bettega, C. Winstead, V. Mckoy, A. Jo*, A. Gauf*, J. Tanner*, L.R. Hargreaves and M.A. Khakoo, "Collisions of low-energy electrons with isoproponal", *Phys. Rev. A*, **84**, 042702 (2011)

28. L.R. Hargreaves, J.R. Brunton, A. Prajapati*, M. Hoshino, F. Blanco, G. Garcia, S.J. Buckman, M.J. Brunger, "Elastic cross sections for electron scattering from iodomethane", *J. Phys. B: At. Mol. Phys.*, **44**, 045207 (2011)

29. O. Zatsarinny, K. Barstchat, G. Garcia, F. Blanco, L.R. Hargreaves, D.B. Jones, R. Murrie*, J.R. Brunton, M.J. Brunger, M. Hoshino and S.J. Buckman, "Electron-collision cross sections for iodine", *Phys. Rev. A*, **83**, 042702 (2011)

30. L.R. Hargreaves, J.R. Brunton, M.J. Brunger and S.J. Buckman, "Electron interaction cross sections for a low temperature 'plasma-like' gas mixtures", *Plasma Sources Sci. Tech.*, **19**, 065201 (2010)

31. L.R. Hargreaves, B. Lohmann, C. Winstead and V. McKoy, "Elastic scattering of intermediate energy electrons from C_{60} molecules", *Phys. Rev. A*, **82**, 062716 (2010)

32. L.R. Hargreaves, M.A. Stevenson and B. Lohmann, "Absolute triple differential cross sections for intermediate energy electron impact ionization of neon and argon*", J. Phys. B: At. Mol. Phys.* , **43**, 205202 (2010)

33. L.R. Hargreaves, M.A. Stevenson and B. Lohmann, "A simple method for normalization of (e,2e) cross sections", *Meas. Sci. Technol.*, **21**, 055112 (2010)

34. L.R. Hargreaves, C. Colyer, M.A. Stevenson, B. Lohmann, O. Al-Hagan, D.H. Madison, and C.G. Ning, "(e,2e) study of two-centre interference effects in the ionization of N_2", *Phys. Rev. A*, **80**, 062704 (2009)

35. M.A. Stevenson, L.R. Hargreaves, B. Lohmann, I. Bray, A. Kheifets and K. Bartschat, "Triply differential cross sections for ionisation of neon and xenon by intermediate energy electrons", *Phys. Rev. A*, **79**, 012709 (2009)

36. T.M. Maddern, L.R. Hargreaves, M.J. Brunger, and S.J. Buckman, "An apparatus for measuring absolute electron collision cross sections with molecular radicals", *Meas. Sci. Tech.*, **19**, 085801 (2008)

37. T.M. Maddern, L.R. Hargreaves, J.R. Francis-Staite, M.J. Brunger, and S.J. Buckman, "Low energy electron collisions with CF_2 radicals", *Phys. Rev. Lett.*, **100**, 063202, (2008)

38. L.R. Hargreaves, J.R. Francis-Staite, T.M. Maddern, M.J. Brunger, and S.J. Buckman, "Normalisation method for electron collision cross sections measured from skimmed nozzle beams", *Meas. Sci. Tech*., **18**, 2783, (2007)

Refereed Conference Proceedings:

1. S.E. John and L.R. Hargreaves, "The alternative vote in Australia: Exacerbating a culture of adversarialism?", *proceedings of the Australian Political Science Association Conference 2011*, 1 (2011)

2. T. Pfluger, M. Holzwarth, A. Senftleben, X. Ren, A. Dorn, J. Ullrich, L.R. Hargreaves, B. Lohmann, D.S. Slaughter, J.P. Sullivan, J.C. Lower and S.J. Buckman, "Kinematically complete experiments for positron impact ionization of helium atoms at the NEPOMUC facility", *J. Phys. Conf. Ser.*, **262**, 012407 (2011)

3. D.S. Slaughter, L.R. Hargreaves, M.A. Stevenson, A. Dorn, J.P. Sullivan, J.C. Lower, S.J. Buckman and B. Lohmann, "A reaction microscope for positron-atom ionisation studies", *J. Phys. Conf. Ser.*, **194**, 072002 (2009)

4. S.J. Buckman, T.M. Maddern, J.R. Francis-Staite, L.R. Hargreaves, M.J. Brunger, G. Garcia, J.C. Lower, S. Mondal, J.P. Sullivan, A. Jones, P. Caradonna, D. Slaughter, C. Mackochekanwa, R.P. McEachran, "Low energy lepton scattering: recent results for electron and positron interactions", *J. Phys. Conf. Ser.*, **133**, 012001 (2008)

5. T.M. Maddern, L.R. Hargreaves, S.J. Buckman and M.J. Brunger, "Progress towards measurement of absolute elastic electron-molecular radical cross sections", *J. Phys. Conf. Ser.*, **86**, 012005 (2007)

Contributed Conference Abstracts:

1. L.R. Hargreaves, A. Sakaamini*, B. Hlousek*, S.M. Khakoo*, M.A. Khakoo, C. Winstead and V. McKoy, "Elastic Electron Scattering from Hexaflouropropene", poster paper at the 68th Gaseous Electronics Conference (2016)

2. A. Sakaamini*, L.R. Hargreaves and M.A. Khakoo, "Electron impact vibrational excitation of methyl chloride" poster paper at the 47th Annual Meeting of the American Physical Society Division of Atomic, Molecular and Optical Physics (2016)

3. M.A. Khakoo, A Sakaamini*, S.M. Khakoo*, L.R. Hargreaves, D. Pastega, M.H.F. Bettega, "Elastic electron scattering from o-, m- and p-xylene", poster paper at the 47th Annual Meeting of the American Physical Society Division of Atomic, Molecular and Optical Physics (2016)

4. S. Patra*, L.R. Hargreaves, M.A. Khakoo, "Low energy electron impact vibrational excitation of acetylene", poster paper at the 47th Annual Meeting of the American Physical Society Division of Atomic, Molecular and Optical Physics (2016)

5. J. Duron and L.R. Hargreaves, "A new apparatus for studies of low energy electron collisions with nucleotide molecules", poster paper at the American Physical Society March Meeting (2016)

6. R. Wright, L.R. Hargreaves, M.A. Khakoo, O.Zatsarinny, K. Barstchat, A. Stauffer, "Coherence parameter measurements for neon and hydrogen", oral paper at the 68th Gaseous Electronics Conference, Honolulu, Hawaii (2015)

7. L.R. Hargreaves, K. Varella*, M.A. Khakoo, C. Winstead and V. McKoy, "Low-energy electron impact excitation of ethanol", poster paper at the 68th Gaseous Electronics Conference, Honolulu, Hawaii (2015)

8. A. Sakaamini*, L.R. Hargreaves, M.A. Khakoo, D.F. Pastega, M.H.F. Bettega, "Low energy elastic scattering from toluene", poster paper at the 68th Gaseous Electronics Conference, Honolulu, Hawaii (2015)

9. M.A. Khakoo, S.M. Khakoo*, A. Sakaamini*, L.R. Hargreaves, C. Winstead and V. McKoy, "Electron impact elastic scattering and vibrtational excitation of ethylene", poster paper at the 68th Gaseous Electronics Conference, Honolulu, Hawaii (2015)

10. M.A. Khakoo, A. Sakaamini*, L.R. Hargreaves, C. Winstead and V. McKoy, "Vibrational excitation of methyl chloride by low energy electron impact", poster paper at the 68th Gaseous Electronics Conference, Honolulu, Hawaii (2015)

11. L.R. Hargreaves, K. Varela, M.A. Khakoo, C. Winstead and V. McKoy, "Electronic Excitation of methanol by low energy electrons", poster paper at the 67th Gaseous Electronics Conference, Raleigh, North Carolina (2014)

12. L.R. Hargreaves, C. Campbell, M.A. Khakoo, O. Zatsarinny and K. Bartschat "Refutation of a propensity rule in low-energy electron scattering by neon", oral paper at the 43rd APS Division of Atomic, Molecular and Optical Physics meeting, Anaheim, United States (2012)

13. K. Ralphs, G. Serna, L.R. Hargreaves, M.A. Khakoo, C. Winstead and V. McKoy, "Low-energy electron scattering from water vapour", oral paper at the 43rd APS Division of Atomic, Molecular and Optical Physics meeting, Anaheim, CA, United States (2012)

14. L.R. Hargreaves, G. Serna, M.A. Khakoo, M.C.A. Lopes, R.F. da Costa, M.H.F. Bettega and M.A.P. Lima, "Electronic excitation of furan molecules by electron impact", poster paper at the 43rd

APS Division of Atomic, Molecular and Optical Physics meeting, Anaheim, CA, United States (2012)

15. L.R. Hargreaves and S.E. John, "The alternative vote in Australia: Exacerbating a culture of adversarialism?", oral paper at Australian Political Science Conference (2011), Canberra, Australia

16. L.R. Hargreaves, M.A. Khakoo, M.C.A. Lopes, R.F. da Costa, M.H.F. Bettega, M.A.P. Lima, "Electronic excitation of furan by low energy electrons", oral paper at the 64th Gaseous Electronics Conference, Salt Lake City, UT, USA (2011)

17. K. Ralphs, G. Serna, L.R. Hargreaves, M.A. Khakoo, C. Winstead and V. McKoy, "Low energy electron impact excitation of water", oral paper at the 64th Gaseous Electronics Conference, Salt Lake City, UT, USA (2011)

18. L.R. Hargreaves, A. Jo, A. Gauf, J. Tanner, M.A. Khakoo, C. Winstead, V. McKoy and M.A.P. Lima, "Low-energy electron scattering from gaseous isoproponal", oral paper at the 64th Gaseous Electronics Conference, Salt Lake City, UT, USA (2011)

19. A. Gauf, A. Jo, T. Walls, L.R. Hargreaves and M.A. Khakoo, "Low-energy elastic scattering from gaseous tetrahydrofuran", oral paper at the 64th Gaseous Electronics Conference, Salt Lake City, UT, United States (2011)

20. G. Serna, R. Al-Buraidi, L.R. Hargreaves, M.A. Khakoo, "Vibrational excitation of furan by electron impact", poster paper at the 64th Gaseous Electronics Conference, Salt Lake City, UT, USA (2011)

21. J.R. Brunton, L.R. Hargreaves, M.J. Brunger, S.J. Buckman, G. Garcia, F. Blanco, O. Zatsarinny, K. Bartschat, C. Winstead, V. McKoy, "Anomalously large cross sections for electron scattering from the CF3 radical", oral paper at the 27th International Conference on Electronic, Atomic and Photonic Collisions, Belfast, Northern Ireland (2011)

22. L.R. Hargreaves, M.C.A. Lopes, K. Ralphs, M.A. Khakoo, R.F. da Costa, M.H.F. Bettega and M.A.P. Lima, "Cross sections for below threshold excitation of furan", poster paper at the 27th International Conference on Electronic, Atomic and Photonic Collisions, Belfast, Northern Ireland (2011)

23. L.R. Hargreaves, K. Ralphs, M.A. Khakoo, C. Winstead and V. McKoy, "Cross sections for electronic excitation of water by low-energy electrons", poster paper at the 27th International Conference on Electronic, Atomic and Photonic Collisions, Belfast, Northern Ireland (2011)

24. L.R. Hargreaves, "Cross sections for electron scattering from the CF_3 radical", oral paper at the 63rd Gaseous Electronics Conference, Paris, France (2010)

25. L.R. Hargreaves, "Electron collision cross sections for 'plasma like' gas mixtures", 10/2010, oral paper at the 63rd Gaseous Electronics Conference, Paris, France (2010)

26. L.R. Hargreaves, "Low energy (e,2e) cross sections for molecules of environmental and technological relevance", oral paper at the International Conference on many particle spectroscopy of atoms, molecules, clusters and surfaces, Sendai, Japan (2010)

27. L.R. Hargreaves, D.S. Slaughter, M.A. Stevenson, A. Dorn, J.P. Sullivan, B. Lohmann and S.J. Buckman, "A reaction microscope for studies of positron collisions with atoms and molecules", poster paper at the 16th Symposium on electron-molecule collisions and swarms, Toronto, Canada. (2009)

28. L.R. Hargreaves, C. Colyer, B. Lohmann and D.H. Madison, "Two-centre effects in (e,2e) measurements of molecular nitrogen", poster paper at the International Symposium on (e,2e), Double Photoionization and Related Topics, Lexington, KY, USA (2009)

29. D.S. Slaughter, L.R. Hargreaves, M.A. Stevenson, A. Dorn, J.C. Lower, J.P. Sullivan, B. Lohmann and S.J. Buckman, 07/2009, "Progress towards measuring differential ionisation cross sections with a magnetised positron beam", poster paper at the International Symposium on (e,2e), Double Photoionization and Related Topics, Lexington, KY, USA

30. L.R. Hargreaves, M.A. Stevenson and B. Lohmann, 07/2009, "A simple method for absolute normalisation of (e,2e) cross sections", poster paper at the 26th International conference on electron, atom and photonic collisions, Kalamazoo, MI, USA

31. D.H. Madison, H.P. Saha, B. Lohmann, M.A. Stevenson and L.R. Hargreaves, "Accuracy of the Gamow factor for approximating the PCI (post-collision interaction) in electron-impact ionization of atoms", oral paper at the 61st Gaseous Electronics Conference, Dallas, TX, USA, (2008)

32. L.R. Hargreaves, J.R. Francis-Staite, T.M. Maddern, M.J. Brunger, and S.J. Buckman, 01/2008, "Absolute cross sections for electron-CF_2 scattering", oral paper at the 15th Gaseous Electronics Meeting, Murramarang, Australia

33. L.R. Hargreaves, J.R. Francis-Staite, T.M. Maddern, M.J. Brunger, and S.J. Buckman, 10/2007, "Absolute cross sections for intermediate electron scattering from CF_2 radicals", oral paper at 60th Gaseous Electronics Conference, Arlington, VI, USA.

34. T.M. Maddern, L.R. Hargreaves, J.R. Francis-Staite, M.J. Brunger, and S.J. Buckman, 07/2007, "Electron scattering from vibrationally cold plasma etchant molecules", poster paper at 25th International Conference on Electronic, Atomic and Photonic Collisions, Freiburg, Germany.

35. L.R. Hargreaves, J.R. Francis-Staite, T.M. Maddern, M.J. Brunger, and S.J. Buckman, 12/2006, "Electron scattering from plasma based fluorocarbons", oral paper at 17th Australian Institute of Physics National Congress, Brisbane, Australia.

36. T.M. Maddern, L.R. Hargreaves, J.R. Francis-Staite, M.J. Brunger, and S.J. Buckman, 03/2006, "Progress towards measuring absolute cross sections for plasma based fluorocarbons", 6th International Workshop on Fluorocarbon Plasmas, Villard-de-Lans, France.

37. L.R. Hargreaves, T.M. Maddern, M.J. Brunger, and S.J. Buckman, 02/2006, "Progress report of a new electron-molecular radical spectrometer", oral paper at 14th Gaseous Electronics Meeting, Murruramarang, Australia.

38. L. Campbell, L.R. Hargreaves, P.A. Thorn, M.J. Brunger and T. Rescigno, 08/2005, "Electron cooling by vibrational excitation of carbon dioxide", poster paper at 14th Symposium on Electron-Molecule Collisions and Swarms, Campinas, Brazil

39. L.R. Hargreaves, T.M. Maddern, M.J. Brunger, W.D. Lawrance, P.J.O. Tuebner and S.J. Buckman, 07/2005, "Cross sections for molecular radicals of technological relevance - Progress report of a new apparatus", poster paper at 24th International Conference on Electronic, Atomic and Photonic Collisions, Rosario, Argentina

40. L.R. Hargreaves, T.M. Maddern, M.J. Brunger, W.D. Lawrance, P.J.O. Tuebner and S.J. Buckman, 02/2005, "Advances in the spectroscopy of molecular radicals", poster presentation, 16th Australian Institute of Physics National Congress, Canberra, Australia

Geoffrey Lovelace

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Curriculum Vitae revised March 8, 2022

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 — Oct. 2002 – Jun. 2007
California Institute of Technology

B.S. in Physics — Aug. 1998 – May 2002
University of Oklahoma

Employment

Professor of Physics — Aug. 2021 – present
Department of Physics
California State University, Fullerton

Associate Professor of Physics — Aug. 2017 – Aug. 2021
Department of Physics
California State University, Fullerton

Assistant Professor of Physics — Aug. 2012 – Aug. 2017
Department of Physics
California State University, Fullerton

Research Associate — Sep. 2007 – Aug. 2012
Department of Astronomy
Cornell University

Postdoctoral Scholar — Jul. 2007 – Aug. 2007
Department of Physics
California Institute of Technology

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, National Science Foundation, AST — PAARE, "The CSUF-led partnership for inclusion of underrepresented groups in gravitational-wave astronomy" — 2022
   $1,180,212 over five years, including sub-awards to Syracuse University, Northwestern University, and Washington State University, pending
2. PI, National Science Foundation, PHY — Gravitational Theory, "RUI: Next-generation numerical relativity for future gravitational-wave observatories" — 2021
   $225,832 over three years, pending
3. PI for CSUF, National Science Foundation, PHY — Gravitational Experiments, "Collaborative Research: The Next Generation of Gravitational Wave Detectors" — 2018
   $211,283 to CSUF, funded 2018–2021
4. Co-PI for CSUF, National Science Foundation, PHY — Gravitational Experiments, "Collaborative Research: The Next Generation of Gravitational Wave Detectors" — 2017
   $206,227 to CSUF, declined
5. PI for CSUF, National Science Foundation, PHY — LIGO Research Support, "Collaborative Research: LSC Center for Coatings Research" — 2016
   $136,819 to CSUF, funded 2017–2020, collaborative proposal spanning 10 institutions, led by Stanford
6. PI, National Science Foundation, PHY — Integrative Activities in Physics, "CAREER: Computational gravitational-wave science and education in the era of first observations" — 2016
   $400,070, funded 2017–2022

7. 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

8. Co-PI, National Science Foundation, AST — PAARE, "Catching a new wave: 2015
the CSUF-Syracuse partnership for inclusion of underrepresented groups in gravitational-wave astronomy"
$956,590 over five years, including sub-award to Syracuse University, funded 2016-2021

9. PI, National Science Foundation, PHY — Integrative Activities in Physics, 2015
"CAREER: Computational gravitational-wave science and education for the era of first observations"
$420,190 over five years, declined

10. PI, National Science Foundation, MRI, "MRI: Acquisition of a 2014
high-performance computer cluster for gravitational-wave astronomy with Advanced LIGO"
$119,791 over three years, funded 2014–2017

11. Co-PI, National Science Foundation, AST - PAARE, "Catching the new wave: 2013
the CSUF-Syracuse partnership for advancing minority participation in gravitational-wave astronomy"
$977,931 over five years to CSUF, $1,476,553 total budget, declined

12. PI, Research Corporation for Science Advancement, Multi Investigator 2013
2013 Cottrell College Science Award, "Developing a numerical injection analysis pipeline for gravitational waves from merging black holes and neutron stars"
$75,000 over two years, funded 2014–2017

13. PI, National Science Foundation, PHY - Gravitational Theory, 2012
"RUI: 2012 Numerical Simulations of Merging Black Holes and Neutron Stars"
$125,723 over three years, funded 2013–2016

Intramural Grants

PI, Course Redesign with Technology: Sustaining Success, "Early intervention 2015
in introductory mechanics"
$8,824 ($1,960 + $6,864 teaching release), funded 2015–2016

PI, Junior/Senior Faculty Grant for Research, Scholarship, 2015
and Creative Activity, "Modeling thermal noise for gravitational-wave antennas"
$6,312 teaching release, declined

PI, Junior/Senior Faculty Grant for Research, Scholarship, 2013
and Creative Activity, "Simulating merging black holes on a computer cluster"
$1986 + $4747 for teaching release, funded 2013-2014

External Computer Time Grants

Co-PI, Frontera Large-Scale Community Partnerships, 2021
"Gravitational Waves from Compact Binaries: Computational Contributions to LIGO"
42 *million CPU-hours computer time awarded*
to the Simulating eXtreme Spacetimes Collaboration

Co-PI, Extreme Science and Engineering Discovery Environment, 2021
"Gravitational Waves from Compact Binaries: Computational Contributions to LIGO"
8.2 *million CPU-hours computer time awarded*
to the Simulating eXtreme Spacetimes Collaboration

Co-PI, Extreme Science and Engineering Discovery Environment, 2020
"Gravitational Waves from Compact Binaries:
Computational Contributions to LIGO"
15.1 *million CPU-hours computer time awarded*
to the Simulating eXtreme Spacetimes Collaboration

Co-PI, Frontera Large-Scale Community Partnerships, 2020
"Gravitational Waves from Compact Binaries: Computational Contributions to LIGO"
56 million CPU-hours computer time awarded
to the Simulating eXtreme Spacetimes Collaboration

Co-PI, Extreme Science and Engineering Discovery Environment, 2019
"Gravitational Waves from Compact Binaries: Computational Contributions to LIGO"
14 *million CPU-hours computer time awarded*
to the Simulating eXtreme Spacetimes Collaboration

Co-PI, Extreme Science and Engineering Discovery Environment, 2018
"Gravitational Waves from Compact Binaries: Computational Contributions to LIGO"
7.1 million CPU-hours computer time awarded
to the Simulating eXtreme Spacetimes Collaboration

Co-PI, Extreme Science and Engineering Discovery Environment, 2018
"Gravitational Waves from Compact Binaries: Computational Contributions to LIGO"
Declined

Co-PI, Extreme Science and Engineering Discovery Environment, 2016
"Gravitational Waves from Compact Binaries: Computational Contributions to LIGO"
6.41 million CPU-hours computer time awarded
to the Simulating eXtreme Spacetimes Collaboration

Co-PI, Extreme Science and Engineering Discovery Environment, 2015
"Gravitational Waves from Compact Binaries: Computational Contributions to LIGO"
6.23 million CPU-hours computer time awarded
to the Simulating eXtreme Spacetimes Collaboration

Co-PI, Extreme Science and Engineering Discovery Environment, 2014
"Gravitational Waves from Compact Binaries: Computational Contributions to LIGO"
6.15 million CPU-hours computer time awarded
to the Simulating eXtreme Spacetimes Collaboration

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 Szilagyi, 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

1. ***Samuel Rodriguez*** M.S., May 2021
   Pursuing Ph.D. in physics at University of Mississippi in fall 2021

2. ***Teresita Ramirez Aguilar*** B.S., May 2021
   Pursuing Ph.D. in physics at Northwestern University in fall 2021

3. ***Sierra Thomas*** B.S., Dec. 2020
   Pursuing Ph.D. in physics at Syracuse University starting fall 2021

4. ***Jennifer Sanchez*** B.S., Dec. 2020
   Pursuing Ph.D. in physics at Northwestern University starting fall 2021

5. ***Denyz Melchor*** B.S., May 2020
   Pursuing Ph.D. in astrophysics at University of California, Los Angeles
   NSF Graduate Research Fellow

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

6. "The first observations of gravitational waves from merging black holes" Mar. 2017
   Physics and Astronomy Colloquium, Swarthmore College, Swarthmore, Pennsylvania

7. "Using supercomputers to simulate merging black holes in the era of gravitational-wave astronomy" Mar. 2017
   Osher Lifelong Learning Institute Eclectics Seminar, Fullerton, California

8. "Doing science in the 21st century: colliding black holes and gravitational-wave astronomy" Feb. 2017
   Keynote presentation, Better Together: CSU Fullerton EdTalk South—Next Generation Science Standards, Discovery Cube Orange County, Santa Ana, CA

9. "Simulations of binary-black-hole mergers" Jan. 2017
   American Physical Society April Meeting, Washington, D.C.

10. "The discovery of gravitational waves from merging black holes" Oct. 2016
    Scientific Symposium, Society for Advancement of Chicanos/Hispanics and Native Americans in Science

11. "The first observations of gravitational waves from merging black holes" Sep. 2016
    Physics and Astronomy Colloquium, University of Oklahoma, Norman, Oklahoma

12. "Observation of gravitational waves from merging black holes" Jul. 2016
    Orange County Astronomers General Meeting, Orange, California

13. "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

14. "Simulating colliding black holes and mirror thermal noise for gravitational-wave astronomy" Sep. 2015
    Physics Colloquium, California State University, Northridge, California

15. "Numerical simulations of merging black holes and neutron stars for gravitational-wave astronomy" Oct. 2014
    Physics Colloquium, Washington State University

16. "Numerical simulations of merging black holes for gravitational-wave astronomy" Apr. 2014
    American Physical Society April Meeting, Savannah, Georgia

Selected Contributed Presentations

1. "Progress toward simulating merging black holes with SpECTRE" Apr. 2021
   Virtual April APS Meeting

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
   12th 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
   21st 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
    20th International Conference on General Relativity and Gravitation and 10th Amaldi Conference on Gravitational Waves, Warsaw, Poland

16. "The tidal disruption of a neutron star by a nearly extremal black hole" Mar. 2013
    29th 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 2022
ASTR 444: Applications of Gravitation
PHYS 499: Independent Study
PHYS 599: Independent Graduate Research
PHYS 597: Master's Project

CSNM 101: Think Like Einstein Fall 2021
PHYS 520: Analytical Mechanics
PHYS 499: Independent Study
PHYS 599: Independent Graduate Research
PHYS 597: Master's Project

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

ASTR 101: Introduction to Astronomy — Fall 2019
PHYS 499: Independent Study

PHYS 225: Fundamental Physics: Mechanics — *flipped classroom redesign* — Spring 2018
ASTR 444: Applications of Gravitation — *new course pilot*
PHYS 499: Independent Study
PHYS 599: Independent Graduate Research

PHYS 520: Analytical Mechanics — Fall 2017
PHYS 499: Independent Study

PHYS 225: Fundamental Physics: Mechanics — *flipped classroom redesign* — 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 — *flipped classroom redesign* — Spring 2016
ASTR 444: Applications of Gravitation — *new course pilot*
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 — *flipped classroom redesign* — 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

Virtual Workshop on Gravitational Waves and High-Performance Computing — Aug. 2021
Introduced 22 students from Citrus College to gravitational-wave science and high-performance computing through a 1-week virtual summer workshop

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 "Relativity and Gravitation: Contemporary Research and Teaching of Einstein's Physics" — Jun. 2016
Salve Regina University, Newport, Rhode Island

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

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

Service

Professional Leadership

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

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

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

Professional Membership

Active member, Cosmic Explorer Project — Jul. 2018 – present

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

External examiner, Oberlin College Physics honors program — Jan. 2022 – May 2022

Member, Classical and Quantum Gravity Editorial Board — Mar. 2021 – present

Member, Classical and Quantum Gravity Advisory Panel — Dec. 2016 – Mar. 2021

Member, American Physical Society LeRoy Apker Award Selection Committee — May 2019 – Aug. 2021

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 32nd 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

Department of Physics Personnel Committee	Aug. 2021 – present
College of Natural Sciences and Mathematics Personnel Committee	Aug. 2021 – present
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

Outreach, Advocacy, and Fundraising

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 http://news.fullerton.edu/gravitational-waves/	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, May 2017
$2,500, annual award given by the California State University, Fullerton College of Natural Sciences and Mathematics

Titan on the Rise: Early Career Investigator Award May 2017
$750, award given by the California State University, Fullerton Office of Research Development

Special Breakthrough Prize in Fundamental Physics co-recipient May 2016
$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."

Woodward Faculty Research Award May 2015
$2,000, annual award given by the California State University, Fullerton Department of Physics

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. Nils L. Fischer, Harald P. Pfeiffer, Gabriel S. Bonilla, Nils Deppe, François Hébert, Lawrence E. Kidder, **Geoffrey Lovelace**, Jordan Moxon, Mark A. Scheel, Saul A. Teukolsky, William Throwe, Nikolas A. Wittek, Tom Wlodarczyk. "A scalable elliptic solver with task-based parallelism for the SpECTRE numerical relativity code." Accepted for publication in Phys. Rev. D (2022). Preprint https://arxiv.org/abs/2111.06767.

2. Katerina Chatziioannou, Roberto Cotesta, Sudarshan Ghonge, Jacob Lange, Ken KY Ng, Juan Calderón Bustillo, James Clark, Carl-Johan Haster, Sebastian Khan, Michael Pürrer, 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 Szilagyi, 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

3. 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 Szilagyi, 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

4. 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

5. "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

6. 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

7. **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.

8. 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

9. 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

10. 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.

11. 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

12. 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

13. 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

14. **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

15. 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

16. 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

17. 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

18. 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

19. 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

20. 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

21. 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

22. 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

23. **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

24. 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

25. 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). https://doi.org/10.1103/PhysRevD.89.061502

26. 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

27. 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). https://doi.org/10.1103/PhysRevLett.111.241104

28. 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).

29. 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

30. 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

31. **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

32. 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

33. 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

34. 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

35. 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

36. 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

37. 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

38. 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

39. **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

40. 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

41. 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

42. 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

43. **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

44. **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

45. **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

46. **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

47. 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

48. 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

49. 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

50. **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

51. 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

52. 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

53. 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.

Submitted for Peer-Reviewed Publication

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

1. Nils L. Fischer, ***Samuel Rodriguez***, Tom Wlodarczyk, **Geoffrey Lovelace**, Harald P. Pfeiffer, Gabriel S. Bonilla, Nils Deppe, François Hébert, Lawrence E. Kidder, Jordan Moxon, William Throwe. "High-accuracy numerical models of Brownian thermal noise in thin mirror coatings." Submitted for publication in Phys. Rev. D (2021). Preprint https://arxiv.org/abs/2111.06893.

2. Nils Deppe, François Hébert, Lawrence E. Kidder, William Throwe, Isha Anantpurkar, Cristóbal Armaza, Gabriel S. Bonilla, Michael Boyle, Himanshu Chaudhary, Matthew D. Duez, Nils L. Fischer, Francois Foucart, Matthew Giesler, Jason S. Guo, Yoonsoo Kim, Prayush Kumar, Isaac Legred, Dongjun Li, **Geoffrey Lovelace**, Sizheng Ma, Alexandra Macedo, ***Denyz Melchor***, ***Marlo Morales***, Jordan Moxon, Kyle C. Nelli, Eamonn O'Shea, Harald P. Pfeiffer, ***Teresita Ramirez***, Hannes R. Rüter, ***Jennifer Sanchez***, Mark A. Scheel, ***Sierra Thomas***, Daniel Vieira, Nikolas A. Wittek, Tom Wlodarczyk, Saul A. Teukolsky. "Simulating magnetized neutron stars with discontinuous Galerkin methods." Submitted to Phys. Rev. D (2021). Preprint https://arxiv.org/abs/2109.12033.

Other Products

i. **Geoffrey Lovelace.** "Computational challenges in numerical relativity in the gravitational-wave era." Nature Computational Science **1**, 450 (2021). https://doi.org/10.1038/s43588-021-00102-2. Invited comment.

ii. 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 Weissa. "A Horizon Study for Cosmic Explorer: Science, Observatories, and Community." Cosmic Explorer Technical Report CE-P2100003 (2021). https://arxiv.org/abs/2109.09882.

iii. 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.

iv. Nils Deppe, William Throwe, Lawrence E. Kidder, Nils L. Fischer, François Hébert, Jordon Moxon, Cristöbal 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 in the era of gravitational-wave astronomy" Nov. 2017
    Cal Poly Pomona Physics and Astronomy Seminar
    Pomona, California

11. "Using supercomputers to simulate merging black holes in the era of gravitational-wave astronomy" Apr. 2017
    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 gravitational-wave astronomy" Mar. 2017
    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 21st century: colliding black holes and gravitational-wave astronomy" Feb. 2017
    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
STEM² 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

33. "Collisions in warped space and time" — May 2014
Orange County Astronomers General Meeting, Orange, California

34. "Numerical simulations of merging black holes for gravitational-wave astronomy" — Apr. 2014
American Physical Society April Meeting, Savannah, Georgia

35. "Supercomputer simulations of colliding black holes" — Oct. 2013
Physics & Astronomy Colloquium, California State University, Long Beach, Long Beach, California

36. "Supercomputer simulations of merging black holes and neutron stars" — Sep. 2013
N. D. Pearson Colloquium Series in Physics, California State University, Dominguez Hills, Dominguez Hills, California

37. "Supercomputer simulations of colliding black holes and neutron stars" — Nov. 2012
Natural Science Seminar, Fullerton College, Fullerton, California

38. "Simulating compact-binary mergers containing nearly extremal black holes" — Sep. 2012
Fall 2012 Meeting of the Eastern Section of the American Mathematical Society, Rochester, New York

39. "Numerical simulations of binary black holes in the presence of spins" — Jul. 2012
Rattle and Shine: Gravitational Wave and Electromagnetic Studies of Compact Binary Mergers conference, Santa Barbara, California

40. "Supercomputer simulations of colliding black holes" — Jan. 2012
Physics Department Colloquium, California State University, Fullerton, California

41. "Numerical simulations of coalescing black holes with nearly extremal spins: gravitational waveforms and horizon dynamics" — Sep. 2011
Center for Computational Relativity and Gravitation Seminar, Rochester Institute of Technology, Rochester, New York

42. "Simulating merging black holes with spins above the Bowen-York limit" — May 2011
Advances and Challenges in Computational General Relativity Workshop, Providence, Rhode Island

43. "Implicit-explicit evolutions of black-hole spacetimes" Apr. 2010
"Selected Topics in Analysis and Numerics for PDEs" session,
Spring 2010 Meeting of the Western Section of the American Mathematical Society, Albuquerque, New Mexico

44. "Numerical simulations of binary black holes with nearly extremal spins" Nov. 2009
Center for Gravitational Wave Physics Seminar, Penn State University, University Park, Pennsylvania

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, Californi*a

49. "Improving binary-black-hole initial data" Nov. 2007
General Relativity and Astrophysics Seminar, University of Illinois at Urbana-Champaign, Urbana, Illinois

TABLE OF CONTENTS

Curriculum Vitae

Michael Eric Loverude
Department of Physics
California State University Fullerton
Fullerton, CA 92834
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mloverude@fullerton.edu

Professional History

Professional Experience

California State University Fullerton (CSUF) **Fullerton, California**

Director, Catalyst Center, January 2011 – January 2017

Professor, Department of Physics, August 2010 - present

Associate Professor, Department of Physics, August 2005- July 2010

Assistant Professor, Department of Physics, August 1999 – July 2005

University of Washington **Seattle, Washington**

Research Associate (post doc), Physics Education Group, Department of Physics, June -August 1999

Research Assistant, Physics Education Group, Department of Physics, Sept 1993 - June 1999.

Booker T. Washington High School **New Orleans, Louisiana**

General Science Teacher *1990 - 1992*

Education

University of Washington **Seattle, Washington**

Ph.D., Physics, June 1999.

M.S. Physics, June 1994

Dissertation: Investigation of student understanding of hydrostatics and thermal physics and of the underlying concepts from mechanics. *Advisor: Lillian C. McDermott.*

Tulane University **New Orleans, Louisiana**

Secondary science certification program, January 1991 - June 1992. Dean's List.

Carleton College **Northfield, Minnesota**

B.A., Physics, cum laude, June 1990. National Merit Scholar.

Awards and Honors

CSUF College of Natural Sciences and Mathematics (CNSM) Distinguished Faculty Member, 2016

CSUF Carol M. Barnes Excellence in Teaching Award, 2009

Catalyst center fellow, 2009 - 2012

Robert and Louise Lee Collaborative Teaching Award, 2006

CSUF CNSM Outstanding Teaching award, 2006

CSUF Recognition Award, Outstanding Scholarly and Creative Activity, 2004, 2010

CSUF Teacher-Scholar Recognition, 2002

CSUF CNSM Student's Choice award, 2002

External Grants and Fellowships (Funded)

1. National Science Foundation IES grant PHYS-1912660: Collaborative Research: Beyond procedures: a research-based approach to teaching mathematical methods in physics," 1/2020-present, (in collaboration with J Thompson, University of Maine, W Christensen, North Dakota State University), CSUF portion: $312,804.
2. National Science Foundation INCLUDES grant HRD-1649240: "$(STEM)^3$: Scaling $(STEM)^2$," $299,263 (M. Filowitz PI, Loverude coPI).
3. National Science Foundation EIR grant PHYS-1406035: "Collaborative Research: Research on Teaching and Learning at the Mathematics-Physics Interface," 9/2014-9/2020, (in collaboration with J Thompson, University of Maine), CSUF portion: $264,262.
4. National Science Foundation IUSE grant DUE 1432829: "Interdisciplinary Assessment of Supplemental Instruction and Attitudes in STEM," (Loverude CoPI, PI Phil Janowicz CSUF), 9/14-present, $349,491.
5. United States Department of Education Fund for Improvement of Post-Secondary Education, "Catalyst Center," Congressionally-directed grant (P116Z090274), $274,000.
6. United States Department of Education Fund for Improvement of Post-Secondary Education, "Catalyst Center," Congressionally-directed grant (P116Z100226), $300,000.
7. National Science Foundation CCLI grant DUE-0817335: "Collaborative Proposal: Teaching and Learning of Thermal Physics," PI: Loverude (in collaboration with PIs J. Thompson, University of Maine, and D. Meltzer, Arizona State University - Polytechnic Campus). CSUF Portion: $160,000.
8. National Science Foundation CCLI grant DUE-0341560, Collaborative Proposal: Research-Based Labs in Introductory Physics, PI: Loverude (in collaboration with PIs S. Kanim, New Mexico State University, and L. Ortiz, Arizona State University). CSUF portion $142,000.
9. Boeing grant: A Proposal to Enhance Physics / Chemistry 102, "Physical Science for Future Elementary Teachers," (in collaboration with Barbara Gonzalez and Roger Nanes), $20,000 per year, 2005-2006 and 2006 - 2007 academic years.

Dr. Victoria Costa from CSUF was the original PI and lead author on #5 and 6; I took over as PI when assuming the role of Catalyst director in 2011.

Other selected recent grant activity

1. Proposals related to K-12 STEM education
   - Jeff Knott California Math and Science Project grant with Westminster USD, $650K (science team)
   - Joel Abraham et al, California State University Chancellor's Office NGSS course development grant, $40K (evaluation team)
   - Megan Tommerup California Math and Science Project 2015 (science team)

2. Program evaluation projects through Catalyst Center ($10K each):
   - Maria Grant & Discovery Science Center, *Dynamic Earth 360*
   - Maria Grant & Discovery Science Center, *Air Quality Lab*

Intramural Grants and Fellowships (Funded)

1. "A cross-discipline investigation of student understanding of the particulate nature of matter," CSUF GE Commitee award 2006, $10,000 (with K. Monteyne and B. Gonzalez, CSUF Department of Chemistry and Biochemistry).
2. "Assessing cross-disciplinary understanding of the particulate nature of matter," Robert and Louise Lee award for Collaborative Teaching 2006, $1500 (with K. Monteyne and B. Gonzalez, CSUF Department of Chemistry and Biochemistry).
3. "Identifying and addressing conceptual difficulties in hydrostatics," CSUF Untenured faculty award 2003, $170 + 3 WTU released time.
4. "Interactive Lecture Materials for a General Education Course in Physics," CSUF FEID award 2002, $310 + 3 WTU released time.
5. "Assessment of laboratories in introductory mechanics," CSUF FEID 2001, $300.
6. "Implementation and assessment of Microcomputer-Based Laboratory instruction in introductory mechanics," State Special Fund Mini-Grant 1999, $5000.
7. "Investigation of student understanding of concepts in thermal physics," CSUF Untenured faculty award 1999, $500.

Peer-Reviewed Publications

*CSUF Undergraduate, **CSUF MS student, ***graduate student elsewhere

1. Pachi Her* and M. E. Loverude, "Examining Student Application of Matrix Algebra and Eigentheory," *PERC Conference Proceedings 2020.*

2. Abolaji Akinyemi***, J.R. Thompson, and M. E. Loverude, "Linking Terms to Physical Significance as an Evaluation Strategy," *RUME Conference Proceedings 2020.*

3. M. E. Loverude and Henry Taylor*, "Student Responses to an Unfamiliar Graphical Representation of Motion," *RUME Conference Proceedings 2020.*

4. Charlotte Zimmerman***, Alexis Olsho, M.E. Loverude, and Suzanne White Brahmia, "Identifying Covariational Reasoning Behaviors in Expert Physicists in Graphing Tasks, *RUME Conference Proceedings 2020.*

5. Brian Farlow***, Marlene Vega**, Michael E. Loverude, and Warren M. Christensen, "Mapping activation of resources among upper division physics students in non-Cartesian coordinate systems: A case study," *Phys. Rev. Phys. Educ. Res.* **15**, 020125 –2019.

6. Anthony Piña*, M. E. Loverude, "Presentation of integrals in introductory physics textbooks," *2019 Physics Education Research Conference proceedings.*

7. Charlotte Zimmerman***, A. Olsho, M. E. Loverude, A Boudreaux, T Smith, and S. W. Brahmia, "Toward Understanding and Characterizing Expert Physics Covariational Reasoning," *2019 Physics Education Research Conference proceedings.*

8. Mikayla Mays**, M. E. Loverude, "Student Interpretation of Coefficients in Fourier Series," *2018 Physics Education Research Conference proceedings*.

9. Henry Taylor*, M. E. Loverude, "'So it's the same equation...': A blending analysis of student reasoning with functions in kinematics," *2018 Physics Education Research Conference proceedings*.

10. Michael E. Loverude, Mathematization and the 'Boas course,' *2017 Physics Education Research Conference (PERC) Proceedings*.

11. Marlene Vega*, Warren Christensen, Brian Farlow***, Gina Passante, and Michael Loverude, Student understanding of unit vectors and coordinate systems beyond cartesian coordinates in upper division physics course, *2016 Physics Education Research Conference (PERC) Proceedings*.

12. Michael E. Loverude, Beyond procedures: quantitative reasoning in upper-division math methods in physics, *XIX Annual Conference Proceedings on Research in Undergraduate Mathematics Education* (2016).

13. Michael E. Loverude and Bradley S. Ambrose, Editorial: Focused Collection: PER in Upper-Division Physics Courses, *Phys. Rev. ST PER* 11, 020002 (2015).

14. Michael E. Loverude, Identifying student resources in reasoning about entropy and the approach to thermal equilibrium, *Phys. Rev. ST PER* 11, 020118 (2015).

15. Michael E. Loverude, Quantitative reasoning skills in math methods, 2015 *Physics Education Research Conference Proceedings* [College Park, MD, July 29-30, 2015], edited by A. D. Churukian, D. L. Jones, and Lin Ding, doi:10.1119/perc.2015.pr.046

16. Michael E. Loverude and Sissi L. Li, Surprisingly, there is an actual physical application…" Student understanding in Math Methods, *2013 PERC Proceedings* [Portland, OR, July 17-18, 2013], edited by P. V. Engelhardt, A. D. Churukian, and D. L. Jones, doi:10.1119/perc.2013.pr.045.

17. Michael E. Loverude, They still remember what I never taught them: Student understanding of Entropy. *2012 Physics Education Research Conference Proceedings* [Philadelphia, PA, August 1-2, 2012], edited by P. V. Engelhardt, A. D. Churukian, and N. S. Rebello AIP Conference Proceedings, 1513 (2012), 266-269. 10.1063/1.4789703

18. Sissi L. Li and Michael Loverude, Identity and Belonging: Are You a Physicist (Chemist)?, *2012 Physics Education Research Conference Proceedings* [Philadelphia, PA, August 1-2, 2012], edited by P. V. Engelhardt, A. D. Churukian, and N. S. Rebello [AIP Conf. Proc. 1513, 246-249 (2013)].

19. Casey Sanchez* and Michael Loverude, Further investigation of examining students understanding of Lenz's law and Faraday's law, *2011 Physics Education Research Conference Proceedings* [Omaha, NE, August 3-4, 2011], edited by N. S. Rebello, P. V. Engelhardt, and C. Singh [AIP Conf. Proc. 1413, 335-338 (2012)], doi:10.1063/1.3680063.

20. Michael E. Loverude, "Assessment to match research-based instruction in upper-division courses," *2011 Physics Education Research Conference Proceedings,* [Omaha, NE, August 3-4, 2011], edited by N. S. Rebello, P. V. Engelhardt, and C. Singh [AIP Conf. Proc. 1413, 51-54 (2012)]

21. "An inquiry-based course in chemistry and physics for preservice K-8 teachers," M. E. Loverude, B. L. Gonzalez, and R. Nanes, *Physical Review Special Topics: Physics Education Research* **7** (1), 010106 (2011).

22. "An inquiry-based course in chemistry and physics for preservice K-8 teachers," M. E. Loverude, B. L. Gonzalez, and R. Nanes, in *Teacher Education in Physics*, D. Meltzer and P. Shaffer, eds., (American Physical Society, College Park, 2011).

23. M. E. Loverude, "Investigating Student Understanding for a Statistical Analysis of Two Thermally Interacting Solids," *2010 Physics Education Research Conference,* M. Sabella, C. Singh, S. Rebello, eds., AIP Conference Proceedings (2010).

24. Michael E. Loverude, "Student Understanding of Basic Probability Concepts in an Upper-Division Thermal Physics Course," in *2009 Physics Education Research Conference,* C. Henderson, M. Sabella, C. Singh, eds., AIP Conference Proceedings **1179** (2009).

25. "Identifying and addressing student difficulties with the concept of pressure in a static liquid," M.E. Loverude, C.H. Kautz, and P.R.L. Heron, *American Journal of Physics* 78. 75 – 85, January 2010.

26. "A research-based interactive lecture demonstration on sinking and floating," M.E. Loverude, *American Journal of Physics* 77, 897 – 901, September 2009.

27. "Curriculum design for the algebra-based course: Just change the `d's to deltas?", M. E. Loverude, S. E. Kanim, and L. Gomez, invited paper in *2008 Physics Education Research Conference Proceedings,* pp. 34-37, July 2008.

28. "An interdisciplinary study of student ability to connect particulate and macroscopic representations of a gas," K. Monteyne, B. L. Gonzalez, and M. E. Loverude, contributed paper in *2008 Physics Education Research Conference Proceedings,* pp. 163-166, July 2008.

29. "A failing grade for physics content examinations," S.E. Kanim, and M.E. Loverude, *The Physics Teacher* 44, pp. 101-105, February 2006.

30. "Student understanding of the ideal gas law. Part I: A macroscopic perspective," C.H. Kautz, P.R.L. Heron, M.E. Loverude, and L.C. McDermott, *American Journal of Physics* 73, 1056 – 1063, October 2005.

31. "Student understanding of gravitational potential energy and the motion of bodies in a gravitational field," M.E. Loverude, *Physics Education Research Conference Proceedings,* July 2004.

32. "Helping students develop an understanding of Archimedes' Principle: Development of research-based instructional materials," P.R.L. Heron, M.E. Loverude, P. S. Shaffer, and L.C. McDermott, *American Journal of Physics* 71, No. 11, pp. 1188 - 1195, November 2003.

33. "Helping students develop an understanding of Archimedes' Principle: Research on Student understanding," M.E. Loverude, C. H. Kautz, and P.R.L. Heron, *American Journal of Physics* 71, No. 11, pp. 1178 - 1187, November 2003.

34. "Measuring the effectiveness of research-based curriculum at a university serving a diverse student population," M.E. Loverude, invited paper in *Physics Education Research Conference Proceedings,* July 2003.

35. "Do students conceptualize energy as a material substance?" M.E. Loverude, *Physics Education Research Conference Proceedings,* July 2002.

36. "Student understanding of the first law of thermodynamics: Relating work to the adiabatic compression of an ideal gas," M.E. Loverude, C.H. Kautz, and P.R.L. Heron, *American Journal of Physics* 70, No. 2, pp. 137-148, February 2002

37. "Student Understanding of Density: A Cross-Age Study," R.Yeend**, M.E. Loverude, and B.S. Gonzalez*, Physics Education Research Conference Proceedings,* July 2001.

38. "An active introduction to evolution," *The American Biology Teacher* 60 (2), February 1998, pp. 132-136 (with Michael C. Lach).

Publications in preparation and under review

39. Abolaji Akinyemi***, M. E. Loverude, and J.R. Thompson, Student solution evaluation strategies across multiple tasks and levels. Anticipated submission to *Phys Rev Physics Education Research* Winter 2022.

40. Abolaji Akinyemi***, J.R. Thompson, and M. E. Loverude, Identification of grouping in student evaluation strategies. Anticipated submission to *Phys Rev Physics Education Research* Spring 2022.

41. Michael E. Loverude, Research and curriculum development on student understanding of the microcanonical ensemble, Part I: Counting Microstates; submitted to Physical Review Physics Education Research.

42. Michael E. Loverude, Research and curriculum development on student understanding of the microcanonical ensemble, Part II: Bridge to the Second Law; submitted to Physical Review Physics Education Research.

Reports and other non-peer-reviewed publications

43. Physics Education Research and the 'Math Methods' course, M. E. Loverude, *American Physical Society Forum for Education Newsletter* Fall 2016.

44. "Collaboration, A Working Group Report from the Foundations and Frontiers in Physics Education Research Conference," M. Stetzer and M.E. Loverude, *American Physical Society Forum for Education Newsletter*, Fall 2009.

45. Costa, V., Gonzalez, B., Loverude, M., Tommerup, M., Carlson, G., Yopp-Edwards, R., and Renne, C. (2009). Undergraduate Science Preparation for Future Elementary/Middle School Teachers at California State University Fullerton. Report to the California State University Chancellor's Office. Fullerton, CA: CATALYST Center.

46. "Querying Other Fields, A Working Group Report from the Foundations and Frontiers in Physics Education Research Conference, A. Elby and M.E. Loverude, *American Physical Society Forum for Education Newsletter*, Fall 2005.

Curriculum Development Experience

Co-author of materials for Math Methods, funded by NSF EIR grant.

Co-author of *Tutorials in Thermal Physics*, series of curricular activities funded by NSF CCLI grant. See PhysPort.org

Co-author of *Research-Based Laboratories in Introductory Mechanics*, series of laboratory activities funded by NSF CCLI grant.

Contributions to *Inquiry Into Physical Science,* R. Nanes (Kendall-Hunt, Dubuque, 2008).

Contributions to *Tutorials in Introductory Physics,* Lillian C. McDermott, Peter S. Shaffer, and the Physics Education Group at the University of Washington (Prentice-Hall, Upper Saddle River, NJ, 2001).

Contributions to *Physics by Inquiry,* Lillian C. McDermott and the Physics Education Group at the University of Washington (John Wiley and Sons, Inc., New York, 1996).

Invited Talks and Posters

1. Michael E. Loverude and H. Taylor, Prompting sense-making with bidirectional reasoning using a convention breaking representation in kinematics, invited presentation in parallel session 2021 Physics Education Research Conference, July 2021.

2. Michael E. Loverude, Mathematization and the 'Boas course,' juried talk, 2017 Physics Education Research Conference, July 2017.

3. Marlene Vega and Michael Loverude, Student resources in polar coordinates, invited talk, Physics Education Research Conference, July 2017.

4. Michael Loverude, Math, transfer and socialization in upper-division physics, plenary presentation, Foundations and Frontiers in Physics Education Research: Puget Sound, June 2016.

5. Michael Loverude, John Thompson, and Joe Wagner, Collaborative Project: Research on student learning at the Physics-Mathematics interface, invited poster, AAAS – NSF conference on IUSE program, Washington, DC, April 2016.

6. Michael Loverude, Discipline-based Education Research: A View From Physics, invited talk, Inter-Club Council Symposium, California State University Fullerton, March 2016.

7. Michael Loverude, Physics Education Research and the Upper Division, physics department colloquium, Texas A&M University Commerce, Commerce, TX, February 2016.

8. Michael Loverude and Warren Christensen, invited panelists, Panel of Support and Information for Graduation Students, Winter National Meeting of the Amercian Association of Physics Teachers, San Diego, CA, January 2015.

9. Michael Loverude, 'Surrounded by nerds,' Physics education research and the upper division, invited talk, Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) national meeting, Los Angeles, October 2014.

10. Michael Loverude, Getting Started: Physics Education Research and the Upper Division, invited talk, American Association of Physics Teachers national meeting, Minneapolis, MN, July 2014.

11. Barbara Gonzalez, Sissi L. Li, and Michael Loverude, Review of an Integrated Physical Science Course for K-8 Teachers. Talk presented at the American Association of Physics Teachers Conference, Minneapolis, MN, July 2014.

12. Michael Loverude, Results from Thermal Physics, invited presentation at Status of Upper-Division Physics Workshop, Corvallis, OR, June 2014.

13. Michael Loverude, Physics education research and the upper division, plenary talk, Joint Meeting of the Texas Sections of the American Physical Society and American Association of Physics Teachers, April 2014,

14. Michael Loverude, Collaborative Engagement across Science and Engineering (CESE): A pre-service teacher education initiative, invited presentation at CSU Southern Symposium on STEM Education, CSU Los Angeles, March 2014.

15. Michael Loverude, Physics Education Research in the upper division, physics department colloquium, San Francisco State University, May 2013.

16. Michael Loverude, An Introduction to Physics Education Research, Inter Club Council Symposium, California State University Fullerton, March 2013.

17. Michael Loverude, Collaborative Project: Research on the Teaching and Learning of Thermal Physics. Invited poster presented at TUES principal investigator conference, Washington, DC. National Science Foundation, January 2013.

18. Michael Loverude, An inquiry-based course in physics and chemistry for pre-service teachers. Invited talk presented at American Association of Physics Teachers Winter national meeting, New Orleans, LA, January 2013.

19. Michael Loverude, Physics Education Research and the upper division, physics department colloquium, California State University Long Beach, October 2012.

20. M.E. Loverude, "They still remember what I never taught them; student understanding of entropy," invited poster at Physics Education Research Conference, Philadelphia, PA (August 2012).

21. Li, Sissi L., and Michael E. Loverude (2012, August). Identity and belonging: Are you a physicist (chemist)?. Invited poster presented at Physics Education Research Conference, Philadelphia, PA. PERC Organizing Committee.

22. Michael Loverude, Physics Education Resarch in upper-division physics core courses: To the 300-level, and beyond! Physics department colloquium, California Polytechnic University Pomona, December 2011.

23. M.E. Loverude, "Assessment to match research-based instruction in upper-division courses," invited poster at Physics Education Research Conference, Omaha, NE, (August 2011).

24. M.E. Loverude, "PER in the upper division," plenary talk at 2011 Foundations and Frontiers in Physics Education Research conference, Bar Harbor, ME (June 2011).

25. M.E. Loverude, "PER in the upper division," invited presentation to NRC Committee on Undergraduate Physics Education Research and Implementation, Irvine, CA (June 2011).

26. M.E. Loverude, "Research on the teaching and learning of thermal physics," invited talk at 2010 Southern California section meeting of American Association of Physics Teachers, Asuza Pacific University, Asuza, CA (November 2010).

27. M.E. Loverude, "What do we know and how do we know it," invited talk at Upper-Division Physics Education Research workshop, Wabash College, Crawfordsville, IN (August 2010).

28. M.E. Loverude, "Your Chocolate is in my Peanut Butter," plenary talk at TRUSE conference, Orono, ME (June 2010).

29. “Making lemonade,” M. E. Loverude, Foundations and Frontiers in Physics Education Research, Bar Harbor, ME (invited poster), July 2007.

30. “Research on student understanding of matter and energy in college physics and chemistry course,” M. E. Loverude, American Chemical Society regional meeting, Reno, NV, June 2006 (invited).

31. “Student understanding of energy,” M.E. Loverude, APS March meeting, Los Angeles, CA, March 2005 (invited).

32. “Student understanding of energy in courses for non-science majors,” M.E. Loverude, AAPT winter meeting, Albuquerque, NM, January 2005 (invited).

33. “Measuring the effectiveness of research-based curriculum at a university serving a diverse student population,” M.E. Loverude, targeted poster session, Physics Education Research Conference, Madison, WI, July 2003 (invited).

34. “Student understanding of the first law of thermodynamics,” M.E. Loverude, American Physical Society meeting, Indianapolis, IN, March 2002.

35. “Student understanding of the first law of thermodynamics,” M.E. Loverude, Physics Department Seminar, California State University Long Beach, October 2001.

36. “Student understanding of the first law of thermodynamics,” M.E. Loverude, Physics Department Seminar, California Polytechnic State University Pomona, May 2001.

37. “Student understanding of the first law of thermodynamics,” M.E. Loverude, Center for Excellence in Science and Math Education, Cal State Fullerton, March 2001.

38. “Student understanding of the first law of thermodynamics,” M.E. Loverude, Gordon Research Conference on Thermal and Statistical Physics, June 2000.

Contributed Talks and Posters

1. Pachi Her, Examining student understanding of matrix multiplication and eigentheory, contributed talk, 2020 Physics Education Research Conference (virtual).

2. Anderson Fung, Ordinary differential equations in math and physics: some preliminary observations, contributed talk, 2020 American Association of Physics Teachers conference (virtual).

3. Pachi Her, Examining student understanding of matrix multiplication and eigentheory, contributed talk, 2020 American Association of Physics Teachers conference (virtual).

4. Anderson Fung, Ordinary differential equations in math and physics: some preliminary observations, contributed talk, 2020 Physics Education Research Conference (virtual).

5. M. E. Loverude and Henry Taylor, “Student Responses to an Unfamiliar Graphical Representation of Motion,” contributed talk, Research in Undergraduate Mathematics Education Conference, Boston, MA (2020)

6. Abolaji Akinyemi, M. E. Loverude, and J. R. Thompson, Linking terms to physical significance as an evaluation strategy, contributed poster, 2019 Physics Education Research Conference.

7. Anderson Fung, M. E. Loverude, “An Exploration of Students' Concept Images of Ordinary Differential Equations,” contributed poster, 2019 Physics Education Research Conference.

8. Pachi Her, M. E. Loverude, “Students' Understanding of Matrix Algebra and Eigentheory,” contributed poster, 2019 Physics Education Research Conference.

9. Anthony Piña, M. E. Loverude, “Presentation of integrals in introductory physics textbooks,” contributed poster, 2019 Physics Education Research Conference proceedings.

10. Charlotte Zimmerman, A. Olsho, M. E. Loverude, A Boudreaux, T Smith, and S. W. Brahmia, “Toward Understanding and Characterizing Expert Physics Covariational Reasoning,” contributed poster, 2019 Physics Education Research Conference proceedings.

11. Mikayla Mays**, M. E. Loverude, “Student Interpretation of Coefficients in Fourier Series,” contributed poster, 2018 Physics Education Research Conference, Washington, DC, July 2018.

12. Anthony Piña*, M. E. Loverude, “Student Blending in Math and Physics Integration Problems,” contributed poster, 2018 Physics Education Research Conference, Washington, DC, July 2018.

13. Henry Taylor*, M. E. Loverude, “‘So it’s the same equation...’: A blending analysis of student reasoning with functions in kinematics,” contributed poster, 2018 Physics Education Research Conference, Washington, DC, July 2018.

14. M. E. Loverude, “Evolution of the vector concept in a math methods course,” AAPT national meeting, Washington, DC, July 2018.

15. M. E. Loverude, “Student reasoning with complex numbers in upper-division physics,” Research in Undergraduate Math Education, San Diego, CA, February 2018.

16. Mikayla Mays* and M. E. Loverude, “Student understanding of Fourier series,” Physics Education Research Conference, Cincinnati, OH, July 2017.

17. Brian D. Farlow***, Warren Christensen, Marlene Vega**, and Michael Loverude, “Addressing Student Ideas About Coordinate Systems in the Upper Division,” AAPT national meeting, Cincinnati, OH, July 2017.

18. M. E. Loverude, "Assessing and Developing Mathematical Reasoning in Upper-Division Physics," contributed talk, AAPT national meeting, Cincinnati, OH, July 2017.

19. Mikayla Mays*, "Student understanding of Fourier series," AAPT national meeting, Cincinnati, OH, July 2017.

20. Marlene Vega**, Michael Loverude, Brian Farlow***, Warren Christensen, Student Unit Vector Resources in Polar Coordinates, AAPT national meeting, Cincinnati, OH, July 2017.

21. Brian D. Farlow***, Marlene Vega**, Michael Loverude, Warren Christensen, Upper-division Physics Student Thinking Regarding Non-Cartesian Coordinate Systems, contributed poster, TRUSE Conference, St. Paul, MN, July 2017.

22. Michael Loverude, Student reasoning with differentials and derivatives in upper-division physics, contributed poster at Research in Undergraduate Mathematics Education annual conference, San Diego, CA, February 2017.

23. Warren Christensen, Brian Farlow***, Marlene Vega**, and Michael Loverude, Upper-division physics student thinking regarding non-Cartesian coordinate systems, contributed poster, Research in Undergraduate Mathematics Education annual conference, San Diego, CA, February 2017.

24. Michael Loverude, Deltas, differentials, and derivatives: Navigating the mathematics of change, contributed poster at 2016 Physics Education Research Conference, Sacramento, CA July 2016.

25. Mikayla Mays* and Michael Loverude, Pedantic and Unnecessary: Student use of units in problems involving integrals, contributed poster at 2016 Physics Education Research Conference, Sacramento, CA, July 2016.

26. Marlene Vega*, Warren Christensen, Brian Farlow***, Gina Passante, and Michael Loverude, Student understanding of unit vectors and coordinate systems beyond cartesian coordinates in upper division physics course, contributed poster at 2016 Physics Education Research Conference, Sacramento, CA, July 2016.

27. Michael Loverude, Student reasoning with vectors throughout the physics curriculum, contributed talk at American Association of Physics Teachers summer meeting, Sacramento, CA, July 2016.

28. Michael Loverude, Beyond procedures: Quantitative reasoning in upper-division Math Methods in Physics, contributed talk, Research in Undergraduate Mathematics Education annual conference, Pittsburgh, PA, February 2016.

29. Michael Loverude, Multivariable calculus in physics, invited presentation, working group on math and physics, Research in Undergraduate Mathematics Education annual conference, Pittsburgh, PA, February 2016.

30. Michael Loverude, Student reasoning in math methods: series approximations, contributed talk at Winter National Meeting of the American Association of Physics Teachers, New Orleans, LA, January 2016.

31. Brian Farlow***, Marlene Vega*, Warren Christensen, and Michael Loverude, Student thinking regarding coordinate systems in the upper division, contributed talk at Winter National Meeting of the American Association of Physics Teachers, New Orleans, LA, January 2016.

32. Marlene Vega*, Warren Christensen, and Michael Loverude, Student understanding of non-Cartesian coordinate systems in upper-division physics, contributed talk at Winter National Meeting of the American Association of Physics Teachers, New Orleans, LA, January 2016.

33. Michael Loverude, Quantitative reasoning in math methods, contributed talk at Summer National Meeting of the American Association of Physics Teachers, College Park, MD, July 2015.

34. Michael Loverude, Quantitative reasoning in math methods, contributed poster at Physics Education Research Conference, College Park, MD, July 2015.

35. Sissi L. Li and Michael Loverude, On the Road to Becoming a Physicist: Signposts and Detours. Poster presented at the Physics Education Research Conference, Minneapolis, MN, July 2014.

36. Sissi L. Li and Michael Loverude, (2014). Women's Ways of Becoming Physicists: Identity and Trajectory. Talk presented at the American Association of Physics Teachers Conference, Minneapolis, MN.

37. Sissi L. Li and Michael Loverude, (2014). Supporting Physics Majors: More than Instruction. Poster presented at the American Association of Physics Teachers Conference, Minneapolis, MN.

38. Abraham JK, Butcher P, Loverude ME, Struckhoff G, Tommerup M, Li S, Weaver-Bowman K, Collaborative Engagement across Science and Engineering (CESE): A pre-service teacher education initiative, contributed poster at CSU Teaching and Learning Symposium 2014, San Marcos, CA.

39. Sissi Li, Heather Chilton*, Michael Loverude, Jocelyn Read, Gabriela Serna*, Joshua Smith, Introductory astronomy course reform: Our journey so far, contributed talk at CSU Teaching and Learning Symposium 2014, San Marcos, Ca.

40. Sissi L. Li and Michael Loverude , Demon-facilitated understanding of entropy: A cognitive and community approach. Contributed talk presented at National Association for Research in Science Teaching annual meeting, San Juan, PR, March 2013.

41. April Hankins**, Michael Loverude, Gabriela Serna*, Sissi L. Li, & Joshua Smith, Do Proportional Reasoning Skills Affect Student Performance in Introductory

Astronomy? Contributed poster at American Association of Physics Teachers Winter national meeting, New Orleans, LA, January 2013.

42. Michael Loverude, Student connections between multiplicity and macroscopic entropy Contributed talk, American Association of Physics Teachers Winter national meeting, New Orleans, LA, January 2013.

43. Serna, Gabriela*, Michael Loverude, and Joshua Smith (2012, October): Assessing instructional reformation in introductory astronomy Contributed poster, Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) national meeting, Seattle, WA.

44. Loverude, Michael E. (2012, August): Community and collaboration in upper-division physics courses Contributed talk, American Association of Physics Teachers Summer national meeting, Philadelphia, PA.

45. Li, Sissi L., and Michael E. Loverude (2012, August): Learning practices in physics Contributed talk, American Association of Physics Teachers Summer national meeting, Philadelphia, PA.

46. Li, Sissi L., Michael Loverude (2012, August): How do physics majors assert their physics identity? Contributed poster, American Association of Physics Teachers Summer national meeting, Philadelphia, PA.

47. Emenike, Mary E., and Michael E. Loverude (2012, June): Investigating Supplemental Instruction through interviews with faculty members and students Contributed poster, Transforming Research in Undergraduate STEM Education conference, St. Paul, MN.

48. Li, Sissi L., and Michael E. Loverude (2012, June): Becoming chemists and physicists: A community perspective Contributed poster, Transforming Research in Undergraduate STEM Education conference, St. Paul, MN.

49. Loverude, Michael E. (2012, June): Student understanding of the approach to thermal equlibrium Contributed poster, Transforming Research in Undergraduate STEM Education conference, St. Paul, MN.

50. S. Li and M.E. Loverude, "Identity and belonging: Are you a physicist (chemist)?," invited poster at Physics Education Research Conference, Philadelphia, PA (August 2012).

51. S. Li and M.E. Loverude, "How do physics majors assert their physics identity," contributed poster at American Association of Physics Teachers summer meeting, Philadelphia, PA (August 2012).

52. S. Li and M.E. Loverude, "Learning practices of physics," contributed talk at American Association of Physics Teachers summer meeting, Philadelphia, PA (August 2012).

53. S. Li and M. E. Loverude, "Becoming chemists and physicists: A community perspective," contributed poster at Transforming Research in Undergraduate STEM Education (TRUSE) Conference, Minneapolis, MN (June 2012).

54. M.E. Loverude, "Student understanding of the approach to thermal equilibrium," contributed poster at Transforming Research in Undergraduate STEM Education (TRUSE) Conference, Minneapolis, MN (June 2012).

55. M. E. Emenike and M. E. Loverude, "Investigating Supplemental Instruction through interviews with faculty members and students" _ Transforming Research in Undergraduate STEM Education (TRUSE): A Conference to Promote the Integration of Research on Undergraduate Mathematics, Physics, and Chemistry Education, University of St. Thomas, St. Paul, MN, 6/3-7/2012.

56. Emenike, M. E., M. Loverude, B. Gonzalez, "Faculty members' experiences with, and perceptions of, Supplemental Instruction (SI) across chemistry, biology, physics, and math disciplines: A qualitative investigation" 243rd national ACS meeting, San Diego, CA, 3/25/2012.

57. M.E. Loverude, "Research-based instruction in upper-division physics courses," contributed talk at American Association of Physics Teachers winter meeting, Ontario, CA (January 2012).

58. M.E. Loverude, "Student understanding of the approach to thermal equilibrium," contributed talk at 2011 American Association of Physics Teachers meeting, Omaha, NE (August 2011).

59. M.E. Loverude, "Student understanding of micro and macro in thermal physics, contributed talk at 2010 American Association of Physics Teachers meeting, Portland, OR (July 2010).

60. M.E. Loverude, "Investigating Student Understanding for a Statistical Analysis of Two Thermally Interacting Solids," contributed poster at 2010 Physics Education Research Conference, Portland, OR (July 2010).

61. M.E. Loverude, "Student Understanding of Basic Probability Concepts in an Upper-Division Thermal Physics Course," contributed talk at American Physical Society March Meeting, Portland, OR (March 2010).

62. "Student understanding of basic probability concepts in an upper-division thermal physics course," M. E. Loverude, poster presented at *Physics Education Research Conference,* Ann Arbor, MI, July 2009.

63. "Student understanding in upper-division physics and chemistry courses covering thermodynamics," M. E. Loverude, talk presented at American Association of Physics Teachers meeting, Ann Arbor, MI, July 2009.

64. “Student understanding of Lenz’ law and Faraday’s law,” C. W. Sanchez (CSUF Undergraduate) and M. E. Loveude, poster presented at American Association of Physics Teachers meeting, Ann Arbor, MI, July 2009.

65. “Curriculum design for the algebra-based course: Just change the `d's to deltas?”, M. E. Loverude, S. E. Kanim, and L. Gomez, Physics Education Research Conference, Edmonton, AB, July 2008 (invited).

66. “An interdisciplinary study of student ability to connect particulate and macroscopic representations of a gas,” K. Monteyne, B. L. Gonzalez, and M. E. Loverude, , Physics Education Research Conference, Edmonton, AB, July 2008.

67. “An interdisciplinary study of student ability to connect particulate and macroscopic representations of a gas,” K. Monteyne, B. L. Gonzalez, and M. E. Loverude, Biennial Conference on Chemical Education, Indianapolis, IN, July 2008.

68. “An exploration of student understanding of the connection between particulate models and macroscopic properties of gases,” K. Monteyne, B. L. Gonzalez, and M.E. Loverude, Physics Education Research Conference, Greensboro, NC, July 2007.

69. “Student understanding of kinematics graphs in algebra- and calculus-based mechanics courses,” M.E. Loverude, S. E. Kanim, and L. G. Ortiz, AAPT summer meeting, Greensboro, NC, July 2007.

70. “Student understanding of probability and introductory statistical physics,” M. E. Loverude, AAPT winter meeting, Seattle, WA, January 2007.

71. “Research on student understanding of matter and energy in college physics and chemistry course,” M. E. Loverude, Biennial Conference on Chemical Education, Purdue, IN, July 2006 (invited).

72. “Student understanding of momentum and energy,” M. E. Loverude, AAPT summer meeting, Syracuse, NY, July 2006.

73. “Research-based Laboratories for Algebra-Based Mechanics,” S.E. Kanim, L.G. Ortiz, and M.E. Loverude, AAPT winter meeting, Anchorage, AK, January 2006.

74. “Identifying student difficulties with projectile motion,” B. W. Frank, L. G. Ortiz, S. E. Kanim, and M. E. Loverude, AAPT summer meeting, Salt Lake City, UT, July 2005.

75. “Identifying student difficulties with projectile motion,” B. W. Frank, L. G. Ortiz, S. E. Kanim, and M. E. Loverude, International Conference on Physics Education, Delhi, India, July 2005.

76. “Student understanding of gravitational potential energy and the motion of bodies in a gravitational field,” M.E. Loverude, AAPT summer meeting, Sacramento, CA, and Physics Education Research Conference, Sacramento, CA, both in August 2004.

77. "Do students treat energy as a material substance?" M.E. Loverude, AAPT summer meeting, Boise, ID, July 2002.

78. "Do students treat energy as a material substance?" M.E. Loverude, Physics Education Research Conference, Boise, ID, July 2002.

79. "Student assessment in an inquiry-based physical science course for prospective elementary teachers," R. Nanes, M.E. Loverude, and B.L. Gonzalez, AAPT winter meeting, Philadelphia, PA, January 2002.

80. "Student conceptions of energy among non-science majors," M.E. Loverude, AAPT summer meeting, Rochester, NY, July 2001.

81. "Student Understanding of Density: A Cross-Age Study," R. Yeend, M.E. Loverude, and B.S. Gonzalez, Physics Education Research Conference, Rochester, NY, July 2001.

82. "An investigation of student understanding of pressure in fluids," M.E. Loverude, AAPT-AAS joint meeting, San Diego, CA, January 2001.

83. "Student understanding of hydrostatic pressure," M.E. Loverude, C.H. Kautz, P.R.L. Heron, and L.C. McDermott, AAPT summer meeting, Guelph, ON, August 2000.

84. "Student understanding of hydrostatics and thermal physics and the underlying concepts from mechanics," M.E. Loverude, C.H. Kautz, P.R.L. Heron, and L.C. McDermott, AAPT summer meeting, San Antonio, TX, August 1999.

85. "Student understanding of hydrostatics and thermal physics and the underlying concepts from mechanics," M.E. Loverude (APS Northwest section meeting, Vancouver, May 1999).

86. "Investigation of student difficulties in thermal physics and their roots in mechanics," M.E. Loverude, C.H. Kautz, P.R.L. Heron, and L.C. McDermott (APS/AAPT Centennial meeting, Atlanta, GA, March 1999).

87. "Identifying student difficulties in interpreting and applying the ideal gas law," C.H. Kautz, M.E. Loverude, P.R.L. Heron, and L.C. McDermott (APS/AAPT Centennial meeting, Atlanta, GA, March 1999).

88. "Identifying and addressing student difficulties with Archimedes' Principle," M.E. Loverude, C.H. Kautz, P.R.L Heron, and L.C. McDermott (AAPT meeting, Lincoln, NE, August 1998).

89. "Identifying and addressing student difficulties with the ideal gas law," C.H. Kautz, M.E. Loverude, P.R.L Heron, and L.C. McDermott (Joint APS/AAPT meeting, Columbus, OH, April 1998).

90. "Identifying and addressing student difficulties with the first law of thermodynamics," M.E. Loverude, C.H. Kautz, P.R.L Heron, and L.C. McDermott (PNACP meeting, Seattle, WA, March 1998).

91. "Identifying student difficulties with the first law of thermodynamics," M.E. Loverude, C.H. Kautz, P.R.L. Heron, and L.C. McDermott (AAPT Summer meeting, Denver, CO, August 1997).

92. "Identifying student difficulties with the ideal gas law," C.H. Kautz, M.E. Loverude, P.S. Shaffer, and L.C. McDermott (AAPT Summer meeting, Denver, CO, August 1997).

93. "Student understanding of thermal physics: Macroscopic variables and microscopic processes" M.E. Loverude, C.H. Kautz, P.R.L. Heron and L.C. McDermott (AAPT Winter meeting, Phoenix, AZ, January 1997).

94. "Identifying and addressing student difficulties in hydrostatics: Buoyancy," M.E. Loverude, C.H. Kautz, and L.C. McDermott (WA State AAPT meeting, Ellensburg, WA, October 1996).

95. "Investigating student understanding of the concept of pressure," C.H. Kautz, M.E. Loverude, S. Vokos, and L.C. McDermott (AAPT Summer meeting, College Park, MD, August 1996).

96. "Student difficulties in applying mechanics to thermal physics," M.E. Loverude, C.H. Kautz, S. Vokos, and L.C. McDermott (Joint APS/AAPT meeting, Indianapolis, IN, May 1996).

97. "Student difficulties in applying mechanics to hydrostatics," C.H. Kautz, M.E. Loverude, P.S. Shaffer, and L.C. McDermott (Joint APS/AAPT meeting, Indianapolis, IN, May 1996).

98. "A comparison of free-response and multiple-choice pretests," S. Kanim, C.H. Kautz, M.E. Loverude, S. Vokos, and L.C. McDermott (AAPT Summer meeting, Spokane, WA, August 1995).

Courses and Workhops Taught

California State University Fullerton	**Fullerton, California**
Physics of Sound (2)	*2020 - 2021*
Thermal and Statistical Physics (21)	*2001 – 2021*
Mathematical Methods in Physics (13)	*2008 - 2020*
Introductory Physics: Mechanics (4)	*1999, 2000, 2001, '04*
Introductory Physics: Electricity and Magnetism (4)	*Sp06, Sp07, Fa18-19*
Elementary Physics: Mechanics	*2007*
Elementary Physics: Electricity / Magnetism / Optics (3)	*2003, 2007-8, 2021*
Introductory Mechanics Laboratory (3)	*2000, 2005*
Survey of Physics (5)	*2000 - 2002*
Survey of Physics: Laboratory (2)	*Fall 1999, 2003*
Physical Science for Pre-Service Elementary Teachers (13)	*2000 - 2006*

University of Washington	**Seattle, Washington**
Summer Physics Institute for Teachers, lead instructor	*Summer 1999*
Physics by Inquiry, teaching assistant	*Sum 1994 – Spr 1999*
Graduate Teaching Seminar, lead instructor	*Fall 1993 - Spr 1999*
Tutorials in Introductory Physics, teaching assistant	*Fall 1992 - Spr 1999*

Seattle Public Schools	**Seattle, Washington**
Content workshops: Changes of State, Electric Circuits	*Fall, Summer 1998*

University of Washington	**Seattle, Washington**
Physics by Inquiry workshops (8)	*1995 - 1999*
Tutorials in Introductory Physics workshops (8)	*1997 – 2001*

Booker T. Washington High School	**New Orleans, Louisiana**
General Science	*1990 - 1992*

Service Activities

Service to the Scientific and Education Community

Planning Committee, Physics Education Research Conference 2017
Session organizer, RUME 2019, RUME 2016, AAPT 2015, PERC 2015, PERC 2007
Guest Editor, Focused Collection on Upper-Division Physics Education Research, Physical Review Special Topics – Physics Education Research
NSF Proposal reviews, approximately 8 panels reviews plus ad hoc reviews for programs including IUSE, S-STEM, and MSP (dates removed per NSF policy)
Member, Committee on Research in Physics Education, American Association of Physics Teachers, 2007- 2010
Co-chair, Planning Committee, Physics Education Research Conference, 2007
Co-chair, Planning Committee, Physics Education Research Conference, 2006
Referee, *Science and Education*
Referee, *The Physics Teacher*
Referee, *Physical Review – Physics Education Research*
Referee, *American Journal of Physics*
Referee, *Physics Education Research Conference* proceedings
Referee, *Research in Undergraduate Mathematics Education* conference submissions

Service to the College (CNSM) and University (CSUF)

Member, CSUF Student Academic Life Committee, 2019 - 2021
Member, CNSM Associate Dean Search Committee, 2020
Associate Director, Catalyst center, 2017-present
Member, CSUF Faculty Personnel Committee, 2014-2015
Member, CNSM Dean Search Committee, 2012-2013, 2013-2014
Director, Catalyst Center. 2011 - 2017
Member, CSUF WASC ReAccreditation Steering Committee, 2009 – 2012
Member, Catalyst center steering committee, 2009 - present
Chair, CSUF Graduate Education Committee, 2007 – 2008
Member, CSUF Graduate Education committee, 2006 - 2008
Member, CNSM Awards Committee, 2007 – 2009
Member, CNSM Curriculum Committee, 2002 - 2005
Member, CNSM review panel for intramural grants, 2005
Member, CNSM General Science Minor Committee, 2000-2001
Member, CNSM Planning Committee for Retreat to Evaluate Scholarship in Math and Science Education, 2000-2001
Blended Teacher Education Program (BTEP) Retreats, 2001, 2002, 2003
Member, Science Education Program Single Subject Credential Interview Panel, 1999-2002

Service to the Department of Physics

Advisor, Physics Club / Society of Physics Students, 2018 - present
Chair, Search Committee, Physics Education Research, 2014-2015
Member, Evaluation Committee, Woodward Award, 2013
Department Vice Chair, 2009 - 2012
Member, Search Committee, Gravitational Wave Physics, 2011-2012
Member, Search Committee, Instructional Support Technician, 2010
Member, Search Committee, Experimental Physics, 2008 – 2009
Member, Planning committee for department retreat, 2008
Chair, Department Personnel Committee, 2006-2007, 2008-2011, 2012-2014, 2018-21
Member, Department Personnel Committee, 2006 – 2014, 2016 - 2021
Member, Search committee for full-time lecturer, 2000
Member, Curriculum Committee, 1999-2009

Research supervision

Graduate degree (major advisor or co-advisor)

Robert Yeend	MAT-S: Fundamental Concepts of Density: Understanding and Alternative Conceptions	May 2001
Victor Gonzalez	M.S., Physics: The Impact of High School Students' Difficulties with Operational Definitions on Understanding the Ideal Gas Law	May 2004
Linda Leonard	M.S., Physics: Mathematical Modeling of Kinematics	May 2014
Marlene Vega	M.S., Physics, Student resources for unit vectors in non-Cartesian coordinate systems	May 2018
Mikayla Mays	M.S., Physics, Student understanding of coefficents in Fourier series	May 2019
Abolaji Akinyemi	Ph.D., Physics (University of Maine), Student evaluation strategies in physics	July 2021
Pachi Her	M.S., Physics, student understanding of matrix multiplication in physics contexts	In progress

Graduate and undergraduate Independent Study

Anderson Fung	Physics 599: Student concept images of separation of variables	2018-2021
Pachi Her	Physics 599: Student interpretation of matrix multiplication in physics contexts	2020-present
Mikayla Mays	Physics 599: Student understanding of Fourier series	2017-2019
Marlene Vega	Physics 599: Student resources for unit vectors in non-Cartesian coordinate systems	2016-2018
Linda Leonard	Physics 599: Mathematical Modeling of Kinematics	2013-2014

Victor Gonzalez	Physics 599: Understanding of ideal gas behavior in high school physics and chemistry courses	2002-2004
Evangeline Chicas	Physics 499: Student understanding of definite and indefinite integration in thermal physics	2020-2021
Regan Jones	Physics 499: Student understanding of gradient	2018-2019
Pachi Her	Physics 499: Student understanding of matrix multiplication and eigentheory	2018-2020
Anderson Fung	Physics 499: Student understanding of ordinary differential equations	2018-2021
Anthony Piña	Physics 499: Student understanding of work integrals	2017-2019
Henry Taylor	Physics 499: Student reasoning with functions in introductory kinematics	2017-2018
Mikayla Mays	Physics 499: Student understanding of Fourier series	Spring 2017
Marlene Vega	Physics 499: Student understanding of vector symbolism in non-Cartesian coordinates	2015 - 2016
Paul Ayers	Physics 499: Electric flux and integration	2014 - 2015
Gabriela Serna	Physics 499: Investigating student learning in a reformed introductory astronomy course	2011 - 2015
Anne Gustafson	Physics 499: Investigating student learning in a peer instruction format in introductory mechanics	2009 - 2010
Rudy Hernandez	Physics 499: Instructional media in physics education	2009 - 2011
Casey Sanchez	Physics 499: Understanding of Faraday's and Lenz' law	2008 - 2011
Nick Vanatta	Physics 499: Investigating student understanding of particulate representations of a gas.	Spring 2007
Mike Ulrich	Physics 499: Innovative instructional strategies in the mcchanics laboratory	Fall 2006 Spring 2007
Joe Marroquin	Physics 499: Investigating student understanding in the introductory mechanics laboratory.	Spring 2006
Carlos Landaverde	Physics 499: Investigating student understanding of kinematics graphs	Spring 2005
Kwang Kim	Physics 499: Investigating student understanding in the introductory mechanics laboratory.	Spring 2004
Russell Gleason	Physics 499: Investigating student understanding in the introductory mechanics laboratory.	Spring 2004
Naomi Rivas	Physics 499: Investigating student understanding of conservation laws	Fall 2004

Masters Theses (Committee Member):

Vince Smith	M.S., Physics: Attitudes and Perceptions About the Learning Environment in a Guided Inquiry-Based Physical Science Course for Future Elementary Teachers	Dec 1999

Kevin Graham	MAT-S: Problem Solving In Physics	May 2000
Yolanda Alonzo	MAT-S: Infusing Critical and Creative Thinking in Science by the Use of Graphic Organizers	May 2001
Nancy Ziolkowski	MAT-S: Applied Physics Laboratory Curriculum: Development and Analysis	Dec 2003
Jennifer Victor	MAT-S: The Effect of Traditional Textbook Versus Inquiry-Based Learning and Fourth Grade Student Attitudes And Knowledge of Electric Circuits	Feb 2004
Ken Martinez	MAT-S: Hands-On Based Instruction and its Effect on Eighth Grade Students' Conceptual Understanding of Acceleration	May 2004
Vanessa Dionne	MAT-S: Particulate representations in general science	May 2005
Doug Bei	M.S., Biology: Student Understanding of Evolutionary Relationships	May 2011
Ken Martinez	MAT-S: The effects of an after school science program	Aug 2012
Rochelle Chanin	MAT-S: Particulate representations of physical and Chemical Change	Nov 2012

GINA PASSANTE

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EDUCATION

2012 **Ph.D., Physics**
University of Waterloo, Canada
Thesis: *On Experimental Deterministic Quantum Computation with One Quantum Bit*

2007 **Certificate of Advanced Studies in Mathematics**
University of Cambridge, United Kingdom
Also known as Part III of the Mathematics Tripos

2006 **B.Sc. (Honours), Physics**
University of Winnipeg, Canada

PROFESSIONAL EXPERIENCE

2020 – present **Associate Professor**
California State University, Fullerton; Physics Department

2015 – 2020 **Assistant Professor**
California State University, Fullerton; Physics Department

2012 – 2015 **Postdoctoral Research Associate**
University of Washington, Physics Education Group, Dept. of Physics

PEER-REVIEWED JOURNAL ARTICLES (J14 AND ON SINCE PROMOSSION)

J18. B. P. Schermerhorn, H. Sadaghiani, A. E. Mansour, S. Pollock, and **G. Passante**, *Impact of problem context on students' concept definition of an expectation value*, Phys. Rev. Phys. Educ. Res. **17**, 020141 (2021).

J17. J. Wells, H. Sadaghiani, B. P. Schermerhorn, S. Pollock, and **G. Passante**, *Deeper look at question categories, concepts, and context covered: Modified module analysis of quantum mechanics concept assessment,* Phys. Rev. Phys. Educ. Res. **17**, 020113 (2021).

J16. P.J. Emigh, E. Gire, C. A. Manogue, **G. Passante**, and P.S. Shaffer, *Research-based quantum instruction: Paradigms and Tutorials,* Phys. Rev. Phys. Educ. Res. **16**, 020156 (2020).

J15. A. Kohnle, S. E. Ainsworth, and **G. Passante**, *Sketching to support visual learning with interactive tutorials,* Phys. Rev. Phys. Educ. Res. **16**, 020139 (2020).

J14. **G. Passante**, B. P. Schermerhorn, S. J. Pollock, and H. R. Sadaghiani, *Time Evolution in Quantum Systems: A Closer Look at Student Understanding*, European Journal of Physics **41**, 015705 (2020).

J13. B. P. Schermerhorn, **G. Passante**, H. Sadaghiani, and S. Pollock, *Exploring student preferences when calculating expectation values using a computational features framework*, Phys. Rev. Phys. Educ. Res. **15**, 020144 (2019).

J12. **G. Passante** and A. Kohnle, Enhancing student visual understanding of the time evolution of quantum systems, Phys. Rev. Phys. Educ. Res. **15**, 10110 (2019).

J11. P. J. Emigh, **G. Passante**, and P. S. Shaffer, *Developing and assessing tutorials for quantum mechanics: Time dependence and measurements*, Phys. Rev. Phys. Educ. Res. **14**, 020128 (2018).

J10. A. Kohnle and **G. Passante**. *Characterizing representational learning: A combined simulation and tutorial on perturbation theory*, Phys. Rev. Phys. Educ. Res. **13**, 020131 (2017).

J9. **G. Passante**, P. J. Emigh, and P. S. Shaffer. *Student ability to distinguish between superposition states and mixed states in quantum mechanics,* Phys. Rev. ST: Phys. Educ. Res. 11, 020135 (2015).

J8. **G. Passante**, P. J. Emigh, and P. S. Shaffer. *Examining student ideas about energy measurements on quantum states across undergraduate and graduate levels,* Phys. Rev. ST: Phys. Educ. Res. 11, 020111 (2015).

J7. P. J. Emigh, **G. Passante**, and P. S. Shaffer. *Student understanding of time dependence in quantum mechanics,* Phys. Rev. ST: Phys. Educ. Res. 11, 020112 (2015).

J6. **G. Passante**, O. Moussa, and R. Laflamme. *Measuring geometric quantum discord using one bit of quantum information*. Phys. Rev. A, 85:032325 (2012).

J5. B. Criger, **G. Passante**, D. Park, and R. Laflamme. *Review article: Recent advances in nuclear magnetic resonance quantum information processing.* Phil. Trans. R. Soc. A 370, 4620–4635 (2012).

J4. **G. Passante**, O. Moussa, D.A. Trottier, and R. Laflamme. *Experimental detection of non-classical correlations in mixed-state quantum computation*. Phys. Rev. A 84:044302 (2011).

J3. M.E. Carrington, R. Kobes, G. Kunstatter, D. Ostapchuk, and **G. Passante**. *Geometric measures of entanglement and the Schmidt decomposition*. J. Phys. A: Theor. 43 315302 (2010).

J2. **G. Passante**, O. Moussa, C.A. Ryan, and R. Laflamme. *Experimental Approximation of the Jones Polynomial with One Quantum Bit*. Phys. Rev. Lett. 103:250501 (2009).

J1. K. Choy, **G. Passante**, D. Ahrensmeir, M.E. Carrington, T. Fugleberg, R. Kobes, and G. Kunstatter. *The dynamics of entanglement in the adiabatic search and Deutsch algorithms*. Can. J. Phys. 85: 955-1021 (2007).

PEER-REVIEWED CONFERENCE PROCEEDINGS

(*CSUF student co-authors, †other student co-authors)

P24. B. Cervantes*, G. Passante, B. Wilcox, and S. Pollock, *An Overview of Quantum Information Science Courses at US Institutions*, 2021 PERC Proceedings [Virtual Conference, Aug 4-5, 2021], edited by M. B. Bennett, B. W. Frank, and R. E. Vieyra, doi:10.1119/perc.2021.pr.Cervantes.

P23. Y. Li†, A. Kohnle, and G. Passante, Student difficulties with quantum uncertainty in the context of discrete probability distributions, 2021 PERC Proceedings [Virtual Conference, August 4-5, 2021], edited by M. B. Bennett, B. W. Frank, and R. E. Vieyra, doi:10.1119/perc.2021.pr.Li.

P22. J. Meyer†, G. Passante, S. J. Pollock, M. Vignal, and B. R. Wilcox, Investigating students' strategies for interpreting quantum states in an upper-division quantum computing course, 2021 PERC Proceedings [Virtual Conference, August 4-5, 2021], edited by M. B. Bennett, B. W. Frank, and R. E. Vieyra, doi:10.1119/perc.2021.pr.Meyer.

P21. B. P. Schermerhorn, H. Sadaghiani, G. Corsiglia†, **G. Passante**, and S. Pollock, *Exploring and supporting physics students' understanding of basis and projection*. Proceedings of the 23rd Annual Conference on Research in Undergraduate Mathematics Education [Boston, MA, 26-28 February 2020], edited by S. Smith Karunakaran, Z. Reed, and A. Higgins. (pp. 926-932)

P20. Ainsworth, S., Kohnle, A., & **Passante, G.** (2020). *Designing Drawing Activities to Support Simulation-based Learning in Quantum Mechanics.* In Gresalfi, M. and Horn, I. S. (Eds.), The Interdisciplinarity of the Learning Sciences, 14th International Conference of the Learning Sciences (ICLS) 2020, Volume 3 (pp. 1581-1584). Nashville, Tennessee: International Society of the Learning Sciences.

P19. E. M. Stump†, C. White*, **G. Passante**, and N. G. Holmes, *Student reasoning about sources of experimental measurement uncertainty in quantum versus classical mechanics*, 2020 PERC Proceedings [Virtual Conference, July 22-23, 2020], edited by S. Wolf, M. B. Bennett, and B. W. Frank, doi:10.1119/perc.2020.pr.Stump.

P18. C. White*, E. Stump†, N. Holmes, and **G. Passante**, *Student evaluation of more or better experimental data in classical and quantum mechanics*, presented at the Physics Education Research Conference 2020, Virtual Conference, 2020, doi: 10.1119/perc.2020.pr.White

P17. A. Quaal*, **G. Passante**, S. J. Pollock, and H.R. Sadaghiani, *Exploratory factor analysis of the QMCA*, 2020 PERC Proceedings [Virtual Conference, July 22-23, 2020], edited by S. Wolf, M. B. Bennett, and B. W. Frank, doi:10.1119/perc.2020.pr.Quaal.

P16. G. Corsiglia†, T. Garcia†, B. Schermerhorn, **G. Passante**, H. Sadaghiani, and S. Pollock, *Characterizing and monitoring student discomfort in upper-division quantum mechanics*, 2020 PERC Proceedings [Virtual Conference, July 22-23, 2020], edited by S. Wolf, M. B. Bennett, and B. W. Frank, doi:10.1119/perc.2020.pr.Corsiglia.

P15. M. Stein†, C. White*, **G. Passante**, and N. G. Holmes, Student interpretations of uncertainty in classical and quantum mechanics experiments, 2019 PERC Proceedings 2019 [Provo, UT, July 24-25, 2019], edited by Y. Cao, S. Wolf, and M. B. Bennett, doi:10.1119/perc.2019.pr.Stein

P14. B. Schermerhorn, A. Vollasenor[†], D. Del Agunos[†], **G. Passante**, S. Pollock, and H. Sadaghiani, *Student perceptions of math-physics interactions throughout spins-first quantum mechanics*, 2019 PERC Proceedings [Provo, UT, July 24-25, 2019], edited by Y. Cao, S. Wolf, and M. B. Bennett, doi:10.1119/perc.2019.pr.Schermerhorn

P13. **G. Passante**, H. R. Sadaghiani, S. J. Pollock, and B. P. Schermerhorn, *Students' choices when solving expectation value problems*, 2018 PERC Proceedings [Washington, DC, August 1-2, 2018], edited by A. Traxler, Y. Cao, and S. Wolf, doi:10.1119/perc.2018.pr.Passante

P12. H. R. Sadaghiani, **G. Passante**, and S. J. Pollock, *Student understanding of quantum mechanical expectation values in two different curricula*, 2018 PERC Proceedings [Washington, DC, August 1-2, 2018], edited by A. Traxler, Y. Cao, and S. Wolf, doi:10.1119/perc.2018.pr.Sadaghiani

P11. S. Pollock, H. Sadaghiani, A. Quaal*, and **G. Passante**, *Designing, validating, and contrasting closely related conceptual quantum mechanics questions for spin states and spatial wavefunctions,* 2018 PERC Proceedings [Washington, DC, August 1-2, 2018], edited by A. Traxler, Y. Cao, and S. Wolf, doi:10.1119/perc.2018.pr.Pollock

P10. C. Green* and **G. Passante**, *The use of ACER to develop and analyze student responses to expectation value problems,* 2017 PERC Proceedings [Cincinnati, OH, July 26-27, 2017], edited by L. Ding, A. Traxler, and Y. Cao, doi: 10.1119/perc.2017.pr.033

P9. Q. X. Ryan, T. Chau[†], H. R. Sadaghiani, and **G. Passante**, *Students' use symbolic forms when constructing Boundary conditions,* 2017 PERC Proceedings [Cincinnati, OH, July 26-27, 2017], edited by L. Ding, A. Traxler, and Y. Cao, doi: 10.1119/perc.2017.pr.081

P8. **G. Passante**, *Energy measurement resources in spins-first and position-first quantum mechanics,* 2016 PERC Proceedings [Sacramento, CA, July 20-21, 2016], edited by D. L. Jones, L. Ding, and A. Traxler, doi: 10.1119/perc.2016.pr.054

P7. M. Vega*, W. Christensen, B. Farlow[†], **G. Passante**, and M. Loverude, *Student understanding of unit vectors and coordinate systems beyond Cartesian coordinates in upper division Physics courses,* 2016 PERC Proceedings [Sacramento, CA, July 20-21, 2016], edited by D. L. Jones, L. Ding, and A. Traxler, doi: 10.1119/perc.2016.pr.086

P6. T. Wan[†], P. J. Emigh[†], **G. Passante**, and P.S. Shaffer, *Student understanding of period in introductory and quantum physics courses*, 2016 PERC Proceedings [Sacramento, CA, July 20-21, 2016], edited by D. L. Jones, L. Ding, and A. Traxler, doi: 10.1119/perc.2016.pr.090

P5. P. J. Emigh[†], **G. Passante**, and P.S. Shaffer, *Student understanding of superposition: Vectors and wave functions*, 2016 PERC Proceedings [Sacramento, CA, July 20-21, 2016], edited by D. L. Jones, L. Ding, and A. Traxler, doi: 10.1119/perc.2016.pr.023

P4. **G. Passante**, P. J. Emigh[†], Tong Wan[†], and P.S. Shaffer, *Investigating student understanding of perturbation theory and inner products of functions,* 2015 PERC Proceedings [College Park, MD, July 29-30, 2015], edited by P. V. Engelhardt, A. D. Churukian, and D. L. Jones. (2016).

P3. **G. Passante**, P. J. Emigh†, and P.S. Shaffer, *Tutorials in Quantum Mechanics: Benefit to students regardless of academic performance,* 2014 PERC Proceedings [Minneapolis, MN, July 30-31, 2014], edited by P. V. Engelhardt, A. D. Churukian, and D. L. Jones. (2015).

P2. **G. Passante**, P. J. Emigh†, and P.S. Shaffer, *Investigating student understanding of basic quantum mechanics in the context of time-dependent perturbation theory*, 2013 PERC Proceedings [Portland, OR, July 17-18, 2013], edited by P. V. Engelhardt, A. D. Churukian, and D. L. Jones. (2014)

P1. P. J. Emigh†, **G. Passante**, and P.S. Shaffer, *Student Understanding of Blackbody Radiation and Its Application to Everyday Objects*, 2013 PERC Proceedings [Portland, OR, July 17-18, 2013], edited by P. V. Engelhardt, A. D. Churukian, and D. L. Jones. (2014).

JOURNAL ARTICLES UNDER REVIEW

2022 B. Schermerhorn, G. Corsiglia, H. Sadaghiani, **G. Passante**, and S. Pollock, *From Cartesian coordinates to Hilbert space: Supporting student understanding of basis in quantum mechanics,* Under review with Phys. Rev. PER

2022 G. Corsiglia, B.P. Schermerhorn, H. Sadaghiani, A. Villase, S. Pollock, and **G. Passante**, *Exploring student ideas on change-of-basis in quantum mechanics,* Under review with Phys. Rev. PER

2022 J. Meyer, **G. Passante**, S. Pollcok, and B.R. Wilcox, *The interdisciplinary quantum information classroom: Themes from a survey of quantum information science instructors*, Under Review with Phys. Rev. PER

RESEARCH GRANTS

External (Awarded)

Year	Role	Title	Agency, Solicitation	Total Budget	CSUF Budget	Status
2020	PI	Collaborative Research: Connecting Spins-First Quantum Mechanics Instruction to Quantum Information Science	NSF: PHY Investigator-Initiated Research Projects	$829,940	$347,901	Funded Award No: PHY-2011958
2018	PI	Collaborative Research: Student Thinking About Measurements Across the Physics Curriculum	NSF: DUE – IUSE Exploration & Design: Engaged Student Learning	$297,494	$137,494	Funded Award No: DUE-1809178
2016	PI	Collaborative Research: Research as a base to develop adaptable	NSF: DUE – IUSE Development & Implementation	$840,685	$275,788	Funded Award No:

		curricula bridging instructional paradigms in Quantum Mechanics	II: Engaged Student Learning			DUE-1626594

Internal (Awarded)

Year	Role	Title	Solicitation	Budget	Status
2020-2021	PI	Student-generated visual representations in introductory physics	CSUF Junior/Senior Faculty Intramural Grant	$4992	Funded
2016-2017	PI	Investigating student Understanding of quantization in chemistry and physics at CSUF	CSUF Junior/Senior Faculty Intramural Grant	$4,913	Funded

Other Grants (Awarded)

Year	Role	Title	Solicitation	Budget	Status
2019	PI	Support for continued conversations between the Math and Physics Education Research Communities	PERTG Mini-Grant	$645	Funded

INVITED TALKS AND COLLOQUIA

23. "Student Thinking about Measurements and Uncertainty in Physics", Oregon State University, Physics Colloquium (May 2021, Online)
22. "Student Thinking about Measurements and Uncertainty in Physics", University of Winnipeg, Physics Colloquium (March 2021, Online)
21. "Student Thinking about Measurements and Uncertainty in Physics", Texas Tech University, Physics Colloquium (February 2021, Online)
20. "Student Learning in Spins-First Quantum Mechanics" Open Quantum Frontier Institute Virtual Workshop: Quantum Education (May 2020, Online)
19. Invited Plenary Speaker at Foundations and Frontiers of Physics Education Research (June 2019, Bar Harbor, Maine)
18. "Improving Conceptual Understanding Through Visual Reasoning", Canadian Association of Physicists Annual Congress (June 2019, Burnaby, Canada)
17. "Using Research to Improve the Teaching of Quantum Mechanics", California State University Long Beach Physics Colloquium (September 2018)
16. "Research as a guide to develop adaptable curricula bridging different instructional paradigms", American Association of Physics Teachers Winter Meeting (January 2018)
15. "Research as a Guide to Improve the Teaching & Learning of QM", Plenary Speaker at INTRIQ Fall Meeting, Bromont, Quebec, Canada
14. "Mathematization of Matrices in Quantum Mechanics", Physics Education Research Conference (July 2017)

13. "Using Research to Improve the Teaching and Learning of Quantum Mechanics", CSUF Department of Chemistry and Biochemistry Seminar (February 2017)
12. "Using Research to Improve the Teaching and Learning of Quantum Mechanics", Michigan State University (November 2016)
11. "Using Research to Improve the Teaching and Learning of Quantum Mechanics", SACNAS 2016, Long Beach, CA (October 2016)
10. "Using Research to Improve the Teaching and Learning of Quantum Mechanics", CSU San Marcos Colloquium (October 2016)
9. "Discussant: State of Quantum Mechanics PER", American Association of Physics Teachers Summer Meeting, Sacramento, CA (July 2016)
8. "Using research to improve the teaching and learning of quantum mechanics", California State University LA (February 2016)
7. "Using research to improve the teaching and learning of quantum mechanics", California Polytechnic University Pomona (May 2016)
6. "Progression of student ideas in Quantum Mechanics", American Association of Physics Teachers Winter Meeting, New Orleans, LA (January 2016)
5. "Improving quantum mechanics instruction using tutorials", American Physical Society NW Annual Meeting, Pullman, WA (May 2015)
4. "Research as a guide to improving student understanding: An example from quantum mechanics", The College of New Jersey (November 2014)
3. "A research based approach to improving the teaching of physics", University of Portland (March 2014)
2. "Detecting quantum correlations in a system that does not contain entanglement", University of Winnipeg Colloquium (May 2010)
1. "Approximating the Jones polynomial with a nuclear magnetic resonance quantum computer", University of Winnipeg Colloquium (May 2009)

CONTRIBUTED CONFERENCE PRESENTATIONS (CSUF Student coauthors in bold)

20. *Time Dependence: Connection the Hamiltonian, Eigenstates, and Eigenvalues,* American Association of Physics Teachers (July 2019)
19. *Methods of Computing Expectation Value: Investigating Students' Choices and Preferences,* American Association of Physics Teachers (January 2019)
18. *Representational choices when solving expectation value problems,* American Association of Physics Teachers (July 2018)
17. *Representational choices when solving expectation value problems,* Physics Education Research Conference (poster, July 2018)
16. *Energy measurement resources in spins-first and position-first quantum mechanics,* Physics Education Research Conference (poster, July 2016)

15. *Measurements in QM: Student Ideas in Chemistry and Physics* (with **Marlene Vega**), American Association of Physics Teachers (poster, July 2016)
14. *Investigating and improving student understanding of perturbation theory in quantum mechanics,* American Association of Physics Teachers (July, 2015)
13. *Investigating student understanding of perturbation theory and inner products of functions,* Physics Education Research Conference (poster, July 2015)
12. *Student difficulty with superposition in quantum mechanics,* American Association of Physics Teachers (July, 2014)
11. Benefit of tutorials regardless of academic standing, Physics Education Research Conference (poster, July 2014)
10. *Student difficulty with superposition in quantum mechanics,* American Physical Society NW Section (May, 2014)
9. *Student ability to reason about basic quantum mechanics in the context of time-dependent perturbation theory*, Physics Education Research Conference (poster, July 2013)
8. *Investigating student difficulties with energy measurements in quantum mechanics,* American Association of Physics Teachers (July 2013)
7. *Student ability to reason about basic quantum mechanics in the context of time-dependent perturbation theory,* Foundations and Frontiers of Physics Education Research, (poster, June 2013)
6. *Tutorials in the Quantum Mechanics Classroom*, Canadian Association of Physicists Congress (May 2013)
5. *Examining Student Understanding in Quantum Mechanics*. American Physical Society NW Section, (October 2012)
4. *Measuring Geometric Quantum Discord using DQC1*. American Physical Society NW Section, (October 2012)
3. *Experimental Detection of Non-classical Correlations in Mixed State Quantum Computation*. Asian Conference on Quantum Information Science, (poster, August 2010)
2. *Experimental Approximation of the Jones Polynomial with One Quantum Bit,* Quantum Works Annual General Meeting (poster, October 2010)
1. *Experimental Approximation of the Jones Polynomial with One Quantum Bit,* Canadian Association of Physicists Annual Congress (May 2009)

SELECTED STUDENT-LED PRESENTATIONS (CSUF students in bold)

2020 **Courtney White**, Emily Stump, N.G. Holmes, and G. Passante, *Student evaluation of more or better experimental data in classical and quantum mechanics*, American Association of Physics Teachers (talk, July 2020) and Physics education Research Conference (poster, July 2020)

2020 **Adam Quaal** and G. Passante, *Exploratory Factor Analysis of the QMCA*, American Association of Physics Teachers (poster, July 2020) and Physics education Research Conference (poster, July 2020)

2019 **Anthony Arruda** and G. Passante, *Student Use of Quantum Notations – Dirac Notation as a Template*, Physics Education Research Conference (poster, August 2019)

2018 **Adam Quaal**, G. Passante, S. J. Pollock, and H.R. Sadaghiani, *Exploring Trends in Context Dependence on the QMCA,* American Association of Physics Teachers 2018 Summer Meeting (poster, July 2018)

2018 **Anthony Arruda** and G. Passante, *Transitioning from Dirac to Function Notation in Spins-first Quantum Mechanics,* Physics Education Research Conference (poster, July 2018)

2017 **Chrystin Green** and G. Passante, *Student use of angular momentum operators to solve expectation value problems*, Physics Education Research Conference and American Association of Physics Teachers (poster, July 2017)

2017 **Adam Quaal**, **Misael Calleja**, and G. Passante, *Student Thinking about Energy Transitions in Introductory Chemistry*, American Association of Physics Teachers (poster, July 2017)

2016 **Marlene Vega**, M. Loverude, G. Passante, and W. Christensen, *Student understanding of Non-Cartesian Coordinate Systems in Upper-division Physics,* American Association of Physics Teachers (talk, January, 2016)

2016 **Chrystin Green** and G. Passante, *The Creation (and Annihilation) of Quantum Mechanics Questions using ACER,* Physics Education Research Conference and American Association of Physics Teachers (poster, July 2016)

2016 **Marlene Vega**, W. Christensen, B. Farlow, G. Passante, and M. Loverude, *Student understanding of unit vectors and coordinate systems beyond Cartesian in upper division physics courses,* Physics Education Research Conference (poster, July 2016)

TEACHING

California State University Fullerton

2021 Spring	Quantum Mechanics 1 (PHYS 555A)
	Quantum Mechanics 2 (PHYS 555B)
	Independent Research (PHYS 499, 597, 599)
2020 Fall	Think Like Einstein (CNSM 101)
	Independent Research (PHYS 499, 597, 599)
2020 Spring	Quantum Mechanics 1 (PHYS 555A)
	Independent Research (PHYS 499, 597, 599)
2019 Fall	Elementary Physics (PHYS 211)
	Modern Physics (PHYS 340)

	Independent Research (PHYS 499, 597, 599)
2019 Spring	Quantum Mechanics 1 (PHYS 555A)
	Independent Research (PHYS 499, 597, 599)
2018 Fall	Elementary Physics (PHYS 211)
	Modern Physics (PHYS 340)
	Independent Research (PHYS 499, 597, 599)
2018 Spring	Elementary Physics (PHYS 211)
	Quantum Mechanics (PHYS 455)
	Independent Research (PHYS 499, 597, 599)
2017 Fall	Modern Physics (PHYS 340)
2017 Spring	Quantum Mechanics (PHYS 455)
	Independent Research (PHYS 597, 599)
2016 Fall	Modern Physics (PHYS 340)
	Independent Research (PHYS 597, 599)
2016 Spring	Quantum Mechanics (PHYS 455)
	Independent Research (PHYS 597, 599)
2015 Fall	Modern Physics (PHYS 340)
	Independent Research (PHYS 499)

University of Washington

2013 – 2015	Tutorials in Teaching Physics (Graduate) – Co-instructor
2012 – 2015	Introductory Physics Tutorials - Instructor
2012 – 2015	Quantum Mechanics (Upper-division) – Tutorial coordinator
2013	Introduction to Quantum Mechanics (Sophomore) - Instructor
2012 – 2014	Physics by Inquiry (In-service teachers) – Co-Instructor
2013	Physics by Inquiry (Upper-division) – Co-Instructor

University of Waterloo

2010 – 2011	Certificate in University Teaching – Graduate Instructional Developer
2011	Undergraduate Summer School in Quantum Information Processing - Instructor

STUDENT RESEARCH SUPERVISION

California State University Fullerton

Graduate Students:

Courtney White (2019 – present)
Anthony Arruda (2018 – 2020)
Zong Yu Wang (2017 – 2019)

Adam Quaal (2016 – 2020, part time)
Chrystin Green (2015 – 2017)

Undergraduate Students:

Bryan Gworek (2020 – present)
Sean Young (2019 – present)
Miguel Ramirez (2019 – present)
Courtney White (2018 – 2019)
Anthony Arruda (2016 – 2018)
Misael Calleja (2017)
Marlene Vega (2015)

Community College:

Selina Jaimes Davila (2016)
Kyle Pannone (2016)

University of Washington

2012 – 2015	Graduate Student: Paul J. Emigh (Faculty advisor: Peter Shaffer)
2013	Undergraduate Student: J. Johnson

University of Waterloo

2010	Undergraduate Student: D. A. Trottier

SELECTED AWARDS

2009 – 2012	Vanier Canada Graduate Scholarship, University of Waterloo ($150,000)
2011	IQC David Johnston Award for Scientific Outreach, University of Waterloo
2008	J. Alan George Student Leadership Award, University of Waterloo
2007 – 2009	Presidents Scholarship, University of Waterloo ($20,000)
2007	Provost Doctoral Entrance Scholarship, University of Waterloo
2007 – 2009	Natural Sciences and Engineering Research Council (NSERC) Graduate Scholarship M, University of Waterloo ($70,000)
2006 – 2007	Commonwealth Scholarship, University of Cambridge, ($40,000)
2006	Honourary Cambridge Commonwealth Scholar, University of Cambridge
2006	Physics Honours Degree Gold Medal, University of Winnipeg
2005	Sir William Stephenson Scholarship, University of Winnipeg

Certifications

2018 **IMPACT Teaching Certificate**, California State University, Fullerton, Faculty Development Center

2010 **Certificate of University Teaching**, University of Waterloo, Centre for Teaching and Learning

SERVICE

Professional Service

2020-2021 Organizing Committee, Physics Education Research Conference (PERC) 2021
2020 NSF Panel Reviewer
2019-2020 Chair, Research in Physics Education Committee, American Association of Physics Teachers (AAPT)
2019-2020 Ex-officio Member, Physics Education Research Local Organizing Committee, AAPT
2018-2019 Vice Chair, Research in Physics Education Committee, AAPT
2017-2018 Member, Research in Physics Education Committee, AAPT
2016 NSF Panel Reviewer
2015 Paper Sorter, American Association of Physics Teachers 2016 Winter Meeting
2014 Organizer, American Physical Society NW Section Meeting Women's Luncheon
2009 Organizer, Canadian Quantum Information Students' Conference

Occasional reviewer for: Physical Review PER, Physical Review A, The Physics Teacher, European Journal of Physics, Canadian Journal of Physics

University Service

<u>California State University, Fullerton</u>

University level:

2020 – 2021 Instructionally Related Activities (IRA) Committee (NSM faculty representative)

College level:

2019 – 2020 NSM Curriculum Committee (Physics Department representative)
2016 – 2020 NSM Assessment Committee (Physics Department representative)

Department level:

2020 – 2021 Physics Department Curriculum Committee
2015 – 2019 Physics Department Curriculum Committee

<u>University of Waterloo</u>

2011 Distinguished Teacher Award Committee, University of Waterloo
2011 Amit and Meena Chakma Awards for Exceptional Teaching by a Student Committee, University of Waterloo

2011	Teaching Excellence Committee (including working groups on TA Training and Course Evaluations), University of Waterloo
2007 – 2008	Guelph-Waterloo Physics Institute Coordinating Committee, University of Waterloo
2005 – 2006	Physics Department Curriculum Committee, University of Winnipeg
2005 – 2006	Physics Student Association, University of Winnipeg, President

SCIENTIFIC OUTREACH

2016 **Warner Middle School**, Westminster, CA
Mentored seventh grade girls for a scholarship interview for a math and science camp. Two of the eight girls I mentored received scholarships.

2012 **Institute for Quantum Computing Open House**, Volunteer
Co-wrote and performed a show for the general public educating them on aspects of quantum physics important for quantum computers.

2004 – 2012 **Let's Talk Science**, Volunteer
Developed interactive activities for children aged 3-17 to create interest for scientific exploration, coordinated with local schools' teachers and administrators to promote and schedule science related activities, judged science fairs and competitions, and created interactive displays at the Manitoba Children's Museum to educate visitors on various science topics.

2007 – 2012 **Institute for Quantum Computing**, Lab tour guide
Provided informative, multimedia laboratory tours to visiting students, high school teachers, journalists, and the interested public.

2010 **NMR Animation**, Scientific consultant
Co-wrote and narrated a script for a 3-minute animation of NMR to educate the broad public about quantum computing research, consulted with professional animator to produce accurate images that enhance understanding of abstract concepts, can be viewed at http://www.youtube.com/user/QuantumIQC#p/u/23/ppXcQIi5I20.

2010 **Institute for Quantum Computing**, Organizer, Children's Science Show
Co-wrote and presented a 30-minute interactive science show for children aged 4-12 to introduce them to the science used in quantum computers.

2010 **University of Waterloo**, Organizing Committee Member, All Science Challenge
Organized a day-long science competition for 100+ grade 6-8 children, promoted the challenge to schools to increase awareness and participation, and managed volunteers to ensure a seamless event experience.

2009 **Quantum to Cosmos Festival**, Volunteer
Explained quantum computers to visitors of the physics festival hosted by the

Perimeter Institute for Theoretical Physics and demonstrated a prototype quantum computer in action.

PROFESSIONAL MEMBERSHIP

American Physical Society, Topical Group on Quantum Information, Topical Group on Physics Education Research, Forum on Education, 2010-present

American Association of Physics Teachers, 2011-present

Research in Physics Education Committee Member 2016-2018

Research in Physics Education Vice-Chair 2018-2019

Research in Physics Education Chair 2019-2020

Canadian Association of Physicists, Division of Physics Education, Committee to Encourage Women in Physics, Division of Atomic, Molecular and Optical Physics Canada, 2007-2015

Jocelyn S. Read — Curriculum Vitae

CONTACT INFORMATION

Department of Physics
California State University Fullerton
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Fullerton CA 92831

Phone: 657-278-8753
Fax: 657-278-2555
E-mail: jread@fullerton.edu

EDUCATION

Doctor of Philosophy in Physics August 2008
Neutron stars in compact binary systems: from the equation of state to gravitational radiation.
University of Wisconsin–Milwaukee, Milwaukee, WI, USA
Advisors: John Friedman & Jolien Creighton

Bachelor of Science May 2002
Combined Honours in Physics and Mathematics
University of British Columbia, Vancouver, BC, Canada

ACADEMIC POSITIONS

California State University Fullerton, USA 2018-
Associate Professor.

Perimeter Institue for Theoretical Physics, Canada
Emmy Noether Visiting Fellow, anticipated 2022-2023, deferred due to pandemic

Carnegie Institution for Science in Pasadena, USA 2020
Visiting Scientist

California Institute of Technology, USA 2019
Visiting Scientist, LSC Extreme Matter Support.

California State University Fullerton, USA 2012-2018
Assistant Professor.

California Institute of Technology, USA 2012-2013
Visiting Associate, Theoretical Astrophysics Including Relativity (TAPIR) group.

University of Mississippi, USA 2010-2012
Postdoctoral Research Associate; Gravitation, Astrophysics, and Theoretical Physics.

MPIGP (Albert Einstein Institute), Potsdam, Germany 2008-2010
Postdoctoral Fellow. Astrophysical Relativity group.

University of Wisconsin–Milwaukee, USA 2003-2008
Doctoral research. Advisors: J. Friedman and J. Creighton.

University of Wisconsin–Milwaukee, USA 2003
Graduate research assistant, Center for Gravitation and Cosmology, LSC Group.

LEADERSHIP

LIGO Scientific Collaboration Program Committee, 2021-

Senior Project Lead, Extreme Matter. Compact Binary Coalescence Working Group. LIGO Scientific Collaboration. 2016-

Editor-in-chief, LIGO Magazine. `http://www.ligo.org/magazine/` 2016-2018

Co-chair, Binary Neutron Star Sources. Compact Binary Coalescence Working Group. LIGO Scientific Collaboration. 2014-2016

Co-chair, LIGO Scientific Collaboration Academic Advisory Council. 2014-2016

PEER-REVIEWED PUBLICATIONS

A full list can be found at:
`http://scholar.google.com/citations?user=0z9YvUcAAAAJ`

31. "The Mass Distribution of Neutron Stars in Gravitational-wave Binaries." Philippe Landry, **Jocelyn S. Read**. Astrophys. J. Lett. 921, L25 (2021).
30. "Observation of gravitational waves from two neutron star-black hole coalescences." The LIGO Scientific Collaboration, the Virgo Collaboration, the KAGRA Collaboration. ApJL, 915, L5 (2021). *Read and CSUF Masters student Derek White contributed in particular to the calculation of the amount of mass remaining outside the remnant black hole after the collisions.*
29. "Parametrized equation of state for neutron star matter with continuous sound speed." Michael F O'Boyle, Charalampos Markakis, Nikolaos Stergioulas, **Jocelyn S Read**. Phys. Rev. D. 102 8 083027 (2020).
28. "GW190814: gravitational waves from the coalescence of a 23 solar mass black hole with a 2.6 solar mass compact object." The LIGO Scientific Collaboration and The Virgo Collaboration. The Astrophysical Jorunal Letters 896 L44 (2020) *CSUF postdoc Phil Landry was on the editorial team for this paper. Read contributed to work on the classification of the 2.6 solar mass "mystery" component.*
27. "GW190425: Observation of a Compact Binary Coalescence with Total Mass ~ 3.4 $M_\odot$," The LIGO Scientific Collaboration and The Virgo Collaboration. The Astrophysical Journal Letters 892 (1), L3 (2020). *Read made significant contributions to the interpretation of matter effects, working with Rossella Gamba of the editorial team. Read also worked with Gamba and CSUF postdoc Phil Landry on an analysis exploring the central density reached in these unusually massive stars.*
26. "Model comparison from LIGO–Virgo data on GW170817's binary components and consequences for the merger remnant," The LIGO Scientific Collaboration and The Virgo Collaboration. Classical and Quantum Gravity 37 (4), 045006 (2020). *Read contributed significantly to this work as Extreme Matter lead, and in particular contributed to code and equation of state infrastructure and review.*
25. "The impact of the crust equation of state on the analysis of GW170817." Rossella Gamba*, **Jocelyn S. Read**, Leslie E. Wade. `https://arxiv.org/abs/1905.02842`, Classical and Quantum Gravity 37 (2), 025008 (2019).
24. "Astrophysical science metrics for next-generation gravitational-wave detectors." Rana X Adhikari, P Ajith, Yanbei Chen, James A Clark, Vladimir Dergachev, Nicolas V Fotopoulos, Sarah E. Gossan, Ilya Mandel, Maria Okounkova, Vivien Raymond, **Jocelyn**

S Read. https://arxiv.org/abs/1905.02842, Class. Quantum Grav. 36 245010 (2019).

23. "Properties of the binary neutron star merger GW170817." The LIGO Scientific Collaboration and The Virgo Collaboration. Phys. Rev. X 9, 011001 (2019) *Read contributed to this work as Extreme Matter lead, and in particular set up the parameters of the injection and recovery study in Appendix B.*

22. "GW170817: Measurements of neutron star radii and equation of state." The LIGO Scientific Collaboration and The Virgo Collaboration. Phys. Rev. Lett. 121, 161101 (2018). *Read contributed significantly to this work as Extreme Matter lead, and in particular led the review team and reviewed code related to equation of state constraint.*

21. "Search for Post-merger Gravitational Waves from the Remnant of the Binary Neutron Star Merger GW170817." The LIGO Scientific Collaboration and The Virgo Collaboration. The Astrophysical Journal Letters, Volume 851, Number 1, December 2017. *Read's undergraduate research students Eric Flynn and Derek White were added as co-authors to this work based on their contributions to importing numerical simulation waveforms.*

20. "GW170817: Observation of Gravitational Waves from a Binary Neutron Star Inspiral." The LIGO Scientific Collaboration and The Virgo Collaboration. Phys. Rev. Lett. 119, 161101, October 2017. *J. Read was the neutron-star astrophysics expert on the internal paper-writing team for this discovery. Read was heavily involved in rapid analyses to determine source properties for this event. As senior lead on the Extreme Matter team, Read coordinated tidal analyses and reviews. Two of her undergraduate research students, Isabella Molina and Erick Leon, contributed to this work and were added as co-authors on this paper as recognition of their contributions. Torrey Cullen is also a co-author on this paper based on his work as an undergraduate/Masters student in Read's group.*

19. "Matter Effects on LIGO/Virgo Searches for Gravitational Waves from Merging Neutron Stars." Class. Quantum Grav. 34 245003 (2017) T. Culllen*, **J. Read**, I. Harry, E. Flynn* *Cullen lead the writing and research of this paper as an undergraduate and Masters student in Read's group. Undergraduate E. Flynn contributed to the use of hybrid waveforms in the analysis.*

18. "Upper limits on the rates of binary neutron star and neutron-star–black-hole mergers from Advanced LIGO's first observing run." The LIGO Scientific Collaboration and The Virgo Collaboration. The Astrophysical Journal Letters, Volume 832, Issue 2, L21. (2016) *J. Read and Ian Harry were the two internal LIGO-Virgo Collaboration editors leading this paper. Read co-chaired the binary neutron star source group during LIGO's first observing run and contributed to configuring searches that found the first signals.*

17. Read is also a co-author on additional papers due to overall contributions to the LIGO Scientific Collaboration since 2015, listed at https://www.lsc-group.phys.uwm.edu/ppcomm/Papers.html. In particular, she contributed to:

    - "GWTC-1: A Gravitational-Wave Transient Catalog of Compact Binary Mergers Observed by LIGO and Virgo during the First and Second Observing Runs." Accepted to PRX.
    - "Constraining the p-mode–g-mode tidal instability with GW170817." (by LSC, Virgo and N. Weinberg) Phys. Rev. Lett. 122, 061104 (2019).
    - "Multi-Messenger Observations of a Binary Neutron Star Merger." Astrophys. J. Lett. 848, L12 (2017)
    - "Gravitational Waves and Gamma-Rays from a Binary Neutron Star Merger: GW170817 and GRB 170817A."(by LSC, Virgo, Fermi-GBM and INTEGRAL). Astrophys. J. Lett. 848, L13 (2017)

- "A gravitational-wave standard siren measurement of the Hubble constant (by LSC, Virgo, 1M2H, DECam GW-EM and DES, DLT40, LCO, VINROUGE and MASTER),
- "Observation of Gravitational Waves from a Binary Black Hole Merger." Phys. Rev. Lett. 116, 061102 (2016)
- "Properties of the binary black hole merger GW150914" Phys. Rev. Lett. 116, 241102 (2016)

16. "Matter effects on binary neutron star waveforms." **Jocelyn S. Read**, Luca Baiotti, Jolien D. E. Creighton, John L. Friedman, Bruno Giacomazzo, Koutarou Kyutoku, Charalampos Markakis, Luciano Rezzolla, Masaru Shibata, Keisuke Taniguchi. Phys. Rev. D 88 (2013) 044042.
15. "The Global Network of Optical Magnetometers for Exotic physics (GNOME): A novel scheme to search for physics beyond the Standard Model." Szymon Pustelny, Derek F. Jackson Kimball, Chris Pankow, Micah P. Ledbetter, Przemyslaw Wlodarczyk, Piotr Wcislo, Maxim Pospelov, Joshua R. Smith, **Jocelyn Read**, Wojciech Gawlik, Dmitry Budker. Annalen der Physik 525 (2013) 659-670.
14. "Measuring a cosmological distance-redshift relationship using only gravitational wave observations of binary neutron star coalescences." Chris Messenger and **Jocelyn Read**. Phys. Rev. Lett. 108 (2012), 91101.
13. "Resonant Shattering of Neutron Star Crusts." David Tsang, **Jocelyn S. Read**, Tanja Hinderer, Anthony L. Piro, Ruxandra Bondarescu. Phys. Rev. Lett. 108 (2012) 011102. *Editor's Suggestion.*
12. "Scientific Objectives of Einstein Telescope." B Sathyaprakash *et al.* Class. Quant. Gravity 29 (2012) 124013.
11. "Compact stars in alternative theories of gravity: Einstein-Dilaton-Gauss-Bonnet gravity." Paolo Pani, Emanuele Berti, Vitor Cardoso, **Jocelyn Read**. Phys. Rev. D. 84 (2011) 104035.
10. "Will black hole-neutron star binary inspirals tell us about the neutron star equation of state?" Francesco Pannarale, Luciano Rezzolla, Frank Ohme, **Jocelyn S. Read**. Phys. Rev. D 24 (2011) 104017.
9. "The vacuum revealed: the final state of vacuum instabilities in compact stars." Paolo Pani, Vitor Cardoso, Emanuele Berti, **Jocelyn Read**, Marcelo Salgado. Phys. Rev. D 83 (2011) 081501.
8. "Gravitational waves from neutron stars: Promises and challenges." N. Andersson, V. Ferrari, D.I. Jones, K.D. Kokkotas, B. Krishnan, **J. Read**, L. Rezzolla, B. Zink. Gen. Rel. Grav. 43 (2011) 409-436.
7. "Tidal deformability of neutron stars with realistic equations of state." Tanja Hinderer, Benjamin D. Lackey, Ryan N. Lang, **Jocelyn S. Read**. Phys. Rev. D 81 (2010) 123016.
6. "The third generation of gravitational wave observatories and their science reach." M. Punturo *et al.* Class. Quantum Grav. 27 (2010) 084007.
5. "Measuring the neutron star equation of state with gravitational wave observations." **Jocelyn S. Read**, Charalampos Markakis, Masaru Shibata, Koji Uryu, Jolien D. Creighton, John L. Friedman. Phys. Rev. D 79 (2009) 124033.
4. "Neutron star equation of state via gravitational wave observations." Charalampos Markakis, **Jocelyn S. Read**, Masaru Shibata, Koji Uryu, Jolien D. E. Creighton, John L. Friedman, Benjamin D. Lackey. J. Phys. Conf. Ser. 189 (2009) 012024.

3. "Constraints on a phenomenologically parameterized neutron-star equation of state." **Jocelyn S. Read**, Benjamin D. Lackey, John L. Friedman, Benjamin J. Owen. Phys. Rev. D 79 (2009) 124032.
2. "Models of helically symmetric binary systems." Shin'ichirou Yoshida, Benjamin C. Bromley, **Jocelyn S. Read**, Koji Uryu, John L. Friedman. Class. Quantum Grav. 23 (2006) S599-S613.
1. "Gravitational wave bursts from cosmic (super)strings: Quantitative analysis and constraints." Xavier Siemens, Jolien Creighton, Irit Maor, Saikat Ray Majumder, Kipp Cannon, **Jocelyn Read**. Phys. Rev. D 73 (2006) 105001.

SUBMITTED PUBLICATIONS

Science-Driven Tunable Design of Cosmic Explorer Detectors. Varun Srivastava, Derek Davis, Kevin Kuns, Philippe Landry, Stefan Ballmer, Matt Evans, Evan Hall, Jocelyn Read, B.S. Sathyaprakash. `https://arxiv.org/abs/2201.10668`.

GWTC-3: Compact Binary Coalescences Observed by LIGO and Virgo During the Second Part of the Third Observing Run `https://dcc.ligo.org/LIGO-P2000318/public` *Megan Loh is a co-author from work with Read as a CSUF intern on parameter estimation during this run.*

The population of merging compact binaries inferred using gravitational waves through GWTC-3 `https://dcc.ligo.org/LIGO-P2100239/public` *Read and Phillipe Landry applied the methods of Astrophys. J. Lett. 921, L25 in this collaborative work.*

WHITE PAPERS

"Compact binaries as probes of dense matter and QCD phase transitions." **J. Read**, M. Coughlin, T. Dietrich, R. Essick, P. Landry, B.S. Sathyaprakash, N. Stergioulas, I. Tews, 86 Additional Authors. Letter of Interest (pdf) for the Particle Physics Community Planning Exercise (Snowmass2021). White Paper has been requested by Snowmass Cosmic Frontier Conveners incorporating multiple LOI topics related to neutron-star astrophysics and QCD.

"A Horizon Study for Cosmic Explorer: Science, Observatories, and Community." 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, Jeff S. Kissel, 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. arXiv:2109.09882

"Compact binaries as probes of dense matter and QCD phase transitions." M. Coughlin , T. Dietrich , R. Essick , P. Landry , **J. Read** , B.S. Sathyaprakash, N. Stergioulas, I. Tews . Particle Physics Community Planning Exercise (Snowmass2021) Letter of Interest, SNOWMASS21-CF7_CF3-EF7_EF0_Jocelyn_Read-195.

" Cosmic Explorer: The Next-Generation U.S. Gravitational-Wave Detector" Dave Reitze, Albert Lazzarini, Joseph Giaime, Mike Landry, Peter Fritschel, Rainer Weiss, Matthew Evans, Stefan Ballmer, Geoffrey Lovelace, Yanbei Chen, B.S. Sathyaprakash, **Jocelyn Read**, Joshua Smith, Duncan Brown, Salvatore Vitale, Rana Adhikari, Bram Slagmolen. Particle Physics Community Planning Exercise (Snowmass2021) Letter of Interest, SNOWMASS21-CF7_CF6-AF6_AF0-IF1_IF0-010.

"Cosmic Explorer: The U.S. Contribution to Gravitational-Wave Astronomy beyond LIGO" 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, Michael Zucker. APC White Paper submitted to the Decadal Survey on Astronomy and Astrophysics (Astro2020).

ASTRONOMICAL NOTICES

"LIGO/Virgo S191110af: Potential pulsar counterparts," David Kaplan, John Friedman, **Jocelyn Read**, Growth Collaboration. GRB Coordinates Network, Circular Service, No. 26243.

EXTRAMURAL GRANTS

Submitted (CSUF PI) US Dept of Energy Office of Science Financial Assistance Program, "Center for Nuclear Astrophysics Across Messengers (CeNAM)." ' Center PI Hendrik Schatz, Michigan State University. CO-Is M. Avila, ANL, T. Beers, ND, A. Frebel, MIT, C. Fröhlich, NCSU, C. Fryer, LANL, F. Herwig, UVic, Canada, Z. Meisel, Ohio U, J. Read, CSU Fullerton, A. Steiner, UT, F. Timmes, ASU, M. Wiescher, ND, P. Woodward, U Minn, A. Aprahamian, ND, E. Brown, MSU, D. Brown, Syracuse, K. Chatziioannou, Caltech, J. Clark, ANL, D. Galloway, Monash, Australia, M. Harvey, TSU, A. Heger, Monash, Australia, C. Horowitz, Indiana U, J. Lattimer, Stony Brook, G. McLaughlin, NCSU, B. Metzger, Columbia, B. O'Shea, MSU, D. Radice, Penn State, S. Reddy, U Washington, L. Roberts, LANL, A. Spyrou, MSU, R. Surman, ND, R. Trappitsch, Brandeis, R. Zegers, MSU. Fullerton is one of 12 CeNAM core institutions, with a requested CSUF subaward budget with Read as PI of $509,060.

(PI) National Science Foundation, PHY - LIGO Research Support, "RUI: Dense Matter and Gravitational Waves: The Coalescence of Neutron Star Binaries," Co-I Phillipe Landry. $204,874, funded 2021-2025.

(PI) National Science Foundation, PHY - LIGO Research Support, "RUI: Dense Matter and Gravitational Waves: The Coalescence of Neutron Star Binaries," $204,874, funded 2018-2022.

(Co-I) National Science Foundation, PHY - LIGP Research Support, "Collaborative Research: The Next Generation of Gravitational Wave Detectors." PI Geoffrey Lovelace, Co-Is Jocelyn Read, Joshua Smith. Collaborative PI Matt Evans, MIT. $211,283 (Fullerton), funded 2018-2021.

(PI) National Science Foundation, AST - Partnerships in Astronomy & Astrophysics Research and Education (PAARE), "The CSUF-Syracuse partnership for inclusion of underrepresented groups in gravitational-wave astronomy" $937,368, funded 2016-2021. Supplement of $19,222, funded 2022.

(PI) National Science Foundation, PHY - LIGO Research Support, "RUI: Dense matter and gravitational waves: the coalescence of neutron star binaries," $126,000, funded 2013-2017.

(Co-PI) Research Corporation for Science Advancement, Multi Investigator Cottrell College Science Award, "Developing a numerical injection analysis pipeline for gravitational waves from merging black holes and neutron stars," Co-PIs Jocelyn Read and

Geoffrey Lovelace, $75,000, funded 2014-2015.

(Co-I) National Science Foundation (NSF) PHY-1429873, "MRI: Acquisition of a high-performance computer cluster for gravitational-wave astronomy with Advanced LIGO," PI Geoffrey Lovelace, Co-Is Jocelyn Read, Joshua Smith $119,791, awarded 2014.

INTRAMURAL GRANTS

Best Practices in Mentoring Undergraduates in Research Grant, "Visualizing Gravitational Waves," $750, funded 2013-2014.

CSUF Intramural Research Award, "High-energy flares from merging neutorn stars," $1993, funded 2013-2014.

AWARDS AND HONORS

Elected Fellow of the American Physical Society 2019.
Citation: For contributions to the understanding of extreme matter within neutron stars, including its effects on gravitational-wave observations, and for the inclusive recruiting and mentoring of next generation gravitational-wave scientists. Nominated by: DGRAV

Outstanding Untenured Faculty Member,
CSUF College of Natural Sciences and Mathematics 2018

Orange County "Game Changer," Orange County Business Council 2018

Peter Sim Lecturer, The Royal Astronomical Society of Canada, Calgary Centre 2017

Woman of the Year in Science and Technology,
California State 29th Senatorial District 2017

Special Breakthrough Prize in Fundamental Physics 2016
shared among 1,012 contributors to the LIGO experiment

Honourable Mention, GWIC Thesis Prize 2008

Midwest Relativity Meeting Blue Apple Award 2007

INVITED TALKS SEMINARS, AND PANELS

since August 2017

37. "Gravitational-wave observations of neutron-star mergers," Workshop III: Source inference and parameter estimation in Gravitational Wave Astronomy, Part of the Long Program Mathematical and Computational Challenges in the Era of Gravitational Wave Astronomy, Institute for Pure and Applied Mathematics, UCLA, November 2021.
36. "The Universe in Gravitational Waves; Learning about dense matter," Lecture Series in Nuclear Astrophysics II, Joint Institute for Nuclear Astrophysics - Center for the Evolution of the Elements (JINA-CEE) NSF Physics Frontiers Center, November 2021.
35. "Introduction to Gravitational Waves and Data Analysis," Biweekly Neutron Star Merger Meetings, Network for Neutrinos, Nuclear Astrophysics, and Symmetries (N3AS) Physics Frontier Center, Virtual, October 2021.
34. "Gravitational-wave observations of neutron-star mergers," Physics and Theoretical Division Colloquium, Los Alamos National Laboratory, July 2021.

33. 'Neutron stars as gravitational-wave sources: dense matter and stellar mass," HEP-GR Colloquium, University of Cambridge, June 2021.
32. "Observing Neutron Stars with Gravitational Waves", European Centre for Theoretical Studies in Nuclear Physics and Related Areas workshop on Neutron Stars as Multi Messenger Laboratories for Dense Matter. June 2021.
31. "Neutron stars as gravitational-wave sources: dense matter and stellar mass," Gravity Seminar, University of British Columbia, May 2021.
30. "Gravitational wave observations and neutron-star matter," NSCL/FRIB Virtual Theory Seminar, October 2020.
29. "Gravitational-wave observations and neutron star measurements," Carnegie/Caltech Theory Thursday, August 2020.
28. "LIGO/Virgo Observations and the Physics of Dense Matter," Rethinking the Relativistic Two-Body Problem: A Universe of Gravitational Waves, August 2020.
27. "Gravitational wave observations and neutron-star matter," ICTS programme on CSQCD, August 2020.
26. "Learning about Neutron-rich Matter with Gravitational Waves," California State University Long Beach Department of Physics and Astronomy Colloquium, March 2020.
25. "Learning about Neutron-rich Matter with Gravitational Waves," Harvey Mudd College, February 2020.
24. "Learning about Neutron-rich Matter with Gravitational Waves," Carnegie Science Observatories Colloqium, January 2020.
23. "Matter in neutron-star mergers," Caltech/JPL Association for Gravitational-Wave Research seminar, December 2019.
22. "Learning about the Nuclear Equation of State from Gravitational Waves," invited session on "Nucleons, nuclei and neutron stars in the era of gravitational waves," Fall Meeting of the Division of Nuclear Physics of the American Physical Society, October 2019.
21. "Neutron star matter and gravitational waves" at the Australian National University School of Physics and Engineering and at the Australian National University Research School of Astronomy & Astrophysics, July 2019.
20. 'The Equation of State in Gravitational Wave Observations." KITP Conference: Merging Visions: Exploring Compact-Object Binaries with Gravity and Light. Santa Barbara, June 2019.
19. "Neutron Star Matter and Gravitational Waves." Gravity & the Extreme Universe (GEU) Annual General Meeting, Canadian Institute for Advanced Research, Kelowna, May 2019.
18. " Gravitational-wave observations and neutron star matter." Colloquium, University of California Davis, Department of Physics, Davis, May 2019.
17. "The science enabled by measuring gravitational waves." Special Session, The Landscape of Next-Generation Gravitational Wave Observatories, 233rd AAS Meeting, Seattle, January 2019.
16. "Gravitational-wave observations and neutron star matter." Strong Gravity Seminar, Perimeter Institute, Waterloo, November 2018.

15. "Neutron star matter constraints from gravitational wave observations." S@INT Seminar, Institute for Nuclear Theory, University of Washington, October 2018.
14. "Neutron star binaries and ground-based GW observations", International Pulsar Timing Array Meeting, on behalf of LSC/Virgo, June 2018.
13. "LIGO/VIRGO Observations of Neutron Star Merger GW170817." CIPANP 2018 - Thirteenth Conference on the Intersections of Particle and Nuclear Physics, LSC/Virgo, plenary, on behalf of LSC/Virgo, June 2018.
12. "Neutron star matter constraints from gravitational-wave observations," on behalf of LSC/Virgo. Nuclear astrophysics in the new era of multi-messenger astronomy workshop, Columbia University, May 2018.
11. "New Extraterrestrial Observations of the Dense Matter Equation of State," on behalf of LSC/Virgo. APS April Meeting 2018, Invited Session: "High Baryon Density Physics in Nuclei and the Cosmos," April 2018.
10. "Measuring the neutron-star equation of state with GW170817." Astronomy Seminar, Herzberg Astronomy and Astrophysics Research Centre, February 2018
9. "Measuring the neutron-star equation of state with GW170817." Astronomy Colloquium, University of British Columbia, February 2018
8. "Measuring the neutron-star equation of state with GW170817." Canadian Institute for Advanced Research Gravity & the Extreme Universe Program Meeting, Banff, February 2018
7. "Multimessenger Astronomy in light of LIGO-Virgo Discoveries." Panel with Barry Barish, Marica Branchesi, Leo Singer, Imre Bartos. 231th AAS Meeting, January 2018
6. "Measuring the neutron-star equation of state with GW170817," on behalf of LSC/Virgo. Conference on "GW170817: The First Double Neutron Star Merger," Kavli Institute for Theoretical Physics, UCSB, December 2017
5. "Matter in neutron star mergers." Caltech/JPL Association for Gravitational-Wave Research seminar, December 2017.
4. "The source of GW170817: neutron-star properties." Joint Institute for Nuclear Astrophysics - Center for the Evolution of the Elements (JINA-CEE) Livestream, December 2017
3. "GW170817: Gravitational waves from a neutron-star merger." MIT Kavli Institute's Astrophysics Colloquium, November 2017
2. "Recent Results from LIGO - GW170817: Gravitational waves from a neutron-star merger." Lawrence Berkeley National Labs, October 2017
1. "Neutron Stars: Gravitational-wave sources with matter." Center for Gravitation and Cosmology, University of Wisconsin Milwaukee, October 2017

August 2012-August 2017

35. "NS Pre-Merger simulations, tidal deformability and GW signatures," panel with Eric Poisson and Katerina Chatziioannou, eXtreme Matter meets eXtreme Gravity Workshop, Montana State XGI, August 2017
34. "Neutron stars: Gravitational-wave sources with matter." 12th Edoardo Amaldi Conference on Gravitational Waves, plenary, Pasadena CA, July 2017.

    item "Dense matter in neutron-star mergers." Canadian Astronomical Society/ Société Canadienne d'Astronomie Annual Meeting, Edmonton AB, May 2017.

33. "Matter in waveforms for LIGO-Virgo analysis", with Ben Lackey, Patricia Schmidt, and James Clark. LIGO/Virgo Collaboration Meeting, Pasadena CA, March 2017.
32. "Searches for all types of binary mergers in the first Advanced LIGO observing run." (On behalf of the LIGO Scientific Collaboration) Einstein Prize Talk and Advanced LIGO Search Results, APS April Meeting, Washington DC, January 2017
31. "Gravitational Waves: Measuring ripples in spacetime" (On behalf of the LIGO Scientific Collaboration), M.J. Murdock Charitable Trust Partners in Science, San Diego CA, January 2017.
30. "Dense matter in gravitational wave sources." Institute of Nuclear Theory Program INT-16-2b, The Phases of Dense Matter, Seattle, WA, July 2016.
29. "Gravitational wave sources and discoveries." (On behalf of the LIGO Scientifi Collaboration) 16th Canadian Conference on General Relativity and Relativistic Astrophysics, Vancouver, Canada, July 2016.
28. "Concepts in Gravitational Wave Science: Bringing LIGO into the Undergraduate Curriculum." Relativity and Gravitation: Contemporary Research and Teaching of Einstein's Physics, Gordon Research Conference in Physics Research and Education, June 2016 2016.
27. "Advanced LIGO: recent results, and prospects in neutron-star astrophysics." California State University, Northridge. 17 February 2016.
26. "Gravitational Wave Searches." (On behalf of the LIGO Scientific Collaboration.) 2016 Aspen Winter Conference on Particle Physics, Aspen, CO. 15 January 2016.
25. "Binary Neutron Stars." Caltech Gravitational Wave Astrophysics School (CGWAS) 2015, Pasadena, CA, July 2015.
24. "Binary Neutron Star Roadmap." LIGO Scientific Collaboration, Compact Binary Coalescence Group Face To Face Meeting, Pasadena, CA, March 2015.
23. "Neutron stars and gravitational waves." Seeing and Hearing the Violent Universe with Gravitational Waves and Light, 2014 SACNAS (Society for Advancement of Hispanics/Chicanos and Native Americans in Science) National Meeting, Los Angeles, CA, October 2014.
22. "Looking inside merging neutron stars with GW signals.", Transient Phenomena in Astronomy and Astrophysics, Second Annual GMT Community Science meeting, Washington, D.C. October 2014.
21. PI representative, "Discovering the Gravitational-wave Universe." NSF Gravity Program PI Day, Arlington, VA, October 2014.
20. "Matter effects on binary neutron star waveforms: modeling and measuring EOS effects up to merger." Binary Star Coalescence as a Fundamental Physics Laboratory, Institute for Nuclear Theory program INT-14-2a, Seattle, WA. 3 July 2014.
19. "Dense matter and gravitational waves: neutron stars in coalescing binaries." Pearson Colloquium Series in Physics, CSU Dominguez Hills, Carson, CA. 28 April 2014.
18. "Extracting neutron star radii from gravitational wave data." Invited session on "Neutron Star Radii", April Meeting 2014 of the American Physical Society, Savannah, Georgia. 5 April 2014.
17. "Listening to the Symphony of Spacetime." NSM-ICC Symposium Faculty Lecture Series, California State University Fullerton, 19 March 2014.

16. "Dense matter and gravitational waves: neutron stars in coalescing binaries." Seminar, Canadian Institute for Theoretical Astrophysics, University of Toronto, Toronto, Canada. 10 March 2014.
15. "Listening to the Symphony of Spacetime." Colloquium series "What Physicists Do," Sonoma State University, Sonoma, CA, 3 March 2014.
14. "Dense matter and gravitational waves: neutron stars in coalescing binaries." Astrophysics Seminar at UC Irvine, Irvine, CA, 25 February 2014.
13. "Gravitational wave data analysis and the neutron star equation of state." Invited Lecturer, Mexican Astrophysics School 2014, Look and Listen: Electromagnetic and Gravitational Wave Signals from Compact Objects. Playa del Carmen, Quintana Roo, Mexico. 20-23 January 2014.
12. "Measuring the Neutron Star Equation of State", Gravitational Wave Physics and Astronomy Workshop 2013, Inter University Centre for Astronomy and Astrophysics, Pune, India. 18 December 2013.
11. "Extreme tides: the dynamic response of neutron stars in merging binaries." Astrophysics Colloquium, Embry-Riddle Aeronautical University, Prescott, AZ, USA. 12 November 2013.
10. "Gravitational Waves and LIGO." KIPAC@10 Big Questions in Particle Astrophysics and Cosmology, SLAC National Accelerator Laboratory, Menlo Park, CA. In Session "Whatever next? Compact objects' continuing application as physics laboratories." *Requested contribution.* 4 September 2013.
9. "From perturbation to observation: measuring the response of neutron stars." Connections for Women: Mathematical General Relativity. Mathamtical Sciences Research Insitute, Berkeley, CA. 3 September 2013.
8. "The Physics of Gravitational Wave Sources: Neutron-star and neutron-star/black-hole binaries." Lecture at the Caltech Gravitational-Wave Astrophysics School, California Institute of Technology, Pasadena, CA. 23 July 2013.
7. "Neutron stars from inspiral to merger: tracing the effects of the equation of state." Long-term workshop on Gravitational waves and numerical relativity, Yukawa Institute for Theoretical Physics, Kyoto, Japan. 29 May 2013.
6. "The neutron-star equation of state: Where does it matter in waveforms?" Session: Waveform Accuracy Requirements for Astrophysics. Science from the First Gravitational Wave Detections Workshop, South Padre Island, TX, USA. 23 May 2013.
5. "The neutron-star equation of state: Where does it matter?" Session: Compact-object Models and Astrophysics Extraction (beyond long lived binaries.) Science from the First Gravitational Wave Detections Workshop, South Padre Island, TX, USA. 22 May 2013.
4. "Learning about dense matter from gravitational waves." in Invited Session: Gravitational Wave Astrophysics. APS April Meeting 2013, Denver, CO, USA. 14 April 2013.
3. "Extreme tides: the dynamic response of neutron stars in merging binaries." Colloquium at California State University Long Beach, Long Beach, CA, USA. 13 November 2013.
2. "Are we getting the right nuclear physics when modelling gravitational waveforms?" With G. Shen. Chirps, Mergers and Explosions: The Final Moments of Coalescing

Compact Binaries. Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA. 21 September 2012.

1. "Extracting Information on Neutron Stars via Gravitational-wave Observations." With T. Hinderer. Chirps, Mergers and Explosions: The Final Moments of Coalescing Compact Binaries. Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA. 5 September 2012.

before August 2012

23. "Gravitational-wave Astrophysics with Systems Containing Matter." Rattle and Shine: Gravitational Wave and Electromagnetic Studies of Compact Binary Mergers. Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA. 1 August 2012.
22. "The dynamic response of merging neutron stars." California State University Fullerton, Fullerton, CA, USA. 1 February 2012.
21. "Extreme tides: the dynamic response of neutron stars in coalescing binaries." Astrophysics Seminar, University of Florida, Gainesville, FL, USA. 28 October 2011.
20. "Learning about dense matter from gravitational-wave observations." Institute for Theoretical Science Seminar, University of Oregon, Eugene, OR, USA. 11 October 2011.
19. "Neutron stars: from nuclear physics to gravitational-wave astronomy." LSST Science Lunch, University of Washington, Seattle, WA, USA. 10 October 2011.
18. "Measuring a cosmological distance-redshift relationship using only gravitational wave observations of binary neutron star coalescences." With C. Messenger. LSC-Virgo wide Data Analysis Council meeting (telecon). 12 August 2011.
17. "EOS/Parameter choices for NSNS/NSBH simulations." Microphysics in Computational Relativistic Astrophysics, Perimeter Institute, Waterloo, Canada. 23 June 2011.
16. "Measuring the neutron-star equation of state using gravitational waves from binary observations." April Meeting of the American Physics Society *(Invited)*, Anaheim, CA, USA. 30 April 2011.
15. "Constraining the equation of state using advanced gravitational-wave detectors." Gravitational Wave Physics and Astronomy Workshop (GWPAW). Milwaukee, WI, USA. 26 January 2011.
14. "Measuring waveforms of binary neutron stars." Caltech-JPL Association for Gravitational Wave Research Seminar. Pasadena, CA, USA. 4 January 2011.
13. "Measuring the equation of state using gravitational waves from binary observations." Exploring Physics with Neutron Stars, a celebration of Fred Lamb's 65th Birthday. Tucson, Arizona. 19 November 2010.
12. "Measuring the size of neutron stars using gravitational waves." Department of Physics and Astronomy, University of Mississippi. 2 November 2010.
11. "What can we learn about neutron stars from binary neutron star coalescences?" Einstein Telescope Working Group 4 meeting. Nice, France. 1 September 2010.
10. "Modelling waveforms from binary neutron stars." NRDA/CAPRA 2010: Theory Meets Data Analysis at Comparable and Extreme Mass Ratios. Perimeter Institute, Waterloo, Canada. 25 June 2010.
9. "Measuring tidal deformation from binary neutron star inspiral." Yukawa Institute for Theoretical Physics, Kyoto, Japan. 14 May 2010.

8. "Dense matter and gravitational waves." Montana State University, Bozeman, MT, USA. 5 March 2010.
7. "Tidal deformation in binary neutron star inspiral." GR Seminar Series, Eberhard-Karls-Universität Tübingen, Germany. 11 Feb 2010.
6. "Tidal deformation in binary neutron star inspiral." University of Southampton Relativity Seminars, Southampton, UK. 4 Dec 2009.
5. "Gravitational waves: modelling sources." Lectures at the 3rd International Summer School on Astroparticle Physics, Radboud University Nijmegen, Nijmegen, the Netherlands. 19-28 August 2009.
4. "Science goals for NINJA 2 - a NR-Matter Perspective," J. Faber, I. Hawke, C. Ott, and J. Read. NRDA 2009: Numerical Relativity and Data Analysis Meeeting, AEI, Potsdam, Germany. 9 July 2009.
3. "Binary neutron star inspiral and the equation of state." University of Wisconsin–Milwaukee, Milwaukee, WI, USA. 5 June 2009.
2. "Physics from binary neutron star coalescences." Einstein Telescope Working Group 4 Meeting, Cardiff University (via telephone). 25 March 2009.
1. "Measuring the size of neutron stars using gravitational waves." Cardiff University, Wales. 6 March 2009.

SELECTED CONTRIBUTED TALKS

"Observing neutron stars with Cosmic Explorer and Einstein Telescope." APS April Meeting 2020, online.

"Matter in compact binary mergers." 231st Meeting of the AAS, Washington DC. 10 January 2018.

"Gravitational waves from neutron-star mergers." APS April Meeting, Salt Lake City, UT, USA. 19 April 2016.

"Measuring luminosity distance and redshift using only gravitational wave observations of binary neutron star coalescences." APS April Meeting, Atlanta, GA, USA. 3 April 2012.

"Build your own embedded spacetime: A theoretical outreach talk" Outreach and Public Engagement Session, Amaldi 9, Cardiff, UK, 12 July 2011.

SELECTED STUDENT POSTERS & PRESENTATIONS

Derek White. "Numerical Simulation Infrastructure For Gravitational Wave Data Analysis." APS April Meeting, April 2019.

Isabella Molina. "Neutron Star Measurements in Third Generation Gravitational Wave Observatories." APS April Meeting, April 2019.

Erick Flynn. "Hybrid Gravitational Wave Systematics and Model Comparisons for Binary Neutron Star Systems" at the APS April Meeting Session L16: Gravitational Waves: Source Modeling, April 2019.

Rossella Gamba, ""The impact of the crust equation of state on the analysis of GW170817," European Physical Society conference on Gravitation (Rome), February 2019.

Erick Flynn. "Hybrid Gravitational Wave Systematics and Model Comparisons." 2018 Annual Meeting of the APS Far West Section. *Flynn was awarded the 2018 Kennedy Reed Award for Best Theoretical Research for this presentation.*

Isabella Molina. "Measuring Properties of Neutron Stars Using Third Generation Gravitational Wave Detectors." Citrus College Research Symposium, September 2016.

Torrey Cullen. "Effects of Waveform Variation in Binary Neutron Star Systems", Pacific Coast Gravity Meeting, UC Santa Barbara, March 2017.

Torrey Cullen. "Hybridizing Gravitational Waveforms of Inspiralling Binary Neutron Star Systems." APS April Meeting. Salt Lake City, UT. April 2016.

Conner Park. "Phenomenological Modeling of Neutron Star Merger." APS April Meeting. Salt Lake City, UT. April 2016.

Phillipe Rodriguez. "Orbital Dynamics of Merging Neutron Stars." Western Regional Honors Conference, University of Nevada, Reno, April 10-12, 2015.

Gabriela Serna. "Intro Astronomy materials developed at California State University Fullerton" LSC-Virgo EPO Group Teleconference. 11 July 2014.

Veronica Lockett-Ruiz, Jocelyn Read. "Resonant effects on BNS Merger gravitational waves." LSC-VIRGO PE+GR+Tides teleconference. October 2013.

Veronica Lockett-Ruiz, Susan Vong, Jocelyn Read. "Resonant Effects on BNS Merger Gravitational Waveforms." LSC-Virgo September Meeting, Hannover, Germany, Sept 2013.

TEACHING

California State University, Fullerton:

- Physics 120 - Introduction to Astronomy Fa2012, Sp2013
  (Course redesigned to Astronomy 101 by Jocelyn Read and Joshua Smith at CSUF)
- Astronomy 101 - Introduction to Astronomy Fa2013, Fa2014, Fa2015, Sp2016, Sp2017, Fa2018, Sp2019, Fa2020, Sp2021, Fa2021, Sp2022
- Astronomy 101L - Introduction to Astronomy Lab Sp2013
  (New GE course developed by Jocelyn Read and Joshua Smith at CSUF)
- Physics 330 A - Electromagnetic Theory I Fa2015, Fa2018, Fa2021
  Upper-division partially flipped class following University of Colorado Boulder materials
- Physics 330 B - Electromagnetic Theory II Sp2016, Sp2018, Sp2019
  Upper-division partially flipped class following University of Colorado Boulder materials
- Physics 416 - Thermal and Statistical Physics Fa2020
  Physics 516 - Statistical Mechanics and Thermodynamics Fa2020
  Joint upper division / graduate course
- Physics 530 A - Electromagnetism I Sp2014, Sp2017, Sp2018
  Graduate-level Electrodynamics
- Physics 449 - Independent Study 2012-

- Physics 557 - Graduate Project 2012-
- Physics 559 - Independent Graduate Study 2012-
- Lab TA supervision for undergraduate physics labs 2012-2015

Supervision of 24 undergraduate students (Heather Chilton, Eric Flynn, Susan Vong, Omar Yousuf, Hannah Allec, Sean Hatcher, Michael Giolli, Conner Park, Torrey Cullen, Isabella Molina, Kevin Abbott, Derek White, Erick Leon, Oscar Martinez, Marc Penuliar, Gabriela Jaimes, Alex Hernandez, Abel Jesus, Anny Antunovich, Cinthia Ramos, Emily Wuchner, Sherelene DeBelen, Sandra Serrano), 12 Masters students (Veronica Lockett-Ruiz, April Hankins, Ivan Ozaeta, Torrey Cullen, Eric Flynn, Amauri Tapia, Rossella Gamba, Derek White, Mary Usufzy, Izzy Kerszenbaum, Abel Jesus), and high school interns (Stevie Rodriguez, Megan Loh) in independent study, research, education, and outreach projects.

Faculty Mentor, Transforming Academic and Cultural Identidad through Biliteracy (TACIB) K12 Teacher Program 2014-2015

- Summer Institute, June 29-July 2, 2015. Presented: "Astronomers and the Mystery of the Gamma Ray Bursts."
- Summer Institute June 23-27, 2014. Presented: "Physics and Astronomy for California Science Standards."
- First Joint Meeting between Teacher Fellows and Faculty Mentors, 21 March 2014. Presented: "Lab Activities on Wave Motion" with Shovit Bhari.
- Joint Meetings between Teacher Fellows and Faculty Mentors, 22 April 2016 and 14 November 2014. Focus on Culturally Responsive Teaching Workshop participation.

Workshop: "Proven Course Redesign eAcademy 2013," California State Polytechnic University, Pomona, CA. 29-31 July 2013.

Workshop: "Improving the College Introductory Astronomy and Space Science Course Through Active Engagement: A Tier I Teaching Excellence Workshop." AAS, Long Beach, CA. 5-6 January 2013.

CONFERENCE ORGANIZATION

Scientific Organizer, The r-process and the nuclear EOS after aLIGO's third observing run. Institute for Nuclear Theory Program INT 20-1b. Online pre-workshop March-April 2020. Rescheduled May 2022.

Scientific Organizing Committee, Seventh Physics and Astronomy at the Extreme (PAX-VII) Workshop, Virtual, August 2021

Scientific Organizer, Exploring Extreme Matter in the Era of Multimessenger Astronomy: from the Cosmos to Quarks. Aspen Summer Program, July 2021.

Organizing Committee, JINA Horizons, Joint Institute for Nuclear Astrophysics - Center for the Evolution of the Elements, Nov-Dec 2020.

Organizing Committee, First Cosmic Explorer Meeting, October 2020.

Lead Scientific Organizer, Astrophysics with Gravitational-Wave Populations. Aspen Winter Conference, February 2019.

Local Organizing Committee, Pacific Coast Gravity Meeting 32, CSU Fullerton, April 2016

Scientific Organizing Committee, Microphysics in Computational Relativistic Astrophysics Workshop 2015 (MICRA 2015), Stokholm, Sweden, August 2015.

Local Organizing Committee, Numerical and Analytical Relativity and Data Analysis, CSU Fullerton, August 2014.

Scientific Organizing Committee, Numerical Relativity Meets Data Analysis (NRDA), Cardiff, Wales July 10-15 2011

Scientific and Local Organizer, Numerical and Analytical Relativity and Data Analysis (NARDA) Workshop, California State University Fullerton, August 2014.

ELECTED POSITIONS

Secretary/Treasurer, Division of Gravity, American Physical Society. 2020-2023

Member-At-Large, Topical Group on Gravitation Executive Committee. American Physical Society. 2013-2016

Co-chair, LIGO Scientific Collaboration Academic Advisory Council. 2014-2016

Postdoc representative, LSC Academic Advisory Council. 2012-2014

PROFESSIONAL MEMBERSHIP

Member of the Cosmic Explorer Consortium 2020-

Member of SACNAS, the Society for Advancement of Chicanos/Hispanics & Native Americans in Science, 2013-

Member of the LIGO Scientific Collaboration, 2010-

Member of American Physical Society
Division of Astrophysics and Topical Group on Gravitation 2005-

Member of the Einstein Telescope Astrophysics Working Group 2009-2010

ADVISORY AND REVIEW

Scientific Advisory Committee (SAC) of the ARC Centre of Excellence for Gravitational Wave Discovery (OzGrav) 2021-

NASA Astrophysics Theory Program Peer Review Panel
NSF Astronomy REU Sites Panel
NSF Graduate Research Fellowship Program Panel
NSF Gravity Review Panel

External reviewer, Classical and Quantum Gravity 2017-
External reviewer, Nature Astrophysics 2018-
External reviewer, ApJ Letters 2017-

	External reviewer, Phys. Rev. D	2010-
	External reviewer, Phys. Rev. Lett.	2013-
	External reviewer, Journal of Physics: Conference Series (JPCS)	2014-
	LSC internal reviewer	2012-

UNIVERSITY SERVICE

College Curriculum Committee, College of Natural Sciences and Mathematics	2021-2022
College Curriculum Committee, College of Natural Sciences and Mathematics	2020-2021
College Curriculum Committee, College of Natural Sciences and Mathematics	2018-2019
CNSM Faculty Awards Committee, CSUF College of Natural Sciences and Mathematics	2018-2019
CSUF Physics Department Personnel Committee	2018-2019
Curriculum and Assessment committee, CSUF Department of Physics	2012-2017
CNSM Faculty Awards Committee, CSUF College of Natural Sciences and Mathematics	2013-2014

MEDIA

Quoted or interviewed by:

Nollyanne Delacruz for the CSUF Daily Titan article "A simple guide to stargazing this autumn," published November 2021.

Adrian Cho for the Science article "Giant detectors could hear murmurs from across universe," DOI: 10.1126/science.371.6534.1089, published March 2021.

Adrian Cho for the Science article "European plan for gigantic new gravitational wave detector passes milestone," published July 2021.

Katia Moskvich for her book "Neutron Stars: The Quest to Understand the Zombies of the Cosmos," Harvard University Press (September 15, 2020).

Charlie Wood for the Popular Science feature "Why are big neutron stars like Tootsie Pops?" published June 2020

Monica Young for the Sky and Telescope feature "GRAVITATIONAL WAVES PUT RULER TO NEUTRON STARS" published March 2020

Adam Mann for the Nature News feature "The golden age of neutron-star physics has arrived," published March 2020.

Charlie Wood for the Scientific American article "Astronomers Spy a Black Hole De-

vouring a Neutron Star" in August 2019.

Sophia Chen for the Wired article "Distant Neutron Stars Could Reveal the Quirks of Quarks," May 2019

Clara Moskowitz for the Scientific American article "Neutron Stars: Nature's Weirdest Form of Matter," March 2019

Joshua Sokol for the Scientific American article "Gravitational Waves Reveal the Hearts of Neutron Stars," June 2018

Joshua Sokol for the Quanta Magazine article " Squishy or Solid? A Neutron Star's Insides Open to Debate," October 2017.

Sophia Chen for the Wired article "Neutron Stars Collide, and Astrophysics Feels the Ripple," October 2017

Davide Castelvecci in the Nature News article "Colliding stars spark rush to solve cosmic mysteries." Nature 550, 309–310 (19 October 2017)

Lauren Williams for the OC Register article "Cal State Fullerton scientists, LIGO detect neutron star collision for first time ever." October 2017

Sanden Totten for Southern California Public Radio,"Caltech wasn't the only SoCal school helping discover gravitational waves", February 2016

Alexandra Witze for Nature News, " Young scientists poised to ride the gravitational wave: Detection of ripples in space-time kicks off new era in physics." February 2016

PUBLIC AUDIENCE PRESENTATIONS

"A Merger in Space: Black Holes And Neutron Stars." Panel with Vicky Kalogera, Duncan Brown, Franz Pretorius, Mario Livio. NYU Global Center, World Science Festival, May 2018

"All about Merging Neutron Stars." Astronomy on Tap, Boston, November 2017

"Gravity and Light." Chabot Space and Science Center Annual Fundraising Gala, October 2017

"Gravitational Waves and Neutron Stars." 2017 Peter Sim Lecture, Royal Astronomy Society of Canada, Calgary AB, March 2017

"Dense matter and gravitational waves: Listening to the symphony of space-time." Public lecture, Orange County Astronomers General Meeting, Chapman University, Orange, CA. 8 August 2014.

"Einstein's Gravitational Waves: Recent and Future Discoveries." With Geoffrey Lovelace and Joshua Smith. Fullerton Library Town and Gown Series, Fullerton, CA. 13 May 2014.

"Dense Matter and Gravitational Waves: Listening to the Symphony of Spacetime." Public lecture, Astrocamp, Idylwild, CA. 6 May 2014.

"The Intense Life of Stars after Death." Public lecture. Oxford Science Café, Oxford, MS, USA. 15 November 2011.

Selected Outreach Activities

Editor-in-chief, LIGO Magazine. `http://www.ligo.org/magazine/` 2016-2018

Classroom visit, Adelaide Price Elementary School, Anaheim CA (3 classes, joint session 50 students), Spring 2017

Classroom visit, Slauson Middle School, Azusa CA (4 middle school classes, two joint sessions, 100 students), Spring 2017

Gravitational Wave outreach event for TACIB high school student visitors. (3 sessions, 120 students) California State University Fullerton, Fullerton, CA. 11 March 2016.

Member of the LSC Education and Public Outreach Working group, social media task force 2011-2016

Planetarium demonstration, Supermoon Eclipse event, California State University Fullerton, Fullerton, CA. 27 September 2015.

Classroom visit for astronomy and astrophysics Q&A; linear functions and the expanding universe, Sycamore Jr. High School, Anaheim, CA, 3 December 2015.

Planetarium demonstration, Concert Under the Stars, California State University Fullerton, Fullerton, CA. 13 September 2014.

Classroom visit for solar system activity, South Jr High School, Anaheim, CA, 19 May 2014.

CSUF Physics 120/Astronomy 101 Observing Nights at CSUF 2012-2015

Editor, LIGO Magazine 2012-2014

Telescope Observing Night, Raymond Elementary Jan 2013

"The Titanium Physicists Podcast."
`http://titaniumphysicists.brachiolopemedia.com/`
Guest physicist on episodes including:

Ep81: LISA the Giant Tumbling Space Triangle	Sept 2019
Ep47: The Song of Falling Stars With Robot Hugs	June 2014
Ep43: Approaching Singularity with Jesse Moynihan	Feb 2014
Ep39: Pasta Matter with Sean Martin	Dec 2013
Ep36: Useless Spheres and Wasteful Rockets with Mur Lafferty	Sep 2013
Ep29: Dark Equivalence with Alisdair Stuart	Feb 2013
Ep27: Death and Heat Death with Cory Doctorow	Dec 2012
Ep25: The No Bear Theorem with Anne Casselman	Nov 2012
Ep20: Time Dilates When You're Having Fun with Mookie Terraccinao	Jul 2012

Additional episodes: 1, 2, 3, 4, 6, 8, 9, 10, 16

"Weird stuff in tiny stars." Back page article. LIGO Magazine, Issue 2, March 2013.

OTHER RESEARCH POSITIONS

University of British Columbia, Vancouver, Canada Summer 2002 Bayesian analysis of period variation in binary star system, with Phil Gregory.

University of California–Los Angeles, USA Summer 2001 Institute for Pure and Applied Mathematics Research in Industrial Projects for Students, Metropolis Monte Carlo simulation of Indium Arsenide surface reconstruction.

Shell Canada, Calgary, AB, Canada Summer 1999 Summer undergraduate research. "Model-based analysis to resolve sub-tuning level detail in Devonian reef."

Canadian Hunter, Calgary, AB, Canada Summer 1997 Shad Valley. Database compilation and analysis for statistically significant correlations between sub-ground temperature and hydrocarbon locations.

Meng (Stephanie) Shen, PhD

Department of Physics, College of Natural Science and Mathematics,
California State University, Fullerton
800 N. State College Blvd. Fullerton, CA 92831
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PROFESSIONAL EXPERIENCE

2020-Present **Assistant Professor**
California State University, Fullerton, California
Department of Physics

2018-2020 **Postdoctoral Scholar**
The University of Chicago, Chicago, Illinois
Pritzker School of Molecular Engineering (IME)

2016-2018 **Postdoctoral Researcher**
Northwestern University, Evanston, Illinois
Department of Materials Science Engineering

2014-2015 **Postdoctoral Fellow**
Northwestern University, Evanston Illinois
Department of Mechanical Engineering

EDUCATION

2008-2013 **Rensselaer Polytechnic Institute (RPI),** Troy, NY, USA
Ph.D. in Materials Science and Engineering
Thesis project: Tunable interfacial thermal conductance
Advisor: Prof. Pawel Keblinski

Fudan University, Shanghai, China
2005-2008 M.S. in Materials Physics
2001-2005 B.S. in Materials Physics

RESEARCH AREAS AND INTERESTS

Computational soft matter, bio-interfaces, electrostatics, heat and mass transfer, membrane filtration, mechanical metamaterials, soft robotics, machine learning, energy and environmental sustainability.

SELECTED RESEARCH GRANTS

2021	CSUF Junior Senior Grants ($4999)
2021-2022	CSUF Summer 2021 Grant for Faculty Support on Scholarly or Creative Productivity ($5000)
2021-2022	XSEDE Covid-19 Consortium Award (30,000 SU)
2020-2021	XSEDE Startup Award (10,000 SU)

GRANT PROPOSAL EXPERIENCES

2021 "Understanding Polypyrrole for Selective Removal of Oxyanions from Water", PI of XSEDE research allocation application, awarded.
2021 "Interplay between COVID-19 viruses and contact surfaces in the built environment", PI of XSEDE Covid-19 consortium application, awarded.
2021 "Understanding and designing surface materials for removal of viral pathogens", PI of Junior/Senior Grant at CSUF, awarded.
2021 "Understanding collective motion by machine learning and physics-based modeling", PI of Summer Grant at CSUF, awarded.
2021 "Collaborative Research: Interplay between viral pathogens and contact surfaces to elucidate fomite transmission in the built environment", co-PI of NSF proposal, under review.
2020 "The effects of electrostatics on the filtration of aerosols", PI of XSEDE startup allocation application, awarded.
2014 "Nanoscale Physics of Reverse Osmosis Membrane Filtration", co-PI of a research allocation computational award granted by XSEDE.

HONOR AND AWARD

2015 Elias Klein Founders' Travel Award from North American Membrane Society.

PEER-REVIEWED PUBLICATIONS

1. C. Sun, **M. Shen,** A. D. Chavez, A. M. Evans, X. Liu, B. Harutyunyan, N. C. Flanders, M. C. Hersam, M. J. Bedzyk, M. Olvera de la Cruz and William R. Dichtel, "High aspect ratio nanotubes assembled from macrocyclic iminium salts", *PNAS*, (2018).
2. **M. Shen,** "Towards the systematic control of the exfoliation of atomically thin layered materials by electrostatics", *ACS Central Science*, 4, 142-143 (2018).
3. Y. Li, M. Girard, **M. Shen**, J. A. Millan and M. Olvera de la Cruz, "Strong attractions and repulsions mediated by monovalent salts", *PNAS* 114, 11838-11843 (2017).
4. **M. Shen**, H. Li and M. Olvera de la Cruz, "Surface Polarization Effects on Ion-Containing Emulsions", *Phys. Rev. Lett.* 119, 138002 (2017).
5. **M. Shen**, S. Keten and R. Lueptow, "Rejection mechanisms for contaminants in polymamide reverse osmosis membranes", *J. Membr. Sci.* 509, 36-47 (2016).
6. **M. Shen**, S. Keten and R. Lueptow, "Dynamics of water flux and contaminant rejection

in polymeric reverse osmosis membranes via molecular dynamics simulations", *J. Membr. Sci.* 506, 95-108 (2016).

7. J. Yang, **M. Shen**, et al., "Phonon transport through point contacts between graphitic nanomaterials", *Phys. Rev. Lett.* 112, 205901 (2014).
8. **M. Shen** and P. Keblinski, "Ballistic vs. diffusive heat transfer across nanoscopic films of layered crystals", *J. Appl. Phys.* 115, 144310 (2014).
9. **M. Shen**, P. K. Schelling and P. Keblinski, "Heat transfer mechanism across few-layer graphene by molecular dynamics", *Phys. Rev. B* 88, 045444 (2013).
10. W. Evans, **M. Shen** and P. Keblinski, "Thermal transport in carbon nanotubes arrays and bundles: Effects of contact area and pressure", *Appl. Phys. Lett.* 100, 261908 (2012).
11. **M. Shen**, W. Evans, D. G. Cahill and P. Keblinski, "Bonding and pressure tunable interfacial thermal conductance", *Phys. Rev. B*, 84, 195432 (2011).
12. D. H. Wu, **M. Shen**, X. F. Shao, et al., "EOS Failure Analysis and Die Attach Optimizing Research of Chips", *Chinese Journal of Semiconductors*, Vol. 29, No.2, 381-386 (2008).
13. **M. Shen**, T. Hua, B. X. Shao and J. Wang, "Influence of IMC Growth on Reliability of Lead-Free Solder Balls", *Semiconductor Technology*, Vol. 32, No. 11, 929-932 (2007).

Publications in progress († Indicates corresponding author)

14. "The rational design of disordered 3D auxetic networks by global node optimization", **M. Shen**, et al. (In preparation)
15. "Mechanisms for enhanced transport selectivity of like-charged ions in hydrophobic-polymer-modified ion-exchange membranes" L. Kong, E. Palacios, **M. Shen**† and X. Liu†. (In response to the 1st round of review)
16. "Understanding the tunability of the interaction between Covid-19 spike proteins and contact surfaces" A. Kemnitz, A. Verduzco and **M. Shen**† (In preparation).

CONTRIBUTED CONFERENCE PRESENTATIONS AND POSTERS (_ Indicates the presenter)

- E. Palacios, L. Kong, X. Liu and **M. Shen**, "Understanding the effect of polypyrrole on the enhanced ion selectivity of ion exchange membranes", the North American Membrane Society 2022, Tempe, AZ.
- M. Shen, "Using modeling and simulations to understand and design ion exchange membranes", flash talk at WRPI conference, California State University-Northridge, Apr. 2022, Northridge, CA.
- E. Palacios, L. Kong, X. Liu and **M. Shen**, "Understanding selective transport of same-charge ions in polymeric membranes", APS March meeting 2022, Chicago, IL.
- A. Kemnitz, A. Verduzco and **M. Shen**, **"**The effect of salt on the interaction between contact surfaces and Covid-19 droplets", APS March meeting 2022, Chicago, IL.
- L. Kong, **M. Shen** and X. Liu, "Hydrophobic conductive polymer modified anion exchange membrane for selective nitrate separation in membrane capacitive deionization", ACS Fall Meeting, Atlanta 2021, Georgia.
- **M. Shen**, "Interfacial tension and wettability of water solution on hydrophilic and hydrophobic surfaces", APS March Meeting 2021, online.
- **M. Shen**, S. Nagel and J. J. de Pablo, "Tuning Auxetic Properties of Networks by the

Bending Resistance", GRS and GRC on Soft Matter 2019, New London, NH.

- **M. Shen**, N. Pashine, S. R. Nagel and J. J. de Pablo, "The effects of torsion and bending resistance on auxetic 3D networks", APS March Meeting 2019, Boston, MA.
- **M. Shen**, H. Li and M. Olvera de la Cruz, Oral presentation, "The effects of interfacial polarization on long-range interaction between aqueous phases in oil", APS March Meeting 2017, New Orleans, LA.
- R. M. Lueptow and **M. Shen**, Oral presentation, "Ångström-Scale Molecular Interactions in Reverse Osmosis Membranes", 2016 Gordon Research Conference on Membranes: Materials and Processes, New London, NH.
- **M. Shen**, S. Keten and R. M. Lueptow, Oral presentation, "Molecular dynamics simulations of water and contaminant transport in RO membranes: size and structural effects", 2015 North American Membrane Society (NAMS 2015), Boston, MA.
- **M. Shen**, S. Keten and R. M. Lueptow, Poster, "Molecular dynamics simulations of water and contaminant transport in RO membranes: chemistry effects", 2015 North American Membrane Society (NAMS 2015), Boston, MA.
- **M. Shen**, S. Keten and R. M. Lueptow, Oral presentation, "Organic solute transport through polymeric reverse osmosis (RO) membranes by molecular dynamics simulations", 2014 North American Membrane Society (NAMS 2014), Houston, TX.
- **M. Shen**, P. K. Schelling and P. Keblinski, Oral presentation, "Ballistic to diffusive heat transfer mechanism across layered interfaces by molecular dynamics", 2013 Materials Research Society (MRS) Spring Conference, San Francisco, CA.
- **M. Shen**, W. Evans and P. Keblinski, Poster, "Interfacial thermal conductance between single-walled carbon nanotubes and between multi-walled carbon nanotubes", 2012 PHONONS conference, Ann Arbor, MI.
- **M. Shen**, W. Evans and P. Keblinski, Poster, "Bonding and pressure tunable interfacial thermal conductance", 2011 Air Force Conference, Washington DC.
- W. Evans, **M. Shen** and P. Keblinski, Poster, "Tunable Thermal transport in carbon nanotubes arrays and bundles", 2011 Air Force Conference, Washington DC.
- **M. Shen**, W. Evans and P. Keblinski, Oral presentation, "Tunable interfacial thermal conductance", 2011 Materials Research Society (MRS) Spring Conference, San Francisco, CA.

INVITED TALKS AND COLLOQUIA

- "Tuning Electrostatic-Mediated Self-Assembly Beyond the Classical Theory", California State University, Fullerton, Physics Club, Fullerton, CA (Oct. 2020).
- "Computational physics in materials design: bottom-up and top-down approaches", California State University, Fullerton, Dept. of Physics, Fullerton, CA (Oct. 2020).
- "The understanding and design of composite soft materials", University of California, Merced, Dept. of Physics, Merced, California (Dec. 2019).
- "The Rational Design of Auxetic Networks", University of Illinois at Chicago, Dept. of Chemical Engineering, Chicago, Illinois (Aug. 2019).
- "The Challenges and Opportunities of Electrostatics in Emulsions and Polymers", University of Illinois at Chicago, Dept. of Chemical Engineering, Chicago, Illinois (Jul. 2018).

- "Electrostatic Interactions of Colloids and Emulsions: The Effects of Salt and Polarization", California Institute of Technology, Los Angeles, California, (Apr. 2018).
- "Exploring the Electrostatic Interactions of Colloids and Emulsions", University of Illinois at Chicago, Dept. of Physics, Chicago, Illinois (Feb. 2018).
- "Molecular dynamics simulations of soft matter with electrolytes"**,** The University of Chicago, The Institute for Molecular Engineering, Chicago, Illinois (Jun. 2017).

MEDIA COVERAGE

2017 "Understanding Rare Earth Emulsions", https://www.mccormick.northwestern.edu/news/articles/2017/10/understanding-rare-earth-emulsions.html, highlighted on the Department of Defense (DOD) University Research page.

TEACHING

California State University Fullerton

2021 Fall	Solid State Physics (PHYS 554/454)
	Developing course materials and instructing upper division and graduate students
2021 Spring	Fundamentals of Physics: Mechanics (PHYS 225)
	Optimized interactive course materials for online teaching
2020 Fall	Fundamentals of Physics: Mechanics (PHYS 225)
	Developed interactive lectures and assessments for online teaching

STUDENT ADVISING

2020-present	Alex Kemnitz, Graduate Researcher, winner of Dan Black Scholarship, "Understanding the Interaction between Viruses and Surfaces"
2020-present	Eric Palacios, Undergraduate Researcher, "The Ion Transport Mechanisms in Ion-Exchange Membranes"

UNIVERSITY AND DEPARTMENT SERVICES

2020-present	Organizing colloquium series in the Dept. of Physics, CSUF
2021-present	Member of Developing Curriculum Committee (DCC) at CSUF

PROFESSIONAL SERVICES

2019:	Discussion leader at Gordon Research Seminar on Soft Matter 2019, in session: Materials, Structures and Design
2018-present:	ACS Central Science
2017-present:	Journal of Membrane Science
2014-present:	Reviewer, The Journal of Applied Physics

SCIENTIFIC OUTREACH

2018 Summer school tutor in the Department of Chemical Engineering at University of Illinois, Chicago (UIC)
2012 Tutor to guide high school girls to science and engineering in the Design Your Future Day program, Troy, NY.

PROFESSIONAL MEMBERSHIP

American Physical Society, Topical Group on Quantum Information, Topical Group on Physics Education Research, Forum on Education, 2016-present
American Association of Physics Teachers, 2020-present

Joshua R. Smith

The Nicholas and Lee Begovich Center for Gravitational-Wave Physics and Astronomy
Department of Physics
California State University Fullerton
800 N. State College Blvd. Fullerton, CA 92831

E-mail: josmith@fullerton.edu
Phone: (657)-278-3716
Web: https://physics.fullerton.edu/∼josmith/

Appointments

2016–	Dan Black Director of Gravitational-Wave Physics and Astronomy
2018–	Professor of Physics
2014–2018	Associate Professor of Physics
2010–2014	Assistant Professor of Physics
	California State University Fullerton (CSUF)
2007–2009	Postdoctoral Research Associate in Physics
	Syracuse University
2006–2007	Postdoctoral Fellow in Physics
	Albert Einstein Institute Hannover / EGO-Virgo

Education

2002–2006 Ph.D. Physics (*Dr. rer. nat.*), Leibniz Universität Hannover

- Advisor: Karsten Danzmann
- Thesis: "Formulation of Instrument Noise Analysis Techniques and Their Use in the Commissioning of the Gravitational Wave Observatory GEO 600"

1998–2002 B.Sc. Physics, Syracuse University

- Advisor: Peter Saulson
- Thesis: "Thermal Noise Associated with Silicate Bonding"

Leadership

2012–	Director, The Nicholas and Lee Begovich Center for Gravitational-Wave Physics and Astronomy, CSUF
2019–	Co-I, Cosmic Explorer Project, Member, Cosmic Explorer Consortium
2016–2017	Member, Executive Committee, APS Far West Section
2011–2015	Chair, Detector Characterization Group, LIGO Scientific Collaboration
2011–2015	Member, Executive Committee, LIGO Scientific Collaboration
2008–	Member, Council, LIGO Scientific Collaboration
2008–2010	Co-chair, Glitch Working Group, LIGO Scientific Collaboration

Awards and Recognition

2017	Orange County's 100 Most Influential, Orange County Register, [link]
2016	Outstanding Untenured Faculty Member, College of Natural Sciences and Mathematics, CSUF
2016	Orange County's 100 Most Influential, Orange County Register, [link]
2016	Gruber Cosmology Prize, 1/1000 awardees from the LIGO Discovery Team, [link]
2016	Special Breakthrough Prize, 1/1000 awardees from the LIGO Contributors, [link]
2015	Cottrell Scholar, Research Corporation for Science Advancement, [link]
2014	40 Under 40, OC Metro Magazine, [link]
2013	NSF CAREER Award, [link]

Selected Publications

CSUF co-authors are shown in bold and CSUF student co-authors are indicated with an additional asterisk. A complete list is at the end of this document and on Google Scholar.

1. "Observation of Gravitational Waves from a Binary Black Hole Merger," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), *Phys. Rev. Lett.* **116** 061102 (2016). [PRL], [arXiv].

2. Lück, H, Smith J., Punturo M. (2021) Third-Generation Gravitational-Wave Observatories. In: Bambi C., Katsanevas S., Kokkotas K.D. (eds) Handbook of Gravitational Wave Astronomy. Springer, Singapore. [Springer]

3. "A hierarchical method for vetoing noise transients in gravitational-wave detectors," **J. R. Smith**, **T. Abbott***, E. Hirose, N. Leroy, D. MacLeod, J. McIver, P. Saulson, P. Shawhan, *Class. Quantum Grav.* **28** 235005 (2011). [CQG], [arXiv].

4. "The path to the enhanced and advanced LIGO gravitational-wave detectors," **J.R. Smith** for the LIGO Scientific Collaboration, *Class. Quantum Grav.* **26** 114013 (2009). [CQG]. A Classical and Quantum Gravity Highlight of 2009-2010.

5. "A Horizon Study for Cosmic Explorer: Science, Observatories, and Community," 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, Jeff S. Kissel, 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, Report number: CE-P2100003, 2021. [arXiv]

6. Chapter 14: Diagnostic methods for gravitational-wave detectors. J. McIver, TJ. Massinger, F. Robinet, **J. Smith**, **M. Walker**. Book Chapter in Advanced Interferometric Gravitational-Wave Detectors. Eds. P. Saulson, D. Reitze, H. Grote. 100 Years of General Relativity. World Scientific Publishing. July 2019. [WS]

7. "Gravitational-wave physics with Cosmic Explorer: Limits to low-frequency sensitivity," ED Hall, K Kuns, **JR Smith**, Y Bai, C Wipf, S Biscans, RX Adhikari, K Arai, S Ballmer, L Barsotti, Y Chen, M Evans, P Fritschel, J Harms, B Kamai, JG Rollins, D Shoemaker, BJJ Slagmolen, R Weiss, and H Yamamoto, Phys. Rev. D 103, 122004 (2021). [PRD], [arXiv]

8. "In-vacuum measurements of optical scatter versus annealing temperature for amorphous Ta2O5 and TiO2:Ta2O5 thin films," **Elenna M. Capote***, **Amy Gleckl***, **Jazlyn Guerrero***, **Michael Rezac***, **Robert Wright**, and **Joshua R. Smith**, J. Opt. Soc. Am. A 38, 534-541 (2021). [JOSA A], [arXiv]

9. "LigoDV-web: Providing easy, secure and universal access to a large distributed scientific data store for the LIGO Scientific Collaboration," **J.S. Areeda**, **J.R. Smith**, A.P. Lundgren, E. Maros, D.M. Macleod, J. Zweizig, *Astronomy and Computing* **18** 27–34 (2017). [ASCOM], [arXiv].

10. "Identifying correlations between LIGO's astronomical range and auxiliary sensors using lasso regression," **M. Walker**, A.F. Agnew, **J. Bidler***, A.P. Lundgren, **A. Macedo***, D. Macleod, T.J. Massinger, O. Patane*, **J.R. Smith**, *Class. Quantum Grav.* **35** 225002 (2018). [CQG], [arXiv].

11. "Optical scatter of quantum noise filter cavity optics," **D. Vander-Hyde***, C. Amra, M. Lequime, F. Magaña-Sandoval, **J.R. Smith**, *Class. Quantum Grav.* **32** 135019 (2015). [CQG], [arXiv].

12. **C. Padilla***, P. Fritschel, **F. Magaña-Sandoval***, **E. Muniz***, **J.R. Smith**, L. Zhang. "Low scatter and ultra-low reflectivity measured in a fused silica window." *Applied Optics*, **53** 1315-1321 (2014). Included in Spotlight on Optics. [AO], [arXiv].

13. "Large-angle scattered light measurements for quantum-noise filter cavity design studies," **Fabian Magaña-Sandoval***, Rana X. Adhikari, Valera Frolov, Jan Harms, **Jacqueline Lee***, Shannon Sankar, Peter R. Saulson, and **Joshua R. Smith**, *JOSA A*, Vol. 29, Issue 8, pp. 1722-1727 (2012). [JOSAA], [arXiv].

14. "Apparatus to Measure Optical Scatter of Coatings Versus Annealing Temperature," **JR Smith**, RX Adhikari, **KM Aleman***, **A Avila-Alvarez***, G Billingsley, **A Gleckl***, **J Guerrero***, A Markosyan, S Penn, **JA Rocha***, **D Rose***, **R Wright**, in Optical Interference Coatings Conference (OIC) 2019, OSA Technical Digest (Optical Society of America, 2019), paper FA.2. [OSA], [arXiv].

15. "In-vacuum measurements of optical scatter versus annealing temperature for amorphous Ta2O5 and TiO2:Ta2O5 thin films," **Elenna M. Capote***, **Amy Gleckl***, **Jazlyn Guerrero***, **Michael Rezac***, **Robert Wright**, and **Joshua R. Smith**, J. Opt. Soc. Am. A 38, 534-541 (2021). JOSA A, [arXiv]

16. Chapter 11: "Optical Scatter." Optical Coatings and Thermal Noise in Precision Measurement. **Joshua Smith** and Michael Zucker. Eds. G. M. Harry, T. Bodiya, R. DeSalvo. Cambridge: Cambridge University Press, 2012. Print. ISBN:9781107003385. [CUP].

17. "Gravity Spy: Integrating Advanced LIGO Detector Characterization, Machine Learning, and Citizen Science," M Zevin, S Coughlin, S Bahaadini, E Besler, N Rohani, S Allen, M Cabero, K Crowston, A K Katsaggelos, S L Larson, T K Lee, C Lintott, T B Littenberg, A Lundgren, C Oesterlund, **J R Smith**, L Trouille, V Kalogera, *Class. Quantum Grav.* 34 6 (2017). [CQG], [arXiv].

18. "Machine learning for Gravity Spy: Glitch classification and dataset," S. Bahaadini, V. Noroozi, N. Rohani, S. Coughlin, M. Zevin, **J.R. Smith**, V. Kalogera, A. Katsaggelos, *Information Sciences* **444** 172-186 (2018). [INS].

19. "Measurement and simulation of laser power noise in GEO600," **J.R. Smith**, J. Degallaix, A. Freise, H. Grote, M. Hewitson, S. Hild, H. Lück, K.A. Strain and B. Willke, *Class. Quantum Grav.* **25** 035003-035015 (2008). [CQG].

20. "Linear projection of technical noise for interferometric gravitational-wave detectors," **J.R. Smith**, P. Ajith, H. Grote, M. Hewitson, S. Hild, H. Lück, K.A. Strain, B. Willke, J. Hough and K. Danzmann, *Class. Quantum Grav.* **23** 527-537, (2006). [CQG].

21. "Feedforward correction of mirror misalignment fluctuations for the GEO 600 gravitational wave detector," **J.R. Smith**, H. Grote, M. Hewitson, S. Hild, H. Lück, M. Parsons, K.A. Strain and B. Willke, *Class. Quantum Grav.* **22** 3093-3104, (2005). [CQG].

22. "Commissioning, characterization, and operation of the dual-recycled GEO 600," **J.R. Smith** et al., *Class. Quantum Grav.* **21** S1737-S1745, (2004). [CQG].

23. "Mechanical loss associated with silicate bonding of fused silica," **J.R. Smith**, G.M. Harry, J.C. Betzwieser, A.M. Gretarsson, D.A. Guild, S.E. Kittelberger, M.J. Mortonson, S.D. Penn and P.R. Saulson, *Class. Quantum Grav.* **20** 5039-5047, (2003). [CQG]. A Classical and Quantum Gravity Highlight of 2003-2004.

Technology Transfers

2015 A. Avila Alvarez, J. Rocha, L. Hargreaves, J. Smith, "InstruTech Hornet 402 Vacuum Gauge Control VI," [NI.com].

2015 A. Avila Alvarez, E. Muniz, J. Rocha, J. Smith, "Driver VIs for Innolight Mephisto S Laser Line," [NI.com].

External Grants

2021 (Senior Personnel) National Science Foundation, PHY-2110594, "Data Handling and Analysis Infrastructure for Gravitational-wave Astronomy," **$753,324 awarded 2021-2025.**.

2020 (PI) National Science Foundation, PHY-2019184 "MRI: Acquisition of a Cryogenic Testbed for Advancing Gravitational-Wave Observation Technology," **$159,934 awarded 2020-2023.**

2018 (PI) National Science Foundation, PHY-1807069, "RUI: Improving LIGO optics and data quality to increase the rate and accuracy of gravitational-wave observations," **$299,538 awarded 2018-2021.** [link]

2018 (Co-PI) National Science Foundation, PHY-1836734, "Collaborative Research: The Next Generation of Gravitational Wave Detectors," **$211,283 awarded 2018-2021.** [link]

2017 (Co-PI) National Science Foundation, PHY-1708035, "Data Handling and Analysis Infrastructure for Gravitational-wave Astronomy," **$634,196 awarded 2017-2021.** [link]

2017 (Co-PI) National Science Foundation, PHY-1708035, "Collaborative Research: LSC Center for Coatings Research," **$152,650 awarded 2017-2020.** [link]

2015 (Co-PI) National Science Foundation, AST-1559694, "Catching a new wave: the CSUF-Syracuse partnership for inclusion of underrepresented groups in gravitational-wave astronomy," **$937,368 awarded 2016-2021.** [link]

2015 (Co-PI) National Science Foundation (NSF), "INSPIRE: Glitch Zoo: Teaming Citizen Science with Machine Learning to Deepen LIGO's View of the Cosmos," **$67,500 awarded 2015-2018.** [link]

2014 (Co-PI) National Science Foundation (NSF) PHY-1429873, "MRI: Acquisition of a high-performance computer cluster for gravitational-wave astronomy with Advanced LIGO," **$119,791 awarded 2014-2017.** [link]

2013 (PI) NSF PHY-1255650, "CAREER: Gravitational-Wave Detector Characterization and Science Education in the Advanced LIGO Era," **$450,000, awarded 2013-2018.** [link]

2012 (Senior Personnel) NSF PHY-1104371, "Data Handling and Analysis Infrastructure for Advanced LIGO and Beyond," $9,000,000 all institutions, **$675,000 CSUF subcontract, awarded 2012-2017.** [link]

2011 (Senior Personnel) National Science Foundation, PHY-0600953, "Enabling Gravitational-Wave Astronomy on the LIGO Data Grid," **$125,000 one-year subcontract to CSUF, awarded 2011-2012.** [link]

2010 (PI) NSF PHY-0970147, "RUI: LIGO detector characterization and optical scatter research," **$240,000, awarded 2010-2013.** [link]

2010 (PI) Research Corporation for Science Advancement, Cottrell College Science Award # 19838, "Extending the astronomical reach of gravitational-wave detectors with all-reflective interferometry," **$35,000, awarded 2010-2012**

Internal Grants

2012 (Co-PI) Faculty Enhancement and Instructional Development Grant, "Enhancing student learning with improved manuals for advanced physics laboratory classes," with Greg Childers, **$5,247, funded 2012-2013**

2011 (PI) CSUF Office of the Associate Vice President for Graduate Programs and Research, Center and Institute Planning and Expansion Program, "Three-year plan for funding and expansion of the Gravitational-Wave Physics and Astronomy Center (GWPAC)," **$15,000, funded 2011-2012**

Courses Taught

PHYS520	Graduate Mechanics, Fa19, Fa20
ASTR101	Introduction to Astronomy, Fa21, Sp18, Sp17, Sp15, Sp14, Fa13
ASTR101L	Introduction to Astronomy Lab, Fa18, Fa13
PHYS120	Introduction to Astronomy, Sp13, Fa12, Fa11
PHYS225	Calculus-based Fundamental Physics: Mechanics, Fa10, Sp10
PHYS300	Mathematical Methods for Physics, Sp21
PHYS315	Computational Physics, Fa15, Sp17, Sp21
PHYS380	Methods Experimental Phys, Fa15
PHYS411	Modern Optics, Fa18, Fa16, Fa14
PHYS481	Experimental Physics, Sp12
PHYS482	Modern Optics Laboratory, Sp11

Professional Membership

2000–	Member, Cosmic Explorer Consortium
2015–	Member, Optica (formerly the Optical Society of America (OSA))
2011–	Member, Society for Advancement of Chicanos and Native Americans in Science (SACNAS)
2011–	Member, American Astronomical Society (AAS)
2007–	Member, American Physical Society (APS), Topical Group on Gravitation, CA/NY Sections
2000–	Member, LIGO Scientific Collaboration

Service

2021	Chair, STEM Symposium " Cosmic Explorer: Science, Observatories, and Community for the US's Next Generation Gravitational-Wave Observatory", SACNAS NDiSTEM Conference
2021	Chair, Department Personnel Committee, Department of Physics, CSUF
2019–2020	Member, Department Personnel Committee, Department of Physics, CSUF
2019	Member, National Science Foundation, Physics Committee of Visitors
2019	Scientific Organizing Committee, Sixth Physics and Astrophysics at the Extreme (PAX) meeting, Cascina, Italy
2019	Reviewer, Program Performance Review, CSUF Department of Mathematics
2018–2021	Advisory panelist, Classical and Quantum Gravity, [link]
2017–2020	Co-Chair, Speaker's Board, LIGO Scientific Collaboration
2013–	Reviewer, National Science Foundation, Physics
2012–	Referee, Optical Society of America Publishing (*Optics Letters*, *Applied Optics*, *JOSA A*)
2011–2016	Faculty Advisor, Physics Club, CSUF Department of Physics
2011–2016	Member, Radiation Safety Committee, CSUF (campus-wide)
2011–	Member, Diversity Working Group, LIGO Scientific Collaboration
2010–	Referee, Institute of Physics Publishing (*Classical and Quantum Gravity*)
2010–2015	Member, Website Committee (ad hoc), CSUF Department of Physics
2016–2017	Chair, Department Personnel Committee, Department of Physics, CSUF
2016–2017	Member, College of Natural Sciences and Mathematics Faculty Awards Committee, CSUF
2015–2016	Member, Search Committee for Dean of the College of Natural Sciences and Mathematics, CSUF
2013,2015	Member, Faculty Search Committee, Department of Physics, CSUF
2015–2017	PhD Qualifying Exam Committee Member for Robert Stone and Guillermo Valdes, University of Texas Brownsville / Rio Grande Valley and University of Texas at San Antonio
2014–2015	Member, Program Performance Review Committee, CSUF Department of Physics
2014–2015	Reviewer, NASA Postdoctoral Program
2011–2012	Member, Student Research Advisory Committee (formerly PURE), CSUF (campus-wide)

2011–2015 Member, MOU Review Committee, LIGO Scientific Collaboration

2010–2013 Member, Safety Committee, CSUF College of NSM

2010–2011 Member, Curriculum Committee, CSUF Department of Physics

2008–2015 Reviewer, Advanced LIGO Acceptance (2014–2015), Enhanced LIGO Calibration (through 2010), Advanced LIGO Data Acquisition System Design (through 2010), Gingin High Power Test Facility (through 2012)

Invited Presentations

2021 "Third generation ground-based gravitational-wave observatories: detector technology and scientific themes," Miami 2021 topical physics conference (Virtual)

2021 "Cosmic Explorer Science and Project," 6th Dawn Meeting on Global Strategies for Gravitational Wave Astronomy (Virtual)

2019 "The Next Generation of Earthbound Laser Interferometric Gravitational-Wave Detectors," Gravitational Waves in the Adirondacks, Blue Mountain Lake, NY

2019 "Apparatus to Measure Optical Scatter of Coatings Versus Annealing Temperature," Optical Interference Coatings 2019, Optical Society of America, Santa Ana Pueblo, NM

2019 "Using optics and precision metrology to measure black holes and neutron stars across the universe," Ventura section of Optical Society of America, Simi Valley, CA

2018 "Observing the universe with waves of gravity," with Geoffrey Lovelace, Fullerton Public Library

2018 "Observing black holes and neutron stars from across the universe with gravity," Physics Department Colloquium, Syracuse University, Syracuse, NY

2017 "Undergraduate research helping to observe black hole mergers from across the universe," 2017 CSU STEM Conference, Los Angeles, CA

2017 "Using precision optics and metrology to measure black hole mergers from across the universe with LIGO," Optical Society of America Optical Design and Fabrication Congress, Denver, CO

2017 "Observing Black Holes From Across the Universe," Public Lecture at the Fullerton Community Center, Fullerton, CA

2017 "The impact of philanthropic support for student engagement in gravitational-wave science," 2017 Ontiveros Legacy Society Recognition Luncheon, CSU Fullerton, Fullerton, CA

2016 "The discovery of gravitational waves from merging black holes," STEM Seminar, Cypress College, Cypress, CA

2016 "Observing black hole mergers from across the universe with LIGO," Physics Colloquium, CSU Northridge, Northridge, CA

2016 "Observing black hole mergers from across the universe with LIGO," Astrophysics Seminar, UC Irvine, Irvine, CA

2016 "Using optics and precision metrology in LIGO to measure black hole mergers from across the universe," 2nd Annual Photonics Society Banquet, UC Santa Barbara, Santa Barbara, CA

2016 "Using optics and precision metrology in LIGO to measure black hole mergers from across the universe," Optical Society of Southern California Meeting, Fullerton, CA

2016 "Current and future gravitational-wave discoveries with the Laser Interferometer Gravitational-Wave Observatory, LIGO," Cal State Long Beach Colloquium, Long Beach, CA

2016 "Current and future gravitational-wave discoveries with LIGO," SLAC experimental seminar, Stanford Linear Accelerator, Menlo Park, CA

2015 "Einstein's Gravitational Waves - Future Discoveries," STEM event, Santiago Canyon College, Orange, CA

2014 "Gravitational-Wave Astronomy with LIGO," Physics Colloquium, CSU Fresno, Fresno, CA

2014 "Einstein's Gravitational Waves," with Jocelyn Read and Geoffrey Lovelace, Fullerton Public Library

2014 "Exploring the gravitational-wave sky with LIGO," California State University Northridge, Physics and Astronomy Colloquium, Northridge, CA

2013 "Detector characterization to prepare for the first gravitational-wave detections," Gravitational Wave Physics and Astronomy Workshop, Pune, India

2013 "Gravitational-Wave Astronomy with LIGO: Opening a New Window on the Universe," Orange County Astronomers General Meeting, Chapman University, Orange CA

2013 "Research in Gravitational-Wave Astronomy and Physics at Cal State Fullerton," Introductory remarks at Discover STEM Event, Cypress College, Cypress, CA

2013 "Gravitational-Wave Astronomy with LIGO: Opening a New Window on the Universe," CSUF Osher Lifelong Learning Institute Science Series, Fullerton, CA

2012 "Gravitational-Wave Astronomy with LIGO," Cal Poly Pomona Physics and Astronomy Seminar, Pomona, CA

2012 "Fighting Noise in the LIGO Interferometers," 2012 SACNAS National Conference, Scientific Symposia Session, Seattle, WA

2012 "Venus, a nice place to live?," public lecture, Fullerton Arboretum Venus Transit Viewing, Fullerton, CA

2012 "Gravitational-wave astronomy with LIGO and Virgo," UC Irvine High-Energy Physics Seminar, Irvine, CA

2011 "Exploring the transient universe with gravitational waves," American Physical Society April Meeting, Anaheim, CA

2010 "Extending the range of gravitational-wave astronomy," Colloquium, Louisiana State University, Baton Rouge, LA

2010 "Searching for gravitational-wave bursts with LIGO, GEO 600 and Virgo," 19th International Conference on General Relativity and Gravitation (GR19), Mexico City, Mexico

2009 "Toward Gravitational-Wave Detection and Astronomy With LIGO," Colloquium, Syracuse University, Syracuse, NY

2008 "Toward Gravitational-Wave Detection and Astronomy With LIGO," Colloquium, California State University, Fullerton, CA

All Publications

Within each year, papers are ordered by the degree of CSUF co-author contributions, with the papers most directly contributed to listed first.

2021

1. Lück, H, Smith J., Punturo M. (2021) Third-Generation Gravitational-Wave Observatories. In: Bambi C., Katsanevas S., Kokkotas K.D. (eds) Handbook of Gravitational Wave Astronomy. Springer, Singapore. [Springer]
2. "A Horizon Study for Cosmic Explorer: Science, Observatories, and Community," 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, Jeff S. Kissel, 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, Report number: CE-P2100003, 2021. [arXiv]
3. "Gravitational-wave physics with Cosmic Explorer: Limits to low-frequency sensitivity," ED Hall, K Kuns, **JR Smith**, Y Bai, C Wipf, S Biscans, RX Adhikari, K Arai, S Ballmer, L Barsotti, Y Chen, M Evans, P Fritschel, J Harms, B Kamai, JG Rollins, D Shoemaker, BJJ Slagmolen, R Weiss, and H Yamamoto, Phys. Rev. D 103, 122004 (2021). [PRD], [arXiv]
4. "In-vacuum measurements of optical scatter versus annealing temperature for amorphous Ta2O5 and TiO2:Ta2O5 thin films," **Elenna M. Capote***, **Amy Gleckl***, **Jazlyn Guerrero***, **Michael Rezac***, **Robert Wright**, and **Joshua R. Smith**, J. Opt. Soc. Am. A 38, 534-541 (2021). [JOSA A], [arXiv]
5. "GWTC-2: Compact Binary Coalescences Observed by LIGO and Virgo during the First Half of the Third Observing Run," R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), Phys. Rev. X 11, 021053 (2021). [PRX], [arXiv]
6. "3G R&D: R&D for the Next Generation of Ground-based Gravitational-wave Detectors," David McClelland, Harald Lueck, Rana Adhikari, Masaki Ando, GariLynn Billingsley, Geppo Cagnoli, Matt Evans, Martin Fejer, Andreas Freise, Paul Fulda, Eric Genin, Gabriela González, Jan Harms, Stefan Hild, Giovanni Losurdo, Ian Martin, Anil Prabhakar, Stuart Reid, Fulvio Ricci, Norna Robertson, Jo van den Brand, Benno Willke, Michael Zucker, Alessandro Bertolini, Stefan Danilishin, Francesco Fidecaro, Gianluca Gemme, Giles Hammond, James Lough, Ettore Majorana, Ando Massaki, **Joshua Smith**, Helios Vocca, Krishna Venkateswara, Robert L. Ward, Kazuhiro Yamamoto, Michele Punturo, David Reitze, Peter Couvares, Stavros Katsanevas, Takaaki Kajita, Vicky Kalogera, Sheila Rowan, Gary Sanders, B.S. Sathyaprakash, David Shoemaker, Report of the Gravtitational Wave International Committee, 2021. [arXiv]
7. "LIGO detector characterization in the second and third observing runs," D Davis, **JS Areeda**, ..., **O Patane***, ..., **JR Smith**, et al 2021 Class. Quantum Grav. 38 135014. [CQG], [arXiv]
8. "Reducing Scattered Light in LIGO's Third Observing Run," S Soni, **JS Areeda**, ..., **O Patane***, ..., **JR Smith**, et al 2021 Class. Quantum Grav. 38 025016. [CQG], [arXiv]

2020

9. "A Cryogenic Silicon Interferometer for Gravitational-wave Detection," Rana X Adhikari, Odylio Aguiar, Koji Arai, Bryan Barr, Riccardo Bassiri, Garilynn Billingsley, Ross Birney, David Blair, Joseph Briggs, Aidan F Brooks, Daniel D Brown, Huy-Tuong Cao, Marcio Constancio, Sam Cooper, Thomas Corbitt, Dennis Coyne, Edward Daw, Johannes Eichholz, Martin Fejer, Andreas Freise, Valery Frolov, Slawomir Gras, Anna Green, Hartmut Grote, Eric K Gustafson, Evan D Hall, Giles Hammond, Jan Harms, Gregg Harry, Karen Haughian, Frances Hellman, Jan-Simon Hennig, Margot Hennig, Stefan Hild, Warren Johnson, Brittany Kamai, Disha Kapasi, Kentaro Komori, Mikhail Korobko, Kevin Kuns, Brian Lantz, Sean Leavey, Fabian Magana-Sandoval, Ashot Markosyan, Iain Martin, Rodica Martin, Denis V Martynov, David Mcclelland, Graeme Mcghee, Joseph Mills, Valery Mitrofanov, Manel Molina-Ruiz, Conor Mow-Lowry, Peter Murray, Sebastian Ng, Leonid Prokhorov, Volker Quetschke, Stuart Reid, David Reitze, Jonathan Richardson, Raymond Robie, Isobel Romero-Shaw, Sheila Rowan, Roman Schnabel, Merle Schneewind, Brett Shapiro, David Shoemaker, Bram Slagmolen, **Joshua Smith**, Jessica Steinlechner, Simon Tait, David Tanner, Calum Torrie, Joris Vanheijningen, Peter Veitch, Gavin Wallace, Peter Wessels, Benno Willke, Christopher Wipf, Hiro Yamamoto, Chunnong

Zhao, Lisa Barsotti, Robert Ward, Angus Bell, Robert Byer, Andrew Wade, William Z Korth, Frank Seifert, Nicholas Smith, Dimitry Koptsov, Zeno Tornasi, Aaron Markowitz, Georgia Mansell, Terry Mcrae, Paul Altin, Min J Yap, Marielle Van Veggel, Graeme Eddolls, Edgard Bonilla, Elvis C Ferreira , Allan S Silva, Marcos A Okada, Diego Taira, Daniel Heinert, James Hough, Ken Strain, Alan Cumming, Roger Route, Daniel Shaddock, Matthew Evans, Rainer Weiss, Classical and Quantum Gravity, 37, 16, 2020. [CQG], [arXiv]

10. "Knowledge Tracing to Model Learning in Online Citizen Science Projects," Kevin Crowston, Carsten Osterlund, Tae Kyoung Lee, Corey Jackson, Mahboobeh Harandi, Sarah Allen, Sara Bahaadini, Scott Coughlin, Aggelos K Katsaggelos, Shane L Larson, Neda Rohani, Joshua R Smith, Laura Trouille, Michael Zevin, IEEE Transactions on Learning Technologies 13, 1, 2020. [IEEE].
11. "GW190814: Gravitational Waves from the Coalescence of a 23 Solar Mass Black Hole with a 2.6 Solar Mass Compact Object," R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), The Astrophysical Journal Letters 896 (2), L44 (2020). [arXiv], [ApJL].
12. "GW190425: observation of a compact binary coalescence with total mass $\sim 3.4\ M\odot$," R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), The Astrophysical Journal Letters 892 (1), L3 (2020). [arXiv], [ApJL].

2019

13. "Cosmic Explorer: The U.S. Contribution to Gravitational-Wave Astronomy beyond LIGO," 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, Michael Zucker, Astro2020 Decadal Survey ground-based technology development white paper, 2019. [arXiv].
14. Chapter 14: Diagnostic methods for gravitational-wave detectors. J. McIver, TJ. Massinger, F. Robinet, **J. Smith**, **M. Walker**. Book Chapter in Advanced Interferometric Gravitational-Wave Detectors. Eds. P. Saulson, D. Reitze, H. Grote. 100 Years of General Relativity. World Scientific Publishing. July 2019. [WS].
15. "Apparatus to Measure Optical Scatter of Coatings Versus Annealing Temperature," **JR Smith**, RX Adhikari, **KM Aleman***, **A Avila-Alvarez***, G Billingsley, **A Gleckl***, **J Guerrero***, A Markosyan, S Penn, **JA Rocha***, **D Rose***, **R Wright**, in Optical Interference Coatings Conference (OIC) 2019, OSA Technical Digest (Optical Society of America, 2019), paper FA.2. [OSA], [arXiv].
16. "Classifying the unknown: discovering novel gravitational-wave detector glitches using similarity learning," SB Coughlin, S Bahaadini, N Rohani, M Zevin, **O Patane***, M Harandi, C Jackson, V Noroozi, S Allen, J Areeda, MW Coughlin, P Ruiz, CPL Berry, K Crowston, AK Katsaggelos, A Lundgren, C Osterlund, **JR Smith**, L Trouille, and V Kalogera, Phys. Rev. D 99, 082002, 2019. [PRD], [arXiv].
17. "Quantum-Enhanced Advanced LIGO Detectors in the Era of Gravitational-Wave Astronomy," M Tse, Haocun Yu, N Kijbunchoo, A Fernandez-Galiana, P Dupej, L Barsotti, CD Blair, DD Brown, SE Dwyer, A Effler, M Evans, P Fritschel, VV Frolov, AC Green, GL Mansell, F Matichard, N Mavalvala, DE McClelland, L McCuller, T McRae, J Miller, A Mullavey, E Oelker, IY Phinney, D Sigg, BJJ Slagmolen, T Vo, RL Ward, C Whittle, R Abbott, C Adams, RX Adhikari, A Ananyeva, S Appert, K Arai, JS Areeda, Y Asali, SM Aston, C Austin, AM Baer, M Ball, SW Ballmer, S Banagiri, D Barker, J Bartlett, BK Berger, J Betzwieser, D Bhattacharjee, G Billingsley, S Biscans, RM Blair, N Bode, P Booker, R Bork, A Bramley, AF Brooks, A Buikema, C Cahillane, KC Cannon, X Chen, AA Ciobanu, F Clara, SJ Cooper, KR Corley, ST Countryman, PB Covas, DC Coyne, LEH Datrier, D Davis, C Di Fronzo, JC Driggers, T Etzel, TM Evans, J Feicht, P Fulda, M Fyffe, JA Giaime, KD Giardina, P Godwin, E Goetz, S Gras, C Gray, R Gray, Anchal Gupta, EK Gustafson, R Gustafson, J Hanks, J Hanson, T Hardwick, RK Hasskew, MC Heintze, AF Helmling-Cornell, NA Holland, JD Jones, S Kandhasamy, S Karki, M Kasprzack, K Kawabe, PJ King, JS Kissel, Rahul Kumar, M Landry, BB Lane, B Lantz, M Laxen, YK Lecoeuche, J Leviton, J Liu, M Lormand, AP Lundgren, R Macas, M MacInnis, DM Macleod, S Márka, Z Márka, DV Martynov, K Mason, TJ Massinger, R McCarthy, S McCormick, J McIver, G Mendell, K Merfeld, EL Merilh, F Meylahn, T Mistry, R Mittleman, G Moreno, CM Mow-Lowry, S Mozzon, TJN Nelson, P Nguyen, LK Nuttall, J Oberling, RJ Oram, B O'Reilly, C Osthelder, DJ Ottaway, H

Overmier, JR Palamos, W Parker, E Payne, A Pele, CJ Perez, M Pirello, H Radkins, KE Ramirez, JW Richardson, K Riles, NA Robertson, Phys. Rev. Lett. 123, 231107. [PRL].

18. "Improving astrophysical parameter estimation via offline noise subtraction for Advanced LIGO," J. C. Driggers et al. (The LIGO Scientific Collaboration Instrument Science Authors) *Phys. Rev. D* **99**, 042001 (2019). [PRD], [arXiv].
19. "Properties of the Binary Neutron Star Merger GW170817," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) *Phys. Rev. X* **9** 011001 (2019). [PRX], [arXiv].
20. "Search for Multimessenger Sources of Gravitational Waves and High-energy Neutrinos with Advanced LIGO during Its First Observing Run, ANTARES, and IceCube," A. Albert et al. and (The LIGO Scientific Collaboration and the Virgo Collaboration), The Astrophysical Journal, 870:134 (16pp), (2019). [ApJ], [arXiv]

2018

21. "Identifying correlations between LIGO's astronomical range and auxiliary sensors using lasso regression," **M. Walker**, **A.F. Agnew**, **J. Bidler***, A.P. Lundgren, **A. Macedo***, D. Macleod, T.J. Massinger, **O. Patane***, **J.R. Smith**, *Class. Quantum Grav.* **35** 225002 (2018). [CQG], [arXiv].
22. "Machine learning for Gravity Spy: Glitch classification and dataset," S. Bahaadini, V. Noroozi, N. Rohani, S. Coughlin, M. Zevin, **J.R. Smith**, V. Kalogera, A. Katsaggelos, *Information Sciences* **444** 172-186 (2018). [INS].
23. "Identification and mitigation of narrow spectral artifacts that degrade searches for persistent gravitational waves in the first two observing runs of Advanced LIGO," PB Covas...**JR Smith**, et al. *Phys. Rev. D* 97, 082002 (2018). [PRL], [arXiv].
24. "Search for Subsolar-Mass Ultracompact Binaries in Advanced LIGO's First Observing Run," B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) Phys. Rev. Lett. 121, 231103 (2018). [PRL], [arXiv].
25. "GW170817: Measurements of Neutron Star Radii and Equation of State," B.P. Abbott et al. (The LIGO Scientific Collaboration and the Virgo Collaboration) Phys. Rev. Lett. 121, 161101(2018). [PRL], [arXiv].
26. "Full band all-sky search for periodic gravitational waves in the O1 LIGO data," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) Phys. Rev. D 97, 102003 (2018). [PRD], [arXiv].
27. "Constraints on cosmic strings using data from the first Advanced LIGO observing run," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) Phys. Rev. D 97, 102002 (2018). [PRD], [arXiv].
28. "GW170817: Implications for the Stochastic Gravitational-Wave Background from Compact Binary Coalescences," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) Phys. Rev. Lett. 120, 091101 (2018). [PRL], [arXiv].
29. "All-sky search for long-duration gravitational wave transients in the first Advanced LIGO observing run," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) Classical and Quantum Gravity, Volume 35, Number 6, (2018). [CQG], [arXiv].
30. "Effects of data quality vetoes on a search for compact binary coalescences in Advanced LIGO's first observing run," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), Classical and Quantum Gravity, Volume 35, Number 6 (2018). [CQG], [arXiv].
31. "First Search for Nontensorial Gravitational Waves from Known Pulsars," B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) Phys. Rev. Lett. 120, 031104 (2018). [PRL], [arXiv].

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32. "GW170817: observation of gravitational waves from a binary neutron star inspiral," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), *Phys. Rev. Lett.* 119 16 161101 (2017). [PRL], [arXiv].
33. "GW170814: A Three-Detector Observation of Gravitational Waves from a Binary Black Hole Coalescence," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), *Phys. Rev. Lett.* 119, 141101 (2017). [PRL], [arXiv].
34. "GW170608: Observation of a 19 solar-mass binary black hole coalescence," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), The Astrophysical Journal Letters 851 2 L35 (2017). [ApJL], [arXiv].
35. "GW170104: Observation of a 50-Solar-Mass Binary Black Hole Coalescence at Redshift 0.2," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), *Phys. Rev. Lett.* 118 221101 (2017). [PRL], [arXiv].
36. "LigoDV-web: Providing easy, secure and universal access to a large distributed scientific data store for the LIGO Scientific Collaboration," **J.S. Areeda**, **J.R. Smith**, A.P. Lundgren, E. Maros, D.M. Macleod, J. Zweizig, *Astronomy and Computing* **18** 27–34 (2017). [ASCOM], [arXiv].
37. "Gravity Spy: Integrating Advanced LIGO Detector Characterization, Machine Learning, and Citizen Science," M Zevin, S Coughlin, S Bahaadini, E Besler, N Rohani, S Allen, M Cabero, K Crowston, A K Katsaggelos, S L Larson, T K Lee, C Lintott, T B Littenberg, A Lundgren, C Oesterlund, **J R Smith**, L Trouille, V Kalogera, *Class. Quantum Grav.* 34 6 (2017). [CQG], [arXiv].
38. "Validating gravitational-wave detections: The Advanced LIGO hardware injection system," C. Biwer, D. Barker, J. C. Batch, J. Betzwieser, R. P. Fisher, E. Goetz, S. Kandhasamy, S. Karki, J. S. Kissel, A. P. Lundgren, D. M. Macleod, A. Mullavey, K. Riles, J. G. Rollins, K. A. Thorne, E. Thrane, T. D. Abbott, B. Allen, D. A. Brown, P. Charlton, S. G. Crowder, P. Fritschel, J. B. Kanner, M. Landry, C. Lazzaro, M. Millhouse, M. Pitkin, R. L. Savage, P. Shawhan, D. H. Shoemaker, **J. R. Smith**, L. Sun, J. Veitch, S. Vitale, A. J. Weinstein, N. Cornish, R. C. Essick, M. Fays, E. Katsavounidis, J. Lange, T. B. Littenberg, R. Lynch, P. M. Meyers, F. Pannarale, R. Prix, R. O'Shaughnessy, D. Sigg, *Phys. Rev. D* 95 062002 (2017). [PRD], [arXiv].
39. "Effects of transients in LIGO suspensions on searches for gravitational waves," M Walker...**JR Smith**, et al. *Review of Scientific Instruments* 88, 124501 (2017). [RSI], [arXiv].
40. "Calibration of the Advanced LIGO detectors for the discovery of the binary black-hole merger GW150914," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), *Phys. Rev. D* 95 062003 (2016). [PRD], [arXiv].

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41. "Observation of Gravitational Waves from a Binary Black Hole Merger," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), *Phys. Rev. Lett.* **116** 061102 (2016). [PRL], [arXiv].
42. "GW151226: Observation of Gravitational Waves from a 22-Solar-Mass Binary Black Hole Coalescence," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), *Phys. Rev. Lett.* **116** 241103 (2016). [PRL], [arXiv].
43. "Coherent Cancellation of Photothermal Noise in GaAs/Al0.92Ga0.08As Bragg Mirrors," T. Chalermsongsak, E.D. Hall, G.D. Cole, D. Follman, F. Seifert, K. Arai, E.K. Gustafson, **J.R. Smith**, M. Aspelmeyer, R.X. Adhikari, *Metrologia* **53** 2 860 (2016). [Met], [arXiv].
44. "Characterization of transient noise in Advanced LIGO relevant to gravitational wave signal GW150914," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), *Class. Quant. Grav.* **33** 13 (2016). [CQG], [arXiv].
45. "Sensitivity of the Advanced LIGO detectors at the beginning of gravitational wave astronomy," D.V. Martynov et al. *Phys. Rev. D* **93**, 112004 (2016). [PRD], [arXiv].

46. "Observing gravitational-wave transient GW150914 with minimal assumptions," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) *Phys. Rev. D* **93**, 122004 (2016). [PRD], [arXiv].
47. "Binary Black Hole Mergers in the First Advanced LIGO Observing Run," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) *Phys. Rev. X* 6, 041015 (2016). [PRX], [arXiv].
48. "GW150914: The Advanced LIGO Detectors in the Era of First Discoveries," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) *Phys. Rev. Lett.* **116**, 131103 (2016). [PRL], [arXiv].
49. "GW150914: First results from the search for binary black hole coalescence with Advanced LIGO," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) *Phys. Rev. D* **93**, 122003 (2016). [PRD], [arXiv].
50. "The Rate of Binary Black Hole Mergers Inferred from Advanced LIGO Observations Surrounding GW150914," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), ApJL, 833, 1 (2016). [ApJL], [arXiv].
51. "Properties of the binary black hole merger GW150914," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) (2016). [PRL], [arXiv].
52. "Astrophysical Implications of the Binary Black-Hole Merger GW150914," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), *Astrophysical Journal Letters*, **818** 2 (2016). [ApJL], [arXiv].
53. "Tests of General Relativity with GW150914," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) Phys. Rev. Lett. **116**, 221101 (2016). [PRL], [arXiv].
54. "GW150914: Implications for the Stochastic Gravitational-Wave Background from Binary Black Holes," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration) Phys. Rev. Lett. **116**, 131102 (2016). [PRL], [arXiv].
55. "High-energy Neutrino follow-up search of Gravitational Wave Event GW150914 with ANTARES and IceCube," B.P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration), *Phys. Rev. D* 93, 122010 (2016). [PRD], [arXiv].

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56. "Optical scatter of quantum noise filter cavity optics," **D. Vander-Hyde***, C. Amra, M. Lequime, F. Magaña-Sandoval, **J.R. Smith**, *Class. Quantum Grav.* **32** 135019 (2015). [CQG], [arXiv].
57. "Improving the data quality of Advanced LIGO based on early engineering run results," L. Nuttall, T. Massinger, **J. Areeda**, J. Betzwieser, S. Dwyer, A. Effler, R. Fisher, P. Fritschel, J. Kissel, A. Lundgren, D. Macleod, D. Martynov, J. McIver, A. Mullavey, **J. Smith**, G. Vajente, A. Williamson, C. Wipf, *Class. Quantum Grav.* **32** 24 245005 (2015). [CQG], [arXiv].
58. "Characterization of the LIGO detectors during their sixth science run," J. Aasi et al. (The LIGO Scientific Collaboration and Virgo Collaboration), *Class. Quantum Grav.* **32** 115012 (2015). [CQG], [arXiv].
59. "Environmental Influences on the LIGO Gravitational Wave Detectors during the 6th Science Run," A. Effler, R.M.S. Schofield, V.V. Frolov, G. González, K. Kawabe, **J.R. Smith**, J. Birch, R. McCarthy, *Class. Quantum Grav.* **32** 035017 (2015). [CQG], [arXiv].
60. "Advanced LIGO," J. Aasi et al. (the LIGO Scientific Collaboration), *Class. Quantum Grav.* **32** 074001 (2015). [CQG], [arXiv].
61. J. Aasi et al., "Narrow-band search of continuous gravitational-wave signals from Crab and Vela pulsars in Virgo VSR4 data," *Phys. Rev. D* **91** 022004 (2015). [PRD], [arXiv].
62. J. Aasi et al., "Searching for stochastic gravitational waves using data from the two colocated LIGO Hanford detectors," *Phys. Rev. D* **91** 022003 (2015). [PRD], [arXiv].

2014

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1995-1996	**M. S.**, Theoretical Physics, "Babeş-Bolyai" University (Cluj, Romania)
1990-1995	**B. S.**, "Babeş-Bolyai" University (Cluj, Romania)

PROFESSIONAL EXPERIENCE:

2014-Present	Professor of Physics Department of Physics, California State University, Fullerton
2010-2014	Associate Professor of Physics Department of Physics, California State University, Fullerton
2006-2010	Assistant Professor of Physics Department of Physics, California State University, Fullerton
2002-2006	Associate Professor of Physics Department of Theoretical Physics, "Babeş-Bolyai" University, Romania
2004-2006	Adjunct Professor of Physics Department of Physics and Astronomy, The University of Iowa, USA
2001-2004	Postdoctoral Scholar Department of Physics and Astronomy, The University of Iowa, USA
2000-2001	Research Associate Department of Physics and Astronomy, Clemson University, USA
1999-2000	Visiting Researcher Department of Mathematics and Physics, University of Camerino, Italy
1999-2002	Assistant Professor of Physics Department of Theoretical Physics, "Babeş-Bolyai" University, Romania
1998-1999	Teaching Assistant Department of Theoretical Physics, "Babeş-Bolyai" University, Romania

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SCIENTIFIC PUBLICATIONS: 86 published articles in refereed journals; one chapter in a NATO ASI Proceedings.

TEACHING EXPERIENCE:

California State University, Fullerton: PHYS 120 *Introduction to Astronomy* (general education class), PHYS 211 *Elementary Physics* (general education class), PHYS225 & PHYS225L *Mechanics* (general education class), PHYS226 *Electricity and Magnetism* (general education class), PHYS227 *Waves, Optics, and Modern Physics* (general education class), PHYS320 *Classical Mechanics* (physics undergraduate students), PHYS340 *Modern Physics* (physics undergraduate students), PHYS416/516 *Statistical Physics* (physics undergraduate & graduate students), PHYS454/554 *Solid State Physics* (physics undergraduate & graduate students), PHYS455/555A *Quantum Mechanics* (physics undergraduate & graduate students), PHYS555B *Quantum Mechanics II* (physics graduate students), PHYS510 *Mathematical Physics* (physics graduate students), PHYS520 *Analytical Mechanics* (physics graduate students), HIST331 *History of Science: Copernicus to the Present* (history undergraduate students), *Student Supervision:* PHYS499 *Independent Study) (physics undergraduate students), PHYS597* Graduate Project *(physics graduate students), PHYS599* Independent Graduate Research (physics graduate students)

The University of Iowa: *Materials and Devices* (electrical engineering undergraduate students), *Statistical Mechanics* (physics graduate students), *Electricity and Magnetism* (physics undergraduate students), *Solid State Physics* (substitute instructor-physics graduate students)

"Babeş-Bolyai" University: *Statistical Physics* (physics undergraduate students), *Condensed Matter Theory* (physics undergraduate students), *Quantum mechanics* (physics undergraduate students), *Theoretical Physics* (chemistry undergraduate students)

AWARDS AND SCHOLARSHIPS:

- "FACULTY ACHIEVEMENT AWARD" (May 2016), Department of Physics, CSUF
- "FACULTY ACHIEVEMENT AWARD" (May 2010), Department of Physics, CSUF
- "VISITING PROFESSOR" (August 2009), Kaiserslautern University (Germany).
- "KITP SCHOLAR" (2007-2009), Kavli Institute for Theoretical Physics, University of California Santa Barbara.
- "REGULAR ASSOCIATE" (2006-2007), The "Abdus Salam" International Center for Theoretical Physics, Italy.

- "STEFAN PROCOPIU" Award for Theoretical Physics presented by the Romanian National Academy of Science (December 2005).
- "IN HOC SIGNO VINCES" Award presented by the Romanian National University Research Council (NURC) to the best Romanian junior researcher in the fields of Mathematics and Natural Sciences (May 2005).
- "JUNIOR ASSOCIATE" (1999-2004), The "Abdus Salam" International Center for Theoretical Physics, Italy.

REFEREE ACTIVITY:

Journals referee: Physical Review Letters, Physical Review B, Journal of Physics: Condensed Matter, Journal of Physics A: Mathematical and Theoretical, Physica E, European Physical Journal B.
Grants referee: NSF, European Commission Research Directorate.

SERVICE:

Department Chair: (2017 - present).
Graduate Advisor: Masters Program in Physics (2007 - present).
Committees: *Physics Department:* Graduate Committee (2006-2007), Search Committee (2007-2008; 2011-2012, 2013-2014), Curriculum Committee (2006-2010), Resource Committee (2008), Department Personnel Committee (2013-2014, 2014-2015)
College of NSM: Careers and Internships Committee (2011-2012), Research Committee (2007), Curriculum Committee (2008 - 2011)
CSUF: University Heights Housing Association Committee (2009 - 2014).

Other activities:
NSM Science Public Lectures: I initiated together with colleagues from other Departments within The College of NSM a series of open lectures for CSUF students and the general public.
Physics Department Colloquim: I co-organized the Department's Colloquium (2006 - 2017).

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LIST OF PUBLICATIONS

Articles in refereed journals

86. Magnetic field effects on the thermoelectric properties of monolayer graphene *Physica E* **124**, 114361 (2020) (M. Crisan, I. Grosu, and I. Tifrea)

85. Graphene transport in a parallel magnetic field: Spin polarization effects at finite temperature *Physica E* **114**, 113612 (2019) (M. Crisan, I. Grosu, and I. Tifrea)

84. Thermoelectric transport properties in graphene connected molecular junctions *Physica E* **96**, 1 (2018) (S.T. Rodriguez, M. Crisan, I. Grosu, and I. Tifrea)

83. NMR parameters in gapped graphene systems, *European Physical Journal B* 89, 140 (2016) (M. Crisan, I. Grosu, and I. Tifrea)

82. An equation of motion analysis of the two stage Kondo effect in T-shaped double-quantum-dot systems, *Physica E* **66**, 245 (2015) (M. Crisan, I. Grosu, and I. Tifrea)

81. Thermoelectric transport properties of a T-shaped double quantum dot system in the Coulomb blockade regime, *European Physical Journal B* 87, 302 (2014) (A. L. Monteros, G. S. Uppal, S. R. McMillan, M. Crisan, and I. Tifrea)

80. Nuclear Spin Diffusion Effects in Optically Pumped Quantum Wells, *European Physical Journal B* **87**, 17 (2014) (Daniel Henriksen, Kim Tom, and I. Tifrea)

79. Electronic transport of a T-shaped double-quantum-dot system in the Coulomb blockade regime *European Physical Journal B* **86**, 102 (2013) (I. Tifrea, Mircea Crisan, George Pal and Ioan Grosu)

78. Nuclear Spin Dynamics in Semiconductor Nanostructures, *invited paper in Spintronics IV, Proc. of SPIE* Vol. 8100, 81000K (2011) (Editors H.-J. M. Drouhin, J.-E. Wegrowe, and M. Razeghi) (I. Tifrea).

77. Nonequilibrium nuclear polarization and induced hyperfine and dipolar magnetic fields in semiconductor nanostructures, *Physical Review B* **84**, 155319 (2011) (I. Tifrea, and M. E. Flatté).

76. Superconductivity in itinerant ferromagnetic systems, *Journal of Superconductivity and Novel Magnetism* **24**, 2091 (2011) (A.A. Diaz, J.J. Rodriguez-Nunez, A. A. Schmidt, and I. Tifrea)

75. Electronic Green's functions in a multi-quantum dot T-shaped system, *Physica E* **43**, 1887 (2011) (I. Tifrea, G. Pal, and M. Crisan).

74. Collective modes of a bilayer double parabolic quantum well spin polarized electron gas, *Physica Status Solidi C* **8**, 2589 (2011) (C. Campbell and I. Tifrea) (4^{th} ICOOPMA, Budapest, Hungary 2010).

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73. Evidence of quantum interference in transport properties of a triple quantum dot T-shape system, *European Physical Journal B* **79**, 455 (2011) (I. Tifrea, M. Crisan, and I. Grosu).

72. Universality of the conductance in quantum dot transport, *Journal of Superconductivity and Novel Magnetism* **23**, 1401 (2010) (M. Crisan, I. Grosu, and I. Tifrea).

71. Transport and current noise characteristics of a T-shape double quantum dot system, *Journal of Physics: Condensed Matter* **21**, 215604 (2009) (K. Brown, M. Crisan, and I. Tifrea).

70. Fano interferences in the transport properties of triple quantum dot T-shaped systems, *Journal of Physics: Conference Series* **150**, 022087 (2009) (I. Tifrea, M. Crisan, and I. Grosu) (LT 25, Amsterdam, The Netherlands 2008).

69. Knight shifts in semiconductor nanostructures, *Physica E* **40**, 1085 (2008) (I. Tifrea) (EP2DS, Genoa, Italy 2007).

68. Pseudogap Transition in T-shaped Double Dots, *Journal of Superconductivity and Novel Magnetism* **21**, 75 (2008) (M. Crisan, I. Grosu, and I. Tifrea).

67. Metallic glass in two dimensional disordered Bose systems; A renormalization group approach, *Journal of Superconductivity and Novel Magnetism* **21**, 51 (2008) (M. Crisan, I. Grosu, D. Bodea, and I. Tifrea).

66. Zero temperature conductance of parallel T-shape double quantum dots, *Physica E* **39**, 214 (2007) (M. Crisan, I. Grosu, and I. Tifrea).

65. Quantum Critical Proximity of the One-Dimensional Ferromagnetic Phase, *Journal of Superconductivity and Novel Magnetism* **20**, 273 (2007) (M. Crisan, I. Grosu, and I. Tifrea)

64. Three-dimensional dilute Bose liquid at finite temperature: a Renormalization Group approach, *Physics and Chemistry of Liquids* **45**, 7 (2007) (M. Crisan, M. Trif, I. Grosu, and I. Tifrea)

63. Large n–expansion limit of the three dimensional ferromagnetic quantum phase transition, *Journal of Low Temperature Physics* **146**, 315 (2007) (D. Bodea, M. Crisan, I. Grosu, and I. Tifrea)

62. Field-induced Bose-Einstein condensation of interacting dilute magnons in three-dimensional spin systems: A renormalization-group study, *Physical Review B* **72**, 184414 (2005) (M. Crisan, I. Tifrea, D. Bodea, and I. Grosu))

61. Evidence for a metallic–like state in the $T = 0$ K phase diagram of a high temperature superconductor, *European Physical Journal B* **46**, 187 (2005) (A.A. Schmidt, J.J. Rodriguez-Nunez, and I. Tifrea)

60. Excitonic condensation in quasi-two-dimensional systems, *Physics Letters A* **346**, 310 (2005) (M. Crisan and I. Tifrea)

59. Magnetic fields from nuclear polarization in parabolic quantum wells, *Journal of Superconductivity* **18**, 207 (2005) (I. Tifrea and M. E. Flatté) (PASPS III, Santa Barbara, USA 2004).

58. Nuclear spin dynamics in parabolic quantum wells, *Physical Review B* **69**, 115305 (2004) (I. Tifrea and M. E. Flatté)

57. Low temperature behavior of a two dimensional quantum antiferromagnet, *Journal of Superconductivity* **17**, 503 (2004) (M. Crisan, I. Grosu, I. Tifrea, and D. Bodea)

56. Quantum critical ferromagnetism in Ni_xPd_{1-x} alloys, *Journal of Low Temperature Physics* **137**, 105 (2004) (D. Bodea, M. Crisan, I. Grosu, and I. Tifrea)

55. Fluctuation conductivity in layered d-wave superconductors near critical disorder, *European Physical Journal B* **36**, 377 (2003) (I. Tifrea, D. Bodea, I. Grosu, and M. Crisan)

54. Thermodynamic properties of high temperature superconductors in the pseudogap regime, *Journal of Superconductivity* **16**, 993 (2003) (I. Tifrea)

53. Specific heat behavior of high temperature superconductors in the pseudogap regime, *European Physical Journal B* **35**, 33 (2003) (I. Tifrea and C. P. Moca)

52. Electric field tunability of nuclear and electronic spin dynamics due to the hyperfine interaction in semiconductor nanostructures, *Physical Review Letters* **90**, 237601 (2003) (I. Tifrea and M. E. Flatté)

51. Quantum Phase Transitions and Renormalization Group Approach, *Romanian Journal of Physics* **48**, 597 (2003) (M. Crisan, I. Grosu, D. Bodea, and I. Tifrea) (Conferinta Nationala de Fizica Teoretica, Bucuresti, Romania 2003).

50. Ginzburg-Landau functional for metals with spin-charge separation: effect of the mass renormalization, *Acta Physica Polonica B* **34**, 383 (2003) (J.A. Budagosky Marcilla, J.J. Rodríguez–Núñez, and I. Tifrea) (SCES 2002, Kraków, Poland 2002)

49. Ginzburg-Landau Expansion in Non-Fermi Liquid Superconductors: Effect of the Mass Renormalization Factor, *Physical Review B* **66**, 104507 (2002) (I. Tifrea, J.A. Budagosky Marcilla, and J.J. Rodríguez–Núñez)

48. Non-Fermi behavior near a quantum phase transition driven by disorder, *Journal of Superconductivity* **15**, 271 (2002) (D. Bodea, M. Crisan, I. Grosu, and I. Tifrea)

47. Collective modes of a bilayer quasi-two-dimensional spin polarized electron gas, *Physica E* **15**, 13 (2002) (I. Tifrea and D. C. Marinescu)

46. Pseudogap influence on the $2\Delta(0)/T_c$ ratio in d-wave superconductors, *Physica C* **371**, 104 (2002) (I. Tifrea, I. Grosu, and M. Crisan)

45. Charge and spin collective excitations in a coupled spin-polarized bilayer system, *Physical Review B* **65**, 125316 (2002) (I. Tifrea and D.C. Marinescu)

44. Thermodynamic limits of the local field corrections in a spin-polarized electron system, *Physical Review B* **65**, 113201 (2002) (D.C. Marinescu and I. Tifrea)

43. Renormalization-group analysis of dilute Bose system in d dimension at finite temperature, *Journal of Physics A: Mathematical and General* **35**, 239 (2002) (M. Crisan, D. Bodea, I. Grosu, and I. Tifrea)

42. Critical behavior of a two-dimensional dilute Bose gas, *Modern Physics Letters B* **15**, 837 (2001) (M. Crisan, I. Tifrea, D. Bodea, and I. Grosu)

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41. Bose-Einstein condensation in layered systems under repulsive interaction, *Journal of Superconductivity* **14**, 563, (2001) (I. Tifrea and I. Grosu)

40. Non-Fermi behavior of the itinerant-electron ferromagnet near the quantum phase transition point, *Journal of Superconductivity* **14**, 421 (2001) (D. Bodea, I. Tifrea, and M. Crisan)

39. Magnetic instability of a two dimensional Anderson non-Fermi liquid, *Journal of Magnetism and Magnetic Materials* **233**, 205 (2001) (I. Tifrea, I. Grosu, and M. Crisan)

38. Two-dimensional dilute Bose gas in the normal phase, *European Physical Journal B* **22**, 79 (2001) (P. Pieri, G.C. Strinati, and I. Tifrea)

37. Magneto-acoustic plasmons in a bilayer quasi two-dimensional spin-polarized system, *Physical Review B* **64**, 073405 (2001) (I. Tifrea and D.C. Marinescu)

36. Detecting phase transitions from the high-temperature phase in systems with a small parameter, *Physical Review B* **64**, 052104 (2001) (P. Pieri, G.C. Strinati, and I. Tifrea)

35. Fluctuation contribution to the specific heat in non-Fermi models for superconductivity, *International Journal of Modern Physics B* **14**, 2988 (2000) (I. Tifrea, I. Grosu, and M. Crisan) (SATT X, Frascati, Italy 2000)

34. Specific heat behavior near the Lifshitz point, *Physica C* **341-348**, 267 (2000) (C.P. Moca, I. Tifrea, and M. Crisan) (M2S-HTCS-VI, Houston, USA 2000)

33. From BCS to Bose-Einstein condensation in a non-Fermi superconductor, *Physica C* **341-348**, 157 (2000) (I. Tifrea, C.P. Moca, and M. Crisan) (M2S-HTCS-VI, Houston, USA 2000)

32. Fluctuation contribution to the specific heat in non-Fermi models for superconductivity, *Physica C* **340**, 161 (2000) (I. Tifrea, I. Grosu, and M. Crisan)

31. Some sum rules for non-Fermi liquids: Aplications taking into account the mass renormalization factor, *Physical Review B* **62**, 4026 (2000) (J.J. Rodriguez-Nunez, I. Tifrea, and S.G. Magalhaes)

30. An analytical approach for the pseudo-gap in the spin fluctuation model, *Journal of Superconductivity* **13**, 411 (2000) (C.P. Moca, I. Tifrea, and M. Crisan)

29. Renormalization group approach of itinerant electron systems near the Lifshitz point, *Physical Review B* **61**, 3247 (2000) (C.P. Moca, I. Tifrea, and M. Crisan)

28. Two dimensional d-waves superconductivity, *Journal of Superconductivity* **13**, 89 (2000) (M. Crisan, I. Tifrea, and I. Grosu)

27. $2\Delta(0)/T_c$ ratio in d-wave superconductors, *Physica B* **259-261**, 464 (1999) (I. Tifrea, I. Grosu, and M. Crisan)(SCES '98 Paris, France 1998)

26. Virtual bound states in d-wave van Hove superconductors, *Physica B* **259-261**, 462 (1999) (M. Crisan and I. Tifrea)(SCES '98 Paris, France 1998)

25. Marginal Fermi liquid model for high-T_c superconductors, *Studia UBB Seria Physica* **XLIV**, 2, (1999) (D. Bodea, I. Tifrea, I. Grosu, and M. Crisan)

24. Electron-fluctuation interaction in a non-Fermi liquid superconductor, *Physical Review B* **59**, 14680 (1999) (M. Crisan, C.P. Moca, and I. Tifrea)

23. Flow equations for the model of hybridized bosons and fermions, *Journal of Superconductivity* **12**, 399 (1999) (C.P. Moca, I. Tifrea, and M. Crisan)

22. Critical temperature of a van Hove superconductor with spin-charge separation, *Physica C* **311**, 310 (1999) (M. Crisan and I. Tifrea)

21. The superconductivity state induced by spin-wave exchange, *Journal of Superconductivity* **11**, 723 (1998) (C.P. Moca, I. Tifrea, and M. Crisan)

20. Flow equation method for a superconductor with magnetic correlations, *Journal of Superconductivity* **11**, 719 (1998) (C.P. Moca, M. Crisan, and I. Tifrea)

19. Nonmagnetic impurities in d-wave pairing superconductors, *Journal of Superconductivity* **11**, 699 (1998) (M. Crisan, M.M. Pop, I. Tifrea, and S. Simon)

18. Effects of finite impurity concentration in van Hove superconductors, *Physical Review B* **58**, 2448 (1998) (I. Tifrea and M. Crisan)

17. Specific heat jump in non-Fermi superconductors, *European Physical Journal B* **4**, 175 (1998) (I. Tifrea and M. Crisan)

16. Critical temperature and Coulomb repulsion in a non-Fermi liquid superconductor, *Physica C* **296**, 91 (1998) (I. Tifrea, I. Grosu, and M. Crisan)

15. Optical conductivity in the van Hove scenario, *Journal of Superconductivity* **11**, 277 (1998) (I. Tifrea and M. Crisan)

14. Superconductivity and critical coupling in non-Fermi liquids, *Journal of Superconductivity* **11**, 339 (1998) (I. Grosu, I. Tifrea, and M. Crisan)

13. Crossover from Cooper pairing to Bose condensation in a van Hove superconductor with localized states, *Journal of Superconductivity* **11**, 265 (1998) (I. Tifrea and M. Crisan)

12. Critical temperature of a non-Fermi liquid superconductor with an energy dependent density of states, *Physical Review B* **56**, 8298 (1997) (I. Grosu, I. Tifrea, M. Crisan, and S. Yoksan)

11. Pair-breaking effect in a van Hove superconductor, *Journal of Superconductivity* **10**, 503 (1997) (I. Tifrea, M. Crisan, and S. Yoksan)

10. Flow-equation method for the single impurity in a 2D superconductor, *Journal of Superconductivity* **10**, 251 (1997)(M. Crisan, C.P. Moca, and I. Tifrea)

9. Crossover between weak and strong coupling in 2D superconductors, *Journal of Superconductivity* **10**, 199 (1997) (M. Crisan and I. Tifrea)

8. Effects of the electron-phonon interaction on the critical temperature of a layered two-dimensional superconductor, *Journal of Superconductivity* **10**, 121 (1997) (I. Tifrea and M. Crisan)

7. Impurity states in van Hove superconductors, *Journal of Superconductivity* **10**, 127 (1997) (I. Tifrea and M. Crisan)

6. Magnetic susceptibility in the Millis-Monien-Pines model, *Physical Review B* **55**, 5998 (1997) (I. Tifrea, M. Crisan, and I. Grosu)

5. Classical spins in van Hove superconductors, *Physical Review B* **54**, 14946 (1996) (I. Tifrea and M. Crisan)

4. Magnetic susceptibility of a disorder high temperature superconductor, *Modern Physics Letters B* **14**, 635 (1996) (I. Grosu, M. Crisan, and I. Tifrea)

3. Damping of quasiparticles in a layered two-dimensional electron gas; influence of electron-phonon and electron-electron interaction, *Journal of Superconductivity* **9**, 475 (1996) (I. Tifrea and M. Crisan)

2. Critical temperature for a layered superconductor containing non-magnetic impurities, *Journal of Superconductivity* **9**, 187 (1996) (M. Crisan, I. Tifrea, and L. Tataru)

1. Marginal behaviour of a layered two-dimensional electron gas interacting with localised spin, *Journal of Superconductivity* **8**, 169 (1995) (M. Crisan, I. Tifrea, and L. Tataru)

Books

3. Nuclear Spins in Semiconductor Nanostructures, in *Manipulated Quantum Coherence in Solid State Systems*, (NATO Science Series Vol. 244, Springer, 2007) (Editors Michael E. Flatté and I. Ţifrea)

2. Quantum Many-Body Methods: Applications to Fermionic and Bosonic Systems (Cluj University Press, 2005) (in romanian) (I. Tifrea, I. Grosu, and M. Crisan)

1. Statistical Physics - Problems and Exercises (Cluj University Press, 2000) (in romanian) (I. Tifrea, I. Grosu, and M. Crisan)

INVITED TALKS AND PRESENTATIONS

45. "Applications of Computer Algebra 2019" *Graphene Transport in a parallel field: Spin polarization effects at finite temperature*, 16 - 20 July 2019, Montreal, Canada (**invited talk**)

44. "6th Annual International Conference on Physics", *Thermoelectric effects in gapped monolayer graphene*, 23-26 July 2018, Athens, Greece (**invited talk**)

43. Cal State Northridge, *Thermoelectric transport in quantum dot systems*, September 2018, Northridge (USA)

42. "11th International Conference On Physics Of Advanced Materials (ICPAM-11)", *Thermoelectric transport properties of a T-shaped double quantum dot system in the Coulomb blockade regime*, 8 - 14 September 2016, Cluj-Napoca, Romania (**invited talk**)

41. "20th International Conference on Magnetism (ICM2015)" *Spin-dependent thermoelectric transport in T-shaped double-quantum-dot systems*, 5 - 10 July 2015, Barcelona, Spain

40. University of Iowa, *Nuclear Spin Diffusion in Quantum Wells*, October 2013, Iowa City (USA)

39. "International Conference on Nanoscience + Technology (ICN+T2012)", *Dynamical Nuclear Polarization of Low Dimensional Nanostructures*, 23 - 27 July 2012, Paris, France

38. "Frontiers of Quantum and Mesoscopic Thermodynamics", *Nuclear Spin Diffusion in Quantum Confined Semiconductor Nanostructures*, 25 - 30 July 2011, Prague, Czech Republic

37. "SPIE Optics + Photonics - Nonoscience + Engineering", *Nuclear Spin Dynamics in Semiconductor Nanostructures*, August 2011, San Diego (**invited talk**)

36. "2nd Workshop on Spin and Charge Properties of Low Dimensional Systems", *Confinement and Diffusion Effects in Nuclear Spin Dynamics in Low Dimensional Nanostructures*, July 2011, Braşov, Romania (**invited talk**)

35. APS March Meeting, *Nuclear Spin Diffusion in Semiconductor Nanostructures*, March 2011, Dallas (USA)

34. Anacapa Society, West Coast Meeting, *Nuclear Spin Dynamics in Semiconductor Quantum Wells*, December 2010, Pomona (USA).

33. University of California, Merced, *Nonequilibrium nuclear polarization and induced hyperfine and dipolar magnetic fields in semiconductor nanostructures*, February 2010, Merced (USA)

32. Kaiserslautern University, *Diagrammatic interpolation between fermionic and bosonic degrees of freedeom in two-dimensional systems*, August 2009, Kaiserslautern (Germany)

31. Spin and Charge Properties of Low Dimensional Systems, *Nonequilibrium nuclear polarization and induced hyperfine and dipolar magnetic fields in semiconductor nanostructures*, July 2009, Sibiu (Romania) (**invited talk**)

30. Kaiserslautern University, *Nuclear Spin Dynamics in Semiconductor Nanostructures*, July 2008, Kaiserslautern (Germany)

29. California State University Northridge, *Nuclear Spin Dynamics in Semiconductor Nanostructures*, April 2008, Northridge (USA)

28. APS March Meeting, *Nuclear Spin Dynamics in Semiconductor Nanostructures*, March 2008, New Orleans (USA)

27. California State University Long Beach, *Nuclear Spin Dynamics in Semiconductor Nanostructures*, March 2008, Long Beach (USA)

26. California State University Fullerton, *Twenty Years of High Temperature Superconductivity*, April 2007, Fullerton (USA)

25. California State University Fullerton, *Optoelectronic Control of Nuclear Magnetization in Semiconductor Nanostructures*, February 2006, Fullerton (USA)

24. University of Basel, *Optoelectronic Control of Nuclear Magnetization in Semiconductor Nanostructures*, November 2005, Basel (Switzerland)

23. NATO ASI "Manipulating Quantum Coherence in Solid State Systems", *Nuclear spin dynamics in semiconductor heterostructures*, August 2005, Cluj-Napoca (Romania) (**invited lecturer**)

22. Max Plank Institute for Physics of Complex Systems, *Optoelectronic Control of Nuclear Magnetization in Semiconductor Nanostructures*, May 2004, Dresden (Germany)

21. University of North Dakota, *Optoelectronic Control of Nuclear Magnetization in Semiconductor Nanostructures*, April 2004, Grand Forks (USA)

20. APS March Meeting, *Electric field tunability of nuclear and electronic spin dynamics due to the hyperfine interaction*, March 2004, Montreal (Canada) (**invited talk**)

19. SPINTECH 2, *Nuclear spin dynamics in parabolic quantum wells*, August 2003, Brugge (Belgium) (oral presentation)

18. Pennsylvania State University, *Electric field tunability of nuclear spin dynamics due to the hyperfine interaction in semiconductor nanostructures*, May 2003

17. MRS Spring Meeting, *Nuclear spin dynamics in parabolic quantum wells*, April 2003, San Francisco (oral presentation)

16. APS March Meeting, *Nuclear spin dynamics due to the hyperfine interaction in parabolic quantum wells*, March 2003, Austin (oral presentation)

15. University of Iowa, *Spin decoherence due to hyperfine interaction in semiconductor nanostructures*, November 2002

14. The National Romanian Conference in Theoretical Physics, *Spin decoherence due to hyperfine interaction in semiconductor nanostructures*, September 2002, Bucharest (Romania) (oral presentation)

13. APS March Meeting, *Electron spin decoherence due to the hyperfine interaction in semiconductor nanostructures*, March 2002, Indianapolis (oral presentation)

12. "Babes-Bolyai" University (Cluj, Romania), *Correct Diagrammatic Expansion between Weak and Strong Coupling Regimes in Two Dimensional Fermionic Systems*, January 2002

11. The University of Iowa, *Correct Diagrammatic Expansion between Weak and Strong Coupling Regimes in Two Dimensional Fermionic Systems*, October 2001

10. Naval Research Laboratory, *Collective modes in a bilayer quasi-two-dimensional spin polarized electron gas*, June 2001

9. University of Alabama-Tuscaloosa, *Correct Diagrammatic Expansion between Weak and Strong Coupling Regimes in Two Dimensional Fermionic Systems*, April 2001

8. Georgia Tech, *Relevance of the pair-pair interaction in the crossover from weak to strong coupling interaction in 2D fermionic attractive systems*, April 2001

7. University of Miami, *Relevance of the pair-pair interaction in the crossover from weak to strong coupling interaction in 2D fermionic attractive systems*, April 2001

6. APS March Meeting, *Collective modes in a bilayer spin-polarized system*, March 2001, Seattle (oral presentation)

5. University of Missouri - Columbia, *The role of the attractive interaction in two dimensional fermionic systems*, February 2001

4. Clemson University, *Crossover phenomena in two dimensional fermionic systems*, October 2000

3. University of Georgia, *Evolution from weak to strong coupling regime in a two dimensional fermionic system*, September 2000

2. University of Georgia, *A non-Fermi liquid approach for HTSC materials. The Anderson model.*, December 1999

1. University of Camerino (Italy), *Non-Fermi liquid models for HTSC materials*, December 1999