Department of Geological Sciences
California State University, Fullerton

Geological Sciences Program Performance Review Self-Study 2021-2022

CONTENTS OF THE SELF-STUDY

I. Department Mission, Goals, and Environment

A. Updated mission and goals since previous PPR

The Earth Sciences, which includes the Geological Sciences, is a rapidly evolving field. These changes arise from shifting job markets that require knowledge of innovate technologies, promotion of societal awareness of human impacts on the environment, and demographic diversification related to attraction of BIPOC into STEM academic and professional careers. The Geological Sciences Department dedicated a retreat and time during faculty meetings during the 2021-22 academic year in order to discuss ongoing changes to the science and profession, craft a comprehensive strategic vision for the Department, and set goals that address our changing field.

Department Mission Statement

The Department of Geological Sciences is an inclusive education and research community of active mentors and role models. We provide an interdisciplinary, student-centered classroom, field, and laboratory experience that emphasizes critical thinking and communication to create scientifically-informed global citizens.

This mission statement has been updated from the one adopted in 2005-06 that was left unchanged in the previous, 2013-14 PPR.

Vision Statements are grouped into those related to curriculum and teaching; student-faculty research; and Department community, service and outreach. The vision statements have been updated from the ones drafted in 2005-06, which were unchanged in the previous, 2013-14 PPR.

Vision: Curriculum and Teaching

The Department of Geological Sciences strives to:

1. Provide an innovative, inclusive, and experiential curriculum that presents opportunities for students to learn in the field, classroom and laboratory settings, and that:
    - trains students to be effective critical thinkers and communicators who are scientifically literate leaders and citizens; and,
    - maintains an environment that is welcoming of, and encourages participation from people of all backgrounds.

2. Encourage faculty to:
    - develop innovative pedagogical approaches, teaching methods, and materials that facilitate an effective learning environment;
    - provide field-based learning opportunities for all students;
    - promote access and involvement of all students in the process of scientific inquiry;
    - develop inter-departmental, interdisciplinary curricular offerings; and
    - foster a welcoming environment to students of all ethnicities, socioeconomic classes, religions, identities and backgrounds.

Vision: Student-Faculty Research

The Department of Geological Sciences strives to:

3. Maintain and strengthen faculty expertise in Earth and surface processes, geoscience education, and Earth history.

4. Foster interdisciplinary research with colleagues outside of our department.

5. Engage in Scholarly and Creative Activity (SCA) in each faculty member's discipline that:
    - actively involves undergraduate and graduate students;
    - results in peer-reviewed publications in respected journals, books, or other media;
    - brings in external funds; and,
    - increases the visibility of our department in the scientific community.

6. Cultivate a high quality, competitive, and nationally recognized graduate program that:
    - requires critical thinking;
    - provides relevant, original research opportunities to all students, including those from historically excluded groups;
    - culminates in a publishable thesis of interest to the greater scientific community; and,
    - prepares our students for future career and/or educational goals.

7. Provide undergraduate research opportunities that:
    - require critical thinking;
    - enhance student learning;
    - includes all students, including those from historically excluded groups; and,
    - prepares our students for future career and/or educational goals.

Vision: Department Community, Service and Outreach

The Department of Geological Sciences strives to:

8. Provide a department environment that:
    - encourages collegiality and collaboration between faculty, staff, and students;
    - works as a group to enhance and promote our department in the college, university, the public, and the scientific community; and,
    - nurtures ties with alumni and friends.

9. Provide service to the department, university and community that:
    - promotes department representation throughout the university;
    - cultivates ties with industry, scientific organizations and educators;
    - welcomes students of all identities and backgrounds; and,
    - broadens the idea of who scientists are and what they do.

10. Increase Earth science awareness in the local community by:
    - serving as a resource of knowledge regarding geoscience processes, products and hazards; and,

- contributing to the education of teachers, community leaders, organizations and the general public

Department Goals – The Department reviewed and approved revised Goals in a series of faculty meetings during the Fall 2021 semester. The revised goals of the Department and the corresponding NSM Strategic Goals and CSUF Goals and Values from the 2018 – 23 Strategic Plan are as follows:

1. *Enhance student learning, improve retention, and minimize time-to degree through effective curricular and teaching strategies.*
    - NSM Strategic Goal 1 – Improve Student Success
    - CSUF Goal 1 – Commitment to a Transformational Titan Experience
    - CSUF Goal 2 – Commitment to Student Success and Completion
2. *Encourage High Quality Scholarly and Creative Activities.*
    - NSM Strategic Goal 2 – Support Student-Faculty Research
    - NSM Strategic Goal 4 – Increase Revenue through Grants and Contracts
    - CSUF Goal 1 – Commitment to a Transformational Titan Experience
    - CSUF Values – Scholarly and Creative Activities, Integrity
3. *Sustain and expand Alumni and Community outreach*.
    - NSM Strategic Goal 4 – Increase Revenue through Fundraising
    - CSUF Goal 4 – Commitment to Our Learning Environment and Legacy
    - CSUF Values – Civic Engagement, DEI, Service to the Region
4. *Expand the number of majors in the Department.*
    - CSUF Values – Civic Engagement, DEI, Service to the Region
5. *Strengthen M.Sc. Program.*
    - NSM Strategic Goal 1 – Improve Student Success
    - CSUF Goal 2 – Student Success and Completion
6. *Implement Interventions that Improve DEI.*
    - NSM Strategic Goal 3 – Recruit and Retain High-Quality and Diverse Faculty and Staff
    - CSUF Goal 2 – Commitment to Student Success and Completion
    - CSUF Values – Student Success, DEI, Collegial Governance, Integrity
7. *Recruit and retain faculty and staff.*
    - NSM Strategic Goal 3 – Recruit and Retain High-Quality and Diverse Faculty and Staff
    - CSUF Goal 3 – Commitment to Faculty and Staff Diversity and Success
    - CSUF Values – Student Success, DEI, Service to the Region

These goals are updated from the goals set forth in our 2013 – 14 PPR:

1. Support effective curricular and teaching strategies that continue to enhance student learning, retention, and time to-degree.
2. Improve community outreach and undergraduate student recruitment.
3. Strengthen the graduate program.
4. Encourage High Quality Scholarly and Creative Activity.
5. Recruit and retain high-quality faculty and staff.

B. Changes in the discipline and department response

1. Employment prospects for students

Employment in the geosciences is projected to grow at an average rate of 4.9% through 2029 (AGI 2020 Geoscience Workforce Report), outpacing U.S. workforce growth estimates over the same span (3.7%) (AGI 2020 Geoscience Workforce Report). In addition, an estimated 27% of the existing geoscience workforce will retire by 2029, which will provide an additional driver of employment opportunities for our students (AGI 2020 Geoscience Workforce Report).

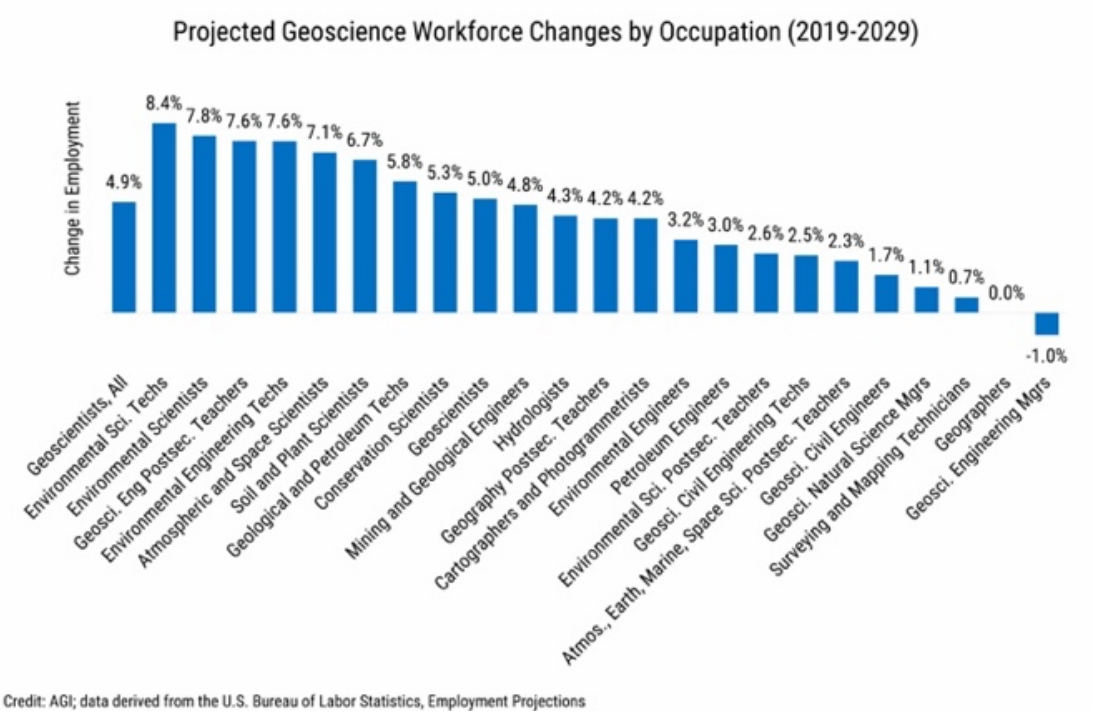

FIGURE 1. Geoscience employment projections by occupation. From Geoscience Workforce Projections 2019-2029 (American Geosciences Institute, 2020).

The majority of job growth in the geosciences will be within environmental science (7.6-8.4%), secondary education (2.3-7.6%, depending on the specialty), hydrology (4.3%), and mining (4.8%) (Fig. 1). This growth is driven by a variety of factors, including greater concern about the environment in a warming world, concern about environmental and social justice, remediation of groundwater pollution, concern about water resources and supplies, and a need for raw materials to drive the coming green economy (e.g., materials for use in batteries for green power storage).

We surveyed our alumni recently (December 2021) to ask about employment history, with 85 respondents. Of the respondents, 85% are currently employed in the geosciences, with 79% of those graduates finding employment in the geosciences less than 6 months after graduating. The majority of our graduates work in the geotechnical, environmental, education and hydrologic fields. Although Geoscience Engineering (i.e., geotechnical) careers are expected to shrink nationally (Fig. 1), this is not the case in California due to strict building regulations; many of our alumni are working in the geotechnical field, and

we are frequently approached by local employers looking to fill entry-level job openings. To summarize, the majority of our students who want to get jobs in the geosciences are able to quickly find employment, and we expect this trend to continue.

2. Preparation and recruitment of prospective students

The Geosciences are a pathway to a well-paying career, with plentiful jobs in industry, government agencies, and education. However, the geosciences have traditionally drawn far fewer students than other STEM disciplines. This is due to a variety of factors, but perhaps the biggest is inadequate Earth Science education in the K-12 curriculum. K-12 students typically take an Earth Science class during 8th grade, and most (75%) never take another Earth Science class during the remainder of their secondary education (NCES, 2019). In addition, the outdated perception that many Geology alumni go on to work in the petroleum industry has tarnished our image amongst younger generations concerned about climate change and environmental issues. Interestingly, many of our students go on to careers in environmental remediation, and the geosciences are positioned to be an integral part of the greening of the global economy.

Insufficient Earth Science education at the K-12 level means that only a handful of students enter the department as first-time freshmen (typically < 5 per year, see Appendix A, Table 3-A), or as transfer students (typically 5 – 10 per year, see Appendix A, Table 3-B). As a result, our department has typically relied on recruitment of majors from our GE classes (GEOL 101, GEOL 101L, and GEOL 310T). While we have been successful in this regard, we recognize that better recruiting at the high school and community college levels will help us further our enrollment goals and provide a more reliable stream of majors to our department. The introduction of the Earth Science B.A. in 2012-13 stabilized our number of majors by attracting students (typically ~40 – 50) that are interested in education, environmental science, or other career paths that are not served by our Geology B.Sc.

A predominant trend in the Geosciences, and STEM in general, is a recognition that we need to remove institutional and traditional barriers to students from underrepresented groups. The Geological Sciences Department has been a leader in granting geology degrees to Latinx students (59 undergraduate degrees awarded from 2014-18; more than any university in California, and 5th nationally; Beane et al., 2021, Nature Communications, https://doi.org/10.1038/s43247-021-00196-6), but we recognize that we must do more to attract underrepresented students to our program and the geosciences in general, and create a welcoming environment for those students choosing to major in the Geosciences.

Despite the challenges to our program, our numbers of majors (currently 101) are well above where they were at their lowest point in 2002-03 (28 majors total), and we feel that we can grow the program by adapting to changes in the discipline (see below) and through outreach at multiple levels. We are striving to make our department more welcoming to traditionally underrepresented groups and want to serve as a model Geosciences department at the national level.

3. Changes in the discipline

Nationally, the Geosciences are undergoing a change from one that has been traditionally dominated by oil and gas extraction to one dominated by minerals mining and extraction, along with applied geology (Prof. Sci, and Technical Svcs. and Waste Mngmt & Remediation Svcs. in Fig. 2), which includes scientists employed in environmental monitoring and cleanup, as well as water resource management. In addition, due to California building regulations, many of our graduates are hired by companies specializing in

construction and engineering geology, which is diverges somewhat from the national trend (Fig. 1), where engineering geology is expected to contract by 1.0%.

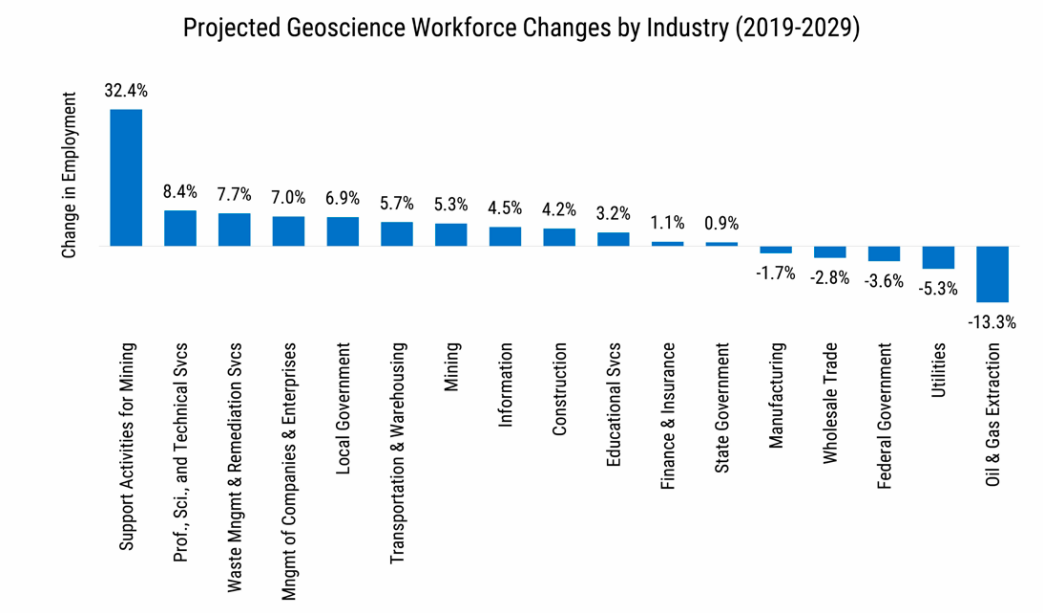

FIGURE 2. Geoscience employment changes by industry. From Geoscience Workforce Projections 2019-2029 (American Geosciences Institute, 2020).

C. Priorities for the future

The priorities of the Geological Sciences 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 of accomplishment are in section VII.

Goal 1. Enhance student learning, improve retention, and minimize time-to degree through effective curricular and teaching strategies.

Priority 1 – Maintain current and develop new High-Impact Practices (HIPs) through faculty research that includes student collaborators and classes that incorporate field/lab/research experiences.

Priority 2 – Assess undergraduate and graduate programs and implement improvement actions.

Priority 3 –Develop a peer-mentoring program.

Goal 2. Encourage high quality Scholarly and Creative Activities.

Priority 1 – Build on student-faculty research capabilities.

Priority 2 – Enhance student-faculty research space.

Priority 3 – Enhance funding opportunities for undergraduate and graduate research.

Goal 3. Sustain and expand alumni and community outreach.

Priority 1 – Continue alumni outreach.

Priority 2 – Continue public engagement in the Earth Sciences.

Goal 4. Expand the number of majors in the department.

Priority 1 – Recruit new majors.

Priority 2 – Remove barriers to student success.

Priority 3 – Consider changing the name of the department.

Goal 5. Strengthen the M.Sc. Program.

Priority 1 – Increase monetary and structural TA and GA support for M.Sc. students.

Priority 2 – Consider the addition of a project-based Master's degree program in order to increase the number of students in the program.

Goal 6. *Implement interventions that improve DEI*

Priority 1: Identify and change exclusionary habits and policies.

Priority 2: Identify and address the ways department activities impact students negatively.

Goal 7. Recruit and retain faculty and staff.

Priority 1 – Hire faculty in subjects of relevance for student success.

Priority 2 – Support staff excellence.

D. Special session and self-support courses

The Department offers four different self-support sections during summer and intersession. These courses are primarily made up of GE courses (GEOL101, 101L, 310T), but we have also offered an upper division geology elective in conjunction with the Department of Biological Sciences (GEOL 336 – GEO/BIO Field Investigations). Our geology capstone course, GEOL 481A (Geology Field Camp), is also offered during the summer, but is state-supported.

II. Department Description and Analysis

A. Curricular changes

Since the last PPR in 2013-14, we have added 4 new classes to our curriculum:

- GEOL 293 – Directed Field and Laboratory Study
- GEOL 336 – GEO/BIO Field Investigations
- GEOL 381 – Data Collection and Analysis for Earth Scientists
- GEOL 433 – Coastal Processes

GEOL 293 was added to the curriculum in order to provide academic credit to freshman, sophomore, or community college students who conduct research with a faculty member that is less rigorous than that expected for an undergraduate thesis, or an upper-division independent study or directed research class. GEOL 336 is an interdisciplinary field course cross-listed with the biology department (BIO 336) that provides an opportunity for students from both departments to interact in the field and expand their perspectives. GEOL 381 is a practical, methods-based class that was established to meet the needs of our Earth Science BA students. GEOL 433 was developed by a faculty member (Carlin), and aligns with his research interests and those of his students.

We revamped our 3 geoscience education-focused classes to better serve our Earth Science majors who are planning on a career in teaching. The number of units for GEOL 102 (Earth Science Investigations for Future Teachers) was increased from 3 units to 4 units by adding a 1-unit lab that provides practical classroom exercises to future K-6 teachers. The name of GEOL 410 was changed from Physical Earth/Space Systems to Planet Earth for Educators to better reflect the education focus of the class, and the curriculum was updated to concentrate on developing Earth Science-based lesson plans for future K-12 teachers. Finally, GEOL 420 (Earth Science Communication, Education and Outreach Methods) was updated to better serve our BA majors who are planning on a career in education, and also provide a background in communication techniques for all of our majors.

Other changes to the curriculum include: 1) elevating Engineering Geology from a 300-level to a 400-level course (from GEOL 376 to 476) and offering it as a quantitative elective (a requirement for the Geology B.Sc.) in order to better reflect the degree of rigor and subject matter in the class; 2) removing the 1- unit lab from GEOL 110T (Topics in Earth Science) in order to encourage more students to enroll in the class; and, 3) adding 4 new topics to GEOL 510T (Continental Margin Sedimentation, Physical and Chemical Evolution of Magmatic Arcs, Ore Deposit Models, and Orogenic Systems) in order to expand our number of class offerings to our graduate students and to better match the research interests of our faculty and their students.

B. Structure of degree program

Undergraduate Program

Our undergraduate program has two majors: 1) B.Sc. in Geology; and, 2) B.A. in Earth Science. In addition, the department also offers a Minor in Geology. The B.Sc. Geology degree is a traditional program that trains students to become professional geologists. Our B.A. in Earth Science is more flexible than the B.Sc. in Geology, and allows students to cater their degree to their professional interests, which could include Earth Science education, environmental science, environmental law, etc. Both degree programs provide a strong foundation for students to pursue post-baccalaureate study. The Student Learning Outcomes (SLOs) for the B.Sc. in Geology and B.A. in Earth Science are provided in Table 1 and mapped to university

Undergraduate Student Learning goals I-III (UPS 300.003), where applicable. The general differences in geology core and electives courses for the two majors are shown in Table 2.

Undergraduate Student Learning Goals	B.Sc. Geology SLOs	B.A. Earth Science SLOs
I. Demonstrate intellectual literacy through the acquisition of knowledge and development of competence in disciplinary perspectives and interdisciplinary points of view.	1) Produce and interpret a geological cross-section	1) Produce and interpret a geological cross-section
	2) Identify geologic materials and explain their geologic significance	2) Model/synthesize and evaluate the function, interaction and trends of Earth Systems: geosphere, hydrosphere, cryosphere, atmosphere, and biosphere
II. Think critically, using analytical, qualitative, and quantitative reasoning, to apply previously learned concepts to new situations, complex challenges and everyday problems.	3) Apply mathematics, chemistry, biology and/or physics to help clarify the mechanisms behind major geological systems.	3) Apply mathematics, chemistry, biology and/or physics to help clarify the mechanisms behind major Earth systems.
	4) Develop a hypothesis, collect, test, and analyze data, summarize results	4) Develop a hypothesis, collect, test, and analyze data, summarize results
III. Communicate clearly, effectively, and persuasively, both orally and in writing.	5) Communicate geological concepts to peers and/or public both orally and written	5) Communicate geoscience concepts to peers and/or public both orally and written

TABLE 1. Student Learning Outcomes (SLOs) of major programs

	B.Sc. Geology		B.A. Earth Science	
	Optional	Required	Optional	Required
GEOL 101 – Introduction to Geology (or 110T)		X		X (May also choose GEOL 102)
GEOL 101L – Introduction to Geology Laboratory		X		X
GEOL 201 – Earth History		X		X
GEOL 303A – Earth Materials		X	X	
GEOL 303B – Igneous and Metamorphic Petrology		X	X	
GEOL 321 – Sedimentation and Stratigraphy		X	X	
GEOL 333 – General Oceanography	X			X
GEOL 335 – Surface Processes and Hydrology		X		X
GEOL 360 – Structural Geology		X	X	
GEOL 380 – Geological Field Techniques		X		X
GEOL 381 – Data Collection and Analysis for Earth Scientists	X		X	
GEOL 406 – Geochemistry	must choose 406, 456 or 476		X	
GEOL 420 – Earth Science Communication, Education and Outreach Methods	X		must choose 420 or 470	
GEOL 456 – Geophysics	must choose 406, 456 or 476		X	
GEOL 476 – Engineering Geology	must choose 406, 456 or 476		X	
GEOL 470 – Environmental Geology	X		must choose 420 or 470	
GEOL 481A – Geology Field Camp	X		X	
GEOL 498 – Undergraduate Thesis		X	X	

TABLE 2. General geology course comparison for B.Sc. in Geology and B.A. in Earth Science.

B.Sc. in Geology: The primary goal of the B.Sc. in Geology curriculum design is to prepare students for a career as a professional geologist or for further education in graduate school. Thus, the curriculum is a traditional geology curriculum that is field-oriented. The degree requires a total of 120 units, of which 48 are geology core or elective courses. The core geology courses cover the spectrum of fundamental geology topics that form the building blocks of geologic knowledge, as given in the following general categories (and the corresponding courses):

Courses that focus on general geology:

- GEOL 101 – Introduction to Geology (or GEOL 110T-Topics in Earth Science)
- GEOL 101L – Introduction to Geology Laboratory

Courses that focus on geologic history:

- GEOL 201 – Earth History

Courses that focus on rocks and minerals, and the processes that form them:

- GEOL 303A – Earth Materials
- GEOL 303B – Igneous and Metamorphic Petrology
- GEOL 321 – Sedimentation and Stratigraphy

Courses that focus on the movement and redistribution of materials at Earth's surface:

- GEOL 335 – Hydrology and Surface Processes

Courses that focus on how rocks are deformed:

- GEOL 360 – Structural Geology

Courses that focus on understanding the field relations of geologic materials:

- GEOL 380 – Geologic Field Techniques
- GEOL 481A – Geology Field Camp (a capstone course for the B.Sc. in Geology)

The core of the major also requires that the students take at least one quantitative geology course, including GEOL 406 (Geochemistry), GEOL 456 (Geophysics) or GEOL 476 (Engineering Geology).

One of the hallmarks of our B.Sc. in Geology degree is the required undergraduate thesis. B.Sc. students are required to take 3 units of GEOL 498 (Undergraduate Thesis), which are typically taken as three 1-unit courses over a three-semester time span. The undergraduate thesis is a capstone experience where majors work one-on-one with a faculty adviser to conduct original research. This experience generally begins during the junior year, and fulfills the university upper-division writing requirement. The Geology B.Sc. major, therefore, includes two capstone experiences: a field camp course (GEOL 481A), and an undergraduate thesis (GEOL 498).

Students are required to take 9 units of geology electives. These electives provide breadth and allow the students to choose classes tailored to their interests and career goals.

Students are also required to take at least 30 units of classes in Related Fields, including one semester of college biology and two semesters each of college level chemistry and physics. Two

semesters of mathematics are required and students can choose either: 1) two semesters of college calculus (MATH 150A and 150B); or, 2) a semester of college calculus (MATH 130) and a semester of statistics (MATH 338).

Student Learning Outcomes (SLOs) for the B.Sc. in Geology are given in Table 2 and the SLOs are mapped onto the B.Sc. curriculum in Table 3. The SLOs are introduced (I) in introductory and related fields courses, developed (D) in most of the core and elective courses and practiced at a high level (P) in the degree capstone courses.

	Produce and interpret a geologic cross-section	Identify geologic materials and explain their significance	Apply mathematics, chemistry, biology and/or physics to help clarify the mechanisms behind major geologic systems	Develop a hypothesis, collect, test, and analyze data, and summarize results	Communicate geological concepts to peers and/or public both orally and written
Related Fields			I	I	
101/110T/101L	I	I	I	I	I
201	D	I	D	D	P
303A		P	P	P	P
303B		P	P	P	P
321	P	D	D	D	D
335		D	D	D	D
360	P	D	D	P	D
380	D	D	D	D	D
406/456/476	P	P	P	P	D
GEOL Electives	D	D	D	P	D
481A	P	P	P	P	P
498	P	P	P	P	P

TABLE 3. B.Sc. in Geology Curriculum Map. I = introduced, D = developed, P = practiced at a high level

B.A. in Earth Science: The B.A. in Earth Science is designed to serve: 1) K-12 science teachers; 2) environmental scientists; and, 3) non-science focused professionals (policy makers/politicians, business leaders, lawyers, and journalists) that will need to understand Earth resources, pollution, and other environmental issues. These "Earth-educated" teachers and professionals will promote the development of a society equipped to manage future changes in Earth systems related to natural and anthropogenic causes. The degree requires a total of 120 units, of which 32 are from geology core, geography and elective courses. We believe the flexibility in elective choices for the B.A. is its hallmark. The 20-unit core of the degree is designed to give students sufficient Earth Science knowledge and breadth as described in the following general categories (and the corresponding courses):

Courses that focus on general geology:

- GEOL 101 – Introduction to Geology (or GEOL 110T – Topics inEarth Science or GEOL 102 – Earth and Astronomical Science for Future Elementary Teachers)
- GEOL 101L – Introduction to Geology Laboratory

Courses that focus on geologic history:

- GEOL 201 – Earth History

Courses that focus on processes at Earth's surface, including water:

- GEOL 335 – Hydrology and Surface Processes
- GEOL 333 – General Oceanography

Courses that focus on understanding field relations of geologic materials:

- GEOL 381 – Data Collection and Analysis for Earth Scientists

Courses that represent a capstone for the student's chosen pathway:

- GEOL 420 – Earth Science for Science Teachers (for students in the teaching pathway)

OR

- GEOL 470 – Environmental Geology

Students are required to take 12 units as electives in geology and geography. These electives provide breadth in the Earth Science curriculum; the selection of courses depends on the interests and career goals of the student. Students are required to take 16-22 units of related fields science courses, with one semester each of biology, chemistry, physics, and math.

The related fields courses can be at lower levels than the related fields courses required for the B.Sc. in Geology, but still offer sufficient scientific and mathematical background and breadth for the degree learning outcomes. In addition to the related fields core, students take 8 units of related field electives that are adviser-approved and tailored to the student's career interests. The remaining 22 units are completely undesignated and provide an opportunity for the students to customize their degree according to academic interests. Students must also take a 3-unit writing course (English 301 or 360) or complete an undergraduate thesis (GEOL 498) tosatisfy the university upper-division writing requirement.

Student Learning Outcomes (SLOs) for the B.A. in Earth Science are given in Table 2, and the SLOs are mapped onto the B.A. curriculum in Table 4. The SLOs are introduced (I), developed (D), and/or practiced at a high level (P) in most of the core and elective courses. Note that the SLOs are practiced at a high level mostly in the capstone 420/470 courses and in the geology electives. Undesignated electives allow students to customize their degree and achieve academic breadth (indicated as AB in Table 4).

	Produce and interpret a geologic cross-section	Model/synthesize and evaluate the function, interaction and trends of Earth Systems: geosphere, hydrosphere, cryosphere,	Apply mathematics, chemistry, biology and/or physics to help clarify the mechanisms behind major Earth systems	Develop a hypothesis, collect, test, and analyze data, and summarize results	Communicate geological concepts to peers and/or public both orally and written
Related Fields			I	I	
101/102/110 T/101L	I	I	I	I	I
201	D	I	D	D	P
333	D	D	D	D	D
335		D	D	D	D
381	D	D	D	D	D
Earth Science Electives	D	D	D	D	D
420	P	P	P	P	P
470	P	P	P	P	P
Undesignated Elective Units	AB	AB	AB	AB	AB

TABLE 4. B.A. in Earth Science Curriculum Map. I = introduced, D = developed, AB = contributes to academic breadth.

Minor in Geology: A minimum of 20 units in geological sciences courses is required for the minor, of which at least 12 units must be upper division and at least 6 of these 12 must be taken in residence. Up to 3 units of GEOL 310T may be applied. Prospective minors make an appointment with a Department adviser in order to select courses that most closelymatch their educational goals.

Graduate Program

The Department has offered a Geology M.Sc. degree since Fall 2000. The Geology M.Sc. is based on the expectation that every geologist must have a thorough knowledge of fundamental geologic principles and that this knowledge be rooted in field- and/or laboratory-based experiences. The M.Sc. degree requires 30 units, of which 21 must be at the graduate level (500 level). The 9-12 core units include Advanced Geological Concepts and Methods (GEOL 500 – 4 units), which teaches new graduate students the basics of how to conduct research, Geoscience Seminar (GEOL 590 – 2 units), and Thesis units that are taken over multiple semesters (GEOL 598 – 3-6 units). Students must take 18-21 units from elective geology and/or related fields "focus" courses (these courses can include up to 6 units of 400-level classes), which are approved on the required study plan prior to completing 9 total graduate units. A public, oral defense of the thesis is required. The Student Learning Outcomes (SLOs) for the M.Sc. in Geology are given below:

Student Learning Outcomes (SLOs), M.Sc. Geology:

- Develop a hypothesis, collect, test, and analyze data, and summarize results
- Communicate geological concepts, both orally and written, to peers and/or the public

All of the SLOs are practiced at a high level, as evidenced by students:

- Completing advanced courses within their discipline;
- Attending and interacting in research seminars at CSUF and other local institutions and professional societies;
- Presenting research at regional and international professional conferences;
- Conducting independent research that includes:

    1. writing of a research proposal;
    2. production of a written thesis that describes the problem, methodology, and results of the student's research;
    3. dissemination of the results through publication in peer-reviewed journals and/or presentations at regional and/or international conferences;
    4. a public oral defense of the thesis.

C. Student demand

The Geology Department has worked to increase numbers of majors by actively recruiting from GE courses taught by the department (GEOL101, 110T, 101L, 310T), at local community colleges (via the development of relationships with community college faculty, including through the SAGE2YC program and by visiting

and giving presentations about our department at community colleges), and through university and community engagement (Experience CSUF, career day, NSM-ICC fall festivities, job fair, CSUF Geology Club exposure, etc.). Since 2016, the number of first time freshman (FTF) applying varied from 76-85 students to our B.A. program and 33-42 students to our B.Sc. program (Appendix A, Tables 1-A & 5A). The percent admitted has fluctuated between 42.5 and 67% for the Earth Science B.A. and 42 and 65% for the Geology B.Sc. (Appendix A, Table 1-A & 5A), with < 30% enrolled to either degree program (ranging from 6-10 total FTF for both degrees combined). The number of upper-division transfer students applying varied from 16-27 students to our B.A. program and 27-49 students to our B.Sc. program (Appendix A, Tables 1-B & 5B). The percent admitted has fluctuated between 20 and 52% for the Earth Science B.A. and 26 and 42% for the Geology B.Sc. (Appendix A, Table 1-A & 5A), with 0-62.5 % enrolled in the B.A. program and 33-56% enrolled in our B.Sc. program (ranging from 5-14 total transfer students for both degrees combined). Therefore, the number of FTF and transfer students enrolling in our department are about the same, and those numbers are small, likely due to reasons listed in section I.B.2. (lack of Earth Science classes in secondary education beyond the 8th grade, outdated perceptions about geology not being a "green" discipline, etc.). As a result, our department has traditionally recruited from our GE courses (GEOL 101, 110T, 101L, 310T), which has provided the majority of majors to our program.

The number of applicants to our graduate program has steadily declined from 30 in 2016 to 16 in 2020 (Appendix B, Table 1). The percent admitted and enrolled has fluctuated between 0 and 37%, ranging from 0 to 10 students. For our current TAs, 6 of 7 are CSUF Geology alumni, and the 7th is a UCLA alumna. This fits a broader trend, where students from out of state frequently decide not to come to CSUF due to the high cost of living in southern California, the low salary that we offer our TAs, and the lack of a tuition waiver and/or out-of-state tuition fee exemptions. Our current TA salary is $14,824 for a 10-month period; fees of $8,304 leave the student with $6,520, or about than $500/month. The department offers a GA to about ¾ of our TAs, paid from the department PTF blanket, which provides summer salary ($2500 for 2 months) and a small monthly increase ($187) in pay to bring the package to $19,568, or $11,264 after the student pays fees. Students are therefore much more likely to come to CSUF for graduate school if they already live in the area and can save money by living at home, or if they are more established in the area and have become accustomed to the high cost of living. As a result, most of our faculty no longer actively recruit students from outside of southern California, and the number of applicants to our program has steadily decreased. A smaller applicant pool means that we have fewer applicants who are qualified to be TAs, and also limits our ability to do science. Most graduate theses result in publications; therefore, our shrinking applicant pool impacts our junior faculty the most by decreasing the amount of publishable research being conducted in their labs.

Our 4-year graduation rate for FTF from 2013-2017 (Appendix A, Tables 3A and 7A) for the Earth Science B.A.is 28.6% (6/21) and 37.5% (6/16) for the Geology B.Sc., while our 6-year graduation rate for FTF is 62% for our Earth Science B.A. students (13/21), and 62.5% for our Geology B.Sc. students (10/16). These rates are similar to or greater than that reported by the university as a whole for 2020 (4-year rate = 32.6%; 6-year rate = 68.7%). Our 2-year graduation rate for transfer students from 2015-2019 (Appendix A, Tables 3B and 7B) for the Earth Science B.A.is 47.0% (8/17) and 43.8% (14/32) for the Geology B.Sc., while our 4-year graduation rate for transfer students is 89.9% for our Earth Science B.A. students (8/9), and 82.3% for our Geology B.Sc. students (14/17). These rates are similar to or greater than that reported by the university as a whole for 2020 (2-year rate = 42.6%; 4-year rate = 80.9%).

Our 4-and 6-year graduation rates have shown steady improvement over time for our FTF (Appendix A, Tables 3A & B), with 4-year graduation rates for FTF increasing from 0 – 66.7% for the B.A. in Earth Science, and from 33.3 to 100% for the B.Sc. in Geology from 2013 – 2016 (Appendix A, Table 3), and 6-year

graduation rates increasing from 40-100% in the B.A. in Earth Science and from 50-100% for the B.Sc. in Geology. Our 2-year graduation rates for transfer students are more variable, but are typically around 50% for both degree programs, while our 4-year graduation rates range from 66.7-100% for both majors. While we strive to help our transfer students finish in 2 years, the lack of an upward trend similar to that of our FTF is likely due to the variable level of preparedness of our transfer students; those that arrive with their GE and related fields complete or mostly complete will have an easier path to finishing in 2 years. Overall, the upward trend in 4-and 6-year graduation rates in our FTF point to the importance of departmental advising in our students' careers, while the uneven trends in transfer students suggests that we need to work with our community college colleagues to make sure transfer students are better prepared for success when they arrive at CSUF.

Approximately half of our graduate students from 2014-18 graduated in 4 years (Appendix B, Table 3), with 0-33.3% graduating in 2 years. Our graduate program and individual study plans are designed so that graduate students finish all of their classes in 2 years; the research aspect of the M.Sc., and particularly writing of the thesis frequently take longer than anticipated; a process that is even further delayed if a student is working full time. We feel that introducing a project-based Master's degree would ease this burden for students who want to get a Master's degree without completing a thesis, or to allow those students who are having difficulty completing their thesis a means to finish their degree.

D. Enrollment trends

Total FTES for the Geological Sciences Department has increased from 377.9 (2016-17) to 409.2 (2020-21) (Appendix A, Table 6A). The proportion of full time equivalent students (FTES, or the number of students if all students were taking 15 units) represented by undergraduate Geology or Earth Science majors during this interval decreased from 97.2 to 92.2 (from 111 to 85 majors), while the proportion of FTES represented by graduate students has decreased from 11.3 to 3.6 (from 17 to 7 M.Sc. students). Overall, while our number of majors has dipped, we have grown our FTES by serving a greater proportion of CSUF population through our GE offerings.

Our number of faculty decreased from 13 from 2016 to 11 in 2020 (11 full time faculty, plus 2 faculty on FERP at half-time). During the same period, our full time equivalent faculty (FTEF, or number of faculty each teaching 15 weighted teaching units, or WTUs) decreased from 14.0 to 11.0 (Appendix C, Table 1). Our FTES increased during this same period from 377.9 to 409.2 (7.6% increase; Appendix A, Table 6A), and our student / faculty ratio (SFR) during this time increased from 27.0 to 37.2 (SFR = FTES/FTEF). By comparison, the university ratio during the same period for tenured/tenure track faculty ranged from 40.2 – 42.1 and NSM ranged from 20.9 – 22.5 (2016 –17 data only; data for 2018 – 20 was unavailable). Geology SFR are below those of the university, but above those for NSM, likely due to the nature of the department, which teaches a combination of large GE sections, where enrollments range from 85-230 to smaller majors classes, where enrollments are typically 10-25 students.

Enrollment in our graduate program has decreased from 17 in 2016-17 to 7 in 2020-21. As noted above, this is likely the result of our pool of applicants shifting from a national pool to a regional pool as the cost of living in southern California has soared, TA salaries have remained low, and tuition waivers remain unavailable. We believe that introducing a project-based Master's track will attract working geologists and grow the program while serving the greater geological community.

The number of bachelor's degrees decreased from 2016-2020 in both our Earth Science and Geology

programs, from 20 to 12 B.A. degrees awarded and from 27 to 12 B.Sc. degrees awarded. The small size of our department means that the number of degrees awarded can fluctuate greatly from year to year; 15 to 20 degrees are typically awarded in each degree program per year (Appendix A, Tables 4 & 8). Master's degrees awarded are also variable, ranging from 1 degree in 2020-21 to 8 degrees in 2019-20; we typically award about 5 M.Sc. degrees per year (Appendix B, Table 4).

E. Plans for curricular changes

We have plans to add courses to better reflect faculty research specialties and the interests of our students over the next 1 – 3 years. We currently have no plans to revise the catalog requirements for either degree program, but will make modifications if the need arises.

Short-term Curriculum Plans:

GEOL 310T – Ancient Life of California – Add an additional topic to our 3-unit upper-division GE class. This lecture/discussion class will discuss the rich history of fossil life in California, focusing on the world-class vertebrate fossil record of southern California.
Rationale: Topics covered by our upper-level GE course include general interest topics: Geology of California, Geology of National Parks, and Hazards of California, in addition to topics related to climate change and resources: Hydrology of Southern California, Earth's Environmental Crisis, California's Water Crisis, etc., but no classes for students that are interested in the geologic history of California. This class is a natural extension for those students who completed GEOL 110T – Dinosaur World, and want to learn more about ancient life in California.

GEOL 401 – Topics in Earth History – This 3 unit course will be lecture/discussion based, and will focus on a specific topic in Earth history, such as mass extinctions, the origin of life, plate tectonic cycles, etc.
Rationale: We have several faculty who specialize in deep-time research, including Bonuso, Kirby, Parham, and Woods. This class would provide an opportunity for faculty to discuss specific topics in more detail than the students receive in GEOL 201 – Earth History, and would provide an upper-level elective that could be taken by undergraduates, or a 400-level course that could be taken by graduate students.

GEOL 403 Mineral Investigations – This 3-unit lecture/activity/lab will explore petrographic and analytical methods of investigating geologic materials of different rock types at the mineral scale.
Rationale: This class will provide advanced instruction in textural and microstructural observations and interpretations in thin section, as well as instruction in analytical methods such as x-ray diffraction, cathodoluminescence imaging, and qualitative and quantitative analyses and the interpretation of such data.

GEOL 515 – Teaching and Learning Geoscience – This 3-unit project-based course will study how learning works, using research from cognitive psychology and science education, and how to apply that knowledge to enhance the ability to teach and learn geoscience.
Rationale: This course will teach masters students to design curriculum and materials that best reflect how people learn. Projects are focused on undergraduate geoscience courses, but acquired content knowledge and skills can be transferred to scientific reports, presentations to the public, etc.

4XX – GIT Preparation Class – This class is a 1-unit activity course designed to help our students pass the Geologist in Training (GIT) exam.
Rationale: Many of our recent graduates take the GIT exam within their first year of employment in order to receive their first professional credential. Our goal for this class is to review pertinent information related to the GIT in order to help the students focus and be successful in passing the exam.

GEOL 580 – Advanced Field Mapping – This 3-unit graduate class will consist of lecture/activities and provide our grad students advanced training in the making of field maps in geologically complex terrains. Several one-day or weekend field trips will go to nearby locations in southern California.
Rationale: This class will provide advanced map interpretation skills that are often lacking in our M.Sc. student population. Senior undergraduate students will also be able to take this class as an elective to build on their skills learned in our introductory field techniques course (GEOL 380) in preparation for field camp.

Long-term Curriculum Plans

Our long-term curricular plans revolve around faculty turnover as new faculty members replace retired faculty, and if we are able to grow the department. In addition, we would also like to address subject deficiencies in our curriculum as they arise. One of our faculty members (Clemens-Knott) retired at the end of 2021, and another faculty member (Knott) is currently in the third year of FERP. In addition, one of our faculty members who retired at the end of AY 2013 (Foster) was never replaced, and we view this an opportunity to expand our faculty expertise.

Current subject/course deficiencies include:

- Resource/Economic Geology – Courses related to economic (mineral resource) geology, exploration, and management. New hire should be in place in Fall 2023.
- Engineering geology – We currently have a 400-level engineering geology course (GEOL 476), but new undergraduate elective and M.Sc. courses will potentially be developed by a new hire following the retirement of Knott.
- Remote Sensing – Courses that teach students about satellite and GIS methods of evaluating environmental and applied Earth science issues. These courses would be taught by an opportunity hire specializing in Remote Sensing.

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

A. Description of department assessment plan and structure

Since our last PPR in 2014 our department worked closely with the Assessment and Institutional Effectiveness division to develop an assessment plan following CSUF's six steps of assessment strategy. Beginning in 2015, department assessment is an ongoing process aimed at continuous improvement of student learning. Our first step included developing SLOs for each of the department degree programs that align with the university's mission, the university's student learning goals, and the accreditation requirements of our discipline. Once we finalized our SLOs, we developed methods of assessment involving direct and indirect measures and determined criteria for success for each measure. Our department SLO matrix includes CSUF's university learning goal, our specific SLOs tied to a specific CSUF

goal, the direct/indirect measurement, and the criteria for success for each SLO (Tables 5, 6, and 7). Our general assessment plan involves testing one SLO for each major each academic year. If our direct and indirect measures meet our criteria for success, we move on to the next scheduled SLO; If any measure fails to meet our criteria for success, we retest that SLO in the following academic year in addition to the SLO planned for the year. Each academic year an assessment report is documented via an online, centralized assessment planning, management and reporting system (AM.Sc.). Prior to 2015, no ongoing assessment plan existed in our department. Table 5 lists our future SLO testing plan.

YEAR	BA Degree	B.Sc. Degree	M.Sc. Degree
2021-2022	SLO 4 – hypothesis	SLO 4 – hypothesis	SLO 1 – hypothesis
2022-2023	SLO 3 – related fields	SLO 3 – related fields	SLO 2 – communication
2023-2024	SLO 1 – cross section	SLO 1 – cross section	SLO 1 – hypothesis
2024-2025	SLO 2 – model	SLO 2 – materials	SLO 2 – communication
2025-2026	SLO 3 – related fields	SLO 3 – related fields	SLO 1 – hypothesis
2026-2027	SLO 4 – hypothesis	SLO 4 – hypothesis	SLO 2 – communication
2027-2028	SLO 5 – communication	SLO 5 – communication	SLO 1 – hypothesis
2028-2029	SLO 1 – cross section	SLO 1 – cross section	SLO 2 – communication

TABLE 5: Student Leaning Outcomes (SLO) testing plan.

B. Student learning outcomes (SLOs)

For our BA in Earth Science program, we tested SLO 2, 3, 4, and 5. See Table 6 for our SLOs and description of the direct and indirect measurement strategies. Assessment criteria were met and exceed our stated success levels for each tested SLO.

For our B.Sc. in Geology program, we tested all five SLOs. See Table 7 for our SLOs and description of the direct and indirect measurement strategies. Assessment criteria were met and exceed our stated success levels for each tested SLO.

University Goals	Department SLO	Direct Measures	Measure of success	Indirect Measures	Measure of success
1. Demonstrate intellectual literacy through the acquisition of knowledge and development of competence in disciplinary perspectives and interdisciplinary points of view.	1) Produce and interpret a geological cross-section	• GEOL 333 ocean data lab • GEOL 380 marble mtns cross section	80% of the students earn a C or better	Student 12-point survey	80% of Students score ≥ 9 (or 75% of total points)
	2) Model/synthesize and evaluate the function, interaction, and trends of Earth Systems: geosphere, hydrosphere, cryosphere, atmosphere, and biosphere	• Grade GEOL 420 projects (spring) • Grade GEOL 470 projects (Fall)	80% of the students earn a C or better	Student 12-point survey	80% of Students score ≥ 9 (or 75% of total points)
2. Think critically, using analytical, qualitative, and quantitative reasoning, to apply previously learned concepts to new situations, complex challenges and everyday problems.	3) Apply mathematics, chemistry, biology and/or physics to help clarify the mechanisms behind major Earth systems.	Biology - direct measures labs 3 & 8 from GEOL 321. Math/physics - direct measures slope stability lab from GEOL 335 Chemistry/math - direct measures lab 7 from GEOL 470	80% of the students earn a C or better	Student 12-point survey	80% of Students score ≥ 9 (or 75% of total points)
	4) Develop a hypothesis, collect, test, and analyze data, summarize results	Evaluate poster presentation at Research Day 12-point rubric	80% of students earn a 9 or better (or 75% of total points)	Student 20-point survey	80% of Students score ≥ 15 (or 75% of total points)
3. Communicate clearly, effectively, and persuasively, both orally and in writing.	5) Communicate geoscience concepts to peers and/or public both orally and written	Evaluate poster presentation at Research Day 8-point rubric	80% of the students score a 6 or better (or 75% of total points)	Student 8-point survey	80% of the students score a 6 or better (or 75% of total points)

TABLE 6: B.A. in Earth Sciences Student Leaning Outcomes (SLO).

University Goals	Department SLO	Direct Measures	Measure of success	Indirect Measures	Measure of success
1. Demonstrate intellectual literacy through the acquisition of knowledge and development of competence in disciplinary perspectives and interdisciplinary points of view.	1) Produce and interpret a geological cross-section	• Grade GEOL 380 project (Marble Mtns cross-section) • Grade GEOL481A project	80% of the students earn a C or better	Student 12-point survey	80% of Students score ≥ 9 (or 75% of total points)
	2) Identify geologic materials and explain their geologic significance	• Grade GEOL 303A project • Grade GEOL 303B project • Grade GEOL 321 project	80% of the students earn a C or better	Student 12-point survey	80% of Students score ≥ 9 (or 75% of total points)
2. Think critically, using analytical, qualitative, and quantitative reasoning, to apply previously learned concepts to new situations, complex challenges, and everyday problems.	3) Apply mathematics, chemistry, biology and/or physics to help clarify the mechanisms behind major geological systems.	Grade 303A, 303B, 321, 406/456 or electives exercises;	80% of the students earn a C or better	Student 12-point survey	80% of Students score ≥ 9 (or 75% of total points)
	4) Develop a hypothesis, collect, test, and analyze data, summarize results	Evaluate poster presentation at Research Day 12-point rubric	80% of students earn a 9 or better (or 75% of total points)	Student 20-point survey	80% of Students score ≥ 15 (or 75% of total points)
3. Communicate clearly, effectively, and persuasively, both orally and in writing.	5) Communicate geological concepts to peers and/or public both orally and written	Evaluate poster presentation at Research Day 8-point rubric	80% of the students score a 6 or better (or 75% of total points)	Student 8-point survey	80% of the students score a 6 or better (or 75% of total points)

TABLE 7: B.Sc. in Geology Student Leaning Outcomes (SLO).

For our M.Sc. in Geology program, we tested all two SLOs. See Table 8 for our SLOs and description of the direct and indirect measurement strategies. We assessed SLO 1 twice. The first assessment indicated that both direct and indirect outcomes were not met. However, the sample size was small (n=3). We reassessed the following year and the direct measurement revealed that 83% of students earned a C or better. Indirect measurements revealed that students presenting proposals under-scored themselves compared to their faculty assessment while final thesis students' self-assessment aligned better with faculty direct assessments. We interpret these differences as confidence growth from the proposal stage to the final presentation stage for our M.Sc. students. Assessment criteria were met and exceeded during SLO 2 testing: 100% of students scored a B or higher on faculty (i.e., direct) and self (i.e., indirect assessment).

University Goals	Department SLO	Direct Measures	Measure of success	Indirect Measures	Measure of success
1. Demonstrate intellectual literacy through the acquisition of knowledge and development of competence in disciplinary perspectives and interdisciplinary points of view.	1) Develop a hypothesis, collect, test, and analyze data, summarize results	Evaluate poster presentation at Research Day 12-point rubric	80% of students earn a 9 or better (or 75% of total points)	Student 20-point survey	80% of Students score ≥ 15 (or 75% of total points)
3. Communicate clearly, effectively, and persuasively, both orally and in writing.	2) Communicate geological concepts to peers and/or public both orally and written	Evaluate poster presentation at Research Day 8-point rubric	80% of the students score a 6 or better (or 75% of total points)	Student 8-point survey	80% of the students score a 6 or better (or 75% of total points)

TABLE 8: M.Sc. in Geology Student Leaning Outcomes (SLO)

C. Role of assessment results in improving teaching and learning practices

To date, assessment results have not been used to improve teaching and learning practice because we have met all assessment outcomes.

D. Other indicators of department effectiveness/success

Our graduation rates for our undergraduate majors remained relatively constant between 2016-17 and 2019-20, when we graduated between 17-20 students with Earth Science B.A. degrees and 14-27 students with Geology B.Sc. degrees (Fig. 3 blue outline). Graduation rates dropped to 12 for both majors in 2020-

21; we interpret this drop to be the result of COVID-19 shutdowns, when student enrollments dropped significantly across the entire CSUF campus. Our job placement after graduation continues to be high and our alumni report finding jobs relatively quickly. According to our most recent Fall 2021 alumni survey, 85% (i.e., 72 out of 85) of those surveyed are presently employed in the geosciences or a related field, with the majority employed in industry. Based on those that are working in the geosciences or a related field, the majority (i.e., 57 out of 72 or 79%) were employed within 6 months after graduation.

Degrees Awarded (Primary Major)

College	Degree Level	Sex	Underrepresented (UR) Status	Race/Ethnicity	First Generation to Degree	Pell Recipient
College of Natural Scienc..	Bachelor's Degree	All	All	All	All	All

Note: Please see the methodology section for definitions on College Year, Pell Status, First Generation, and other data elements.

College	Primary Degree Program	College Year											
		2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
College of Natural Sciences and Mathematics	Biochemistry BS	57	49	37	43	49	49	57	68	67	88	74	60	53
	Biological Science BS	140	141	138	130	137	145	183	192	207	214	181	211	173
	Chemistry BA	*	*	*	*	*	12	*	11	13	11	12	17	12
	Chemistry BS	*	10	*	*	10	11	*	11	11	22	21	23	14
	Earth Science BA				*	*	12	15	12	20	17	19	17	12
	Geology BS	11	12	15	12	18	12	15	24	27	15	14	20	12

FIGURE 3. Undergraduate graduation rates per major.

E. Assessment of virtual learning

To date, we have not included virtual courses in our assessment plan. Our department presently teaches four permanent sections virtually per year (i.e., GEOL 101 – Physical Geology, GEOL 101L – Physical Geology lab, and 2 sections of GEOL 310T – Topics in Geology). All courses are taught during the summer and serve mostly non-major, general education students. Our main assessment goal examines the articulation between our student learning goals and our degree programs' success; thus, adding our virtual courses to our assessment plan does not test the success of our degree programs, it tests general education assessment which is not the scope of our department assessment.

IV. Faculty

A. Changes in FTEF since last PPR

Since 2016, our FTEF has decreased from 14.0 to 11.0 (Appendix C, Table 1), despite our FTES increasing from 377.9 to 409.2 (a 7.6% increase; Appendix A, Table 6A). The number of undergraduate majors decreased during this time from 121 to 101. We currently have 8 tenured faculty (2 Professors and 6 Associate Professors), 3 untenured faculty (Assistant Professors), and one full-time lecturer for a total of 12 full-time faculty.

Our full-time faculty members have decreased from a high of 15 in 2009-10 to twelve at the time of this writing. This is due to one retirement (Clemens-Knott), one faculty on FERP (Knott), and one faculty who retired, but was never replaced (Foster, at the end of AY 2013). These losses will be partially offset by hiring a Resource Geologist to start in AY 2023 – 24 (pending approval), and the assumed replacement of Foster's position by an Engineering Geologist (see below). In addition, given the opportunity and space, we would like to hire a Remote Sensing specialist to replace Knott.

The loss of full time faculty members has considerably affected our academic offerings. The impacts of individual losses include:

- Dr. Foster taught Engineering Geology (GEOL 476) and Advanced Topics in Engineering Geology (GEOL 575T). Dr. Knott has taught Engineering Geology, but is currently on FERP, and will retire within the next 2 years. We plan to replace Dr. Foster with a search for an Engineering Geologist when Dr. Knott retires.

- Dr. Clemens-Knott taught GEOL 303B (Igneous Petrology), a core course, and an important part of our curriculum. Dr. Clemens-Knott also taught several popular undergraduate and graduate classes, including GEOL 404 (Optical Mineralogy), and GEOL 510T-10 (Mesozoic Era). We will replace Dr. Clemens-Knott with a Resource Geologist beginning AY 2023 – 24, pending search approval.

- Dr. Knott currently teaches Engineering Geology (GEOL 476) and is currently in his 3rd year of FERP. We would like to replace Dr. Knott with a Remote Sensing specialist during the next 5 years if we are permitted to expand our faculty.

Additionally, the loss/pending loss of these faculty have led to the following:

- Fewer faculty members to mentor/advise undergraduate thesis projects. The loss of faculty members places a greater stress on currently faculty to engage students in meaningful student-faculty research and provide a transformational Titan experience (University Strategic Goal #1).

- Hiring of part-time faculty to teach our upper-division core courses. This year, we will need to hire part-time faculty to teach GEOL 303B (Igneous and Metamorphic Petrology). When Knott retires, we will need to hire part-time faculty to teach GEOL 476 (Engineering Geology).

- Assigning a greater number of WTUs to part-time faculty.

- Difficulty in staffing important committees, including advising, personnel, and curriculum.

B. Priorities for future hires

The Geological Sciences Department dedicated a portion of a retreat and time during faculty meetings during the 2021-22 academic year in order to discuss future hires in light of ongoing changes to the science and profession, and how to best serve our students to make sure they are well-prepared to enter the workforce or graduate programs. Our hiring plan is as follows:

2023-24: Resource Geologist. We would like to hire a resource geologist that specializes in ore deposits that provide the resources for new technologies, including cleaner energy and environmental sustainability. This field is expected to grow 4.8% over the next decade (Fig. 1), and we would like to be at the cutting edge of this transition. A Resource Geologist would cover our needs to teach GEOL 303A and/or GEOL 303B, and develop classes in their expertise, including those related to economic (mineral resource) geology, exploration, and management.

2024-25: Engineering Geologist. Note that the timing of this search will be based on when Knott exits the FERP program. An Engineering Geologist would replace the expertise of Dr. Foster, who retired at the end of AY 2012-13. While Dr. Knott has taught Engineering Geology (GEOL 476) since the retirement of Dr. Foster, Dr. Knott will exit the FERP program within the next 2 years, and we will no longer have any faculty with the expertise to teach this class. Approximately half of our graduates that are employed in the private sector following graduation go to work for Engineering Geology companies (see section I.B.1), and so this expertise is necessary in order for us to properly support the needs of the private sector. In addition, Dr. Knott's research interests lie outside of Engineering Geology, so we have not had an expert in this field within our department for nearly 10 years. Such expertise beyond the ability to teach a specific class is important in terms of the ability to advise students in up-to-date research and cutting-edge methods, but also to make connections within the industry to aid in the employment prospects of our students.

202X-2X: Remote Sensing. Remote sensing uses satellite and GIS data to detect and monitor the physical aspects of an area, and has an almost unlimited number of applications in the Geosciences, including environmental studies, mapping, deformation related to volcanism or earthquakes, land use studies, etc. We currently have no faculty who specialize in this important field, or who can teach classes and train our undergraduates in remote sensing. Students working with this faculty member would learn sophisticated techniques that could be applied throughout industry and government, and would open a new avenue of employment for our students.

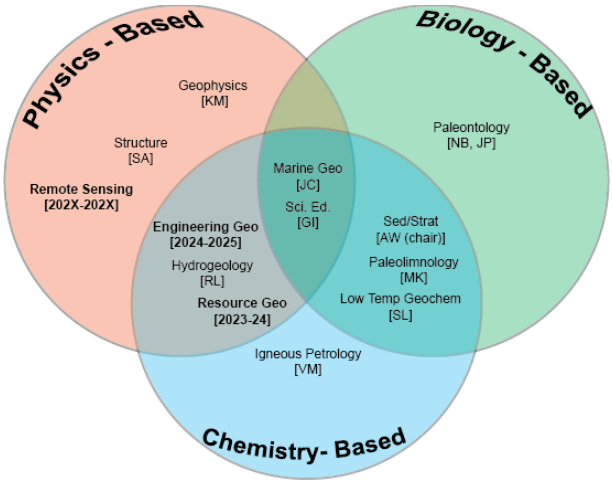

FIGURE 4. Existing and new (bold) faculty specialties within the Department. Initials refer to individual faculty. Dates indicate the academic year of planned search.

C. Role of full-time and part-time faculty and student teaching assistants

Tenure-track faculty typically teach our upper-division core courses, elective courses, and graduate courses. Part-time faculty typically teach GE courses, and TAs teach GEOL 101 labs as instructors of record. The number of total sections taught has varied between 101 and 119 (Figure 5), with the overall number of sections declining from a high of 119 in AY 2017-18 to 101 in AY 2019-20 and AY 2020-21. This decline in the number of sections taught is due to the cancellation of low-enrolled sections of GEOL 101L, and, to a lesser extent, other GE courses. The decline in the overall number of TAs is apparent in the drop of the number of sections taught by TAs between AY 2018-19 and 2019-20, and a corresponding increase in the number of sections taught by part time faculty.

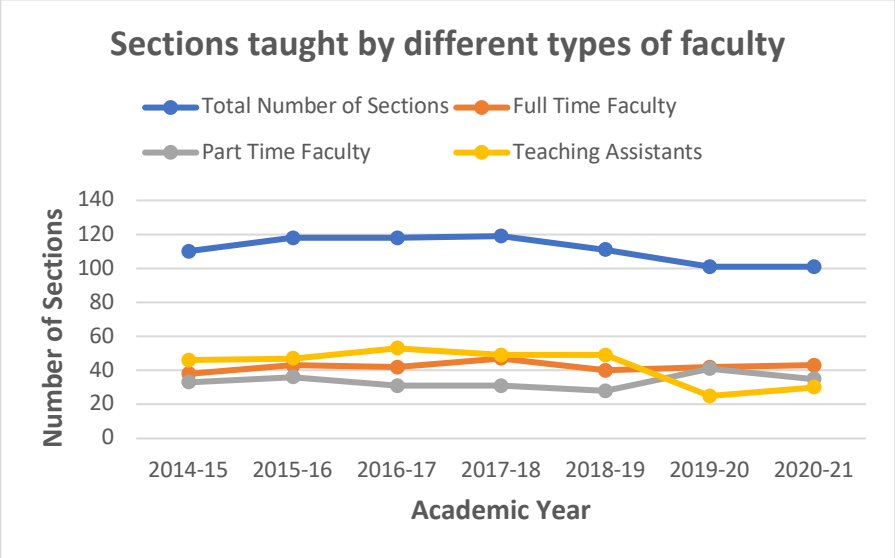

FIGURE 5. Number of sections taught by different types of faculty.

Figure 6 shows the number of WTUs taught by different types of faculty. Overall, about 50% of Geology WTUs are taught by full time faculty, with the remainder taught by part time faculty and teaching assistants. The number of WTUs taught by full time faculty increased over time due to tenure track faculty teaching more sections of large-enrollment GE courses (i.e., GEOL 101, 110T, and 310T) in order to recruit more students to the major.

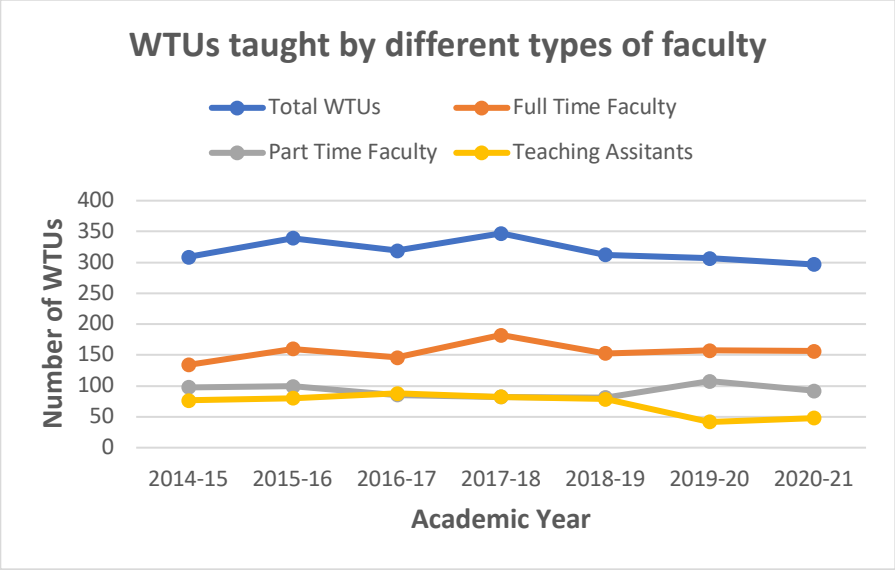

FIGURE 6. Number of WTUs taught by different types of faculty.

D. Instructor participation in special sessions self-support programs

The Department offers four different self-support sections during summer and intersession. These courses are primarily made up of GE courses taught by a mix of full-time and part-time faculty (GEOL 101, 101L, 310T). In addition, we also offer an upper division geology elective in conjunction with the Department of Biological Sciences (GEOL 336 – GEO/BIO Field Investigations) that is taught by full-time faculty. Our geology capstone course, GEOL 481A (Geology Field Camp), is also offered during the summer, but is state-supported, and is taught by full-time faculty.

V. Student Support and Advising

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

Undergraduate Student Advising

Our undergraduate B.Sc. and B.A. majors must be advised upon declaring the major and have mandatory advising every semester thereafter. Mandatory advising usually takes place during a two-week window at about mid-semester, shortly after the next semester's schedule is released and prior to the opening of registration. Advising is scheduled for one hour for new majors and for a half hour for continuing majors with a faculty member serving as undergraduate adviser. Geology Minor students are encouraged to be advised every semester, but it is not mandatory. All active FT faculty during a semester advise students

with the exception of the Department Chair and Graduate Advisor. The general goals and structure of our undergrad advising are given below.

- Chart a pathway for students through the B.Sc. & B.A. major requirements;
- Ensure students are making timely progress towards graduation;
- Enable students to meet faculty throughout the department;
- Help faculty develop a better understanding of our own curriculum;
- Provide information on likely student enrollment for the following semester, which aids in scheduling and the assigning of TAs for upper-division classes.

The administrative structure of undergraduate advising includes:

- Undergraduate Committee of multiple tenure-tenure track faculty (all active FT Faculty except Chair and Graduate Advisor) tasked with the responsibility for undergrad advising;
- Main Undergraduate advisor (committee chair) has responsibility of coordinating advising activities, training new faculty advisers, conducting all grad checks, and conducting all new student advising during summer or intersession.

Since the last PPR we have made the following improvements to undergraduate advising:

- Development of online advising appointment scheduling;
- Widespread usage of advising "notes" on student's Titan Degree Audit to track advising activities;
- Development of virtual advising appointments to continue advising during the COVID-19 pandemic;
- Increased focus on students eligible to graduate within 4-years (GI 2025 Initiative)

Minor Advising:

Minors are placed in the same pool of students as the majors for advising and distributed evenly and randomly to the faculty advisors. Advising appointments are optional for minors; it is up to the student whether they want to schedule their appointment with the assigned advisor. Because advising is voluntary, advising holds are not assigned to minors. When advised, minors are instructed on which courses they may take to fulfill their minor requirements.

Graduate Student Advising

The Department of Geological Sciences uses a three-tier advising system for graduate students: **Graduate Advisor**, **General Education Coordinator**, and the student's specific **Project Advisor**.

Graduate Advisor: (All graduate students) Upon admittance, all new graduate students are contacted by the Department Graduate Advisor with a list of important sites/links/handbooks. This information includes the Department Graduate Handbook, the University Graduate Studies webpage, and the Department webpage, where they can access important forms required to begin their journey. During their first semester, the Department Graduate Advisor instructs new graduate students on important deadlines and how to develop a study plan. The Graduate Advisor is available for further instruction or help as needed and their role also includes study plan management, graduate checks, and oversight on other issues that involve the graduate curricula. Finally, the Graduate Advisor acts as the liaison between the Department of Graduate Studies and the Department of Geological Sciences for issues that pertain to the graduate student.

General Education Coordinator: (Teaching Assistants Only) Graduate students offered a TA attend a mandatory advisement with the Department of Geological Sciences General Education contact during the week before classes begin. This TA orientation focuses on TA responsibilities, teaching advice, and other pedagogical material aimed at preparing the TA for their teaching responsibilities. Each TA is then required to take 1 unit of GEOL593 for two consecutive Fall semesters where they are regularly mentored and reviewed for their TA position. Within the first few weeks of the semester, new TA's (and TA's entering their second year) are also required to attend a campus session on Unit 11 (union) compliance where they learn about their TA rights and privileges.

Faculty Advisor: (All graduate students) All Department graduate students are also assigned a Faculty Advisor that also serves as the chair of their thesis committee. The Faculty Advisor is the student's mentor with whom the student should have the most contact. The Faculty Advisor is expected to help the graduate student succeed in the program by providing project direction, goals, resources, and timeline, and also help with the development of a study plan. The Faculty Advisor meets with their graduate students regularly as commensurate with student's needs and the project's development.

B. Student access to research opportunities, internships, outreach, and student assistant teaching opportunities.

Student research opportunities: All B.Sc. Geology and M.Sc. Geology students must complete a mandatory thesis in collaboration with a faculty advisor. B.Sc. students must take 3 units of GEOL 498 (Undergraduate Thesis), while M.Sc. students take 3 – 6 units of GEOL 598 (Master's Thesis) towards the completion of their degree. All tenure track faculty participate in student-faculty research and lecturers also have the opportunity to involve undergraduates in research. Students pursuing a B.A. in Earth Science are not required to do a thesis, but they have the opportunity to conduct undergraduate research and complete a thesis and/or other independent research in collaboration with a faculty member if they choose (via GEOL 493 – Directed Studies and/or GEOL 499 – Independent Study). Thesis work is supported through a combination of state support of faculty research labs, external research grants by faculty, and philanthropic funds raised by the Department. Students doing research and presenting their results at meetings generally pursue travel funding from the Associated Students Interclub Council (ICC) or the society/agency funding the meeting (e.g., Geological Society of America, the Southern California Earthquake Center, etc.).

Internships: Our students have the option of getting upper division geology elective credit for internships via GEOL 495 – Geological Sciences Internship, although relatively few students received this credit prior to the start of the pandemic in March 2019. We are frequently approached by local geotechnical or environmental or firms, as well as government agencies (e.g., USGS) who are interested hiring students who have nearly completed their degrees on a part-time basis, and many of our undergraduates have parlayed these jobs into full-time positions following graduation. We will strive to make students more aware of the option of getting academic credit for completing an internship during academic advising.

Geology club: Our Department has a very active student-run Geology Club that is part of the Associated Students Inter Club Council. Officers are elected annually and there are typically 30+ students active in the club. The Geology Club sponsors student events that foster social interactions, creates community, and promotes student research. The Geology Club is highly involved in outreach efforts, including giving scientific demonstrations at public events (e.g., Prehistoric OC), participating in university events including Become a Titan Day, and volunteering in the community.

Seminar series: We have a bi-weekly seminar series whereby professionals are invited to give talks and interact with students and faculty. Prior to the pandemic, we (speaker, students, faculty and staff) would convene at a local pizza restaurant following the seminar for continued discussions in a less formal setting (typically 10-15 students). We intend to re-establish this tradition when conditions permit.

Participation in professional meetings: Our students regularly attend and participate in national and regional professional society meetings (Geological Society of America, American Geophysical Union, American Association of Petroleum Geologists, National Groundwater Association, etc.) and in local professional organizations such as the South Coast Geological Society. Students at these organization meetings are engaged in geology discussions and have opportunities to network with potential employers and graduate school advisors; many make graduate school or job connections at these meetings.

Student Assistant Teaching Opportunities: Our undergraduate students can get upper-division geology elective credit for acting as a student teaching assistant via Geological Sciences Tutorial (GEOL 496L). Students taking GEOL 496L assist faculty with setting up and administering labs, assisting with running field trips, and general tutoring of students. In addition, student teaching assistants may be asked to plan and deliver a lecture for a single lab, under the supervision of a faculty advisor. Student teaching assistants do not grade student work.

VI. Resources and Facilities

A. State and non-state resources

The breakdown of state and non-state resources received since 2014-15 can be found in Appendix E. Our state support resources are generally broken down into 2 categories: Part-time faculty blanket (PTFB) and operating expense-student worker (OE-SA). The PTFB is covered by Dean and VPAA funds to meet required course needs and includes salary for all part-time lecturers, state-funded graduate assistants (GA), teaching assistants (TA), and Instructional Support Assistants (ISA). Our PTF blanket increased from $361,870.24 in 2014-2015 to a high of $492,285.39 in 2015-16, followed by a steady decline to low of $322,725.96 in 2019-20. This steady decrease reflects cutting of under-enrolled sections of our GE classes, and placing more full time faculty in large GE classes.

The OE-SA has varied between $76,000.46 (2014-15) and $93,765.74 (2016-17). Variations in these expenses predominantly depend on: 1) start-up costs for new faculty, which is included in equipment and supplies/services categories; and, 2) the purchase of vehicles (2015-16, 2020-21) for teaching and student-faculty research. Lower OE-SA amounts in 2019-20 and 2020-21 also reflect the pandemic's effect on our research efforts, as well as our ability to hire student workers; no student workers were hired while campus was closed. A summer special course fee under state support is a fee paid by students enrolling in our Geology Field Camp (GEOL481A); we use this money to support vehicle maintenance/repairs.

Our faculty have been successful in obtaining grants and contracts. Many of the grants and contracts provide resources as release time and indirect cost (IDC) money. Our faculty obtained extramural grants at a rate of $13,323 to $939,487 per year in total. All of these grants provide valuable resources for allowing faculty to work with students on research projects that are expensive due to travel, field, lab, and/or analytical costs that are inherent in our discipline. Overall, the number of and total amount of grants received decreased after 2017, which reflects the decoupling of the department from the John D. Cooper

Center and the loss of grant funding that was associated with the center. One of our priorities (section VII) is to increase grant submittals.

Philanthropic giving to the Department varied from $4,790 to $18,676 per year over the last 6 years. Overall, giving to the department has increased over time, especially over the last 2 years, when the department conducted a Crowdfunding campaign in conjunction with its annual Alumni Night that occurs every October. In addition, the department received a $10,000 gift in 2019 from an anonymous donor, and a $20,000 gift in 2021 from Diane Clements-Knott and Jeffrey Knott. The donation by Diane Clements-Knott and Jeffrey Knott set up a new undergraduate scholarship fund (Knott^2), and is naming a huddle space on the remodeled second floor of McCarthy Hall. We also entered an agreement with two alumni (Christine and Michael Irwin) in 2020 to bequeath a portion of their estate to the department, which is valued at $400,000. Department fundraising typically revolves around our Alumni Night event that we hold each October. Our department was chosen to take part in a Crowdfunding effort in 2020 and 2021, which allowed us to reach a greater number of alumni that live out-of-state, or who otherwise don't typically attend the in-person event. The result is that we've been able to more than double the amount of annual donations to the department. The department further benefited from matching funds provided by the McKenzie Scott-Dan Jewett gift, which provided another $13,330 in 2021. The result of increased fundraising is that we have been able to endow two of our scholarships (Prem K. Saint Hydrology and Knott^2 scholarships) and bring other scholarships and awards closer to being endowed (Marilyn A. Brown scholarship). One of our long-term goals is to work with University Advancement to increase donor giving to an average of $20,000/year.

B. Special Facilities and Equipment

The Department of Geological Sciences includes classrooms, offices, and research labs that are located in the basement, 2nd, 3rd, 4th, 5th, and 6th floors of McCarthy Hall (MH) as well as the 1st and 2nd floors of Dan Black Hall (DBH). The second floor of MH is currently undergoing a renovation, to be completed in Spring 2022.

<u>Geology-controlled instructional classrooms (rooms under renovation are presented as old room number/new room number)</u>:

MH-341 – Structural geology, Earth materials, field techniques, seminars, faculty and club meetings
MH-255/201 – *currently under renovation* – Sedimentology and stratigraphy, paleontology, Earth history courses and Physical Geology lab courses
MH-212/236 – *currently under renovation* – Surface processes, hydrology, and Physical Geology lab courses
MH-208/203 – *currently under renovation* – Physical Geology lab (GEOL 101L) courses
MH-263/233 – *currently under renovation* – Computer lab with 28 Windows based computers. Utilized by courses that require heavy computer use, including geophysics, geochemistry, and other courses with computer applications on a regular basis (tectonics, hydrology, surface processes, and petrology courses)
DBH-203 – Earth Materials and Petrology courses

<u>Special facilities</u>:

DBH-205 – Rock Preparation Lab
DBH-240 – ICP lab
MH-259/202 – *currently under renovation* – Department Technician Office

MH-208C/234 – *currently under renovation* – Specimen storeroom
MH-327D – Department Information Technology Office
MH-6 – Field Supply Storeroom
MH-3 – Rock crushing room
MH-53 – Rock storage room
MH-45 and 577 – Part-Time Faculty Offices and cubicles
MH264F/231 – *currently under renovation* – Teaching Assistant Offices
Faculty Research Labs – not listed separately, but these faculty research labs are essential to achieving the Retention, Tenure, and Promotion standards that require success in SCA (research).

Changes over the last five years: The main change to the Geological Sciences Department is the renovation of the second floor of McCarthy Hall, where the departmental office and lab prep rooms are located, along with most of the departmental classrooms and faculty offices.

McCarthy Hall was originally built in 1963 and is the oldest building on campus. The renovation of the 2nd floor of McCarthy Hall (MH-2) is the first step in renovating the entire building, and is being done in concert with necessary fire and life safety improvements to the entire building. The MH-2 renovation will provide geology students and faculty with a brighter, refreshed environment, updated, state-of-the-art classrooms, informal learning spaces where students and faculty can interact, and a new patio where departmental events can be held.

Classrooms are located in approximately the same area of MH-2 as before, in the western half of the interior of the building (Fig. 7). MH-203 (formerly MH-208) is located on the northeast corner of the block of rooms, and the northeast corner of this room is made of glass, allowing for “science on display”, where passing students can see classroom instruction taking place, and scientific materials (e.g., large fossils, minerals, groundwater models, etc.) will be placed for passerby to see. The rooms are arranged around an interior hallway to allow samples from the Geology Lab Support and Rock Specimen rooms to be easily stored, prepped, and moved into the classroom as needed.

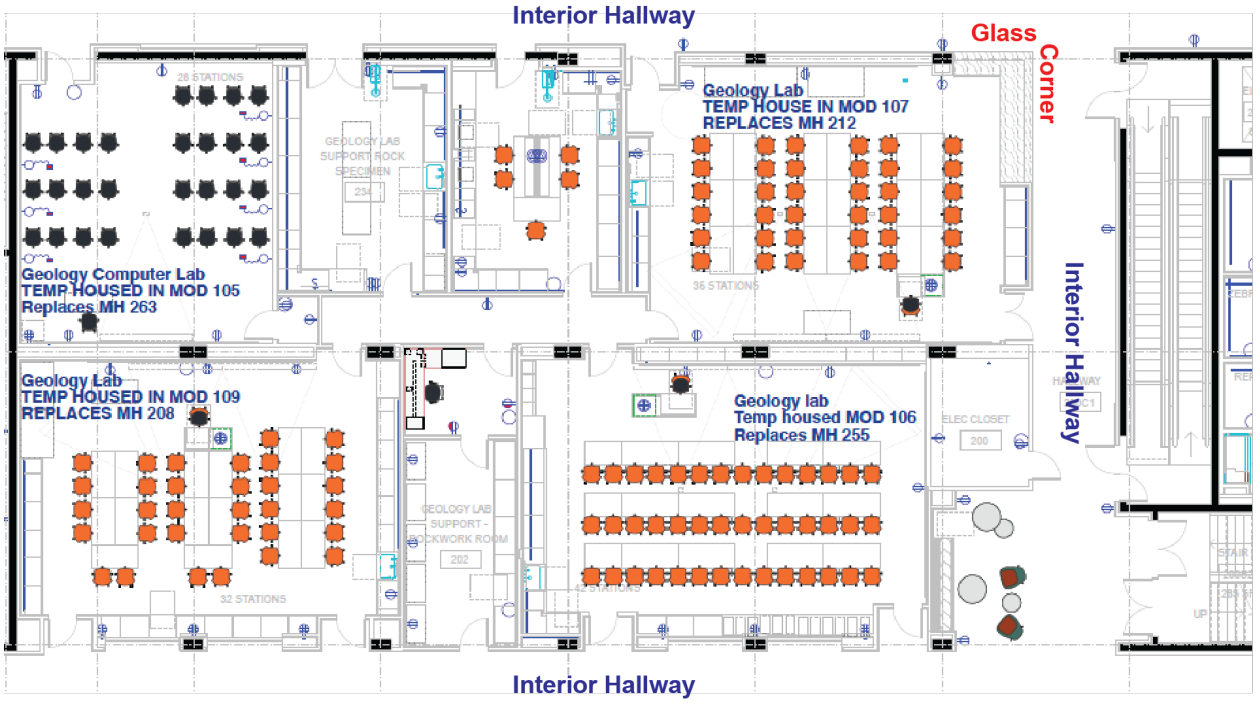

FIGURE 7. Floor plans of future classroom spaces on the 2nd floor of McCarthy Hall.

Faculty and graduate teaching assistant offices are located along a portion of the northwestern portion of the building (Fig. 8). The TA offices can house up to 8 TAs, and have a central area with a large meeting table. Faculty offices are centralized into a faculty "neighborhood" to encourage interaction between faculty. Offices along the outer wall have windows, and cut-outs at the tops of walls separating offices allow natural light into the entire office complex.

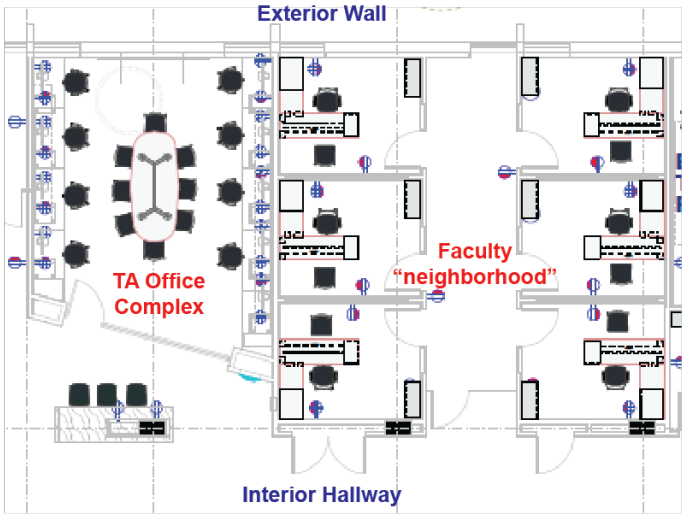

FIGURE 8. Floor plans of future TA Office complex and faculty "neighborhood", MH 2nd floor.

The Geology main office adjoins the Biology main office in the southwestern corner of MH-2. Geology and Biology will share a conference room that adjoins both office complexes (Fig. 9).

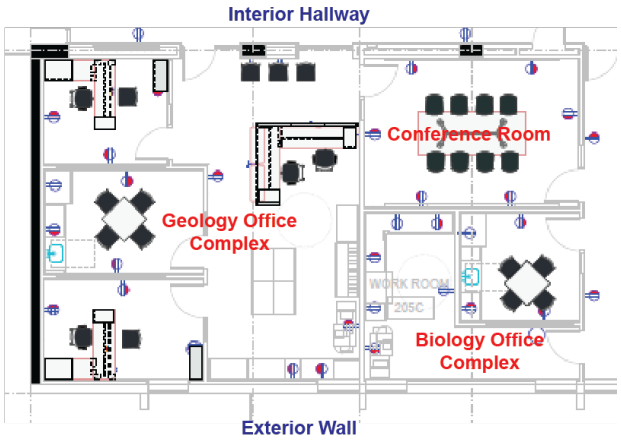

FIGURE 9. Floor plans of future Geology Main Office complex, Conference room (shared with Biology), and a portion of the Biology Main Office Complex, MH 2nd floor.

Overall, a renovated MH-2 should provide an improved learning environment for our students and work environment for our faculty and staff. However, the renovation has led to an overall decrease in space for the department through the permanent loss of some rooms, and the downsizing of others. Of largest concern is the downsizing of our computer lab from 912 ft^2 to 788 ft^2. We also lost an additional 111 ft^2 (MH-263A) in support space for the computer lab that housed our department plotter, Parscore machine, and a large-format printer. In addition, our Geology Club Room (MH-270 & 270A) was lost to the renovation. While some of this loss of space can be made up for with the better design and layout of the new MH-2, some space is likely lost permanently. This limits the department's ability to expand as well as our ability to find space to put new equipment.

Otherwise, there have been a few space changes in the past 5 years, but no significant renovations, including:

- Acquired MH-340 wet lab from Biology. No renovation of space, only removal of Biology equipment, desks and shelving. Space is currently occupied by Akçiz.
- Acquired existing 8'x20' Storage container near Corp Yard.
- Metcalf is taking over lab space on remodeled second floor of McCarthy Hall (MH-235).

Other minor Renovation or modifications in existing spaces over the last 5 years include:

- MH-341 – New carpeting
- MH-254 – New flooring
- MH-263 – Campus IT/AV upgrade
- DBH – 211 (Carlin lab) – New Electrical wiring for appliance in fume hood
- MH-3 – Wiring/breaker upgrade for rock crushing equipment
- MH-255, 208, 212, 341, 673, DBH-203 – Various new projectors, switches, Apple TVs, and AV cabinets/racks

Major equipment purchases over the last 5 years include:

- (10) Petrographic microscopes
- SUV-252, 2004 Excursion – New engine
- SUV-335, 2016 Suburban
- SUV-404, 2020 Yukon XL
- PU-419, 2020 Silverado 2500HD and bed cap
- Less significant but noteworthy:
    - 20" Water Saw, converted from new oil saw
    - Shatterbox grinding dish
    - GEOL 101L Rocks and Minerals
    - (12) Brunton transits
    - Refurbished 17 Ft Trailer

Future Priorities

There are currently plans to renovate the remainder of MH, and add a new, 2 story science building in front of DBH to house wet labs. Our main concern is that we want to make sure that Geology is included from the planning stage onwards with any new construction or renovations in order to make sure that we are able to plan future Geology spaces to suit our needs. Other future priorities for the Geology department include:

- Update Geology spaces on other MH floors as the MH remodel continues.
- Move wet labs from MH to proposed new science building.
- Acquire lab space for one new hire (Remote Sensing hire).
- Develop and utilize a shared lab space for analytic equipment.
- Develop and utilize a single, large learning/activity space that can accommodate larger teaching and demonstration materials (stream table, wave tanks, virtual sandbox, groundwater models, etc.) in order to increase the amount of usable space in our other classrooms.

C. Library Resources

A unified library management system is used at all 23 CSU campuses, including the Pollak Library at CSU Fullerton. As part of the system, the Pollak Library offers OneSearch as a discovery tool for finding books, journals, articles, media, etc., that are part of the Pollak Library collection. Additionally, patrons are also able to discover over 29 million books collectively held by all the CSU libraries. Books held at other CSU libraries that are not immediately accessible at the Pollak Library can be requested for delivery to the Pollak Library at no charge through the CSU+ service.

Through our partnership with the CSU system, as well as local subscriptions, Pollak Library is able to provide access to many vital resources for the study of geology. The Pollak Library holds a subscription to GeoRef, a database produced by the American Geological Society, which offers access to over 3 million records pertaining to geoscience articles, books, maps, reports and conference papers. Other databases offered by the Pollak Library that are useful in the study of geology are: GreenFile, Web of Science, EiVillage, and ScienceDirect.

The library is able to provide access to a substantial number of journals through subscriptions to electronic, full-text journal packages. A significant number of titles pertinent to geology are available in packages purchased from major academic publishers. Within the earth sciences subdiscipline in SpringerLink, there are 27 journals, among them *Environmental Geology, Journal of Applied Volcanology, Journal of Earth Science, Journal of Petroleum Exploration and Production Technology, Bulletin of Volcanology, Environmental Earth Sciences, Journal of Volcanology and Seismology,* and *Mineralium Deposita.*

Aggregated databases also offer access to articles in numerous geology journals. The Pollak Library subscribes to both *OmniFile Full Text* and *Academic Search Premier*. A recent search for “geology” in only peer-reviewed journals found over 250,000 articles in *Academic Search Premier* and over 39,000 articles in *OmniFile Full Text* from journals such as *Geology, Geological Society of America Bulletin, Science, Nature, Journal of Geology, Geology Today, Journal of Geoscience Education,* and *Geological Magazine.*

Each year the Pollak Library acquires print and electronic books relevant to geology through several methods: an established approval plan, a Demand-Driven Acquisition (DDA) program, eBook package subscriptions such as *Academic Complete*, selections made by the STEM Librarian, and faculty requests. While the library's approval plan automatically supplies new books in relevant call number ranges, the DDA program allows the library to provide access to a large number of e-books that are purchased or rented as they are accessed by patrons. To supplement these two plans, the STEM librarian is provided an allotment each year with which to purchase both print and e-books that are not acquired by other means. The library currently owns almost 3,400 print books within the field of geology, and provides access to over 1,000 additional eBooks within the DDA pool.

VII. Long-term Plans

A. Summary of long-term plans, priorities and metrics

Goal 1. Enhance student learning, improve retention, and minimize time-to degree through effective curricular and teaching strategies.

Priority 1. – Maintain current, and develop new High-Impact Practices (HIPs) through faculty research that includes student collaborators and classes that incorporate field/lab/research experiences. Our Department has a strong commitment to HIPs through a required undergraduate thesis for our Geology B.Sc. students, and an optional undergraduate thesis for our Earth Science B.A. students. In addition, most majors courses include a combination of field and laboratory activities, including class research projects, which are invaluable to our students, but come with a cost to the department and our students. Lab activities require expendables, while field experiences require transportation to and from the field, as well as camping gear, which the students are expected to supply. While we currently have multiple vehicles that are in their prime that we can transport students to and from field trip sites, we require continued support from the Provost's office for fuel and maintenance and Associated Students Inc. Instructionally Related Activities grants in order to keep the cost of field experiences at a minimum for students. Our department is striving to build up a supply of camping gear (tents, sleeping bags, etc.) that we can loan to our students in order to remove a potential roadblock to participation and provide equitable learning opportunities for all students. We are very fortunate, in that 4 of our 7 instructional spaces are being replaced and updated by the renovation of the second floor of McCarthy Hall, however, we still need to supply materials for classes so students can continue to acquire hands-on experiences (e.g., water testing kits for hydrology exercises, rock, mineral, and fossil samples for introductory and majors courses, thin sections for upper level geology classes, field books and hand lenses for field trips, etc.). Finally, we are concerned that the department will lose faculty-student research spaces during the renovation of McCarthy Hall and possible construction of a new science laboratory building to house all of the wet labs currently located in MH. Student-focused research is an integral part of our department's philosophical approach, and we must retain our dedicated research spaces. In addition, we would like to see all of our larger teaching and demonstration materials (stream table, wave tanks, virtual sandbox, groundwater models, etc.) placed in a single, large learning/activity space that can accommodate them and increase the amount of usable space in our other classrooms.

Metrics: Maintenance of well-stocked and supported teaching and research labs. Continued support from the Provost's office for fuel and maintenance for our field vehicles. Develop a fund for lab and camping supplies that alumni can contribute to. Purchase a 3D printer and/or laser cutter to develop teaching materials (e.g., topographic maps, mineral models, fossils, etc.) that improve hands-on experiences for our

students. Prioritize faculty-student research spaces, including the development of a dedicated learning/activity space with learning stations that includes our stream table, wave tanks, virtual sandbox, groundwater models, etc.

Priority 2. – Assess undergraduate and graduate programs and implement improvement actions. Continue current assessment plan and strategies designed to test one student learning outcome (SLO) per degree program each year. If a specific SLO does not meet our designated outcome, then we plan to retest that SLO in addition to the planned SLO for the following year. If a SLO fails to meet our stated outcome twice, we plan to discuss this finding with faculty members, update teaching methods, and introduce regular (i.e., weekly, monthly) assessments within the course to discover any learning gaps.

Metrics: Correct SLOs that do not meet expectations over a 2-year assessment period.

Priority 3. – Develop a peer-mentoring program. Our peer-mentoring program will provide psychosocial and academic student support to positively impact academic achievement and retention in STEM, particularly for underrepresented students. We plan to study effects on students' sense of belonging, self-efficacy, and practice-linked identities to determine best practices and expand our program to the college-level via external funding.

Metrics: Quantitative and qualitative assessment using surveys and interviews. Surveys will use the Sense of Social and Academic Fit in STEM scale as well as the affective model of identity, self-efficacy, and closeness to measure students' sense of belonging and geoscientist identity. Questions are designed to measure the reasoning behind a student's sense of belonging in our department and greater geoscience community. In addition, interview questions will investigate a student's mental model of the qualities that make up a scientist and to what degree the student identifies with these qualities.

Goal 2. Encourage High Quality Scholarly and Creative Activities

Priority 1 – Build on student-faculty research capabilities. The Department of Geological Sciences is one of the few academic departments at CSUF to require an undergraduate thesis based on faculty collaboration and original research of all of its majors in one degree program (B.Sc. Geology), and provide an opportunity for majors in a second degree program (B.A. Earth Sciences) to complete optional undergraduate theses. The distribution of student theses amongst faculty is uneven, which places significant time and resource constraints on those faculty who advise greater numbers of students.

Metrics: All B.Sc. and M.Sc. students complete a thesis project in collaboration with a faculty member. Develop procedures to spread the thesis advising loads more evenly.

Priority 2 – Enhance faculty-student research space. A significant obstacle to maintaining or increasing SCA output is a shortage of faculty-student research lab space. The department is currently using all available lab space and has no room to grow. In addition, current facilities in McCarthy Hall are small and dated, with only one research lab space being modernized in the ongoing MH 2nd floor renovation. While the updates to McCarthy Hall are long overdue and much appreciated, our department wants to make sure that any new renovation plans or buildings include a robust geology presence in order to ensure morale for our current faculty and serve as an asset as our Department competes against other institutions

for top faculty candidates. This further supports Priority 1 of Goal 2, allowing us to adequately support student-faculty research.

Metrics: Sufficient space (size and capabilities) for all faculty. Inclusion of the department in planning of all future renovation/building projects. Increase research space with multi-student research groups in mind.

Priority 3 – Enhance funding opportunities for undergraduate and graduate research. Extramural funding opportunities are limited and difficult to obtain. The Department will work to inform faculty and students of extramural and intramural grant opportunities, including incentive funds and intramural grants provided by the university. The Department will also enhance our philanthropic fund-raising efforts to provide another source of support for student-faculty research.

Metrics: Increase in numbers of grants submitted by faculty and students. Establishment of a departmental philanthropic fund to support undergraduate research.

Goal 3. Sustain and expand Alumni and Community outreach

Priority 1. Continue Alumni Outreach. The Department fosters interaction with our alumni in order to maintain a pipeline to industry for our students, assess the effectiveness of our program in professional settings, enhance philanthropic fundraising, and to further community relations. We engage our alumni annually via our Alumni Night Reception, which is held in concert with a fund-raising drive. In addition, we also use this event to present our Alumni of the Year award to a respected and established alumni. We would like to continue this activity and expand alumni giving so that we raise a minimum of $20,000 per year. In addition, we plan to survey our alumni on a more regular basis to make sure our program is keeping up with trends in the profession and measure the satisfaction of alumni with the program. Finally, we would like to reestablish our alumni newsletter to provide another means of keeping in touch with our alumni.

Metrics – Establish a department newsletter editor. Increase alumni giving so that annual average giving over a 7-year period is $20,000 per year. Establish an annual alumni survey where we assess the satisfaction of our alumni and assess the needs of the profession.

Priority 2. Continue public engagement in the Earth Sciences. The Department conducts outreach to the academic and general community in order to further public relations. This has historically involved faculty members presenting research to academic and community groups, volunteering in K-12 classrooms, giving scientific demonstrations at public events (e.g., Prehistoric OC), and volunteering with professional (e.g., PS-SEPM) and community organizations (e.g., Boy Scouts, etc.). We would like to continue and expand these efforts, and also invite more people from the scientific and professional community to speak to us so we can better understand their needs.

Metrics – Faculty present research and give general talks to professional and community groups. Volunteer in the community and with professional organizations. Invite people from industry and outside of academia to present at seminars to discuss their needs, DEI, etc.

Goal 4. Expand the number of majors in the Department.

Priority 1. – Recruit new majors. The Geological Sciences Department has undergone a reduction in the number of majors since the last PPR, as discussed in section II. Declining enrollments in the geosciences are a national trend whose causes are still poorly understood, but may be related to a downturn in the oil and gas industry. At the same time, the emergence of new technologies and a greater awareness of environmental issues in the general public represent an opportunity for growth.

Metric: Expand outreach efforts to community colleges and high schools. Consider rebranding the department to better align with our department identity and priorities.

Priority 2. – Remove barriers to student success. While the Geological Sciences Department strives to have all our students complete their degrees in a timely manner, we recognize that there are both institutional and external barriers to student success. While institutional barriers can be surmounted by effective advising and peer mentoring, external barriers, like access to camping gear are less obvious, but no less daunting for some of our students. We propose to remove this barrier by setting up a supply of camping gear that our students can borrow, as well as a fund for alumni to contribute to that will be used to purchase camping and academic supplies (e.g., field notebooks, hand lenses, etc.).

Metric: Develop a peer mentoring program where our younger students are mentored by upperclassmen. Continue to look for academic barriers and adjust advising procedures to address those barriers. Advise students to take advantage of tutoring and resources to help them be successful in related fields (Biology, Chemistry, Math, and Physics). Analysis of prerequisites to help smooth the way in geology classes, as well as in related fields. Establish an inventory of camping gear that can be loaned out to students in need, as well as a philanthropic fund for the purchase of academic and camping supplies.

Priority 3. – Consider changing the name of the Department. The department has traditionally been focused on the geological sciences, however, the introduction of the Earth Science B.A. in the 2012-13 academic year provided an impetus for us to expand our expertise beyond the classic, rock and mineral- and field-based geologic curriculum into specialties as diverse as hydrogeology, environmental sustainability, climate change, coastal science, and metacognition-based geoscience education. We believe that a change in name will better reflect the scientific diversity of our department, and signal a more inclusive environment to potential majors.

Metric – Query CSU departments that have changed their name to ask how this has affected their enrollments and career trajectories of their students.

Goal 5. Strengthen M.Sc. Program

Priority 1 – Increase monetary and structural TA and GA support for M.Sc. students. TA salaries at CSUF are amongst the lowest in the region, which creates a financial hardship for our students, and also impacts our ability to attract graduate students from outside of the region. While the department once attracted students from across the country, we now find ourselves mostly recruiting and attracting students from the southern California region who can live at home, or who are already adapted to the high cost of living. The Department instituted a GA to augment the TA salary and provide summer income, but even with the GA, our TAs are still poorly paid and struggle to make ends meet. Graduate students frequently take on external jobs to subsidize their living expenses, which leads to delays in graduation. In addition, departmental budget constraints mean we are only able to offer a GA to about 2-3 of our 5-6 TAs per year. A tuition waiver would be the most effective way to increase effective TA salaries and attract more high

quality applicants by removing an institutionally-derived financial obstacle. The implementation of fee waivers must come from the university, since this represents a large investment in the success of the entire graduate program.

Metrics: Encourage university administrators to institute a university-wide fee waiver program. Establish a philanthropic fund within the department to supplement a portion of graduate fees.

Priority 2 – Consider the addition of a project-based Master's degree program in order to increase the number of students in the program. The M.Sc. program in the Department has typically been small, with many graduate classes having enrollments of < 5 students. We would like to consider adding a second Master's program in Geological Sciences with a project option that would attract professionals and students who are excluded from our M.Sc. program due to barriers to completing a traditional thesis. Implementation of such a program could increase our graduate student enrollment without putting greater pressure on our faculty to advise more M.Sc. thesis students, and would extend our reach into the professional community.

Metrics: Discuss the outlines of an M.A. at future faculty meetings, and hold a retreat to design an M.A. program.

Goal 6. Implement interventions that improve DEI

Priority 1: Identify and change exclusionary habits and policies. The Geosciences are one of the least diverse STEM fields, and we recognize that we need to identify and change exclusionary habits and policies in order to increase the participation of BIPOC and women in our field. We initiated DEI training during Fall of 2021, using Project URGE. URGE, or Unlearning Racism in the Geosciences, is an 8 part program of videos, readings, and deliverables designed to help geoscientists unlearn racism and improve accessibility, justice, equity, diversity, and inclusion (AJEDI) in our discipline.

Metrics: Complete URGE program in Spring 2022. Continue to discuss DEI readings at least once per semester, along with any additional URGE materials as they are released. Establish a Departmental DEI committee to implement the URGE deliverables.

Priority 2: *Identify and address the ways department activities impact students negatively.* While we strive to support our students and make them feel welcome in the department, we understand that we may not be aware of how our actions impact our students.

Metrics: Launch an annual department climate survey. Implement alternatives that increase the success rate for all students. Increase outreach to affinity groups. Develop and implement a more inclusive curriculum in consultation with the Departmental DEI committee.

Goal 7. Recruit and retain faculty and staff

Priority 1: Hire faculty in subjects of relevance for student success. The faculty will change somewhat over the next 6 years, as 1 faculty is retiring (Clemens-Knott), and one will exit the FERP program within the next 2 years (Knott). We will assess the needs of our students as well as trends in the field to ensure that these are more than just "replacement" hires, but reflect the developing needs of the community and our students while ensuring that teaching needs will be met.

Metrics: Assess national trends and survey alumni to see what knowledge and skills are valued within the professional community, and make sure our hiring plan addresses these needs.

Priority 2: Support staff excellence. The 3 staff in the Department of Geological Sciences are exceptional and contribute immensely to our smooth-running department. We recently hired an ASAII to replace the previous person who retired from this position at the end of 2019. Staff morale and cohesion will continue to be important and we will continue to look for ways to support the staff and fortify high morale.

Metrics: Successfully guide our new ASAII through the probationary period. Look for ways to bolster morale amongst staff members.

B. Long-term budget in support of long-term plan and priorities

Goal 1. Enhance student learning, improve retention, and minimize time-to degree through effective curricular and teaching strategies.

Priority 1 – Maintain current, and develop new High-Impact Practices (HIPs) through faculty research that includes student collaborators and classes that incorporate field/lab/research experiences.

- Vehicle Repair and Preventative Maintenance: $20,000. Five of our 8 vehicles are 2012 models or older. We will need to perform preventative maintenance on these vehicles in order to keep them reliable and pay for repairs as they arise.
- Vehicles: $120,000. We will need to purchase new vehicles as our oldest vehicles (2004 and 2007 models) will not likely last another 7 years. These 2 vehicles are large SUVs that seat 7-8 passengers and are necessary for taking students on field and research trips.
- Vehicle Fuels and Lubricants: $25,000/year. These are required to maintain our field-and research-based HIPs.
- Microscopes: $75,000. We require 10 new petrographic microscopes at a cost of $7500 each to replace 30+ year old microscopes in our mineralogy and petrology courses.
- Microscope Maintenance: $5000. We contract with an outside company to perform preventative maintenance on all of our student and research microscopes every 2 years in order to keep them in good working order.
- Field equipment (Brunton compasses, GPS units and portable radios): $17,900. We require 20 new Brunton compasses ($550 each), 30 new GPS units ($200 each) and 30 new 2-way radios ($60/pair) to replace old, lost, broken units.
- Rock saw blades: $1500. Our saw blades have a limited lifespan, and our 3 oldest saws will require new diamond blades to keep working.
- Laser cutter: $5000. Purchase a laser cutter to develop teaching materials (e.g., topographic maps, mineral models, fossils, etc.) that improve hands-on experiences for our students

Priority 2 – Assess undergraduate and graduate programs and implement improvement actions:

- No anticipated extra costs.

Priority 3 –Develop a peer-mentoring program

- $2000 for camping, food, etc. for field trip support and group meetings. This funding will provide seed money to get the program started, in anticipation of Isava and Bonuso obtaining extramural funding to expand and enhance the program.

Goal 2. Encourage high quality Scholarly and Creative Activities

Priority 1 – Build on student-faculty research capabilities

- No anticipated direct costs other than those listed in Goal 1, Priority 1 above and Goal 2, Priority 2 below.
- Cost of remodeling current faculty lab spaces is unknown, and will depend on if and how the McCarthy Hall remodeling project continues, and if a new science building is constructed in front of Dan Black Hall.

Priority 2 – Enhance student-faculty research space

- Renovation of current lab spaces: costs unknown, but will depend on the continuation of MH renovations beyond the current 2nd floor renovation.

Priority 3 – Enhance funding opportunities for undergraduate and graduate research

- $2000/year for undergraduate and graduate grants. This program will be funded through philanthropic giving by our alumni or other sources.

Goal 3. Sustain and expand community outreach

Priority 1 – Continue Alumni outreach

- No anticipated costs to the department. We will utilize philanthropic and IDC funds for alumni outreach efforts.

Priority 2 – Continue public engagement in the Earth Sciences

- No anticipated costs to the department. We will utilize philanthropic and IDC funds for public outreach efforts.

Goal 4. Expand the number of majors in the department

Priority 1 – Recruit new majors

- No anticipated costs to the department.

Priority 2 – Remove barriers to student success

- No anticipated costs to the department.

Priority 3 – Consider changing the name of the department

- No anticipated costs to the department.

Goal 5. Strengthen the M.Sc. Program

Priority 1 – Increase monetary and structural TA and GA support for M.Sc. students.

- Provide every full-time TA with a GA package*:* $14,232/year. Providing every TA with a GA package will increase the number of GAs from 4 to 7.
- Initiation of a graduate fee waiver program by the university: costs unknown.

Priority 2 – Consider the addition of a project-based Master's degree program in order to increase the number of students in the program.

- No anticipated costs to the department.

Goal 6. Implement interventions that improve DEI

Priority 1: Identify and change exclusionary habits and policies.

- No anticipated costs to the department.

Priority 2: Identify and address the ways department activities impact students negatively.

- No anticipated costs to the department.

Goal 7. Recruit and retain faculty and staff

Priority 1 – Hire faculty in subjects of relevance for student success.

- Start-up and new faculty release time: Costs vary. We plan to hire 2 new faculty, and may expand our faculty by one member over the next 7 years. Current start-up costs for new Geology faculty members are about $100,000/faculty member, excluding lab remodel costs.
- Faculty search costs: $5,000/search. Includes advertising and interview costs.

Priority 2 – Support staff excellence

- Staff morale: $1,000/year. Support staff morale through staff lunches and through workplace improvements.

APPENDIX A. UNDERGRADUATE DEGREE PROGRAMS

Earth Science BA

Office of Assessment & Institutional Effectiveness

Table 1. Undergraduate Program Applications, Admissions, and Enrollments

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

Fall	# Applied	# Admitted	# Enrolled
2016	83	39	6
2017	80	34	4
2018	76	43	6
2019	78	47	2
2020	85	55	3

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

Fall	# Applied	# Admitted	# Enrolled
2016	23	8	5
2017	16	5	0
2018	15	3	1
2019	27	14	8
2020	25	12	4

Table 2. 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	11	9.2	38	28.5	48	37.7	0.78
2017-2018	13	12.0	31	23.3	44	35.4	0.81
2018-2019	10	9.7	32	26.2	42	35.9	0.87
2019-2020	10	9.0	33	28.3	42	37.3	0.89
2020-2021	8	7.1	35	30.8	42	37.9	0.90

[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	5	0.0%	40.0%	40.0%	16.7%	-16.7%
2014	2	0.0%	0.0%	50.0%	100.0%	100.0%
2015	5	0.0%	20.0%	40.0%	-66.7%	-75.0%
2016	6	66.7%	100.0%	100.0%	0.0%	0.0%
2017	3	66.7%	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	3	66.7%	100.0%	100.0%
2016	5	40.0%	60.0%	80.0%
2017	0	-	-	-
2018	1	0.0%	100.0%	100.0%
2019	8	50.0%	N/A	N/A

Table 4. Degrees Awarded

College Year	Degrees Awarded
2016-2017	20
2017-2018	17
2018-2019	19
2019-2020	17
2020-2021	12

Geology (BS)

Office of Assessment & Institutional Effectiveness

Table 5. Undergraduate Program Applications, Admissions, and Enrollments

Table 5-A. First-Time Freshmen: Program Applications, Admissions, and Enrollments

Fall	# Applied	# Admitted	# Enrolled
2016	37	22	2
2017	33	18	3
2018	42	22	6
2019	36	15	4
2020	37	24	7

Table 5-B. Upper-Division Transfers: Program Applications, Admissions, and Enrollments

Fall	# Applied	# Admitted	# Enrolled
2016	49	13	6
2017	41	13	5
2018	38	16	9
2019	45	18	6
2020	27	8	4

Table 6. Undergraduate Program Enrollment in FTES

Table 6-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	273.5	104.4	377.9
2017-2018	277.1	107.6	384.6
2018-2019	259.1	112.3	371.3
2019-2020	232.0	128.9	361.0
2020-2021	262.6	146.6	409.2

[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 6-B. 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	13	10.6	60	48.9	73	59.5	0.82
2017-2018	9	7.8	45	38.1	53	45.9	0.87
2018-2019	15	14.3	47	41.1	62	55.4	0.89
2019-2020	14	13.3	46	42.2	60	55.5	0.93
2020-2021	10	9.4	49	44.9	59	54.3	0.92

[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 7. Graduation Rates for Degree Program

Table 7-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	6	33.3%	50.0%	50.0%	33.3%	0.0%
2014	3	33.3%	66.7%	66.7%	– **	– **
2015	2	0.0%	100.0%	100.0%	0.0%	0.0%
2016	2	0.0%	0.0%	N/A	N/A	N/A
2017	3	100.0%	100.0%	100.0%	0.0%	0.0%

**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.*
***Note: All students in 2014 Cohort were non-Pell, non-UR students.*

Table 7-B. Transfer Student Graduation Rates*

Entered in Fall	Cohort	% Graduated		
		In 2 Years	**In 3 Years**	**In 4 Years**
2015	6	0.0%	33.3%	66.7%
2016	6	50.0%	66.7%	83.3%
2017	5	80.0%	100.0%	100.0%
2018	9	55.6%	77.8%	N/A
2019	6	33.3%	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 8. Degrees Awarded

College Year	Degrees Awarded
2016-2017	27
2017-2018	15
2018-2019	14
2019-2020	20
2020-2021	12

APPENDIX B. GRADUATE DEGREE PROGRAMS

Table 1. Graduate Program Applications, Admissions, and Enrollments

Fall	# Applied	# Admitted	# Enrolled
2016	30	11	10
2017	21	7	6
2018	19	7	7
2019	15	0	0
2020	16	4	4

Table 2. Graduate Program Enrollment by Headcount and FTES

Academic Year (Annualized)	Headcount	FTES	FTES per Headcount
2016-2017	17	11.3	0.68
2017-2018	18	10.6	0.59
2018-2019	16	10.5	0.66
2019-2020	9	5.0	0.56
2020-2021	7	3.6	0.52

Table 3. Graduate Student Graduation Rates

All Master's Entered in Fall:	Cohort	% Graduated		
		In 2 Years	**In 3 Years**	**In 4 Years**
2015	6	0.0%	50.0%	50.0%
2016	10	0.0%	20.0%	60.0%
2017	6	33.3%	50.0%	50.0%
2018	7	14.3%	14.3%	N/A
2019	0	-	-	-

Table 4. Master's Degrees Awarded

College Year	Degrees Awarded
2016-2017	6
2017-2018	4
2018-2019	3
2019-2020	8
2020-2021	1

APPENDIX C. FACULTY

Table 1. Full-Time Instructional Faculty, FTEF, FTES, SFR

Table 1. Faculty Composition[1]

Fall	Tenured	Tenure-Track	Sabbaticals at 0.5	FERP at 0.5	Full-Time Lecturers	Actual FTEF
2016	7	6	0.0	0.0	1	14.0
2017	8	5	0.0	0.0	1	14.0
2018	8	4	0.5	0.0	1	13.0
2019	6	4	0.0	0.0	1	11.0
2020	7	3	1.0	0.0	1	11.0

[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

Provide 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.

Table 1A. Summary of State Support and amounts spent on salaries, O&E, and student assistants.

Fiscal Year	Full Time Faculty*†	Teaching Associates and Graduate Assistants*†	Part Time Faculty*†	Part Time Faculty Blanket*	Operating Expenses and Student Assistants
2014-2015	$ 894,981.50	$ 159,361.07	$ 202,509.17	$ 361,870.24	$ 76,000.46
2015-2016	$ 970,942.50	$ 154,476.39	$ 337,809.00	$ 492,285.39	$ 77,860.52
2016-2017	$ 1,072,050.68	$ 161,469.60	$ 231,664.39	$ 393,133.99	$ 93,765.74
2017-2018	$ 1,132,104.00	$ 179,462.40	$ 209,455.30	$ 388,917.70	$ 85,911.36
2018-2019	$ 1,047,029.52	$ 192,070.27	$ 185,500.69	$ 377,570.96	$ 85,894.70
2019-2020	$ 1,244,792.00	$ 92,155.72	$ 230,570.24	$ 322,725.96	$ 83,503.59
2020-2021	$ 1,264,134.00	$ 128,183.47	$ 216,589.76	$ 344,773.23	$ 82,937.42

* Amount does not include benefits, only salaries.
†This is the amount spent.

Table 1B. Extramural Grant funding obtained by the department from 2014 – 2021.

Fiscal Year	Number of Grants	Total Extramural Grant Funding*
2014-2015	5	$537,802.00
2015-2016	9	$939,487.00
2016-2017	9	$647,430.00
2017-2018	2	$71,947.00
2018-2019	3	$68,506.00
2019-2020	1	$13,323.00
2020-2021	1	$293,703.00

* this is the amount obtained during a specific year; grants may last for several years.

Table 1c. Philanthropic Funds raised via gifts and donations from 2014 – 2021.

Fiscal Year	Funds Raised
2014-2015	$6,885.00
2015-2016	$4,790.00
2016-2017	$6,060.00
2017-2018	$5,537.41
2018-2019	$7,929.00
2019-2020	$8,381.00
2020-2021	$15,460.01
2021-2022	$18,676.00

* in addition, the department received a donation of $10,000 from an anonymous donor in December 2019 and $20,000 in May 2021 from Diane Clemens-Knott and Jeffrey Knott.

APPENDIX E. LONG-TERM PLANNING

Table 1a. Student Learning Goals

Geology PPR Goal/Priority	Goal Description	Metric
1-1	Maintain current, and develop new High-Impact Practices (HIPs) through faculty research that includes student collaborators and classes that incorporate field/lab/research experiences.	• Maintenance of well-stocked and supported teaching and research labs. • Continued support from the Provost's office for fuel and maintenance for our field vehicles. • Develop a fund for lab and camping supplies that alumni can contribute to. • Purchase a 3D printer and/or laser cutter to develop teaching materials (e.g., topographic maps, mineral models, fossils, etc.) that improve hands-on experiences for our students. • Prioritize faculty-student research spaces, including the development of a dedicated learning/activity space with learning stations that includes our stream table, wave tanks, virtual sandbox, groundwater models, etc.
1-2	Assess undergraduate and graduate program	• Correct department effectiveness through teaching/learning best practices. • If SLO outcomes do not meet expectations over a 2-year assessment period, the assessment committee chair will work with the faculty member(s) to improve teaching materials and learning practices to ensure that learning goals articulate well with assignment tasks. • Faculty member(s) will be encouraged to poll students pre-and post-assignment to gauge any learning gaps.
1-3	Develop a peer-mentoring program	• Quantitative and qualitative assessment using surveys and interviews. • Improve time to graduation and retention metrics
4-1	Recruit new majors	• Expand outreach efforts to community colleges and high schools. • Consider rebranding the department to better align with our department identity and priorities.

4-2	Remove barriers to student success	• Develop a peer mentoring program where our younger students are mentored by upperclassmen. • Continue to look for academic barriers and adjust advising procedures to address those barriers. • Advise students to take advantage of tutoring and resources to help them be successful in related fields (Biology, Chemistry, Math, and Physics). • Analysis of prerequisites to help smooth the way in geology classes, as well as in related fields. • Establish an inventory of camping gear that can be loaned out to students in need, as well as a philanthropic fund for the purchase of academic and camping supplies.
4-3	Consider changing the name of the department	• Query CSU departments that have changed their name to ask how this has affected their enrollments and career trajectories of their students.
5-1	Increase monetary support for M.Sc. students	• Encourage university administrators to institute a university-wide fee waiver program. • Establish a philanthropic fund within the department to supplement a portion of graduate fees.
5-2	Consider the addition of a project-based Master's thesis	• Discuss the outlines of a project-based Master's degree at future faculty meetings, and hold a retreat to design this program.
6-1	Identify and change exclusionary habits and policies	• Complete URGE program in Spring 2022. • Continue to discuss DEI readings at least once per semester, along with any additional URGE materials as they are released. • Establish a Departmental DEI committee to implement the URGE deliverables.
6-2	Identify and address how department policies affect students negatively	• Launch an annual department climate survey. • Implement alternatives that increase the success rate for all students. • Increase outreach to affinity groups. • Develop and implement a more inclusive curriculum in consultation with the Departmental DEI committee.

7-1	Hire faculty in subjects of relevance for student success.	• Assess national trends and survey alumni to see what knowledge and skills are valued within the professional community, and make sure our hiring plan addresses these needs.
7-2	Support staff excellence.	• Successfully guide recently hired ASAII through the probationary period. • Look for ways to bolster morale amongst staff members. • Encourage staff to learn new skills and complete necessary training.

Table 1b. SCA Goals

Geology PPR Goal/Priority	**Goal Description**	**Metric**
2-1	Build on student-faculty research capabilities	• All B.Sc. and M.Sc. students complete a thesis project in collaboration with a faculty member. • Increase the number of B.A. students that complete B.A. theses and Directed Studies (GEOL 493) or Independent Study (GEOL 499L) classes.
2-2	Enhance faculty-student research space	• Sufficient space (size and capabilities) for all faculty. • Inclusion of the department in planning of all future renovation/building projects. • Increase research space with multi-student research groups in mind.
2-3	Enhance funding opportunities for undergraduate and graduate research	• Increase in numbers of grants submitted by faculty and students. • Establishment of a departmental philanthropic fund to support undergraduate and graduate research.

Table 1c. Service Goals

Geology PPR Goal/Priority	**Goal Description**	**Metric**
3-1	Continue alumni outreach	• Establish a department newsletter editor. • Increase alumni giving so that annual average giving over a 7-year period is $20,000 per year. • Establish an annual alumni survey where we assess the satisfaction of our alumni and assess the needs of the profession.

3-2	Continue public engagement with the Earth Sciences	• Faculty present research and give general talks to professional and community groups. • Volunteer in the community and with professional organizations. • Invite people from industry and outside of academia to present at seminars to discuss their needs, DEI, etc.

APPENDIX F. *CURRICULUM VITAE* OF FACULTY

Curriculum Vitae

Sinan O. Akçiz
Assistant Professor of Geology
Department of Geological Sciences, California State University - Fullerton

Professional Preparation:

PhD Geology, 2004, Massachusetts Institute of Technology, USA
BS Geological Engineering, 1997, Istanbul Technical University, Turkey

Appointments:

2016 – current: Assistant Professor, California State University Fullerton
2015 – 2015. Part-time faculty at CSU Fullerton and CSU Northridge
2013 – 2016. Adjunct Assistant Professor and Assistant Researcher at UCLA
2010 – 2013. Assistant project scientist at UC Irvine
2011 – 2013. Lecturer at UCLA
2005 – 2009. Part-time lecturer at California State University at Fullerton.
2005 – 2011. Postdoc at UC Irvine
2004 – 2005. Adjunct Assistant Professor at Boston College

Classes taught since 2016:

Structural geology (GEOL 360), Geological Field Techniques (GEOL380), Summer Field Camp (GEOL 481A), Physical Geology (GEOL 101), Quaternary Tectonics (GEOL475), Paleoseismology (GEOL575T)

Recent presentations:

- **Akciz, S. O.** & Kirby, M., 2021. Multidisciplinary investigation of determining channel incision ages in the Carrizo Plain, California. SCEC Annual Meeting, 2021.
- Rockwell, T., **Akciz, S. O.**, Gath, E., 2021. New age data constrain the recurrence interval on the Whittier Fault. SCEC Annual Meeting, 2021.
- **Akciz, S. O.** (2019) Fault slip distribution and structural style along the southern 15 km of the M7.1 Ridgecrest earthquake surface rupture: Summary of field observations. Hewett Lecture, UC Riverside.
- **Akciz, S. O.**, Grant Ludwig, L., and Arrowsmith, J R. (2018) Limitations of Paleoseismic data along the fastest slipping section of the San Andreas Fault. Eos Trans. AGU, Fall Meet. Suppl., Abstract S44A-05.

Peer-reviewed Publications since 2016:

- **Akciz, S. O.** and Rockwell, T., 2022 (accepted for publication at BSSA). Holocene faulting and earthquake recurrence along the northern Agua Tibia-Earthquake Valley Fault Zone and implications for slip distribution in southern California

- DuRoss, C., Gold, R., Dawson, T., Scharer, K., Kendrick, K., **Akciz, S. O.,** Zinke, R., 2020. Surface Displacement Distributions for the July 2019 Ridgecrest, California, Earthquake Ruptures. Bulletin of the Seismological Society of America. 10.1785/0120200058.
- Grant Ludwig, L., **Akciz, S. O.**, Arrowsmith, J R., and Salisbury, J. B. (2019) Reproducibility of San Andreas fault slip rate measurements at Wallace Creek in the Carrizo Plain, CA. Earth and Space Science, v.6, no. 1, 156-165. doi:10.1029/2017EA000360
- Salisbury, J. B., Arrowsmith, J. R., Brown, N., Rockwell, T., **Akciz, S. O.**, & Ludwig, L. G. (2018) The Age and Origin of Small Offsets at Van Matre Ranch along the San Andreas Fault in the Carrizo Plain, California. Bulletin of the Seismological Society of America, Vol.108, 639-653. doi:10.1785/0120170162

Current and recently graduated M.S. Students and their projects:

- Inserra, N. (CSUF, M.S. – Geology): "Paleoseismic Investigation of the Late Holocene Rupture History of the South-Central San Andreas Fault at Van Matre Ranch Site, Carrizo Plain, California" (MS Thesis completed in Summer 2019)
- Gutierrez, J. (CSUF, M.S. – Geology): "Assessing The Impact Of 3D-Printed Geologic Block Models In Improving Spatial Thinking Skills Of College Students Taking Physical Geology Lab Classes" (MS Thesis completed in Spring 2020)
- Hawkins, J. (CSUF, M.S. – Geology): "Incision history of displaced channels along the San Andreas Fault in the Carrizo Plain, CA." (Thesis in progress)
- Eggers, J. (CSUF, M.S. – Geology): "Neotectonics of the Santa Cruz Island Fault, Santa Barbara County, CA" (Thesis in progress)

Undergraduate students advised on thesis projects:

Adam Wells, Radwan Muhtala, Joseph Grohman, Sena Padilla, Jeremy Torres, Julia Rosenblit, Aidan Salazar, Bryan Padilla, Brandon Cugini, Hunter Nortman, Jacob Madrid.

Current and Pending Funding:

- Creation of the Community Paleoseismic Database (CPD) and its IT infrastructure to support SCEC science – Southern California Earthquake Center: (pending Collaborative proposal. CSUF portion $16,313)
- Multidisciplinary investigation of determining channel incision ages in the Carrizo Plain, California – Southern California Earthquake Center: ($38,241)
- Building the Community Rheology Model (CRM): geologic investigation of ductile shear zone rheology – Southern California Earthquake Center: (Collaborative proposal. CSUF portion $8,008)
- Modeling the Rupture Dynamics of Strong Ground Acceleration (>1g) in Fault Stepovers – Southern California Earthquake Center (Collaborative proposal. CSUF portion - $3,000)
- Revised and expanded chronology of Whitter Fault earthquakes through dating archived samples from the Olinda Creek site, Brea, California – Southern California Earthquake Center ($10,323)

Dr. Nicole Bonuso

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Education

Doctor of Philosophy (PhD) University of Southern California, Los Angeles – May 2005
Specialization: Invertebrate Paleontology and Evolutionary Paleoecology
Dissertation: The Structure and Development of Middle to Late Triassic Brachiopod Paleocommunities

Master of Science (MS), Syracuse University, Syracuse – May 2000
Specialization: Invertebrate Paleontology and Evolutionary Paleoecology
Dissertation: Quantitative Paleoecology of the Hamilton Group of Central New York

Bachelor of Arts (BA), University of Rhode Island – 1996
Major: Geology
Four-year collegiate athlete: Women's Rowing Team

Administrative/Successful Leadership Experience

Chair, Undergraduate Advising Committee
August 2010 to present

Position summary: Lead advisors and provide on-going resources, support, and training to a team of eight faculty members in areas of developmental advising and student success. My main responsibilities include advising students, training and support faculty advisors, trouble shoot emerging advising issues, work with the curriculum committee to implement and advertise changes to the curriculum, work with department staff to organize and schedule advising, perform all graduation checks for undergraduate majors and minors, and work with NSM success team to coordinate department summer orientation for new and transfer students.

Significant accomplishments:

- Reorganized departmental advising strategy to streamline process, and enhance student persistence, success, and degree completion.
- Drafted and maintain workflow procedures for both in person and virtual advising.
- Established a summer advising procedure for new and transfer orientation students
- Learned that being kind, curious, and an actively listener helps build relationships with students and established my office as a safe space for students to seek help and advice.

Chair, Department Assessment Committee
August 2014 to 2015, 2019 to present

Position summary: Provide leadership and oversight for all department assessment. Worked with Dr. Su Swarat and Office of Assessment and Institutional Effectiveness to design department level assessment strategies for all three majors (i.e., BA, BS, and MS degrees).

Significant accomplishments:

- Developed and implemented plan to assess student learning outcomes that was faculty-led, administratively-supported, and student-centered.
- Worked with department faculty to drafted new student learning outcomes (SLO) for our BA, BS, and MS degrees.
- Developed and implemented direct and indirect measures for all SLO.
- Tested one SLO per semester for each degree major and reported results in Compliance Assist.

College of Natural Science and Mathematics (NSM) Inclusion and Equity Committee
August 2020 to present

Position summary: Our committee's goal focuses on providing equitable access to opportunities and resources necessary for student success in large enrollment 100 level courses. To attain this goal, we defined equity gap, reviewed current literature/resources, identified best practices for closing the equity gap, and tested our best practices on a few NSM large enrollment courses.

Significant accomplishments:

- Summarized and compiled a list of best classroom practices including examples of low-risk classroom assessments, guidelines on taking attendance, and growth mindset and belonging activities.
- Developed a syllabus guide to help faculty upgrade their syllabi with more inclusive and equitable language.
- Brainstormed ways to disseminate our work; to move beyond the willing and obtain a greater reach within our college and university.

Teaching

2006 to Present	California State University, Fullerton, CA **Associate Professor:** Physical Geology (GEOL 101), Dinosaur World (GEOL 110T), Earth History (GEOL 201), National Parks and California Geology (GEOL 310T), Paleontology (GEOL 322), Field Methods (GEOL 380), Field Camp (GEOL 481A), Research Methods in Geology (GEOL 501), Advanced Paleontology (GEOL 510T), Geosciences Seminar (GEOL 590)
2006	California State University, Long Beach, CA **Lecturer**: Physical Geology (GEOL 102), Paleontology and Evolution (GEOL 341)

Student Evaluations (n= number of courses)	*SOQ values (out of 4.0): * exceeds Department of Geological Sciences averages*
Total course average (n= 30)	3.50*
100-level courses (n= 12)	3.70*
200-, 300-level courses (n=21)	3.60*
500-level courses (n=5)	3.40

Scholarship

Articles **indicates students author*

2021 (14) **Bonuso, N.** Zacherl, D.C**, ***Vreeland, K., and *Ditmar, J. (accepted July 2021) Reconstructing Oyster Paleocommunity Structure Over the last 3.6 Million Years: A Southern California Case Study. PaleoBios

2020 (13) **Bonuso, N**., *Stone, T, and Williamson, K. (2020). Upper Triassic (Carnian) Sponge Reef Mounds from South Canyon, central Nevada Facies Vol. 66, Issue 16, p. 1-15.

2018 (12) **Bonuso, N**., Lloyd, S., and Lorentz, N. L., (2018). Pioneer reef communities within a Middle Triassic (Anisian) to Upper Triassic (Carnian) missed carbonate-siliciclastic ramp system from the Star Peak Group, South Canyon, central Nevada. Palaeogeography, Palaeoclimatology, Palaeoecology, Vol. 503, p. 1-12

2018 (11) Marshall, C. R., Finnegan, S., Cities, E., Holroyd, P. A., **Bonuso, N**., Cortez, C., Davis, E., Dietl, G. P., Druckenmiller, P.S., Eng, R. C., Garcia, C., Estes-Smargiassi, K. Hendy, A., Hollis, K. A., Little, H., Nesbitt, E. A., Roopnarine, P. Skibinski, L. Vendetti, J., and White, J. D. (2018). Quantifying the dark data in museum fossil collections as palaeontology undergoes a second digital revolution. Biology Letters. Vol. 14. P.1-4.

2016 (10) *Hiner, C., Kirby, M.E., **Bonuso, N**., Patterson, W., Palermo, J., Silveira, E. (2016). Late Holocene Hydroclimatic Variability Linked to Pacific Forcing: Evidence from Abbott Lake, Coastal Central California. Journal of Paleolimnology, Vol. 56. Issue 4, p. 299-313.

Grants and Awards

2021 CSUF Summer Undergraduate Research Academy (SUReA) **(Funded) PI: Nicole Bonuso**

2020 Searching for the Carnian Pluvial Event within central Nevada, USA. **(Not funded** Palaeontological Association Research Grant, $14,000) **PI: Nicole Bonuso**

2019 Deciphering biotic responses to rapid climate change at the Pliocene-Pleistocene boundary **(not funded** J/S/G research Program and State Special Fund for Research and Scholarship and Creative Activity-CSUF, $5000) **PI: Nicole Bonuso**

2018 Documenting Reef Recovery After Mass Extinction. (**funded** RSCA Incentive Grant $15,000) **PI: Nicole Bonuso**

2017 Examining Reef Mound Construction to Understand How Reefs Recovered After Mass Extinction. (**funded** CSUF CSU-COAST Undergraduate Research Support Program $750) PI: *Travis Stone; **Co PI: Nicole Bonuso**

2017 Examining Long-Term Reef Recovery After Mass Extinction (**not funded** at American Chemical Society/Petroleum Research Fund, $70,000) **PI: Nicole Bonuso**

2017 Using Paleoecology to Understand How Coral Reefs Recover from Mass Extinction **(not funded** J/S/G research Program and State Special Fund for Research and Scholarship and Creative Activity-CSUF, $5000) **PI: Nicole Bonuso**

2017 Digitization TCN Collaborative: Documenting Fossil Marine Invertebrate Communities of the Eastern Pacific - Faunal Responses to Environmental Change over the last 66 million years. (**funded** NSF $551,000 Award# 1503678) **PI: Charles Marshall UC Berkeley; Participant: Nicole Bonuso**

Abstracts **indicates thesis student author*

2020 (44) *Leidelmeijer, J A, Kirby, M E, Sproul Dit Macdonald, G, Carlin, J, **Bonuso, N**, Loyd, S J, Han, J, Nauman, B, Avila, J And Woodward, A Late Glacial to Early Holocene Paleolimnology Inferred from Barley Lake Sediments (Northern Coastal Ranges, California) - Cordilleran Section Meeting *Abstracts with Programs.* Vol. 52, No. 4

2020 (43) *Dickson, S, Carlin, J, and **Bonuso, N**. Evolution of Southern California Coastal Wetland. Geological Society of America - Cordilleran Section Meeting *Abstracts with Programs.* Vol. 52, No. 4

2019 (42) *Stone, T. and **Bonuso, N.** Quantitatively assessing reef mound communities within the Upper Triassic carbonates along the eastern Panthalassic ocean. P. 338. Paleobios, Vol. 36, Supplement 1.

2018 (41) *Stone, T. and **Bonuso, N.** Examining Reef Mound Construction to Understand How Reefs Recovered After Mass Extinction. Geological Society of America -Annual Meeting *Abstracts with Programs.* Vol. 50

2017 (40) Marshall, C.R., Clites, E.C., **Bonuso, N.**, Davis, E., Dietl, G. P., Druckenmiller, P., Eng, R., Estes-Smargiassi, K., Finnegan, S., Garcia, C., Duggan-Haas, D.[1], Hendy, A. J.W., Hollis, K., Holroyd, P. A., Legler, S., Little, H., Nesbitt, E. A., Ross, R. M., Skibinski, L., Roopnarine, P. D., Vendetti, J. And White, L. D. Digitization of Millions of Marine Invertebrate Fossils Through The Eastern Pacific Invertebrate Communities of The Cenozoic (EPICC) Thematic Collections Network (TCN). Geological Society of America - Annual Meeting *Abstracts with Programs.* Vol. 49, No. 6.

2017 (39) *Ditmar, J. and **Bonuso, N**. Paleoecology of Late Pleistocene Oyster Beds, San Pedro, California. Western Society of Malacologists Meeting. Abstract Volume.

Completed Theses Bachelor's student; **Master's student**

2021 Maren Jorgensen – Documenting Conodont Biostratigraphy to Constrain Late Triassic dates.

2019 Melonie Nguyen - Abundance and Diversity in Favret Canyon After the Permian-Triassic Extinction Event.

2019 Connor Prentiss - A Study on Research Methods of Triassic Reef Fossils in Favret Canyon, Nevada

2019 Jesus Sancen - Comparison of Thin Section and Outcrop Data from Favret Canyon, central Nevada

2018 Travis Stone – Examining Reef Mound Construction to Understand Reefs Recovered After Mass Extinction

2017 Jolene Ditmar – A Paleoecology Study of Pleistocene Oyster Beds, San Pedro, California

2017 Bryan Rue - A Paleoecology Study of Pleistocene Oyster Beds, San Pedro, California

2017 Maree Kutcher - A Paleoecology Study of Pleistocene Oyster Beds, San Pedro, California

2017 Glenn Dunke – Design for a Geospatial Database and Related Mobile Application

2017 **Edween Hernandez** – Documenting ecological recovery within the Middle Triassic of Central Nevada

Joseph A. Carlin, Ph.D.
Associate Professor
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657-278-3054

Professional Preparation

Texas A&M University-Corpus Christi, Corpus Christi, TX	Communications	BA, 2004
Texas A&M University-Galveston, Galveston, TX	Ocean and Coastal Resources	BS, 2008
Texas A&M University, College Station, TX	Oceanography	Ph.D., 2013
Texas A&M University-Galveston, Galveston, TX	Postdoctoral Research Associate, Marine Sciences	2013 - 2014

Academic Appointments

Associate Professor, California State University, Fullerton	Geological Sciences	2020 - Present
Assistant Professor, California State University, Fullerton	Geological Sciences	2104 - 2020

Recent Publications (since 2016)

Arias-Ortiz, A., Oikawa, P. Y., **Carlin, J**., Masqué, P., Shahan, J., **Kanneg, S., Paytan, A., Baldocchi, D., 2021. Tidal and nontidal marsh restoration: A trade-off between carbon sequestration, methane emissions, and soil accretion. Journal of Geophysical Research: Biogeosciences, 126, e2021JG006573.

Van Allen, R., Schreiner, K.M., Guntenspergen, G., **Carlin, J.**, 2021. Changes in organic carbon source and storage with sea level rise-induced transgression in a Chesapeake Bay marsh. Estuarine, Coastal and Shelf Science, 107550.

*Leidelmeijer, J.A., Kirby, M.E.C., MacDonald, G., **Carlin, J.A.**, **Avila, J., Han, J., Nauman, B., Loyd, S., Nichols, K., Ramezan, R., 2021. Younger Dryas to early Holocene (12.9 to 8.1 ka) limnological and hydrological change at Barley Lake, California (northern California Coast Range). Quaternary Research, 1-15.

Carlin, J.A., Schreiner, K.M., Dellapenna, T.M., McGuffin, A., Smith, R.W., 2021. Evidence of recent flood deposits within a distal shelf depocenter and implications for terrestrial carbon preservation in non-deltaic shelf settings. Marine Geology 431, 106376.

Carlin, J., Addison, J., Wagner, A., Schwartz, V., Hayward, J., Severin, V., 2020. Response: Commentary: Variability in Shelf Sedimentation in Response to Fluvial Sediment Supply and Coastal Erosion Over the Past 1,000 Years in Monterey Bay, CA, United States. Front. Earth Sci 8, 210.

Carlin J., Addison J., Wagner A., Schwartz V., **Hayward J., and **Severin V., 2019. Variability in Shelf Sedimentation in Response to Fluvial Sediment Supply and Coastal Erosion Over the Past 1,000 Years in Monterey Bay, CA, United States. Frontiers in Earth Science, 7:113. doi: 10.3389/feart.2019.00113

Reynolds, L.C., Simms, A.R., Ejarque, A., King, B., Anderson, R.S., **Carlin, J.A.**, Bentz, J.M., Rockwell, T.K., Peters, R., 2018. Coastal flooding and the 1861–2 California storm season. Marine Geology, 400, 49-59.

*Leeper, R., Rhodes, B., Kirby, M., Scharer, K., **Carlin, J**., Hemphill-Haley, E., Avnaim-Katav, S., MacDonald, G., Starratt, S., *Aranda, A., 2017. Evidence for coseismic subsidence events in a southern California coastal saltmarsh. Scientific Reports 7, 44615. http://doi.org/10.1038/srep44615

Carlin, J.A., Lee, G., Dellapenna, T., +Laverty, P., 2016. Sediment resuspension by wind, waves, and currents during meteorological frontal passages in a micro-tidal lagoon. Estuarine, Coastal and Shelf Science 172, 24-33. doi:10.1016/j.ecss.2016.01.029

(*CSUF Graduate Student Author, **CSUF Undergraduate Student Author, +Student Author)

Recent External Funding (since 2016)

Co-Principal Investigator, Zacherl, D. (CSUF - Lead Principal Investigator), Miller, L. (SDSU), Whitcraft, C. (CSULB), Nichols, K. (OC Coastkeeper) "Development of Cost-effective Metrics for Monitoring Living Shorelines." CSU-Council on Ocean Affairs, Science and Technology (COAST) State Science Information Needs Program. May 2021 - October 2023, $389,923.

Senior Personnel, Cassem, M. (CSUF - Principal Investigator) "Establishing Roots to Grow STEMs:Building Capacity in a College of Natural Sciences and Mathematics." National Science Foundation (NSF) - Improving Undergraduate STEM Education (HSI). June 2020 - June 2025, $2,476,859.

Principal Investigator, Oikawa, P. (CSUEB - Principal Investigator), "Constraining Carbon Budgets and Sedimentation Rates in Coastal Wetlands." CSU-Council on Ocean Affairs, Science and Technology (COAST) Grant Development Program. May 2020 – October 2021, $19,990 ($13,240 to CSUF).

Co-Principal Investigator, Kirby, M. (Principal Investigator) "Collaborative Research: The California Precipitation Dipole: Spatiotemporal Variability and Forcings Over the Past 3000 Years." National Science Foundation (NSF) - Paleo Perspectives on Climate Change (P2C2) - Geomorphology and Land Use Dynamics Program. June 2017 - June 2020, $345,802.

Principal Investigator, "PRF-UNI: Linking decadal-scale changes in continental shelf sediment accumulation to variability in ocean and terrestrial processes." American Chemical Society-Petroleum Research Fund, July 2017 – September 2019, $55,000.

Other Accomplishments

- 21 undergraduate theses completed
- 2 graduate theses completed
- 5 new courses or topics developed
- Presenter or co-author on >30 conference abstracts since 2016
- 4 Intramural Grants funded
- Chair/Organizer of technical sessions at 7 professional meetings
- Member of the Executive Committee for the CSU Council on Ocean Affairs Science and Technology (COAST), January 2020 - present
- Member of the Editorial Board for the journal *Coasts* (MDPI Publishing), September 2021 - present
- Co-Guest Editor for a Special Issue of *Water* (MDPI Publishing), "Observation and Numerical Modeling of Sediment Transport in Coastal Areas."
- Manuscript reviewer for > 20 articles since 2016
- External grant proposal reviewer for >20 proposals since 2016
- 5 invited technical seminars/presentations since 2016

Wayne Henderson
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Riverside, CA 92505
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whenderson@fullerton.edu

Curriculum Vitae

Education

- Bachelor of Science, Geology, The George Washington University, 1/30/97
- Bachelor of Arts, History, The George Washington University, 1/30/97
- Master of Science, Geology, Louisiana State University, 7/17/99
- PhD student, Geology, University of California, Riverside, 9/99-1/03

Awards and Honors

- 2017 PS-SEPM Honorary Membership Award
- 2016 Athens Institute for Education and Research Membership
- 2011 Outstanding Lecturer, College of Natural Science and Math, California State University, Fullerton
- 2010 Student Social Justice Guest Speaker, California State University Fullerton, Global Warming: Too Hot, Too Cold, But Not Just Right, April 17, 2010
- Lerner Memorial Fund $1000, 2001. “Saukiid Trilobites and Their Implications for Late Cambrian Paleogeographic and Paleoenvironmental Reconstructions.”
- Geological Society of America $1500, 2001. “Saukiid Trilobites and Their Implications for Late Cambrian Paleogeographic and Paleoenvironmental Reconstructions.”
- Paleontological Society $500, 2001. “Saukiid Trilobites and Their Implications for Late Cambrian Paleogeographic and Paleoenvironmental Reconstructions.”
- Graduate Fellowship, Smithsonian Institution 2000-2001. “Saukiid Trilobites and Their Implications for Late Cambrian Paleogeographic and Paleoenvironmental Reconstructions.”
- Paleontological Research Institute Graduate Student Research Award $500, 2000.
- University of California, Riverside, Board of Trustees 4 Year PhD Fellowship
- Sigma Xi 1999 Student Member, Louisiana State Chapter.
- Geological Society of America Research Grant, 1998. “Distinguishing Natural and Archaeological Shell-Rich Deposits of the Chenier Plain, Southwestern Louisiana.”
- Paleontological Society Research Grant, 1998. See above.
- Louisiana State University Department of Geology Scholarship, 1997-1998.
- $1500 Marathon Scholarship, 1998-1999.
- Marshall Memorial Scholarship, George Washington University, 1995-1997.
- Massachusetts Alumni Scholarship, George Washington University, 1993-1997.
- Board of Trustees Scholarship, George Washington University, 1993-1997.
- Golden Key National Honor Society- membership 1995.
- Phi Eta Sigma- membership April 1994.

Publications

- Knott, J. and Henderson, W. (2020), ***Physical Geology Laboratory Manual***: Dubuque, IA, Kendall/Hunt, 8th Edition, 121 pp.
- Sturmer, Daniel M., Trexler, James H. Cashman, Patricia, H., Dolbier, Rachel, and Anderson, Thomas (2011) Late Paleozoic Basins, Tectonism, and Resources of North-Central Nevada, editors: Caputo, Mario, and Henderson, Wayne, Pacific Section Society of Sedimentary Geology, Book 110
- Montaya, Marisa, and Henderson, Wayne (2010) Does Environmental Education Provoke Environmentally Responsible Behavior? GSA Abstracts with Programs Vol. 42, No. 4
- Carrasco, Joseph, Marsaglia, Kathleen M., Marden, Mike, Kirby, Matthew E., and Henderson, Wayne (2008) Paleolimnologic Study of Redpath Lake, North Island, New Zealand. GSA Abstracts with Programs 151-14
- Henderson, Wayne, Terpolilli, Christopher, Mata, Scott, and Carrasco, Joseph. (2006) Undergraduate Student Perceptions of Water Quality and Environmental Issues, a Quantitative Study to Encourage Student Awareness and Activity Concerning Environmental Issues. ATINER, Abstracts A-13.
- Henderson, W., Terpolilli, C., Mata, S., and Carrasco, J. (2006) Student Perceptions of Water Quality and Environmental Issues, a Quantitative Study to Encourage Student Awareness and Activity Concerning Environmental Issues: *In* **Environmental Engineering: Education, Research and Economy**, Athens Institute of Education and Research: Athens, Greece, Chapter 2, pp 1-15.
- Henderson, Wayne, Terpolilli, Christopher, Mata, Scott, and Carrasco, Joseph. (2006) Undergraduate Student Perceptions of Water Quality and Environmental Issues, a Quantitative Study to foster student understanding and action dealing with environmental issues. GSA Abstracts with Programs Vol. 38, No. 7.
- Terpolilli, Christopher, Henderson, Wayne, Mata, Scott, and Carrasco, Joseph. (2006) Does a passport and a checkbook matter; what factors influence students knowledge and concern for environmental issues. GSA Abstracts with Programs Vol. 38, No. 7.
- Henderson, W., Anderson, L. C., and McGimsey, C., (2002) Distinguishing Natural and Archaeological Shell-Rich Deposits of the Chenier Plain, Southwestern Louisiana. PALAIOS: 17(2), pp 147-161
- Henderson, W.G., and Hughes, N., (2002) Late Cambrian Saukiid Trilobites: Taxonomic Clues to Paleogeography. Geological Society of America, Abstract with Programs 19: A64.
- Henderson, W. G., (2001) Late Cambrian Saukiid-Dikelocephalid Trilobites and Their Implications for Paleogeographic and Reconstructions. Trilobites and Their Relatives, Oxford, Abstract with Programs: A-20, p. 17.
- Henderson, W. G., and Hughes, N., (2001) Late Cambrian Saukiid-Dikelocephalid Trilobites and Their Implications for Paleogeographic and Reconstructions. North American Paleontology Conference, Berkeley, Paleobios: 21(2).
- Henderson, W. G., (2001) Late Cambrian Saukiid-Dikelocephalid Trilobites and Their Implications for Paleogeographic and Reconstructions. California Paleontology Conference, Los Angeles, Paleobios: 21(1).
- Henderson, W., (1999) Distinguishing Molluscan Shell-Rich Natural and Archaeological Deposits of the Chenier Plain, Southwestern Louisiana. Thesis,

Department of Geology and Geophysics, Louisiana State University, Baton Rouge, Louisiana, 123 p.

- Henderson, W., Anderson, L. C., and McGimsey, C., (1998) Distinguishing Natural and Archaeological Shell-Rich Deposits of the Chenier Plain, Southwestern Louisiana. Geological Society of America, Abstract with Programs 30: A122.

Distinctions/Memberships

- Faculty Member, Athens Institute for Education and Research (ATINER), Athens, Greece 2016
- SEPM Vice-President Pacific Section 2008, Membership Manager 2009-Current
- Faculty Advisor non-profit, *Together We Rise* 2008-Current
- Faculty Advisor Titan Chess Club 2015-Current
- Faculty Co-Advisor AAPG Student Chapter CSUF
- Faculty volunteer/guest speaker Bryant Elementary School, Riverside, CA
- Louisiana State University, Department of Geology, Graduate Student Representative, 4/98-5/99.
- Student Council President, Bishop Guertin High School, Nashua, NH.
- Loyalty Award, Bishop Guertin High School, 6/93.

- Member:

Geological Society of America	Sigma Xi
Paleontological Society	AAPG Student Chapter LSU
Golden Key National Honor Society	Pacific Section SEPM
Together We Rise	AAPG
Society of Sedimentary Geology	

Conferences Attended

- GSA Annual Meeting October 2020 Montreal
- GSA Cordilleran Meeting May 2020 Pasadena
- AAPG Pacific Section Meeting April 2019 Long Beach
- AAPG Pacific Section Meeting April 2018 Bakersfield
- AAPG Pacific Section Meeting May 2017 Anchorage, Alaska
- AAPG Pacific Section-Rocky Mountain Meeting October 2016 Las Vegas
- AAPG Pacific Section Meeting May 2015 Oxnard
- AAPG Pacific Section Meeting April 2014 Bakersfield
- AAPG Pacific Section Meeting April 2013 Monterey
- AAPG National and Pacific Section Meeting April 2012 Long Beach
- AAPG Pacific Section Meeting May 2011 Anchorage, Alaska
- GSA/AAPG Pacific Section Meeting May 2010 Anaheim
- AAPG Pacific Section Meeting April 2009 Ventura
- AAPG Pacific Section Meeting April 2008 Bakersfield
- GSA Annual Meeting November 2006 Philadelphia, Pennsylvania
- AAPG Pacific Section Meeting April 2005 San Jose

- ATINER International Conference August 2005 Athens, Greece
- AAPG Pacific Section Meeting May 2003 Long Beach
- GSA Annual Meeting November 2002 Denver, Colorado
- 2nd International Conference on Trilobites April 2001 Oxford, United Kingdom
- GSA Annual Meeting November 2001 Boston, Massachusetts
- GSA Annual Meeting November 2000 Reno, Nevada
- GSA Annual Meeting October 1999 Denver, Colorado
- GSA Annual Meeting November 1998 Toronto, Ontario, Canada
- GSA Annual Meeting October 1996 Denver, Colorado

Professional Field Trips Attended and Assisted In Organization Of

- PS-SEPM Fall Field Trip: September 28-29, 2018, FROM SHORELINES TO AQUIFERS: LATE CRETACEOUS THROUGH PLIOCENE FILL OF THE NORTHERN SACRAMENTO VALLEY, Todd J. Greene, Russell S. Shapiro, David Maloney**,** California State University, Chico
- PS-SEPM Fall Field Trip: October 7-8 2017, Jurassic World: Architecture of Eolian Dunes, Ephemeral Streams,and Marine Shoreline,Page Sandstone,Carmel Formation, and Navajo Sandstone, Southwest Utah:Caputo, M. V., and Anderson, T. B
- PS_SEPM Fall Field Trip: October 6, 2016, Trace Fossils in Relation to Eolian Stratification, Lower and Middle Jurassic Aztec Sandstone, Valley of Fire State Park, Southern Nevada: Rowland, S. M., and Caputo, M. V.
- PS-AAPG Spring Conference, May 5, 2015 Santa Cruz Island Tour: Boles, J. R., UC Santa Barbara Trip
- PS-SEPM Fall Field Trip: November 8-9, 2014, Continental Extension Old and New at the Edge of the Mojave, Field Trip Leaders: Russell Shapiro, Todd Greene (California State University-Chico) & Carol Dehler (Utah State University)
- PS-SEPM Fall Field Trip: October 4-6, 2013, Devonian Carbonate Platform of Eastern Nevada: Facies, Surfaces, Cycles, Sequences, Reefs, and the Cataclysmic Alamo Impact Breccia. Trip Leaders: John E. Warme (Evergreen, Colorado) and Mara E. Brady (Fresno State)
- PS-SEPM Fall Field Trip: October 19 - 21, 2012, Salinas Basin Petroleum System of Central California and Its Outcrop Expression. Trip Leaders: Tess Menotti and Stephan Graham (Stanford University)
- PS-SEPM Fall Field Trip: September 17-20, 2011, The Paleozoic Basins, Tectonism, and Resources of North-Central Nevada. Trip Leaders: Daniel Sturmer, James Trexler, Patricia Cashman, Rachel Dolbier (University of Nevada, Reno) and Thomas Anderson (Sonoma State University)
- PS-SEPM Fall Field Trip: November 7-9, 2011, The Miocene Monterey Formation of Pismo Beach, California. Trip Leaders: Kevin Bohacs, Margaret Keller, and Jon Schwalbach (AERA Energy)
- PS-SEPM Fall Field Trip: November 6-7, 2010, The Late Paleozoic Section at Arrow Canyon Nevada: Facies, Cyclicity, and the Far-Field Record of Late Paleozoic Ice Age. Trip Leader Matthew Clapham (UC Santa Cruz)

- AAPG-GSA Annual Meeting Field Trip: May 28-29, 2010, Geologic Excursions in California and Nevada: Tectonics, Stratigraphy and Hydrology. Trip Leaders: H. E Clifton & Raymond V Ingersoll (UCLA)
- PS-SEPM Fall Field Trip: September 17-20, 2009 Geologic Guidebook to Santa Cruz Island, Southern California. Trip Leader: James R Boles (UC Santa Barbara)
- PS-SEPM Fall Field Trip: September 13-14, 2008 Geology of Orange County, California & the Irvine Ranch National Natural Landmark. Trip Leaders: A. E Fritsche (CSU Northridge), R. J. Behl (CSU Long Beach), Ivan Coburn (CSU Los Angeles)

CURRICULUM VITAE

Virginia "Ginny" Isava

Department of Geological Sciences
McCarthy Hall (MH-341D)
800 N State College Blvd.
Fullerton, CA 92831 USA

Email: visava@fullerton.edu
Phone: (657) 278-5616

EDUCATION

Ph.D., Geological Sciences with Minor in Education, *Stanford University* 2021
Thesis: Evaluating local and extraregional sources for the Late Cretaceous Nanaimo Group, British Columbia, via coupled detrital/basement $^{40}Ar/^{39}Ar$ thermochronology and Pb isotopes

B.S. with honors, Earth and Ocean Sciences, *Duke University* 2015
Thesis: Garnet zoning and the metamorphic history of Great Smoky Mountains National Park, USA

ACADEMIC APPOINTMENTS

Assistant Professor, *California State University, Fullerton* 2021–Present

CAL STATE FULLERTON COURSES

Planet Earth for Educators (GEOL 410) Fall 2021
Earth Science Communication, Education, and Outreach Methods (GEOL 420) Spring 2022

PUBLICATIONS

Isava, V., Grove, M., Mahoney, J.B., and Haggart, J., 2021, Testing local and extraregional sediment sources for the Late Cretaceous northern Nanaimo basin, British Columbia, using $^{40}Ar/^{39}Ar$ detrital K-feldspar thermochronology: Geosphere, v.17, no. 6, p. 2234–2261, doi:10.1130/GES02395.1.

Mahoney, J.B., Haggart, J., Grove, M., Kimbrough, D., **Isava, V.**, Link, P., Pecha, M., and Fanning, M., 2021, Provenance and basin evolution of the Late Cretaceous Nanaimo basin: a definitive link to northern latitudes: Geosphere, v. 17, no. 6, p. 2197–2233, doi:10.1130/GES02394.1.

Isava, V., Grove, M., Shulaker, Z., and Hourigan, J., Pb isotope results for Cretaceous arc crust in the Pacific Northwest, U.S.A. and Canada *(in preparation)*.

Isava, V., Grove, M., Shulaker, Z., Hourigan, J.K., Mahoney, J.B., and Haggart, J.W., Using detrital K-feldspar Pb isotopic compositions from the Late Cretaceous northern Nanaimo basin, British Columbia, to select between cratonal rocks of the northwestern and southwestern United States as the source of its extraregional sediment *(in preparation)*.

CONFERENCE PRESENTATIONS

Isava, V., and Price, A., 2021, Measuring expert problem-solving in geoscience through a natural hazards assessment: Geological Society of America Abstracts with Programs, v. 53, no. 6, doi:10.1130/abs/2021AM-366972.

Isava, V., and Price, A., 2021, Assessing expert problem-solving in geoscience (poster): Inaugural X-DBER Conference, University of Nebraska-Lincoln (online).

Isava, V., Grove, M., and Mahoney, J.B., 2020, Pb isotopic variation of Cretaceous arc crust in the Pacific Northwest, U.S.A. and Canada: Geological Society of America Abstracts with Programs, v. 52, no. 6, doi:10.1130/abs/2020AM-351191.

Isava, V., Grove, M., and Mahoney, J.B., 2019, To what extent was the Nanaimo Basin of Southern British Columbia derived from the adjacent Coast Plutonic Complex?: Geological Society of America Abstracts with Programs, v. 51, no. 5, doi:10.1130/abs/2019AM-338179.

Isava, V., Grove, M., Mahoney, J.B., and Kimbrough, D.L., 2016, Detrital K-feldspar thermochronology of the Nanaimo Group: Characterization of basement and extraregional basin contributions: Abstract 153056 presented at 2016 Fall Meeting, AGU, San Francisco, California, 12–15 December.

Isava, V., Grove, M., Mahoney, J.B., and Kimbrough, D.L., 2016, Detrital K-feldspar thermochronology of the Nanaimo Group: Evidence for Late Cretaceous denudation of arc crust and the influx of extraregional sediment: Geological Society of America Abstract with Programs, v. 48, no. 7, doi:10.1130/abs/2016AM-277776.

INVITED LECTURES/PRESENTATIONS/WORKSHOPS

Center for Diverse Leadership in Science, *University of California – Los Angeles* — October 2021
"Next Step Workshops: Career Planning for Post-Graduates" (panel)

Department of Geological Sciences, *California State University, Northridge* — April 2021
"Measuring geoscience expertise development using hazard assessments" (seminar)

Department of Geological Sciences, *California State University, Fullerton* — March 2021
"Developing expertise in geoscience" (seminar)

Center for Diverse Leadership in Science Research & Outreach Symposium, *University of California – Los Angeles* — April 2019
"Knowing what I know now: The strategies and support that made graduate school worthwhile" (keynote)

CHAIRED SESSIONS, WORKSHOPS, AND ROUNDTABLES

Geological Society of America Annual Meeting — October 2021
"T165. Measuring Learning in Geoscience Education" (topical session)

Earth Educators' Rendezvous — July 2021
"Rethinking course assessment: Measuring development of expertise" (roundtable)

GRANTS, FELLOWSHIPS, AND AWARDS

Certificate of Achievement in Mentoring in the School of Earth, Energy & Environmental Sciences, *Stanford University* — 2019

Preparing Future Professors Fellowship, *Stanford University* — 2019

Predoctoral Research Development Grant, *Social Science Research Council* — 2019

Harriet Benson Fellowship, *Stanford University* — 2019

Graduate Student Research Grant, *Geological Society of America* — 2018

Graduate Studies Enhancement Grant, *Social Science Research Council* — 2016, 2017

McGee/Levorsen Grant, *Stanford University* — 2016, 2017

Enhancing Diversity in Graduate Education (EDGE) Doctoral Fellowship, *Stanford University* 2015

Mellon Mays Undergraduate Fellowship, *Andrew W. Mellon Foundation* 2013

Curriculum Vitae

Matthew E. Kirby, Ph.D.
California State University, Fullerton
Department of Geological Sciences
Office: MH-276

Lab DBH- 175
Fullerton, CA 92834-6850
Office Phone (657) 278-2158
Lab Phone (657) 278-3303
E-mail mkirby@fullerton.edu

Education.

Professor	California State University, Fullerton, CA	*2015-*
Associate Professor	California State University, Fullerton, CA	*2008-2015*
Assistant Professor	California State University, Fullerton, CA	*2002-2008*
Post-Doc Research Assoc.	University of Southern California Los Angeles, CA	*2001-02*
Projects:	Lacustrine sedimentology; Holocene tropical climate variability and forcings; climate modeling.	
Ph.D.	Syracuse University, Syracuse, NY	*2001*
Advisor:	Dr. Henry T. Mullins	
Dissertation:	14,600 Calendar Years of Decadal-to-Centennial Scale Atmospheric Circulation and Precipitation Change, Fayetteville Green Lake, NY.	
M.Sc.	University of Colorado/Institute of Arctic and Alpine Research, Boulder, CO	*1996*
Advisor:	Dr. John T. Andrews	
Thesis:	Mid to late Wisconsin Ice Sheet/Ocean Interactions in the Northwest Labrador Sea: Sedimentology, Provenance, Process, and Chronology.	
A.B.	Hamilton College, Clinton, NY	*1993*
Advisor:	Dr. Eugene W. Domack	
Thesis:	High Resolution Seismic Stratigraphy and Sedimentological Analysis of Holocene Glacial Marine Sediments in the Palmer Deep Basin, Bellingshausen Sea, Antarctica. Elected as Associate Member to Sigma Xi, The Scientific Research Society (1993)	

Teaching Experience.

2002-	California State University, Fullerton, CA **Assistant/Associate/Full Professor:** Physical Geology (GEOL 101); Honors Program: Critical Thinking (101H); Earth's Atmosphere (GEOL 140); Earth's Atmosphere and Oceans (GEOL 140); Earth's Environmental Crises (GEOL 310T); General Oceanography (GEOL 333); Surface Processes and Hydrology (GEOL 335); Writing in the Geosciences (GEOL 410); Paleoclimatology (GEOL 440); Environmental Geology and Planning (GEOL 470); Advanced Topics in Geology (GEOL 500); Paleolimnology (GEOL 510T); Geoscience Seminar (GEOL 590).

Publications (peer-reviewed only [accepted, in press, in revisions, or in review]).

52) In Revisions, Angela Daneshmand, Joseph Carlin, Brady Rhodes, **Matthew Kirby**, R. Leeper, R. Smith, S. Loyd, Michaela Adler. Identifying coseismic subsidence using salt marsh stratigraphy from a Southern California coastal wetland. GSA Bulletin. (11/1/18).

51) 2021, Scott W. Starratt, **Matthew E. Kirby**, and Katherine Glover. Diatom Record of Holocene Moisture Variability in the San Bernardino Mountains, California, USA. *M. R. Rosen et al. (eds.)*, Limnogeology: Progress, Challenges and Opportunities *in* Syntheses in Limnogeology. Springer Nature Switzerland AG 2021. DOI: https://doi.org/10.1007/978303066576-0_11

50) 2021, Marden, Michael; Holt, Katherine; Ryan, Matthew; Carrasco, Joe; Marsaglia, Kathleen; **Kirby, Matthew**; Palmer, Alan. Stratigraphy and vegetation signals from an upland, landslide-dammed, paleolake during the Last Glacial-Interglacial Transition, Waipaoa Sedimentary System, Hikurangi Margin, eastern North Island, New Zealand New Zealand Journal of Geology and Geophysics. pp. 1-22. DOI: https://doi.org/10.1080/00288306.2021.1947327

49) 2021, Jenifer A. Leidelmeijer#, **Matthew E. C. Kirby***, Glen MacDonald, Joseph A. Carlin, Judith Avila#, Jiwoo Han#, Benjamin Nauman#, Sean Loyd, Kevin Nichols, Reza Ramezan. Younger Dryas to early Holocene (12.9 and 8.1 ka cal yr BP) limnological and hydrological change at Barley Lake, CA (northern California Coast Range). Quaternary Research. pp. 1-15. DOI: https://doi.org/10.1017/qua.2021.9 *corresponding author, #student author

48) 2021**,** Routson, C.C., Kaufman, D.S., McKay, N.P., Erb, M.P., Arcusa, S.H., Brown, K.J., ***Kirby, M.E.,*** Marsicek, J.P., Anderson, R.S., Jiménez-Moreno, G., Rodysill, J.R., Lachniet, M.S., Fritz, S.C., Bennett, J.R., Goman, M.F., Metcalfe, S.E., Galloway, J.M., Schoups, G., Wahl, D.B., Morris, J.L., Staines-Urías, F., Dawson, A., Shuman, B.N., Gavin, D.G., Munroe, J.S., Cumming, B.F., 2021. A multiproxy database of western North American Holocene paleoclimate records. Earth System Science Data. 13, 1613-1632. https://doi.org/10.5194/essd13-1613-2021

47) 2021**,** Lund, S., Mortazavi, E., Platzman, E., **Kirby, M.E.**, Stoner, J., Okada, M. Rock Magnetic Variability of Quaternary Deep-Sea Sediments from the Bering Sea and their Environmental Implications. Deep Sea Research Part I. https://doi.org/10.1016/j.dsr.2021.103487

46) 2021 **Kirby, M.E.,** Patterson, W.P., Ivanovici*, L., Sandquist, D., Glover, K.C., 2018. Evidence for a large middle Holocene flood event in the Pacific southwestern United States (Lake Elsinore, California), in: Starratt, S.W., Rosen, M.R. (Eds.), From Saline to Freshwater: The Diversity of Western Lakes in Space and Time. Geological Society of America Special Paper 536. (*student).

45) 2020, Glover, K.C., Chaney, A., **Kirby, M.E.**, Patterson, W.P. and MacDonald, G.M., 2020. Southern California Vegetation, Wildfire, and Erosion Had Nonlinear Responses to Climatic Forcing During Marine Isotope Stages 5–2 (120–15 ka). Paleoceanography and Paleoclimatology, 35(2), p.e2019PA003628**.**

44) 2019, Katherine Baumberger; M.V. Eitzel; **Matthew E. Kirby**; Michael H. Horn. Movement and habitat selection of the western spadefoot (*Spea hammondii*) in southern California. PLoS ONE 14(10): e0222532. https://doi.org/10.1371/journal.pone.0222532

43) 2019, **Matthew E. Kirby,** Stefanie A. Mayer, William T. Anderson, Brenna Hess, Corey Stout, Jennifer Palermo, Jenifer Leidelmeijer, Hogan Rangel, Gregory Weisberg, and Amanda Shellhorn, Mojave Climate Hidden in Lake Mud, Mojave National Preserve Science Newsletter. (peer reviewed [n=3]) https://www.nps.gov/moja/learn/science-newsletter.htm

42) 2019 **Kirby,** M.E.C., Patterson, W.P., Lachniet, M., Noblet, J.A., Anderson, M.A., Nichols, K., Avila*, J. Pacific Southwest United States Holocene summer Paleoclimate inferred from Sediment $\delta^{18}O_{(calcite)}$ values (Lake Elsinore, CA). Frontiers in Earth Science vol. 7, article 74, 14pp. https://doi.org/10.3389/feart.2019.00074. Open Access (*student).

41) 2018 **Kirby, M.E.,** Heusser, L., Scholz, C., Ramezan, R., Anderson, M.A., *Markle, B., Rhodes, E. Glover, K.C., *Fantozzi, J., *Hiner, C., *Price, B., *Rangel, H., 2018. A late Wisconsin (32 10k cal a BP) history of pluvials, droughts and vegetation in the Pacific south west United States (Lake Elsinore, CA). Journal of Quaternary Science 33, 238-254. (*student)

40) 2018 Bryan Shuman, Cody Rouston, Nicholas McKay, Sherilyn Fritz, Darrell Kaufman, **Matthew Kirby**, Connor Nolan, Greg Pederson, and Jeannine St. Jacques, Placing the Common Era in a Holocene context: millennial to centennial patterns and trends in the hydroclimate of North America over the past 2000 years, Climate of the Past, 14, 665-686. https://doi.org/10.5194/cp-14-665-2018

39) 2017 Holden, A.*, Southon, J., Kipling, W., **Kirby, M.**, Aalbu, R., and Markey, M., A 50,000-year insect record from Rancho La Brea, Southern California: Insights into past climate and fossil\deposition, Quaternary Science Reviews 168, 123-136. https://doi.org/10.1016/j.quascirev.2017.05.001 (*student)

38) 2017 K. Glover*; G. MacDonald; **M. Kirby**; E. Rhodes; L. Stevens; E. Silveira; S. Lydon; A. Whitaker. Insolation and North Atlantic Climate Forcing in alpine Southern California since 125 ka, Quaternary Science Reviews 167, 47-62. (*student)

37) 2017 Leeper*, R., Rhodes, B., **Kirby, M.E.**, Scharer, K.M., Carlin, J.A., Hemphill-Haley, E., Avnaim-Katav, S., MacDonald, G.M., Starratt, S.W., Aranda*, A.N., Evidence for coseismic subsidence events in a southern California coastal saltmarsh, Scientific Reports 7, 44615, doi:10.1038/srep44615 (*student)

36) 2016 Hiner, C.A.*, **Kirby, M.E.#**, Bonuso, N., Patterson, W.P., Palermo, J., Silveira, E., Late Holocene hydroclimatic variability linked to Pacific forcing: evidence from Abbott Lake, coastal central California. Journal of Paleolimnology: 56 (4), 299-313 (*student; #corresponding and lead author M.E. Kirby)

35) 2016 **Kirby, M.E.**, Climate science: Water's past revisited to predict its future. Nature 532:44-45.

Non-Peer Reviewed Papers/Commentaries/Articles.

(3) 2017 **Kirby, M.E.,** CSUF expert explains relationship between the Pacific Ocean and California's drought history (invited commentary) http://www.ocregister.com/articles/california-740685-water-southern.html

Abstracts (up-to-date as of 01/20/22 n = 156).

Grants and Contracts (bold red = funded). Total awarded $1,695,661; Total to CSUF $1,112,457

California State University, Fullerton, CA

2021 Upgrades and Acquisitions for the Collaborative Cal-State Fullerton Paleoclimate, Coastal Processes, and Archaeology Lithics Research Laboratories (*in review* at **NSF-IF**; $247,680). PI: Dr. Matthew Kirby (CSUF Department of Geological Sciences); co-PIs: Dr. Edward Knell (CSUF Department of Anthropology) and Dr. Joe Carlin (CSUF Department of Geological Sciences), submitted on 09/07/21

2021 Collaborative Research: The California Precipitation Dipole: Spatiotemporal Variability and Forcings Over the Past 3000 Years: (***supplemental funding* awarded** at **NSF-EAR P2C2**; $17,527). PI: Matthew E. Kirby. (8/15/21)

2021 Learning from California's Past Water History to Prepare for the Future: A Sediment Study at Silver Lake, CA (*in review* at **CSU WRPI**, $8,072). PI: Dr. Matthew Kirby, submitted June 19, 2021

2020 Learning from the Past - Informing for the Future: A history of Late Holocene floods along the Ping River, Thailand ***written, submitted (8/1/20), and returned (8/28/20) due to COVID-19*** at **National Geographic Society**; $29,582). PI: Dr. Matthew E. C. Kirby, co-PI: Dr. Joe Carlin (asked to resubmit in Fall 2021 or TBA depending on COVID-19)

2019 A Transdisciplinary Temporal, Spatial, and Site Function Based Approach to Establishing Prehistoric Settlement Patterns around Pluvial Lake Mojave, Mojave Desert, California (*not funded* at **NSF-BCS**; $316,160). PI: Dr. Edward Knell (CSUF Department of Anthropology); co-PIs: Dr. Matthew Kirby and Dr. Joe Carlin (CSUF Department of Geological Sciences), submitted on 12/20/19

2019 Lake-Margin Wetland Habitat and Resource Patch Dynamics at Pluvial Lake Mojave and other Mojave Desert Pluvial Lakes (***funded*** at **Anza Borrego Foundation, Robert S. Begole Archaeological Research Grant**; $5,000). PIs: Ed Knell and Matthew E. Kirby

2019 Multidisciplinary investigation of determining channel incision ages in the Carrizo Plain, California (***funded*** at **SCEC**; $38,241). PIs: Sinan O. Akçiz and Matthew E. Kirby.

2018 Collaborative Research: Documenting drought frequency, severity, and extent from the Holocene to the Anthropocene in semi-arid peninsular India (*not funded* at **NSF** International Research Experiences for Students (IRES) Track 1; $471,000). Lead PI: Andrew Michelson (SUNY, Maritime). Collaborative PIs: Bhattacharya (CU Boulder) and Leonard-Pingel (OSU-Newark); **Senior Collaborator:** Matthew E. Kirby (CSUF).

2018 Sailing in the Mojave Desert: (***funded*** at **CSUF RSCA**; $15,000). PI: Matthew E. Kirby.

2018 Late Glacial Human-Environment Interactions at Glacial Lake Mojave: (***funded*** at ***BLM***; ~$9,000). PI: Matthew E. Kirby. Co-PI: Ed Knell

2018	Re-Examining Southern California Lake Sediment Cores with Environmental DNA to Revolutionize How We Study the Past: (***funded*** at **NSF BCS-GSS**; $207,023, no funds to CSUF). **PIs:** Rachel Meyer, Beth Shapiro, Don Hankins, Glen MacDonald, Bob Wayne (all UCLA); **Senior Collaborator:** Matthew Kirby
2017	Collaborative Research: The California Precipitation Dipole: Spatiotemporal Variability and Forcings Over the Past 3000 Years: (***funded*** at **NSF-EAR P2C2**; $345,802). PI: Matthew E. Kirby. Co-PIs: J. Carlin (CSUF), Reza Ramezan (CSUF), Kevin Nichols (CSUF), Glen MacDonald (UCLA - $193,430). 06/01/17-05/31/20

External Committees/Service (non-departmental committees).

2021-2022	**Committee Member:** CSUF CNSM DEI Committee for Undergraduate Research
2021	**Organizing Committee:** 3rd Annual SoCal Geomorphology Symposium
2021	**Panelist:** California Forum for Diversity in Graduate Education
2021	***Mentor:*** Meeting of the Mind: Supporting Present and Future Geoscience Educators at local 2YCs and 4YCs (mentee UCI graduate student)
2021	**Committee**: CSU 2021 Water Resources and Policy Initiatives (WRPI) Conference Planning Committee
2020	**Mentor:** CSUF Office of Research and Sponsored Projects Faculty Mentor Program (mentee: Dr. Sarah Grant [CSUF Anthropology])
20XX	**Panelist:** National Science Foundation P2C2 Program (confidential)
2019 & 2020	**Search Committee Member:** CSUF Office of Research and Sponsored Projects Search Committee for the Manager of Research Development position
2019	**Award Committee:** AGU International Award Selection Committee
2018	**Convener:** AGU Session
2018 & 2019	**Committee Member:** AGU Harry Elderfield Student Paper Award Committee
2017 & 2018	**Secretary:** Elected American Geophysical Union Paleoceanography and Paleoclimatology Focus Group Secretary (2-year term)
2017	**Convener:** AGU Session
2016	**Coordinator:** American Geophysical Union Meeting Outstanding Student Presentation Award (OSPA) coordinator for Paleoceanography and Paleoclimatology Focus Group
2016-	**Faculty Mentor:** Titan Athletics Faculty Mentor for CSUF Men's Soccer Team
2016	**Convener:** AGU Session
2016	**Convener:** GSA Session

2016-17 **Search Committee Member:** CSUF NSM Representative for the Search for AVP of Research and Sponsored Programs

2015, 2018 2019, 2020 **Chair:** CSUF Department of Geological Sciences Department Personnel Committee Chair

2015, 2016 **Award Committee:** AGU Dansgaard Mid-Career Award (http://honors.agu.org/scientific-contribution/paleoceanography-and-paleoclimatology/)

2014-present **Review Editor:** Frontiers in Paleoecology

2012-present **Award Committee**: GSA IC Russell Award (http://www.geosociety.org/awards/divisions.htm)

2011-2019 **Chair:** CSUF Department of Geological Sciences Graduate Committee

2002- **Reviewer:** External Tenure Reviewer: 10

2002- **Paper Reviewer:** 138 reviews including: Nature, Geology, Nature Geoscience, Science Advances, Scientific Reports, Marine Geology, Environmental Science and Technology, Hydrogeology Journal, Earth and Planetary Science Letters, Journal of Quaternary Science, Journal of Paleolimnology, Sedimentology, Paleo-3, Geomorphology, Climate Dynamics, Earth Science Reviews, AGU Special Publication Series, Global and Planetary Change, Boletín de la Sociedad Geológica Mexicana, Earth Surface Processes and Landforms, Journal of Arid Environments, Boreas, Quaternary International, Quaternary Science Reviews, Geophysical Research Letters, Quaternary Research, Holocene, The Geological Society Special Publications, The Holocene, Earth Surface Dynamics, SEPM Special Publications, Frontiers Earth Science, Continental Shelf Research, Journal of Sedimentary Research, Climate of the Past

2002- **Grant Reviewer:** 73 reviews including: National Science Foundation, Petroleum Research Fund, Natural Environment Research Council, Israeli Science Foundation, Climate Change Data and Detection Program, National Park Service, ANR

Students Advised (bold = complete; red = MS**)**. *Statistics*: Total advised n = 64 (MSc n = 18; BS/BA = 46; Female n = 37 Hispanic n = 17). As of 11/30/21

(64) 2021- William Bourbois: B.A. Geology in progress for SP23. Chino Hills State Park.

(63) 2021- Ashley Hansen: B.S. Geology in progress for SP23. Chino Hills State Park.

(62) 2021- Jessica Saunders: B.A. Geology in progress for SP23. Chino Hills State Park.

(61) 2021- Raquel Carmona: B.S. Geology in progress for SP23. Chino Hills State Park.

(60) 2021- Nick Burdy: B.S. Geology in progress for SP23. Kelly Lake, CA.

(59) 2021- Samuel Hippard: B.A. Geology in progress for SP23. Carrizo Lake, CA.

(58) 2021- Daisy Quiroz: M.Sc. Geology. Big Lake Holocene lake history.

(57) 2020- Christian Novich: B.S. Geology in progress for SP22. Carrizo Lake CLPC21-4.

(56) 2020- Ashley Scholder: B.S. Geology in progress for SP22. Salton Sea Holocene lakes.

(55) 2020- Sophia O'Barr: B.S. Geology *in progress* for SP22. Maddox Lake

(54) 2019-2021 **Jin Woo Im**: B.S. Geology *graduated August 2021*. Thesis Title: Inferring Holocene Lake Level Changes Using Sediments from Kelly Lake, California. 29pp. (#30)

(53) 2019-2021 **Tracy Donelli**: B.S. Geology *graduated August 2021*. Thesis Title: A Holocene Lake Level History at Big Lake, California. 33pp. (#29)

(52) 2019- **Daisy Quiroz**: B.A. Geology. *graduated May 2021*. Thesis Title: Reconstructing the Holocene Lake Level Record for Big Lake, California. 45pp. (#28)

(51) 2019- Leslie Velvarde: B.S. Geology *in progress* for SP22. Kelly Lake

(50) 2018-2020 **Jazleen Barbosa**: B.S. Geology. *graduated August 2020*. Thesis Title: 9,000 years of paleohydrological history inferred using lacustrine sediments from Maddox Lake, CA. 17pp. **(#27)**

(49) 2018-2020 **Lacy Fitzgerald-Boggis**: B.A. Geology *Finished Fall 2019.* Holocene climate change using sediment from North Yolla Bolly Lake, CA. **(#24)**

(48) 2018-2020 **Kyle Campbell:** B.S. Geology. *Finished Fall 2019.* Tule Lake, CA Holocene runoff history. **(#26)**

(47) 2018-2020 **Stephanie Hernandez**: B.A. Geology. *Finished Fall 2019.* Tule Lake, CA Holocene lake level history. **(#25)**

(46) 2018- Hank Dickey: M.Sc. Geology *in progress for F20*. Silver Lake, CA.

(45) 2018-2019 **Adam Rueckert**: M.Sc. Environmental Studies project *graduated May **2019***; Thesis Title: Evidence for a sustained late Holocene dry period in the North Coast Range of California (Barley Lake, CA). 48pp.

(44) 2018- Alex Woodward: M.Sc. Geology *in progress for F20*. North Yolla Bolly Lake, CA.

(43) 2017-2019 **Judith Avila**: B.Sc. Geology *graduated May 2019*. Thesis Title: A 10,000 Year Water History Inferred from North Yolla Bolly Lake Sediments, California. 54pp. **(#22)**

(42) 2016-2018 **Justin Blyar**: B.Sc. Geology *graduated December **2018***. Thesis Title: Reconstructing Late Holocene Climate Using Sediments from Barley Lake, California. 38pp. **(#21)**

(41) 2016-2020 **Christine La Munyon**: B.A. Geology *graduated* summer 2020. Thesis Title: A Late Holocene Reconstruction of Water History in Northern California Using Sediments from Barley Lake, CA. 31pp. **(#26)**

(40) 2016-2021 **Jenifer Leidelmeijer**: M.Sc. Geology *graduated August 2021*. Thesis Title: Reconstructing limnological and Hydrological change during the late glacial to early Holocene and tracking the western United States precipitation dipole using sediments from Barley Lake. 137pp.

(39) 2015-2017 **Hogan Rangel**: B.Sc. Geology *graduated May **2017***. Thesis Title: Statistical Analysis of the Relationship Between Coastal Precipitation and Desert Precipitation Across Southern California. 47pp. **(#20)**

(38) 2015-2016 **Corey Stout**: B.Sc. Geology *graduated December **2016***; Thesis Title: Reconstruction of hydrologic variability during the last 1,200 years using sediments from Ford Lake in the Mojave Desert, California. 35pp. **(#19)**

(37) 2014-2016 **Brenna Hess**: B.A. Geology *graduated May **2016***; Thesis Title: Reconstruction of fire and climate from the Ford Lake sediments: southeast Mojave Desert, California. 33pp. **(#18)**

(36) 2014-2016 **Stefanie Mayer**: M.Sc. Geology *graduated January **2016***; Thesis Title: A 1200 Year History of Hydrologic Variability Using Sediment From Ford Lake, CA. 101pp.

(35) 2014-2017 Emily Silveira: M.Sc. Geology *exited MS program in Spring 2017*.

Invited Talks (*not* including National and Regional Research Conferences [e.g., GSA, AGU, AAG, etc.]).

62) 2022 **UC Santa Barbara** Department of Earth Science Seminar Series

61) 2021 **International Union for Quaternary Research (INQUA)** Stratigraphy and Chronology Commission (SACCOM) Virtual Seminar Series

60) 2021 **Hamilton College** Virtual Alumni Talk Series

59) 2019 **Dana Point Science Night** Talk.

58) 2019 **Chiang Mai University.** Department of Geological Sciences

57) 2019 **Elsinore Valley Municipal Water District.** City of Lake Elsinore.

56) 2019 **CSUF** Library Faculty Noontime Talks.

55) 2019 **Los Angeles Basin Geological Society** Talk. Long Beach.

54) 2018 **CEPSYM Conference** at UC Davis. Invited Speaker.

53) 2018 **CSDCO Workshop** in Arlington, VA.

52) 2018 **CSUF CCAMS** Grant Happy Hour.

51) 2018 **MUCH Workshop** (A Multi-proxy lacustrine approach to Understanding the Climatic and environmental History in semi-arid western India) at Minneapolis, MN. Invited Speaker.

50) 2018 **Fullerton College Natural Sciences Seminar**.

49) 2018 **Southwest Extreme Precipitation Symposium (SWEPSYM)** at SCRIPPS Institute of Oceanography. Invited Speaker.

48) 2017 **CSUF Research Festival Day: Connecting Faculty with Campus Collaborators.** Invited Keynote Speaker.

47) 2016 **SoSAFE workshop at the Southern California Earthquake Center (SCEC) Annual Fall Meeting**: Invited Speaker

46) 2016 **Binghamton University Lecture Series:** A Muddy Perspective on Past Climate.

45) 2016 **American Chemical Society – Orange County Section:** 2016 special dinner meeting for the outstanding college chemistry students in Orange County, CA

44) 2016 **University of California, Riverside Seminar Series:** Department of Earth Sciences. 15,000 Yrs of Drought and Pluvials in the Coastal Southwest United States.

Biographical Sketch
Dr. Jeffrey R. Knott

Professional Preparation

UCLA	Geology	B.S. 1983
CSU Los Angeles	Geology	M.S. 1992
UC Riverside	Geological Sciences	Ph.D. 1998

Appointments

2001-present	Asst.-Assoc.-Full-Emeritus Professor/G.E. Coord.	CSU Fullerton
1997-2001	Senior Geologist	UNOCAL Corp.
1989-1992	Associate Engineering Geologist	Calif. Dept. of Transportation
1984-1988	Staff Geologist	Masterman & Assoc., Inc.

PEER-REVIEWED PUBLICATIONS (2018-2022)

CSUF undergraduate student (*); CSUF graduate student ($^{\#}$); graduate student from another institution ($^{\$}$)

Knott, J.R., Sarna-Wojcicki, A.M., Barron, J., Wan, E., Heizler, L., and Martinez*, P., *accepted*, Tephrochronology of the Monterey and Modelo Formations, California, in, Aiello, I., Barron, J., Ravelo, C., eds., Understanding the Monterey Formation and Similar Biosiliceous Units across Space and Time: GSA Special Paper.

Harmon, R.S., Khashchevskaya$^{\$}$, D., Morency$^{\$}$, M., Owen, L.A., Jennings, M., **Knott**, J.R., and Dortch, J.M., 2021, Analysis of rock varnish from the Mojave Desert by handheld laser-induced breakdown spectroscopy; Molecules 2021, v. 26, 5200.

Gleason$^{\$}$, C., Frisbee, M., Rademacher, L., Sada, D., Meyers$^{\$}$, Z., **Knott**, J., Hedlund, B., 2020, Hydrogeology of desert springs in the Panamint Range, California, USA: Geologic controls on the geochemical kinetics, flowpaths, and mean residence times of springs: Hydrological Processes, v. 34, n. 13, p. 2923-2948.

Craddock, J.P., Malone, D.H., Wartman, J., Kelly, M.J., Junlal, Liu, Bussolotto, M., Invernizzi, C., **Knott**, J., and Porter, R., 2019, Calcite twinning strains from syn-faulting strike-slip fault gouge: small-offset strike-slip, normal and thrust faults: International Journal of Earth Sciences, v. 109(1), p. 1-42.

Muessig, S.J., Pennell, W.M., **Knott**, J.R., and Calzia, J.P., 2019, Geology of the Monte Blanco Borate Deposits, Furnace Creek Wash, Death Valley, California: U.S. Geological Survey Open-File Report 2018-1111, 30 pp.

Knott, J.R., Wan, E., Deino, A.L., Casteel, M., Reheis, M.C., Phillips, F.M., Walkup, L., McCarty*, K., Manoukian*, D.N., and Nunez*, E., 2019, Lake Andrei: A Pliocene pluvial lake in Eureka Valley, eastern California, in, Starratt, S. and Rosen, M., eds., From Saline to Freshwater: The Diversity of Western Lakes in Space and Time: Geological Society of America Special Paper 536, p. 125-142.

Knott, J.R., Liddicoat, J.C., Coe, R.S., and Negrini, R.M., 2019, Radiocarbon and paleomagnetic chronology of the Searles Lake Formation, San Bernardino County, California, U.S.A., in, Starratt, S. and Rosen, M., eds., From Saline to Freshwater: The Diversity of Western Lakes in Space and Time: Geological Society of America Special Paper 536, p. 81-95.

Brush$^{\$}$, J.A., Pavlis, T.L., Hurtado, J.M., Jr., Mason, K.A., **Knott**, J.R., and Williams, K.E., 2019, Evaluation of field methods for 3-D mapping and 3-D visualization of complex metamorphic structure using multi-view stereo terrain models from ground-based photography: Geosphere, v. 15, n.1, p. 188-221.

Knott, J.R., and Garcia, A.L., 2018, Replicate photography and stability of the Death Valley landscape: 10th Death Valley Natural History Conference, November 6-8, 2015, Furnace Creek, CA, p. 245-265.

Knott, J.R., Phillips, F.M., Reheis, M.C., Sada, D., Jayko, A., and Axen, G., 2018, Geologic and Hydrologic Concerns about Pupfish Divergence during the Last Glacial Maximum: Proceedings of the Royal Society B, v. 285: 20171648.

Knott, J.R., Machette, M.N., Wan, E., Klinger, R.E., Liddicoat, J.C., Sarna-Wojcicki, A.M., Fleck, R.J., Deino, A.L., Geissman, J.W., Slate, J.L., Wahl, D.B., Wernicke, B.P., Wells, S.G., Tinsley, J.C. III, Hathaway*, J.C., and Weamer*, V.M., 2018, Late Neogene-Quaternary tephrochronology, stratigraphy and paleoclimate of Death Valley, CA, U.S.A.: Geological Society of America Bulletin, v. 130, n. 7/8, p. 1231-1255.

ABSTRACTS/PRESENTATIONS (2018-2022)

Knott, J., Mahan, S., Bright, J., Langer*, L., Ramirez*, A., McCarty*, K., and Garcia, A., 2022, Pliocene development and MIS-4 freshwater lake deposits of Deep Springs Valley, western Great Basin, Inyo County, California: Implications for regional tectonics and paleoclimate: GSA Abstracts with Programs (GSAAP), v. 53.

Khashchevskaya$^{\$}$, D., Morency$^{\$}$, M., Owen, L.A., Harmon, R.S., **Knott**, J.R., and Dortch, J., 2021, Analysis of rock varnish from east-central California by handheld laser-induced breakdown spectroscopy: AGU Fall meeting.

Martinez*, P., **Knott**, J.R., Sarna-Wojcicki, A.M., Heizler, L., and Wan, E., 2021, Tephrochronology of the Modelo Formation at Balcom Canyon, Ventura County, California: GSAAP, v. 52.

Langer*, L., **Knott**, J.R., Clemens-Knott, D., and Garcia, A.L., 2019, Tephrochronology, And Detrital Zircon Dating Of Pliocene Fluvial Conglomerate, Deep Springs Valley, Ca: Implications For Eastern California Paleohydrology: GSAAP, v. 51.

Craddock, J.P., Malone, D., Wartman, J., Kelly, M., Liu, J., Bussolotto, M., Invernizzi, C., **Knott**, J.R., and Porter, R.C., 2019, Twinning Strains From Syn-Faulting Calcite Gouge: Small-Offset Strike-Slip, Normal And Thrust Faults: GSAAP, v. 51.

Frisbee, M.D., Phillips, F.M., Van Wijk, J., Axen, G.A., Wilson, J.L., Sada, D.W., **Knott**, J.R., Rademacher, L.K., and Hedlund, B.P, 2019, Hydrological Fragmentation And Genetic Isolation Of Springs Following Tectonic Extension In The Southern Great Basin Of NV And CA: GSAAP, v. 51.

Phillips, F.M., Lutz[$], B., Axen, G.A., and **Knott**, J.R., 2019, Regional-Scale Detachment Faulting As a Mechanism For Crustal Extension In The Northern Portion Of The Eastern California Shear Zone: GSAAP, v. 51.

Lutz[$], B., Berry[$], M., Umek, J., Phillips, F.M., Sada, D.W., **Knott**, J.R., Van Wijk, J., and Axen, G.A., 2019, Tectonic Fragmentation Of Landscape Drives Species Endemism In Death Valley Springs: GSAAP, v. 51.

Knott, J.R., Lutz[$], B., Heizler, M., Phillips, F.M., and Heitkamp*, K., 2019, Tectonic Reorganization in the Death Valley Area at 4 Ma: GSAAP, v. 51.

Knott, J. R., Wan, E., Deino, A.L., Casteel, M., Reheis, M. C., Phillips, F. M., Walkup, L. C., McCarty*, K. R., Manoukian*, D. and Nunez*, E., 2018, Lake Andrei: A Pliocene Pluvial Lake in Eureka Valley, Eastern California: GSAAP, v. 50, n. 6.

Deino, A.L., **Knott**, J. R., Renne, P.R., Hemming, S., and Turrin, B., 2018, Development of a ~3.3 Ma Sanidine Standard for $^{40}Ar/^{39}Ar$ Dating: GSAAP, v. 50, n. 6.

Avila*, S.T., Lackey, J.S., Lutz[$], B., **Knott**, J.R., Mueller[$], N., 2018, Paleographic Interpretation of the Fish Lake Valley/Horse Thief Hills Area Using Geochemistry of Volcanic Rocks: GSAAP, v. 50, n. 5.

Walker*, A., Mueller[$], N. J., Lutz[$], B., **Knott**, J.R., Lackey, J. S., 2018, Geochemical Correlation of Basalts in the Sylvania Mountains, California and Nevada: GSAAP, v. 50, n. 5.

Knott, J.R., Lutz[$], B., Griffie*, E., Clemens-Knott, D., Chen[#], N., Calzia, J.P., 2018, Identification of Hunter Mountain Batholith Clasts in the Furnace Creek Formation, Death Valley, California: GSAAP.

Jimenez*, E., **Knott**, J.R., Lackey, J.S., 2018, Geochemistry of Basalts in the White Moutains and Silver Peak Range, California and Nevada: Southern California Academy of Sciences (SCAS) meeting, Cal Poly Pomona.

Avila*, S., Mueller[$], N., Lutz[$] B., **Knott**, J.R., Lackey, J.S., 2018, Paleogeographic Interpretation of the Fish Lake Valley/Horse Thief hills area using Geochemistry of Volcanic Rocks: SCAS meeting, Cal Poly Pomona.

Knott, J.R., 2018, Geologic Perspectives on Pupfish (Cyprinodontidae) Dispersal: SCAS meeting, Cal Poly Pomona.

SYNERGISTIC ACTIVITIES (2018-2022)

Co-Convener – Technical Session, Geological Society of America Cordilleran Section Meeting (March, 2022)
Chair, Board of Governors, California Desert Studies Consortium (2016-2018)
Member, Board of Governors, California Desert Studies Consortium (2014-2018)

STUDENTS ADVISED (2017-2022)

CSUF Undergraduate Thesis Students Advised; * - professional geologist; ^ - graduate school

Shayna Avila*^	Emma Griffie*	Eddie Jimenez	Grant Kennis*
Lindsey Langer*	Eddie Reyes*	Amber Walker*^	Priscilla Martinez^
Matthew Pilker^			

Thesis Committee Member at other universities

Jade Brush*, M.S., University of Texas at El Paso Brandon Lutz*, Ph.D., New Mexico Tech

AWARDS/HONORS

2019 - Elected Fellow of the Geological Society of America

GRADUATE AND POSTDOCTORAL SPONSORS

Dr. Stephen G. Wells – New Mexico Institute of Technology
Dr. Martin L. Stout (deceased) – CSU Los Angeles
Dr. G. Todd Ririe – UNOCAL Corp

W. RICHARD LATON, Ph.D.

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wlaton@earthforensics.com

VITAE

EDUCATION

Ph.D. (1997), Geology with an emphasis in Hydrogeology, Western Michigan University
Groundwater – Kalamazoo River Interaction near the Parchment City Well Field, Parchment, Michigan.

M.S. (1992), Environmental Earth Science (Coastal Geomorphology), Western Michigan University
Small-Scale Coastal Cells as Control Mechanisms on Sediment Movement; Identification and Mapping.

B.A. (1989), Earth Science (Oceanography), Saint Cloud State University, Minnesota
Density Flow Analysis of Turbidity Currents.

PROFESSIONAL SUMMARY

Dr. Laton is an expert in the field of geology/hydrology/hydrogeology. He is currently an Associate Professor of Hydrogeology in the Department of Geological Sciences, California State University, Fullerton and the prestigious 2014 Ross Oliver award winner. This is a continuation of a career that includes years of teaching, consulting, litigation support and management experience. Dr. Laton possesses extensive knowledge in the areas of hydrogeology, soil and water contamination, fluvial geomorphology, hydrology and surface water, wetlands, coastal monitoring/geomorphology, environmental field sampling techniques and well hydraulics-well design as well as environmental remote sensing/GIS. His classes at the university encompass topics including; water quality, environmental sampling, groundwater modeling, well hydraulics, oceanography, and basic geology. He enjoys introducing students to applied research and acts as the faculty advisor to a large number of upper-level students. He has also acted as a consultant for a numerous companies and agencies that need input on the above subjects as well as natural hazard assessment and mapping.

TEACHING EXPERIENCE

2006 – Present California State University, Fullerton. CA
Associate Professor of Hydrogeology. Responsible for teaching lower division classes in Hydrogeology (GEOL 436); Physical Geology (GEOL 101-GE); Water Crisis in California (GEOL 310T): Sedimentology and Stratigraphy (GEOL 321); Hydrology and Surface Processes (GEOL 335) and upper division classes in Groundwater Modeling; Environmental Sampling and Protocols; Well Hydraulics and Aquifer Analysis (GEOL 535T)

2015 – 2018; 2019 - 2022 Western Michigan University, Kalamazoo, MI.
Adjunct Associate Professor, Department of Geological and Environmental Sciences.

2000 – 2006 California State University, Fullerton. CA
Assistant Professor of Hydrogeology. Responsible for teaching lower division classes in Hydrogeology (GEOL 436); Meteorology (GEOL 340-GE); Oceanography (GEOL 333-GE); Physical Geology (GEOL 101-GE) and Lab (GEOL 101L-GE) and upper division classes in Groundwater Modeling; Environmental Sampling and Protocols; Well Hydraulics and Aquifer Analysis (GEOL 535T); Research Methods in Geology (501); Geology Seminar (GEOL 590)

2001 – 2016 Western Michigan University. Kalamazoo, MI

Responsible for Summer Field Course in Hydrogeology. Teach at least 1-week graduate level field course(s) every year including (1) Principles of Well Drilling and Installation; (2) Principles and Practices of Aquifer Testing; (3) Remediation Design and Implementation

1999 – 2000 California State University, Fullerton. CA

Part-time instructor. Responsible for Oceanography (GEOL 333) and Water Quality (GEOL 437).

Other Teaching Experience

2021 Instructor – Field Training Day – Gregg Drilling
2021 Instructor – California Public Water Supply Systems (postponed by Covid)
2018 Instructor – CalGeo – Soil Logging and Litigation
2016-17 Instructor – SCGS – Soil Sampling and Classification Short-Course

CERTIFICATIONS

California Geologist (PG-7098) California Hydrogeologist (CHg-958)

TEACHING PHILOSOPHY

As a professor, my main goal is to provide students with practical experience essential for building a successful career. In addition to providing the "*nuts and bolts*" of a subject, I encourage students to apply traditional knowledge to innovative approaches through applied research and hands-on experience. I aspire to motivate students by fostering participation in unique learning opportunities, many of which are provided by local companies, agencies, and vendors willing to share their services and expertise.

Through private and government grants and contracts, I am able to provide multiple funding opportunities to my students, allowing them the means to spend more time on their academic studies and also providing experience through field-related projects. My main research focus is groundwater hydrology and hydrogeology of arid environments. Most of my students directly participate in this research and are able to obtain either Bachelor's or Master's degrees through individual projects for which they are responsible.

I encourage my students to actively participate in professional organizations in order to build strategic partnerships and create a broad reaching network of individuals and indispensable resources. Further, I encourage students to present abstracts and posters at local and national conferences and to publish their research as much as possible in order to stimulate educated discussions with their peers and accomplished professionals.

The best way to measure the effectiveness of my objectives and to judge my goals is to elicit student feedback and evaluation. I am consistently rated very high by my students in their end of semester assessments. My biggest reward as a teacher is a lasting professional and personal relationship with my students. I enjoy working with and supporting students through their academic careers and feel honored when they graduate with a professional degree.

AWARDS, HONORS, SPECIAL QUALIFICATIONS

- NGWA 2014 Ross L. Oliver Award
- NGWA 2014 Keith E. Anderson Award
- Western Michigan University 2011 – Distinguished Alumni Award
- NGWA 2009 McEllhiney Lecturer for Water Well Technology
- International Ground Source Heat Pump Association (IGSHPA) Accredited Trainer (20589-0709)

NATIONAL AND UNIVERSITY COMMITTEES

- CSUF, Hiring Committee for VP Government and Community Relations (2020)
- CSUF, Campaign Congress, 2020-present
- CSUF, Strategic Planning Committee Member, 2019-present
- CSUF, Hiring Committee for VP Advancement (2018)
- CSUF, University Advancement Committee Member, 2003-05; 2011-15; 2017-21 (chair 2017-20)
- CSUF, ENST Advisory Committee, 2004 - present
- WMU, Geosciences Advisory Council Member 2007 - present (co-Chair 2013- 2017)
- GRAC – Educational Committee Member 2009 - present

NATIONAL GROUND WATER ASSOCIATION

- NGWA Research and Education Foundation, President, 2015-2017
- NGWA Research and Education Foundation, Board Member, 2010-2014, 2017-2018
- Scientists and Engineers Division, Board Member, 2004-2008; 2016-2020

- NGWA - McEllhiney Lecture Committee, 2014 - 2018 (chair 2014); 2019 - present
- NGWA – Board of Directors, 2008-2014

FUNDED GRANTS and CONTRACTS
(CSUF total to date through 2020: over $ 3,000,000)

2016-20

- California High Speed Rail Authority ($500,000); Oversee Groundwater issues as they may pertain to construction and operations of the California High Speed Rail. Including groundwater modeling review and deep groundwater monitoring.

2004 – 2014

- Mojave Water Agency ($2,099,000); *Grant for work on Water Resource Evaluation and Mapping – Mojave Desert Region* (Alto, Este, Oeste and Centro Hydrologic Sub-areas).

IN-KIND DONATIONS for Research / Projects

- Supplies for Screen and Gravel Pack Analysis (est. $2,000); Donated by Johnson Screens
- DJI Phantom II (est. $2,500); Donated by Earth Forensics Inc.
- Cave Bear, misc. fossils (est. $200,000); Donated by Gregg Family Foundation
- Woolly Mammoth (est. $500,000); Donated by Gregg Family Foundation
- Software (Visual Modflow) ($2,700); Donated by Earth Forensics Inc.

PROFESSIONAL PUBLICATIONS, ABSTRACTS, PRESENTATIONS and POSTERS

Peer-Reviewed Publications (Published, Accepted, Submitted)

1. Laton, W.R., 2021. *Malibu, California: A Story of Wastewater, Politics, and Science*. The Professional Geologist. 2021; Vol. 58. No. 2, pages 15-19. USPS 590-810 and ISSN 0279-0521
2. Laton W.R., 2019. *New perspectives on horizontal to vertical well ratios for site cleanup*. Remediation. 2019; 30: 27–31. https://doi.org/10.1002/rem.21628
3. [2]Dailey, D., Sauck, W., Sultan, [2]M., Milewski, Laton, W.R., Foster, J., [2]Ahmed, M., Schmidt, C., Eckhart, L., Garcia, A., [2]Chouinard, K., 2015. *Geophysical, geochemical, and remote sensing applications for a better understanding of the structural controls on groundwater flow in the Lucerne Valley, California.* Journal of Hydrology: Regional Studies 3 (2015) 211-232. https://doi.org/10.1016/j.ejrh.2014.12.002
4. Laton, W.R., 2006. *Building Groundwater Monitoring Wells on Campus – A Case Study and Primer*. Journal of Geoscience Education (Vol. 54, No. 1), pgs 50-53. https://doi.org/10.5408/1089-9995-54.1.50
5. Laton, W.R., Whitley, R.J., and Hromadka II, T.V., 2006. *A Methodology for Identifying the Potential Source of Groundwater Contamination in a Multiple Source Problem Using a New Mathematical Approach*. Hydrogeology Journal. DOI 10.1007/s10040-006-0106-4
6. Laton, W.R., Hromadka II, T.V. and Picciuto J.A., 2006. *Estimating Runoff Quantities for Flow and Volume-based BMP Design.* Hydrological Science and Technology, Volume 22, No.1-4.
7. Laton, W.R., 2004. *Seepage, Flow and Chemical Partitioning Between the City of Parchment Wellfield and the Kalamazoo River, Southern Michigan.* Journal of Floodplain Management (Vol. 4, No. 1), pgs 11-32.
8. Foster, J.F., Laton, W.R., and Perez, R. *Sudden Late Holocene closure of San Elijo Lagoon, northern San Diego County, California.* (in prep)
9. Laton, W.R., Perez, R., Foster, J.F., *UAV Thermal Mapping of the High-Speed Rail (HSR) Route through the San Gabriel Mountains, California.* (in review)

Guidebooks, Full Paper Proceedings and Articles

1. Laton, W.R., Perez, R., and Bausch, D., 2018. Hazard Maps for Riverside County, California. San Diego Association of Geologists annual field trip guidebook (update of earlier version).
2. Laton, W.R. and Krstich, B., 2010. *Zoom Zoom, Public works managers are now using Google Earth to track environmental and water resources*. Public Works Online. (Public Works Manual 2010)
3. Laton, W.R., 2005. The Cutting Edge "*Teaching Hydrogeology in the 21st Century*". NGWA-AGWSE News and Views. (article September 2005)
4. Jenson, J. and Laton, W.R., 2005. Second Annual Groundwater Summit. NGWA-AGWSE News and Views. (article September 2005)
5. Laton, W.R., 2004. *Building Ground Water Monitoring Wells on Campus: A Case Study and Primer*. NGWA-AGWSE News and Views. Vol. 1, Issue 1.
6. D. Bausch, E. Gath, T. Gonzales, and R. Laton, 2000. *GIS-Based Hazard Mapping and Loss Estimation in the Safety Element of the General Plan for Riverside County, California*. California: EERI 6th International Conference on Seismic Zonation, Riverside County, California.
7. Laton, W.R., [1]Perez, R., and Bausch, D., 2000. *New Hazard Maps for Riverside County, California*. San Diego Association of Geologists annual field trip guidebook.
8. Laton, W.R., 1992. *Small-Scale Coastal Cells as Control Mechanisms on Sediment Movement; Identification and Mapping*. OCEANS '92, Newport, Rhode Island.

Public Reports and White Papers

1. Laton, W.R., Foster, J., Perez, R., and Becker, M., 2020. *Phase I1 Groundwater Study – Palmdale to Burbank Section of California High Speed Rail*. California High Speed Rail Authority.
2. Laton, W.R., 2019. *Reconsidering Horizontal to Vertical Well Ratios for Site Clean-up*. EnRx.
3. Laton, W.R., 2016. *Phase 1 Groundwater Study – Palmdale to Burbank Section of California High Speed Rail*. California High Speed Rail Authority.
4. Laton, W.R., 2016. *DTSC Aquifer Test Guidance*. Reviewer for draft guidance document.

Abstracts, Presentations and Posters

1. Laton, W.R., 20-Years of CSUF Research – From the Mojave to the Ocean. (ENST Invited)
2. Laton, W.R., Havranek, T., Robinson, L. and Koenigsberg, S., 2020. *Fundamentals of Horizontal Well Systems and Modeling Tools.* AEHS, 30th Annual International Conference on Soil, Sediments, Water, Energy, (Virtual - Workshop)
3. Laton, W.R., 2021. *A Decision Tool to Determine if Horizontal Well Systems Can Replace Vertical Well Systems.*
4. Laton, W.R., 2021. *Groundwater of California*. WMU Geology (Invited)
5. Laton, W.R., Havranek, T., Robinson, L. and Koenigsberg, S., 2020. *Fundamentals of Horizontal Well Systems and Modeling Tools.* AEHS, 36th Annual International Conference on Soil, Sediments, Water, Energy, (Virtual - Workshop)
6. Laton, W.R., 2020. *Groundwater of the States: California*. NGWA Webinar Series.
7. Laton, W.R., 2020. *A Decision Tool to Determine if Horizontal Well Systems Can Replace Vertical Well Systems.* AEHS, 36th Annual International Conference on Soil, Sediments, Water, Energy, (Virtual). (abstract/presentation)
8. Laton, W.R., 2020. *New Perspectives on Horizontal to Vertical Well Ratios for Site Cleanup*. 12th International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Battelle, Portland, OR. (abstract/presentation) (*conference postponed*)
9. Laton, W.R., 2020. *Malibu California, Wastewater and Politics* Cal State University, Fresno, CA. (Invited)
10. *2Alonzo, T., Laton, W.R., Hanna, T., 2019. *Comparing Natural Silica Sand and Glass Bead Filter Packs Used in Production Well Design and Construction*. NGWA Expo, Las Vegas, NV. (abstract/presentation) (Outstanding Research Award)
11. Laton, W.R., 2019. *The Concept of Sustainability and the Recruiting of Younger Millennials*. NGWA Expo, Las Vegas, NV. (workshop)
12. Laton, W.R., 2019. *Reconsidering Horizontal to Vertical Well Ratios for Site Clean-up.* AEHS, 29th Annual International Conference on Soil, Water, Energy, and Air. San Diego, CA. (abstract/presentation)
13. Laton, W.R., 2018. *Take my Job*. NGWA Expo, Las Vegas, NV. (workshop)
14. Laton, W.R., 2018. *20-Years of CSUF Research – From Mojave to the Ocean*. California Groundwater Resources Association, Southern Branch. (Invited)
15. Laton, W.R., 2018. *Groundwater – The Water beneath Our Feet*. CSUF Fullerton Arboretum. (Invited)
16. *Perez, R. and *Laton, W.R., 2018. *The Use of UAVs for Groundwater Research.* California State University, San Bernardino. (Invited)
17. *Perez, R. and Laton, W.R., 2017. *UAV's for Use in Groundwater Resources*. NGWA Expo, Nashville, TN. (workshop)
18. Laton, W.R., 2017. *Introduction to Borehole Geophysics*. NGWA Expo, Nashville, TN. (workshop)
19. Laton, W.R., 2017. *Malibu California, Wastewater and Politics*. Southern California Chapter of AEG. (Invited)

20. Laton, W.R., 2017. *Low Altitude Photography Utilizing UAVs – Geologic and Hydrologic Applications*. Los Angeles Basin Geological Society. (Invited)
21. Laton, W.R., 2016. *Preparing for the Field, What to Take?* NGWA Expo, Las Vegas, NV. (workshop)
22. Laton, W.R., 2016. *Wastewater, Politics and Science*. South Coast Geological Society (Invited).
23. Laton, W.R., 2016. *Malibu, California; A Story of Wastewater, Politics and Science*. Western Michigan University. (Invited)
24. Laton, W.R., 2016. *Holding Back the Ocean and Recharging Aquifers with Treated Wastewater.* Minnesota Groundwater Association, Annual Meeting. (Invited)
25. Laton, W.R., 2016. *UAV Mapping and Business Opportunities.* Ground Water Institute. Tucson, AZ. (Invited)
26. Laton, W.R., 2016. *Malibu, California; A Story of Wastewater, Politics and Science*. GSA Section meeting, Ontario, CA. (abstract/presentation)
27. [*]Perez, R., Laton, W.R., Cruikshank, M. and [1]Hugh, C., 2016. *UAV Imagery and Mapping: What are the Capabilities and Limitations?* SAGEEP 2016, Denver, CO. (abstract/presentation)

[1]Undergraduate Student; [2]Graduate Student; * Presenter

SELECTED SHORT-COURSES, WORKSHOPS ATTENDED

- Johnson Screens – Groundwater and Wells
- IGSHPA – Train the Trainer Course
- NGWA – Keeping the Pump Primed, Aquifer Sustainability

AFFILIATIONS

- California Groundwater Association
- Groundwater Resources Association of California
- International Association of Hydrogeology
- National Ground Water Association
- South Coast Geological Society
- International Ground Source Heat Pump Association
- American Institute of Professional Geologists

VOLUNTEER WORK

- WMU Alumni Gathering (2019 - present)
- CSUF Alumni Fall Dinner (2013 - present)
- CSUF Geology Research Day (2017 - present)
- Santiago Middle School – Taught Plate Tectonics and Science (2018)
- Science Olympiad Assistant (2013 - 17)
- Elementary School presentations annually: "*The Water Cycle*"

SUPERVISED COMPLETED THESES

Student Name	Year	Degree	Thesis Title
Nagata, Brayden	2021	BS	Relationship Between Groundwater, Selenium Concentration, and the Corcoran Clay, NW Fresno County, CA
Zeko, Mike	2021	BS	Pomona Perchlorate Study
Strohm, Chelsea	2021	MS-ENST	The Use of Physical Groundwater Models in Higher Education
Allen, Ronald	2020	BS	The Carboniferous and Pleistocene; An Analysis on the Genus Preset within Geologic Time
Rangel, Liliana	2020	BS	Water Budget of the San Gorgonio Mountains Mill Creek and Santa Ana River Water Basin
Martinez, Charles	2020	BS	Implications of Grain Size on Hydraulic Conductivity
Murphy, Patrick	2020	MS-ENST	Evaluating the Fate of Legacy 1,4-Dioxane and NDMA in Orange County's Coastal Aquifers
Severin, Vitoria	2020	MS-ENST	Analyzing the Mission Valley Aquifer as a Groundwater Source in San Diego, CA.
Barragan, Adrian	2019	BS	Examining the Water Quality from a Section of the Santiago Creek
Alonzo, Terrinda	2018	BS	13-Year Analysis of Water Pressure and Chemical Changes from Well CSF-1, Fullerton, CA
Case, Aaron	2018	MS-ENST	Perchlorate in Urban and Industrial Environments
Cragg, Byron	2018	BS	Designing Scientific Payloads for Use on Extra-Planetary Rovers
Emilio, Chelsea	2018	MS-ENST	Urban Firework Fallout
Escobar, Adrian	2018	BS	Ground Source Heat Pump Potential Characterization for California State University, Fullerton
Lopez, Daniel	2018	MS-ENST	Should California Price Water as a Commodity to Increase Conservation?
Meadows, Adam	2018	BS	Investigation and Monitoring the Spread of Water Contaminates Using an Open-Source Database in the Orange County Area
Offner, Erica	2018	MS-ENST	Carbon Dioxide Levels in Water Vapor
Vanderwal, Joshua	2018	BS	Safety Element for Cal State University Fullerton – Understanding of Hazards Surrounding the Campus
Grajeda, Remington	2017	MS-ENST	Shaping Environmental Attitudes in Students: An Inquiry-based Approach
Kennedy, Taylor	2017	MS-ENST	Investigation of the Laguna Cell Beaches Using Lidar and Erosional Examination
Masters, John Paul	2017	MS-ENST	Subsurface Analysis of Orange County Water District's La Palma Groundwater Recharge Basin in Anaheim, California
Forester, Dinielle	2017	BS	Water Budget and Audit: Premier Color Nursery
Ibarra, Nancy	2016	BS	Drilling Methodology: A Field Guide and its Use for the Drilling Industry
Pham, Christine	2016	MS-ENST	Efficacy of Capsaicin-based epoxy coating for preventing attachment of Quagga mussels (Dresissena Bugensis)
Battig, Lisa	2015	MS-ENST	An Educational Kit Elucidating the Connections Between Sanitation, Hygiene and Waterborne Disease
Masters, John Paul	2015	BS	Subsurface Analysis of fluvial sediments from the Holocene-Pleistocene Epochs at California State University, Fullerton, California

Natividad, Anthony	2015	BS	A Hydrogeological Survey of a Mountainous Region: The Significance of Monitoring a Water Budget at a Localized Source
Carreon, Rosangela	2014	MS-ENST	Remote Sensing Climatic Impact on Snow Cover for the San Gabriel Mountains in Southern California
Cortez, Lucy	2014	BS	Wetlands Delineation using Dendrochronology and Historical Rainfall Data to Cross-date the Climatic Stress Regimes in the Prado Dam Basin Located in Corona, Riverside County, California
Law, Natalie	2014	BA	Evolution and Growth of a Mitigation Wetland: A Case Study in Norco, California
Morlan, Randall	2014	MS	The Effects of Agricultural Activities on the Migration of the Hinkley Chromium Plume, San Bernardino County, California
Dubberke, Kirk	2013	BS	Malibu Creek Watershed – Aquifer Testing Analysis
Irani, Fabian	2013	BS	The Use of Groundwater Fluctuations in a Tidal Zone for the Determination of Aquifer Properties
Lockhart, Benjamin	2013	MS-ENST	Colonial Nesting Seabirds in Burris Basin: Forage Prey Availability Assessment and Habitat Enhancement Suggestions
Maine, Lindsay	2013	MS-ENST	Media Blending: Which Combination is Best for Stormwater Discharge from Scrap Metal Recycling Operations?
Vavricka, Emily	2013	MS-ENST	A Forensic Evaluation of Dry Cleaners: A Case Study in Santa Ana, California
Cadaret, Erik	2012	BS	Hydrogeologic Investigation and Geochemistry Analysis of the Sheep Creek Fans Regional Aquifer, San Bernardino County, CA
Dotzer, Alec	2012	BS	Lithologic Analysis of a Soil Layer at Various Points via a Biosparge Pilot Test at a Contaminant Impacted Site in Coachella Valley, Riverside County, CA
Hoffman, Michael	2012	MS	Hydraulic Tomographic Modeling of the Yorba Linda Water Well Field, Yorba Linda, California
Martin, Allen	2012	MS-ENST	Lower Owens River Project, Recovery: A longitudinal imagery analysis of near river vegetation change along the Owens River, Owens Valley, Inyo County, California
Sickler, Heidi	2012	MS-ENST	Environmental Change in the Wetland Ecosystem of Fish Slough in Bishop, California Derived from Wetland Delineation Methods and Aerial Photography
Xayarath, Van	2012	MS-ENST	Orange County's Water Supply: A preliminary research to convert storm channels to natural bottom streams for basin recharge
Evans, Patrick James	2011	MS-ENST	Desalination in Southern California: The Inevitable wave of the future!
Rimbenieks, Mikaila	2011	MS-ENST	Quantifying Forest Natural Background and Road Sediment Yield in Big Bear Lake, California
Barker, Shelby	2010	MS	An Investigation of the Potential for Surficial Recharge in the Lucerne Valley Groundwater Basin, Mojave Desert, CA
Luedy, Justin	2009	MS-ENST	Testing the Relationship of Dissolved Metals in Stormwater, Newport Beach, California
Barthel, Peggy	2008	MS	Water Budget and Hydrogeologic Model of Spring Flow at Limestone Hill, Zzyzx Desert Studies Center
Daley, Dale	2008	BS	Subsurface Mapping of the El Mirage Groundwater Barrier, San Bernardino County, California
Monzon, Eric	2008	MS-ENST	Estimating Applied Irrigation for Urban Landscapes in South Coast Southern California, Using Theoretical and Conventional Means

Ebbs, Veva	2007	MS-ENST	Quantification of Sub-Surface Groundwater Flow from Middle Mojave River Valley Basin into the Harper Lake Basin
Kolstad, Kenneth	2007	MS	Analysis of a Steady-State Model: Prediction of Trichloroethylene Vapor Concentration, Using Known Dissolved Phase Concentration
Lizzi, Anthony	2007	MS	Evaluation of the Potential Groundwater Resources of the Golem Well West Rancho Bernardo, San Diego County, California
Patschull, Eric	2007	MS	Evidence of a North Projecting Ancient Boulder Thalweg in Latest Quaternary Deposits of the Santa Ana River, Orange County, California
Cruikshank, Michael	2006	BS	Hydrogeological Investigation of an Open Alluvial Basin: Oeste Hydrologic Sub-basin, San Bernardino County, California
Dolmat, Joan	2006	BS	Deep Multiport Research Monitoring Well, CSF-1, Fullerton, CA: Stratigraphy, Lithology and Geologic Setting
Hunt, Sean	2006	MS	Artificial Recharge as Possible Causes of Observed Long –Term Change in Transmissivity for the Aquifers of the San Pedro Formation in the Central Basin of the Greater Los Angeles Basin, California
Williams, Steve	2006	MS	Hydrogeologic Investigation of a Shallow Aquifer System with Emphasis on Precipitation Induced Groundwater
Surko, Tammy	2006	MS	Gravity survey of Lucerne Valley, San Bernardino County, Mojave Desert, southern California: implications for basin geometry and structure
Blazevic, Mike	2005	BS	Hydrogeological Investigation of a Closed Alluvial Basin: Lucerne Valley, San Bernardino County, California
Napoli, Nick	2005	BS	Change in Groundwater Storage in the Lucerne Valley Groundwater Sub-Basin — 1954 To 2002, Lucerne Valley, California
Nguyen, Chinh	2005	MS-ENST	Application of Convex Hull in Identifying Pollution Sources in the Central and West Coast Basins, Los Angeles County, California
Brendle, Christine	2004	BS	Remediation of Soil and Groundwater at a Former Service Station
Hajmanouchehri, Daneh	2004	MS-ENST	Water Quality in Relation to Watershed Management in The Lower San Gabriel River, Southern California
McCurdy, Jim	2004	MS-ENST	Water Chemistry and Groundwater Flow for the San Bernardino Mountains
Versluis, Patrick	2004	MS-ENST	The Fate of Perchlorate: A Look at Perchlorate Entering Orange County's Groundwater
Yuen, Pansy	2004	MS-ENST	Performance Assessment on Water Quality and Biological Effects of Urban Stormwater Runoff, Norco Hills Wetland, Riverside County, California
Evans, Rachel	2003	BS	Water Quality Analysis – Yellowstone National Park
Figueroa, Otto	2003	MS	Groundwater Flow Model of a Coastal Aquifer, Malibu, California
Hasegawa, Shuichi	2003	MS-ENST	Environmental Hazard Risk Assessment on Water Resources along the Santa Ana River
Kerza-Kwiatecki, Paul	2003	MS-ENST	Monitoring the Rocky Inter-Tidal Zone of Crystal Cove State Park; Creation of an interactive GIS bio-database
Springer, Ben	2003	MS-ENST	The Importance of Wetland Monitoring: A Case Study of a Restored Wetland in Norco, California
Thomas, Sean	2003	BS	Dewatering Plan for the El Toro Area
DeKraker, Dan	2003	BS	Development of a Ninth Grade Earth Science Course
Brand, Randy	2002	BS	Hydrogeologic and Geologic Considerations for Selected sites near the Santa Margarita, Upper Ysidora, and Lower Ysidora Groundwater Basins in Southern California

Figueroa, Otto	2002	BS	Hydrogeologic Characterization and Assessment of Impacts of Wastewater Discharge for Proposed Construction, Trancas Canyon, Malibu, California
Rosales, Tom	2002	MS-ENST	An examination of the benefits and costs to implement the Municipal Storm Water Permit for Orange County – similarities and differences between coastal and inland cities
Schmucker, Kelly	2002	MS-ENST	Water Quality of a Wetland A Case Study in Norco, CA
Wiles, Steffy	2002	BS	Angels Camp – Gamma Ray Logging Examination and Correlation
Eckhart, Lance	2001	MS-ENST	Vertical Gradient Investigation of a Southern California Landfill
Fields, David	2001	BS	Orange County Groundwater Contour Maps for 2000
Rashidi-Fard, Shaghayegh	2001	BS	Water Quality Testing and Monitoring Program at the Santa Rosa Ecological Reserve
Vortis, Kevin	2001	BS	Geologic History of San Elijo Lagoon San Diego County, California
Mathew Blinstub	2000	MS-ENST	Spatial and Temporal Differences in Surface Water Quality in Newport Bay and San Diego Creek, Orange County, California from 1976 to 1996

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Professional Preparation

University of California	Santa Barbara	Geology	B.Sc. 2005
Univ. of South. California	Los Angeles	Geol. Sciences	Ph.D. 2010
University of California	Los Angeles	Earth, Plan. Sci.	Postdoc 2010-2013

Appointments

Associate Professor, Geol. Sciences, California State University, Fullerton (2019-present)
Assistant Professor, Geol. Sciences, California State University, Fullerton (2013-2019)
Instructor, International Geobiology Course (2014-2016)
Agouron Institute Postdoc, Univ. of Calif., Los Angeles (July 2011-Aug 2013)
Postdoctoral Researcher, Univ. of California, Los Angeles (Sept 2010-June 2011)
Research Assistant, University of Southern California (2009-2010)
Incoming Teaching Assistant Mentor, University of Southern California (2009)
Teaching Assistant, University of Southern California (2005-2009)

Awards and Honors

Received, Outstanding Untenured Faculty Member CSUF NSM 2019
Nominee, Outstanding Untenured Faculty Member CSUF NSM 2018
Nominee, Outstanding Untenured Faculty Member CSUF NSM 2017
Received, Oakley Fellowship USC 2009-2010
Received, Award for Excellence in Teaching USC 2009
Nominee, Award for Excellence in Teaching USC 2008

Classes Taught

Introduction to Geology (Geol 101)
Environmental Geology (Geol 470)
Geochemistry (Geol 406)
Environmental Isotope Geochemistry (Geol 506T)

Peer-Reviewed Publications (* indicates advised student author)

Cui, H., Kaufman, A.J., Xiao, S., Zhou, C., Zhu, M., Cao, M., ***Loyd, S.J.***, Crockford, P., Liu, X., Goderis, S., Wang, W., Guam, C., 2021, Coupled C, S, and Ba cycles in response to the oxygenation of Earth's surface environments: Insights from the Ediacaran Shuram excursion, Journal of the Geological Society.

Medina-Ferrer, F., Rosen, M.R., Feyhl-Buska, J., Russell, V.V., Sonderholm, F., ***Loyd, S.J.***, Shapiro, R., Stamps, B.W., Petryshyn, V., Demirel-Floyd, C., Bailey, J.V., Johnson, H.A., Spear, J.R., Corsetti, F.A., 2021, Potential role for microbial ureolysis in the rapid formation of carbonate tufa mounds, Geobiology.

Asadi, E., Asadi, A., Daneshian, J., Woods, A.D., ***Loyd, S.J.***, 2021, Evidence of Mid-Cretaceous carbon cycle perturbations and OAE2 recorded in Cenomanian to

middle Campanian carbonates of the Zagros fold–thrust belt basin, Iran: Journal of Asian Earth Sciences 218, 104863.

Upadhyaya, D., Lucarelli, J., Arnold, A., Flores, R., Bricker, H., Ulrich, R.N., Jesmok, G., Santi, L., Defliese, W., Eagle, R.A., Carroll, H.M., Bateman, J.B., Petryshyn, V., ***Loyd, S.J.***, Tang, J., Priyadarshi, A., Elliott, B., Tripati, A., 2021, Carbonate clumped isotope analysis (Δ_{47}) of 21 carbonate standards determined via gas-source isotope-ratio mass spectrometry on four instrumental configurations using carbonate-based standardization and multiyear data sets: Rapid Communications in Mass Spectrometry 35, 24p.

Dodd, M.S., Zhang, Z., Li, C., Algeo, T.J., Lyons, T.W., Hardisty, D.S., ***Loyd, S.J.***, Meyer, D.L., Gill, B.C., Shi, W., Wang, W., 2021 Development of carbonate-associated phosphate (CAP) as a proxy for reconstructing ancient ocean phosphate levels: Geochimica et Cosmochimica Acta 301 48-69.

Leidelmeijer, J. A., Kirby, M. E., MacDonald, G., Carlin, J. A., Avila, J., Han, J., Nauman, B., ***Loyd, S.***, Nichols, K., and Ramezan, R., 2021, Younger Dryas to early Holocene (12.9 to 8.1 ka) limnological and hydrological change at Barley Lake, California (northern California Coast Range): Quaternary Research 1-15, doi.org/10.1017/qua.2021.9.

Li, Z., Cao, M., ***Loyd, S. J.***, Algeo, T. J., Zhao, H., Wang, X., Zhao, L., and Chen, Z.-Q., 2020, Transient and stepwise ocean oxygenation during the late Ediacaran Shuram Excursion: Insights from carbonate $\delta^{238}U$ of northwestern Mexico: Precambrian Research 344, 105741.

*Caesar, K.H., Kyle, J.R., Lyons, T.W., Tripati, A.E., and ***Loyd, S.J.***, 2019, Carbonate formation in salt dome cap rocks by microbial anaerobic oxidation of methane: Nature Communications 10, doi.org/10.1038/s41467-019-08687-z.

Stamps, B.W., Nunn, H.A., Petryshyn, V., ***Loyd, S.J.***, Oremland, R.S., Miller, L.G., Rosen, M.R., Johnson, H.A., Stevenson, B.S., Berelson, W.M., GeoBiology 2016, Corsetti, F.A., Spear, J.R., 2018, The Metabolic Capability and Phylogenetic Diversity of Mono Lake During a Bloom of *Picocystis* strain ML: Applied and Environmental Microbiology 84, doi.org/10.1128/AEM.01171-18.

Kraus, E.A., Beeler, S.R., Mors, R.A., Floyd, J.G., Geobiology 2016, Piazza, O., Frantz, C.M., ***Loyd, S.J.***, Berelson, W., Stevenson, B.S., Marenco, P.J., Spear, J.R., Corsetti, F.A., 2018, Assessing the biological contribution to mineralized cap formation in the Little Hot Creek hot spring system: Frontiers in Microbiology 9, 13 p.

Bonuso, N., ***Loyd, S.J.***, and Lorentz, N.J., 2018, Pioneer reef communities within a Middle Triassic (Anisian) to Late Triassic (Carnian) carbonate ramp system from the Star Peak Group, South Canyon, central NV. Paleontology, Paleoecology, Paleoclimateology 503, 1-12.

Bradley, J.A., Daille, L.K., Trivedi, C.B., Bojanowski, C.L., Stamps, B.W., Bradley, S.S., Nunn, H.S., Johnson, H.A., ***Loyd, S.J.***, Berelson, W.M., Corsetti, F.A., Spear, J.R., 2017, Carbonate-rich cones: Insights into a modern analog for insipient microbialite formation, Little Hot Creek, Long Valley Caldera, California: Nature Biofilms and Microbiomes 32, 11 p.

Hardisty, D.S., Lu, Z., Bekker, A., Diamond, C.W., Gill, B.C., Jiang, G., Kah, L., Knoll, A.H., ***Loyd, S.J.***, Osburn, M.R., Planavsky, N.J., Wang, C., Zhou, X., Lyons,

T.W., 2017, Perspectives on Proterozoic surface ocean redox from iodine contents in ancient and recent carbonate: Earth and Planetary Science Letters 463, 159–170.

Loyd, S.J., 2017, Preservation of overmature, ancient, sedimentary organic matter in carbonate concretions during outcrop weathering: Geobiology 15, 146–157.

Loyd, S.J., Sample, J., Tripati, R.E., Defliese, W.F., Brooks, K., Hovland, M., Torres, M., Marlow, J., Hancock, L.G., Martin, R., Lyons, T., and Tripati, A.E., 2016, Methane cold seep carbonates yield clumped isotope signature out of equilibrium with formation temperatures: Nature Communications 7, doi:10.1038/ncomms12274

Loyd, S.J., and Berelson, W.M., 2016, The modern record of "concretionary" carbonate: Reassessing a discrepancy between modern sediments and the geologic record: Chemical Geology 420, 77–87.

Loyd, S.J., Corsetti, F.A., Eagle, R.A., Hagadorn, J.W., Shen, Y., Zhang, X., Bonifacie, M., Tripati, A.K., 2015, Evolution of Neoproterozoic Wonoka-Shuram Anomaly-aged carbonates: Evidence from clumped isotope paleothermometry: Precambrian Research 264, 179–191.

Eagle, R.A., Enriquez, M., Grellet-Tinner, G., Perez-Huerta, A., Hu, D., Tutken, T., Montanari, S., ***Loyd, S.J.***, Ramirez, P., Tripati, A.K., Kohn, M., Cerling, T., Chiappe, L., Eiler, J., 2015, Isotopic (^{13}C-^{18}O) ordering in eggshells reflects body temperatures and suggests differing thermophysiology in two Cretaceous dinosaurs: Nature Communications 6, 1-11.

Corsetti, F.A., Ritterbush, K.A., Bottjer, D.J., Greene, S.E., Ibarra, Y., Yager, J.A., West, J., Berelson, W.M., Rosas, S., Becker, T.W., Levine, N.M., ***Loyd, S.J.***, Martindale, R.C., Petryshyn, V.A., Carroll, N.R., Petsios, E., Piazza, O., Pietsch, C., Stellmann, J.L., Thompson, J.R., Washington, K.A., and Wilmeth, D.T., 2015, Investigating the paleoecological consequences of supercontinent breakup: Sponges clean up in the Early Jurassic: The Sedimentary Record 13, 4–10.

Loyd, S.J., Dickson, J.A.D., Boles, J.R., Tripati, A.K., 2014, Clumped isotope constraints on cement paragenesis in septarian concretions: Journal of Sedimentary Research 84, 1170–1184.

Peng, Y., Bao, H., Pratt, L.M., Kaufman, A.J., Jiang, G., Boyd, D., Wang, Q., Zhou, C., Yuan, X., Xiao, S., ***Loyd, S.***, 2014, Widespread contamination of carbonate-associated sulfate by present-day secondary atmospheric sulfate: Evidence from triple oxygen isotopes: Geology 42, 815–818.

Loyd, S.J., Dickson, J.A.D., Scholle, P.A., Tripati, A.K., 2013, Extensive, uplift-related and non-fault-controlled spar precipitation in the Permian Capitan Formation: Sedimentary Geology 98, 17–27.

Loyd, S.J., Marenco, P.J., Hagadorn, J.W., Lyons, T.W., Kaufman, A.J., Sour-Tovar, F., and Corsetti, F.A., 2013, Local $\delta^{34}S$ variability in ~580 Ma carbonates of northwestern Mexico: Implications for the Neoproterozoic marine sulfate reservoir: Precambrian Research 224, 551–569.

Loyd, S.J., Corsetti, F.A., and Tripati, A.K., 2012, Determining the diagenetic conditions of concretion formation: Assessing temperatures and pore waters using clumped isotopes: Journal of Sedimentary Research 82, 1006–1016.

Loyd, S.J., Marenco, P.J., Hagadorn, J.W., Lyons, T.W., Kaufman, A.J., Sour-Tovar, F., and Corsetti, F.A., 2012, Sustained low marine sulfate concentrations from the

Neoproterozoic to the Cambrian: Insights from carbonates of northwestern Mexico and eastern California: Earth and Planetary Science Letters 339-340, 79–94.

Loyd, S.J., Berelson, W.M., Lyons, T.W., Hammond, D.E., and Corsetti, F.A., 2012, Constraining pathways of microbial mediation for carbonate concretions of the Miocene Monterey Formation using carbonate-associated sulfate: Geochimica et Cosmochimica et Acta 78, 77–98.

Loyd, S.J., and Corsetti, F.A., 2010, The origin of the mm-scale lamination in the Neoproterozoic lower Beck Spring Dolomite: Implications for widespread, fine-scale, layer-parallel diagenesis in Precambrian carbonates. Journal of Sedimentary Research 80, 678–687.

Loyd, S.J., Becker, T.W., Conrad, C.P., Lithgow-Bertelloni, C., and Corsetti, F.A., 2007, Time variability in Cenozoic reconstructions of mantle heat flow: Plate tectonic cycles and implications for Earth's thermal evolution. Proceedings of the National Academy of Sciences 104, 14266–14271.

Invited Talks

Loyd, S.J., 2019, Carbonate concretion formation through time, Los Angeles Basin Geological Society Meeting, Long Beach CA, Sept 27.

Loyd, S.J., 2017, Salt dome cap rock calcite formation by the anaerobic oxidation of methane: Southern California Geological Society Meeting, Orange CA, Oct 2.

Loyd, S.J., 2017, A novel mineral-sourced sulfate AOM diagenetic system: Rock-Hosted Life Workshop, Caltech, Feb 6.

Loyd, S.J., 2016, Concretions and modern marine diagenetic carbonates: analogous or anomalous?: University of Southern California paleo seminar, Oct 7.

Loyd, S.J., 2015, Assessing the "modern" record of concretionary carbonate: Caltech geoclub seminar, May 21.

Loyd, S.J., 2015, Assessing the "modern" record of concretionary carbonate: UCR external speaker seminar, May 19.

Synergistic Activities

Pa'Lante Scholarship Program Mentor (2021-present)

Geology Curriculum Reviewer CID (Course Identification Numbering System), 2017-present.

Visiting Scholar Host, Scholar: Bai Maquzong, East China University of Technology, 2017-2018.

Participant in NASA Rock-Hosted Life Working Group for Mars 2020 Landing Site Workshop, Feb 6-7 2017, Caltech, Pasadena CA.

Journal manuscript reviewer (60+ articles), Geology, Geobiology, Earth and Planetary Science Letters, American Journal of Science, Geochimica et Cosmochimica Acta, Biogeosciences, Chemical Geology, Tectonics, Journal of Sedimentary Research, Precambrian Research, Geological Society of America Bulletin, Gondwana Research, Palaeogeography Palaeoclimatology Palaeoecology, American Association of Petroleum Geology Bulletin, Sedimentary Geology, Terra Nova, Journal of South American Earth Sciences

Proposal review panel member (2 panels), NASA Astrobiology: Exobiology and Evolutionary Biology

Proposal external reviewer (6 proposals), Petroleum Research Fund

Book reviewer, A practical guide to carbonate clumped isotopes and multiply-substituted isotopologues. Submitted to Wiley-Blackwell for 'New Analytical Methods in Earth and Environmental Science'

Meeting session convener, American Geophysical Union Annual Meeting 2014, Astrobiology Science Convention 2013

CSUF Committees: Curriculum Committee (Dept, 2013-present), Space Committee (Dept, 2016-2018), Advising Committee (Dept, 2013-present), Radiation Safety Committee (CNSM, 2014-present, Chair 2016-present), Tectonophysics Search Committee (2018-19), Geoscience Education Search Committee (2014), NSM Curriculum Committee (2019-present), University Curriculum Committee (2019-present)

Grants

CSUF ORSP Grant, 2021-2022, Assessing carbonate concretion growth mechanisms using integrated field-based, geochemical and petrographic data, $5,000. PI: ***Loyd, S.J.***

CSUF RSCA Grant, 2019-2020, Multiple sulfur isotope characterization of salt dome cap rock: Exploration of microbial involvement in sulfur mineralization, $15,000. PI: ***Loyd, S.J.***

CSUF-Jr. Intramural Grant, 2018-2019, Assessing the controls and impacts of carbon dioxide degassing from fissure ridge hot springs, $6,408. PI: ***Loyd, S.J.***

CSUF-Incentive Grant, 2016-17, Formation mechanisms and organic carbon protection potential of modern sedimentary dolomite, $6,408. PI: ***Loyd, S.J.***

Petroleum Research Fund, American Chemical Society, PRF-UNI Grant # 55428-UNI2, 2015-present, The formation of salt dome cap rock calcites and relationships with sulfate reduction, $55,000. PI: ***Loyd, S.J.***

CSUF-ASI, 2014, Improvement of Geochemistry (Geol 406) lab exercises, $1,000. PI: ***Loyd, S.J.***

CSUF-Incentive Grant, 2014-15, Constraining carbon sources of salt dome cap rocks, $9,947. PI: ***Loyd, S.J.***

CSUF-Jr. Intramural Grant, 2014-2015, Exploring carbon sources for carbonate concretion formation in the Cretaceous Holz Shale, $2,500. PI: ***Loyd, S.J.***

Advised Students

Current: Tracy Donelli (graduate, Geology MSc), Melonie Nguyen (graduate, Geology MSc)**,** Bayne Westrick-Snapp (graduate, Geology MSc), Mauricio Avila (graduate, Geology MSc), John Hill (graduate, Geology MSc), Antonio Sandoval (graduate, Geology MSc), Jamie Hoffman (undergraduate, BSc Geology)

Past: Kylie Caesar (graduate, Geology MSc), Marissa Smirnoff (graduate, Geology MSc), Kassandra Mora (undergraduate, BSc Geology), Yasmeen de la Cruz (undergraduate, BSc Geology), Andres Bustos (undergraduate, BSc Geology), Connor Frederickson (undergraduate, BSc Geology), Kaelin Andelin (undergraduate, BSc Geology), Bayne Westrick-Snapp (undergraduate, BSc Geology), Lucas Lu (undergraduate, BSc Geology), Shawn Colby (undergraduate, BSc Geology), Allison Beida (undergraduate, BSc Geology), Julie Unson (undergraduate, BSc Geology)

Dr. Valbone 'Vali' Memeti

Dept. of Geological Sciences
California State University Fullerton
800 N. State College Blvd
Fullerton, CA 92831

Email: vmemeti@fullerton.edu
Phone: (657) 278-3882
Fax: (657) 278-7266
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Professional Preparation

Durham University, England	Igneous Geochemistry	postdoc, 06/2012-05/2014
University of Southern California	Geology of magmatic systems	PhD Degree, 08/2009
University of Technology, Darmstadt	Structural Geology	MSc Degree, 01/2003
University of Technology, Darmstadt	Geology and Paleontology	BSc Degree, 10/1998

Appointments

Associate Professor, California State University Fullerton	08/2021-present
Assistant Professor, California State University Fullerton	08/2014-08/2021
Adjunct Research Assistant Professor, Univ of Southern California, Los Angeles	06/2010-08/2014
Marie Curie research fellow, Durham University, UK	06/2012-05/2014
Lecturer in Geology, Occidental College, Los Angeles	01/2012-05/2012
Lecturer in Mineralogy, University of Southern California, Los Angeles	08/2011-12/2011
Lecturer in Geology-Mineralogy, Pomona College, Claremont	01/2011-12/2011
Lecturer in Geology, Cal. State University, Fullerton	01/2011-05/2011
Lecturer in Geology, Washington University in St. Louis	08/2009-05/2010

Journal articles published as senior author

*undergraduate student, **graduate student, ***postdoc, [1]**graduate student at USC

1. **Memeti**, V., Paterson, S., Mundil, R., **2021**, Coupled magmatic and host rock processes during the initiation of the Tuolumne Intrusive Complex: A transition from ephemeral sheets to long-lived, active magma mushes: *Geol. Soc. of Amer. Bull.,* https://doi.org/10.1130/B35871.1
2. **Oppenheim, L.F., **Memeti**, V., Barnes, C.G., **Chambers, M., Krause, J., Esposito, R., **2021**, Feldspar recycling across magma mush bodies during the voluminous Half Dome and Cathedral Peak stages of the Tuolumne Intrusive Complex, Yosemite National Park, CA: *Geosphere,* p. 1–30, https:// doi.org /10.1130 /GES02286.1.
3. [1]**Ardill, K.E., **Memeti**, V., and Paterson, S.R., **2020**, Reconstructing the physical and chemical development of a pluton-porphyry complex in a tectonically re-organized arc crustal section, Tioga Pass, Sierra Nevada: *Lithosphere*, https://doi.org/10.2113/2020/8872875
4. **Chambers, M., **Memeti**, V., Eddy, M.P., Schoene, B., **2020**, Half a million years of magmatic History recorded in a K-feldspar megacryst of the Tuolumne Intrusive Complex, California: *Geology*, v. 48, https://doi.org/10.1130/G46873.1
5. *Patterson, S.F., **Memeti**, V., *McKay, R., Lipps, J.H., Pederson-Guzman, J., **2020**, Determining the basaltic source rocks of enigmatic cogged stones from southern California: *California Archaeology*, v. 12, n. 2, doi: 10.1080/1947461X.2020.1812024.

Journal articles published co-author (only 2nd and 3rd author papers listed)

6. Barnes, C.G., Werts, K., **Memeti**, V., Paterson, S.R., *Bremer, R., **2021**, A tale of five enclaves: mineral perspectives on origins of mafic enclaves in the Tuolumne Intrusive Complex: *Geosphere*, v. 17, p. 1–23, https://doi.org/10.1130/GES02233.1.
7. Werts, K., Barnes, C.G., **Memeti**, V., Ratschbacher, B., **Williams, D., Paterson, S., **2020**, Hornblende: A Tool for Assessing Mineral-Melt Equilibrium and Recognizing Crystal Accumulation: *American Mineralogist*, v. 105, p. 77–91, https://doi.org/10.2138/am-2020-6972

8. Barnes, C.G., Werts, K., **Memeti**, V., Ardill, K., **2019**, Most granitoid rocks are cumulates: deductions from hornblende compositions, and zircon saturation: *Journal of Petrology*, v. 60, n. 11, p. 2227–2240, doi: 10.1093/petrology/egaa008.
9. ***Martínez Ardila, A.M., Clausen, B.L., **Memeti**, V., Paterson, S.R., **2019**, Source contamination, crustal assimilation, and magmatic recycling during three flare-up events in the Cretaceous Peruvian Coastal Batholith: An example from the Ica-Pisco plutons: *Journal of South American Earth Sciences*, v. 95, 102300, https://doi.org/10.1016/j.jsames.2019.102300.
10. ***Martínez Ardila, A.M., Paterson, S.R., **Memeti**, V., Parada, M.A., Molina, P.G., **2019**, Mantle driven cretaceous flare-ups in Cordilleran arcs: *Lithos*, v. 326–327, p. 19- 27, https://doi.org/10.1016/j.lithos.2018.12.007.
11. Ardill, K.E., Paterson, S.R., and **Memeti**, V., **2018**, Spatiotemporal magmatic focusing in upper mid crustal plutons of the Sierra Nevada arc: *Earth and Planetary Science Letters*, v. 498, DOI: 10.1016/j.epsl.2018.06.023.
12. Hines, R., Paterson, S.R., **Memeti**, V., Chambers, J.A., **2018**, Nested incremental growth of zoned upper crustal plutons in the Southern Uplands Terrane, UK: fractionating, mixing, and contaminated magma fingers: *Journal of Petrology*, https://doi.org/10.1093/petrology/egy034.
13. Paterson, S., Clausen, B., **Memeti**, V., and Schwartz, J.J., **2017**, Arc magmatism, tectonism, and tempos in Mesozoic arc crustal sections of the Peninsular and Transverse Ranges, southern California, USA, in Kraatz, B., Lackey, J.S., and Fryxell, J.E., eds., Field Excursions in Southern California: Field Guides to the 2016 GSA Cordilleran Section Meeting: *Geological Society of America Field Guide 45*, p. 81–186, doi:10.1130/2017.0045(04).
14. Barnes, C.G., **Memeti**, V., and Coint, N., **2016**, Deciphering magmatic processes in calc-alkaline plutons using trace element zoning in hornblende: *American Mineralogist*, Special collection: Perspectives on origins and evolution of crustal magmas, v. 101, p. 328–342. DOI: http://dx.doi.org/10.2138/am-2016-5383
15. Paterson, S.R., **Memeti**, V., Mundil, R., Žák, J., **2016**, Repeated, multiscale, magmatic erosion and recycling in an upper-crustal pluton: Implications for magma chamber dynamics and magma volume estimates: *American Mineralogist*, Special collection: Perspectives on origins and evolution of crustal magmas, v. 101, p. 2176-2198, DOI: http://dx.doi.org/10.2138/am-2016-5576

Conference abstracts (n=85 total; first author=12; ugrad 1st author=21; grad 1st author=11; postdoc=3)

Extramural grants funded

1. 2018, US Geological Survey National Cooperative Geologic Mapping Program, EDMAP: Geologic mapping of the Jack Main intrusive complex in the central Sierra Nevada, CA: An unusual antithetically migrating plutonic complex in a magma focusing center. Amount funded: $16,947.
2. 2016, NSF-EAR 1550935: Collaborative Research: Testing the Existence of Magma Mush Zones and Potential Processes of Magma Differentiation in the Mid-crust with In situ Mineral Geochemistry. Amount funded: $186,606.
3. 2016, NSF-EAR 1624854: Collaborative Research: RUI: Examining the Temporal, Spatial and Geochemical Focusing of Magmatism During a Continental Arc flare-up. Amount funded: $149,961.

Service

1. Panel reviewer of U.S. Geological Survey EDMAP grant proposals since 2020 (ca. 40-60 proposals)
2. Reviewer for manuscripts submitted to various geology and petrology journals
3. Reviewer for NSF and international funding agencies
4. Session convener at Geological Society of America annual and Cordilleran Section meetings (4x)
5. Student conference mentor
6. Published free downloadable **TravelStorysGPS mobile app "Yosemite: A Story of Fire and Ice"** for the public to learn about the magmatic and glaciation history of Yosemite National Park. https://www.travelstorys.com/tours/154/Yosemite%20National%20Park

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Kathryn Metcalf
Curriculum Vitae

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cell: (850) 509-8855

APPOINTMENTS

Assistant Professor, California State University, Fullerton 2019-
Assistant Professor, SUNY Oneonta, 2018-2019
Lecturer, SUNY Oneonta, 2017-2018

EDUCATION

University of Arizona, Ph.D., Geosciences 2018
University of Arizona, M.S., Geosciences, 2012
University of North Carolina at Chapel Hill, B.S., Geological Sciences, 2010

GRANTS AWARDED

2020 NSF Tectonics EAR-2020457, *Collaborative Research: Evaluating the evolution of the southern Himalayan-Tibetan orogeny: What happened during Paleocene-Eocene time?,* co-PI with Delores Robinson (Lead PI, University of Alabama) – $293,703

2020 Junior/Senior Intramural Grant, *Evolution of a subduction zone preserved in the Klamath Mountains, northern California* – $4,714

2016 NSF East Asia Pacific Summer Institute (EAPSI) NSF-OISE-1614206 *EAPSI: Integrating English-language and Chinese-language literature on the India-Asia collision to better understand the formation and evolution of subduction complexes*, collaborated with Professor Ding Lin at the Institute of Tibetan Plateau Research in Beijing, China – $5,000

SELECTED PUBLICATIONS

Metcalf, K., and Kapp, P., 2019, History of subduction erosion and accretion recorded in the Yarlung suture zone, southern Tibet, in Treloar, P. J., Searle, M. P. eds., Himalayan Tectonics: A Modern Synthesis, Geological Society of London Special Publications, 483, doi: 10.1144/SP483.12.

Metcalf, K., and Kapp, P., 2017, The Yarlung suture mélange, Lopu Range, southern Tibet: Provenance of sandstone blocks and transition from oceanic subduction to continental collision: Gondwana Research, v. 48, p. 15-33, doi: 10.1016/j.gr.2017.03.002.

Metcalf, K., and Kapp, P., 2015, Along-strike variations in crustal seismicity and modern lithospheric structure of the central Andean forearc, in DeCelles, P.G., Ducea, M.N., Carrapa, B., and Kapp, P.A. eds., Geodynamics of a Cordilleran Orogenic System: The Central Andes of Argentina and Northern Chile, Geological Society of America Memoirs, 212, p. 61-78, doi: 10.1130/2015.1212(04).

SELECTED MEETING PRESENTATIONS

*Undergraduate thesis student

Sabello, B. C.*, **K. Metcalf,** Provenance and Deformation of Sandstone and the History of Transtension in Yunnan, China, Geological Society of America, Cordilleran Section, Poster, Abstract 7-8, May 2021.

Aguilar, A.*, **K. Metcalf**, The Rattlesnake Creek Terrane: An Enigmatic Tectonostratigraphic Terrane of The Klamath Mountains, California and Oregon, Geological Society of America, Cordilleran Section, Poster, Abstract 7-4, May 2021.

Metcalf, K., A. Aguilar*, Record of Paleozoic to Middle Jurassic Tectonics in the Rattlesnake Creek Terrane, Klamath Mountains, Northern California, Geological Society of America, Poster, Abstract, October 2020.

Metcalf, K., P. A. Kapp, History of subduction erosion and accretion recorded in the Yarlung Suture Zone, southern Tibet, 34th Himalaya-Karakorum-Tibet Workshop, Oral, Abstract, p. 62, June 2019.

Kiraly, A., A., Makushkina, T., Ghosh, K. L., Haynie, B. H., Parks, D. E., Portner, **K., Metcalf**, M., Manga, M. A., Jadamec, K. A., O'Farrell, L. N., Moresi, R. J., Stern, Understanding the Effects of Slab Holes on Mantle Flow and Surface Dynamics, European Geophysical Union, Oral, Abstract 12544, April 2018.

Metcalf, K., P. A. Kapp, Jurassic forearc sedimentation and reconstruction of subduction dynamics along the southern margin of the Lhasa terrane, American Geophysical Union, Oral, Abstract T33C-0726, December 2017.

Kiraly, A., A., Makushkina, D. E., Portner, B. H., Parks, T., Ghosh, K. L., Haynie, **K., Metcalf**, M., Manga, K. A., O'Farrell, L. N., Moresi, M. A., Jadamec, R. J., Stern, The Effect of Slab Holes on the Surrounding Mantle Flow Field and the Surface from a Multi-Disciplinary Approach, American Geophysical Union, Oral, Abstract DI11A-0277, December 2017.

Metcalf, K., P. A. Kapp, Subduction dynamics recorded in the Yarlung Suture subduction complex, southern Tibet, Cooperative Institute for Dynamic Earth Research, Poster, July 2017.

RECENT FIELD WORK

2021 Klamath Mountains – Mapping and sample collection for microstructures, petrography, and geochronology. Summer field season, 2 weeks

2020 Klamath Mountains – Reconnaissance mapping and sample collection for microstructures, petrography, and geochronology. Summer field season, 2.5 weeks

TEACHING

Undergraduate theses supervised

Anthony Aguilar, Fall 2021

Brigitte Camille Sabello, summer 2021

Graduate theses supervised
Diana Urda, expected Spring 2023

Lecture and Field
GEOL 101 Introduction to Geology
GEOL 355 Earth's Interior
GEOL 456 Introduction to Geophysics
GEOL 481A Geology Field Camp
GEOL 500 Advanced Geological Concepts and Methods
GEOL 510T Tectonics
GEOL 590 Geoscience Seminar
*ESCI 100 Introduction to the Earth
*GEOL 120 Introduction to Geology
*GEOL 227 Global Tectonics
*GEOL 275 Mapping Techniques in Geosciences
*GEOL 330 Structural Geology

*At SUNY Oneonta

SERVICE/OUTREACH

University Committees
Information Technology 2021-
College Committees
NSM DEI 2021-
Computation 2022-
Department Committees
Curriculum 2021-
Computer Affairs 2019-2021
Faculty Advisor
Geology Club 2019-

JAMES F. PARHAM

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California State University
Fullerton, CA 92834-6850
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Education

2003: *Ph.D.*, Integrative Biology, University of California, Berkeley, CA.
1996: *B.S.*, Geology (highest distinction), University of Rhode Island, Kingston, RI.

Primary Position

2017 – Present: *Associate Professor*, California State University, Fullerton, CA.
2012 – 2017: *Assistant Professor*, California State University, Fullerton, CA.

Other active Positions and Research Associations

2019–Present: *Research Associate,* Department of Vertebrate Paleontology, Natural History Museum of Los Angeles, CA.
2012–Present: *Research Associate,* Museum of Paleontology, University of California, Berkeley, CA.
2010–Present: *Research Associate,* National Museum of Natural History, United States National Museum, Smithsonian, Washington D.C.
2008–Present: *Research Associate,* Center for Comparative Genomics, California Academy of Sciences, San Francisco, CA.

PUBLICATIONS 2016-2022

*= invited commentaries, semi-popular, notes, newsletters.
Underline = student collaborators under my supervision

2022 and In Press

94. **Parham, J.F.,** J.A. Barron, J. Velez-Juarbe. In Press/2022. Middle and late Miocene marine mammal assemblages from the Monterey Formation of Orange County, California. In: I. Aiello, J. Barron, C. Ravelo (Eds.). Understanding the Monterey Formation and Similar Biosiliceous Units across Space and Time: Geological Society of America Special Paper 556.

2021

93. Joyce, W.G., Anquetin, E.-A. Cadena, J. Claude. I.G. Danilov, S.W. Evers, G.S. Ferreira, A.D. Gentry, G.L. Georgalis, T.R. Lyson, A. Pérez-García, M. Rabi, J. Sterli,

N. S. Vitek, **J.F. Parham (co-corresponding author)**. 2021. A nomenclature for fossil and living turtles using phylogenetically defined clade names. Swiss Journal of Palaeontology. 140(5):1-45.

92. Türkozan, O., Ç. Karacaoğlu, **J.F. Parham**. 2021. Reconstructions of the past distribution of *Testudo graeca* mitochondrial lineages in the Middle East and Transcaucasia support multiple refugia since the Last Glacial Maximum. The Herpetological Journal 31:10-17.
91. Lin, L., S. Li, M. Chen, **J.F. Parham**, H. Shi. 2021. Sea turtle demand in China threatens the survival of wild populations. iScience 24(6):102517.
90. Wang, J., Y. Liu, J.J. Fong, **J.F. Parham**, H. Shi. 2021. Reproductive ecology of the Hainan four eye-spotted turtle (*Sacalia insulensis*) on Hainan Island, China. Chelonian Conservation and Biology 20(1):103-108.
89. Seidel, M.E., and **J.F. Parham**. In press/2021. Comments on the origin of West Indian slider turtles (genus *Trachemys*). Herpetological Review 52(4).

* Shi. H., Wang, J., H.-Q. Chen, and **J.F. Parham**. 2021. China's wildlife protection: add oversight and annual reviews. Nature 592:685.
* Wang, J., **J.F. Parham**, H. Shi. 2021. China's turtles need protection in the wild. Science 371(6528):473.

2020

87. **Parham, J.F.,** T.J. Papenfuss, A.B. Sellas, B.L. Stuart, W.B. Simison. 2020. Genetic variation and admixture of red-eared sliders (*Trachemys scripta elegans*) in the USA. Molecular Phylogenetics and Evolution 145 (2020):10672.
88. Biewer, J.N., J. Velez-Juarbe, **J.F. Parham (corresponding author)**. 2020. Insights on the dental evolution of walruses based on new fossil specimens from California. Journal of Vertebrate Paleontology e1833896:1-42.
86. Simison, W.B., **J.F. Parham**, T.J. Papenfuss, A.W. Lam, J.B. Henderson. 2020. An annotated chromosome-level reference genome of the red-eared slider turtle (*Trachemys scripta elegans*). Genome Biology and Evolution 12 (4):456-462.
85. Gong, S., J. Wu, Y. Gao, J.J. Fong, **J.F. Parham**, and H. Shi. 2020. Integrating and updating wildlife conservation in China. Current Biology 30.
84. Joyce, W.G., **J.F. Parham**, J. Anquetin, J. Claude, I.G. Danilov IG, J.B. Iverson, B. Kear, T.R. Lyson, M. Rabi, J. Sterli. 2020. Pan-Testudines, Testudinata, Testudinesm Pan-Pleurodira, Pleurodira, Pan-Cryptodira, Cryptodira. Pp. 1041-1063. In: K. de Queiroz, P.D. Cantino, J.A. Gauthier (Eds.). Phylonyms: A Companion to the PhyloCode. CRC Press, Boca Raton.

2019

83. Fong, J.J., B.L. Stuart, T.E. McCormack, **J.F. Parham.** 2019. First genetic data of the critically endangered Vietnamese pond turtle (*Mauremys annamensis*) from known-locality specimens. Current Herpetology 38(2):140-152.

2018

82. Magallanes, I., **J.F. Parham (co-first author)**, G.-P. Santos, J. Velez-Juarbe. 2018. A new tuskless walrus from the Miocene of Orange County, California, with comments on the diversity and taxonomy of odobenids. PeerJ 6:e5708.

81. Türkozan, O., F. Kiremit, B.R. Lavin, F. Bardakci, **J.F. Parham**. 2018. A comparison of the morphological and mitochondrial variation of spur-thighed tortoises, *Testudo graeca*, in Turkey. *The Herpetological Journal* 28:1-9.
80. Gentry, A.D., **J.F. Parham**, D.J. Ehret, J.A. Ebersole. 2018. A new species of *Peritresius* Leidy, 1856 (Testudines: Pan-Cheloniidae) from the Late Cretaceous (Campanian) of Alabama, USA, and the occurrence of the genus within the Mississippi Embayment of North America. *PLOS ONE* 13(4):e0195651.
79. Arakelyan, M., O. Türkozan (co-first author), N. Hezaveh, and **J.F. Parham**. 2018. Ecomorphology of tortoises (*Testudo graeca* complex) from the Araks River Valley. *Russian Journal of Herpetology* 25(4): 245-252

2017

78. Kloess, P.A., and **J.F. Parham**. 2017. A specimen-based approach to reconstructing the late Neogene seabird communities of California. *Palaeogeography, Palaeoclimatology, Palaeoecology* 468:4730-484.
77. Barboza, M.M., **J.F. Parham**, G.-P. Santos, B.N. Kussman, J. Velez-Juarbe. 2017. The age of the Oso Member, Capistrano Formation, and a review of fossil crocodilians from California. *PaleoBios* 34:1-16.

2016

76. Auliya, M., S. Altherr, D. Ariano-Sanchez, E.H. Baard, C. Brown, R.M. Brown, J.-C. Cantu, G. Gentile, P. Gildenhuys, E. Henningheim, J. Hintzmann, K. Kanari, M. Krvavac, M. Lettink, J. Lippert, L. Luiselli, G. Nilson, T.Q. Nguyen, V. Nijman**, J.F. Parham,** S.A. Pasachnik, M. Pedrono, A. Rauhaus, D. Rueda, M.-E. Sanchez, U. Schepp, M. van Schingen, N. Schneeweiss, G.H. Segniagbeto, R. Somaweera, E.Y. Sy, O. Türkozan, S. Vinke, T. Vinke, R. Vyas, S. Williamson, and T. Ziegler. 2016. Trade in live reptiles, its impact on wild populations, and the role of the European market. *Biological Conservation* 204:103-119.
75. Pyenson, N.D., **J.F. Parham**, and J. Velez-Juarbe. 2016. The dilemma of trade samples and the importance of museum vouchers: caveats from a study on the extinction of Steller's sea cow. *Biology Letters* 12: 20150149.
74. Santos, G.-P., **J.F. Parham**, and B.L. Beatty. 2016. New data on the ontogeny and senescence of *Desmostylus*. *Journal of Vertebrate Paleontology* 36(2):e1078344.

1996-2015

Publication 1-73.

GRANTS AND OTHER FUNDING 2016-2022

PI, Co-PI

2019–Present: *Turtle Conservation Fund.* **$1,994. Parham PI.** New data on the origin and validity of data deficient Mexican slider turtles.
2018–2021: *Senior Intramural Research Award.* **$4,966. Parham PI.** The Lost Bonebed of

Orange County.

2016–2019: *State Wildlife Grant*. $125,137 total. **$63,000 to Parham co-PI ($37,000 to Cal State Fullerton; $26,000 through RCD).** E. Tennant PI. Conservation assessment of four newly discovered endemic species of California legless lizard (*Anniella*).

2014–2018: *National Science Foundation.* **$500,000. Parham PI (since 2016).** J.H. Lipps (PI until 2016, Parham co-PI). CSBR: Natural History Collections: Protecting and Improving Orange County's (California) Paleontological Collection (OCPC).

2014–2017: *California State University Program for Education and Research in Biotechnology (CSUPERB).* **$14,704.84. Parham PI.** W.B. Simison co-PI. Sequencing and bioinformatics of slider turtle genomes: A system for evolutionary studies, conservation, and student opportunity.

Collaborator

2016–2018: *National Science Foundation: Digitization TCN: Collaborative: Documenting Fossil Marine Invertebrate Communities of the Eastern Pacific. Faunal Responses to Environmental Change over the last 66 million years*. P. Roopnarine PI, $530,256. Project: A partnership of nine natural history museums, united to digitize marine invertebrate fossils found in the eastern Pacific.

SELECTED MEDIA 2016-2022

Interviews/articles arising from my lab's activities or collaborative research (excluding CSUF news articles and press releases)

2020 December: *OC Register* print article and online articles (e.g., *Polar Journal*, *NHMLAC Connects*) about publication #88 (Insights on the dental evolution of walruses based on new fossil specimens from California).

2018 October: *OC Register* print article and online articles (e.g., *MyNewsLA.com*) about publication #82 (A new tuskless walrus from the Miocene of Orange County, California, with comments on the diversity and taxonomy of odobenids).

2017 September: *OC Register* print article about Wooly mammoth donation to TSU.

2017 April: *OC Register* print article and online articles (e.g., *PLOS Paleo Community*) about publication #77 (The age of the Oso Member, Capistrano Formation, and a review of fossil crocodilians from California).

2017 February: *Hoy* print article (in Spanish) about Publication #78 (. A specimen-based approach to reconstructing the late Neogene seabird communities of California).

2017 September: *OC Register* print article about mammoth donation to TSU.

2016 February: Smithsonian online article about publication #75 (The dilemma of trade samples and the importance of museum vouchers: caveats from a study on the extinction of Steller's sea cow).

2016 January: Graduate student radio interview (KPCC) and National Geographic write-up of publication #74 (New data on the ontogeny and senescence of *Desmostylus*").

SELECTED PROFESSIONAL ACTIVITIES 2016-2022

Theses, Cal State Fullerton

MSc., Geological Sciences: Katrina Awalt (2016 – 2021), Jacob Biewer (2016 – 2019), Emily Chebul (2018 – Present), Adrian Garibay (2018 – Present), Jared Heuck (2016 –

2019), Gabriel-Philip Santos (2013 – 2018), Tristan Stock (2021 – Present), Thuat Tran (2020 – Present).

Undergraduate Thesis: Michaela Adler (2014 – 2016), Crystal Cortez (2014 – 2016), Adrian Garibay (2015 – 2016), Isaac Magallanes (2014 – 2017), Shooka Shahbazi (2016 – 2018), Tristan Stock (2020 – 2021), JieQi Yan (2020 – Present).

Environmental Studies: Crystal Cortez (2019 – 2021)

Mentoring at other Institutions

2016 – 2020: PhD committee member for Andrew Gentry (Department of Biology, University of Alabama Birmingham).

Teaching

2022 Spring (planned): *Dinosaur World GEOL 110T*
2022 Spring: (planned): *Introduction to Geology GEOL 101*
2021 Fall: *Data Collection and Analysis for Earth Scientists GEOL 381*
2021 Fall: *Dinosaur World GEOL 110T*
2021 Spring: *Dinosaur World GEOL 110T*
2021 Spring: *Introduction to Geology GEOL 101*
2020 Fall: *Data Collection and Analysis for Earth Scientists GEOL 381*
2020 Fall: *Introduction to Geology GEOL 101*
2020 Spring: *Advanced Paleontology (Vertebrate Paleontology of Orange County) GEOL 510T*
2020 Spring: *Dinosaur World GEOL 110T*
2019 Fall: *Geology of the National Parks 310T*
2019 Fall: *Dinosaur World GEOL 110T*
2018 Fall: *Dinosaur World GEOL 110T*
2018 Fall: *Introduction to Geology GEOL 101*
2016 Spring: *Advanced Paleontology (Description and Biostratigraphy) GEOL 510T*

Active Editing
2008 – Present: Editorial committee, *Novitates Caribaea*.

Past Editing

2012 – 2020: Fossil Calibration Editor, *Palaeontologia Electronica.*
2008 – 2018: Editorial committee, *Hispaniolana*.

Symposia/Workshops Organized

2019 (June 26): *Lead convener* (with J. Velez-Juarbe, A. Valenzuela-Toro) "Fossil marine tetrapods of the Pacific Symposium" at the 11th North American Paleontological Conference, Riverside, CA.

Other Service

2021: Scientific Committee of Turtle Evolution Symposium 2021 (TES) Virtual Meeting (Hosted by the Museo Paleontológico Egidio Feruglio, Trelew, Argentina)

2021: Scientific Committee of the 9th Secondary Adaptation of Tetrapods to Life in Water (SECAD) Virtual Meeting (Hosted by five academic groups in South America in Santiago, Chile)

Selected Presentations (*= invited speaker)

2020: International Meeting on the Secondary Adaptation of Tetrapods to Life in Water "New data on the stratigraphic distribution of marine mammal assemblages in Southern California"
2019: North American Paleontological Conference "An overview of marine turtle evolution with an emphasis on new data from Eastern Pacific fossils"
2017: * California Academy of Sciences, San Francisco, CA "Mock Turtles and Red-Eared Invaders: Origins and Implications of Anthropogenic Hybrid Turtles"
2017: * California Academy of Sciences, San Francisco, CA "Legless Lizards of the Lost Desert of California"

Active Committees

2019 – Present: Graduate Advisor, Dept. Geological Sciences
2021 – Present: Intramural Grant Committee

Past Committees

2019 – 2020: Faculty Search Committee (Geoscience Education)
2020: Post-Tenure Review Committee
2018: Curriculum Committee, Dept. Geological Sciences
2018: Chair of College of Natural Sciences and Mathematics Faculty Award Committee
2015 – 2016, 2018: Chair of Computer Committee, Dept. Geological Sciences
2015 – 2018: Computer Committee, Dept. Geological Sciences
2012 – 2018: Undergraduate Advising Committee, Dept. Geological Sciences
2012 – 2018: John D. Cooper Archaeology and Paleontology Center Faculty Curator
2017: Chair of College of Natural Sciences and Mathematics Faculty Award Committee
2015 – 2016: Faculty Search Committee (Structural Geologist)
2014 – 2016: Geology Club Faculty Advisor

RECOGNITION

2019: Honored by becoming eponym of fossil sea turtle (*Asmodochelys parhami*)
2016: Outstanding Untenured Faculty Member, College of Natural Sciences and Mathematics, Cal State Fullerton
2016: Recognition of the Highest Quality Scholarly and Creative Activity, Cal State Fullerton

Adam Daniel Woods
Professor and Chair of Geological Sciences

Department of Geology
California State University, Fullerton
P.O. Box 6850
Fullerton, CA 92834-6850

(657) 278-2921
(657) 278-7266 FAX
awoods@fullerton.edu

EDUCATION:

University of Southern California, Los Angeles, CA 1993-1998
Graduation Date: August 1998 (Ph.D. Geological Sciences)
Graduate Advisor: David J. Bottjer
Dissertation Title: *Paleoenvironmental analysis of the Union Wash Formation, east-central California: Evidence for unique Early Triassic paleoceanographic conditions*

University of Cincinnati, Cincinnati, OH. 1991-1993.
Graduation Date: June 1993 (M.S. Geological Sciences).
Graduate Advisor: Thomas J. Algeo
Thesis Title: *A fine-scale geochemical and stratigraphic analysis of the Lower Mississippian Sunbury Shale*

Millersville University of Pennsylvania. 1987-1991
Graduated May 1991 (B.S. Geological Sciences).

PROFESSIONAL EXPERIENCE:

August 2019 – present: **Chair, Geological Sciences Department, CSU Fullerton**

August 2003 – present: **Professor, CSU Fullerton**

Classes taught:

Geol. 101: Physical Geology
Geol. 101L: Physical Geology Lab
Geol. 110T: Dinosaur Planet
Geol. 201: Historical Geology
Geol. 310T: Natural Hazards of California
Geol. 321: Sedimentation and Stratigraphy
Geol. 322: Invertebrate Paleontology
Geol. 380: Geologic Field Techniques
Geol. 481A: Field Camp
Geol. 510T-1: Sedimentary Basin Analysis
Geol. 510T-8: Carbonate Sedimentology

COMPLETED MS THESES SINCE 2014

Alms, Paul
Competed: June 2014
Title: Complex Ichnofabrics in the Lower Member of The Union Wash Formation, East-Central California: Failed Recovery from the Permian-Triassic Mass Extinction

Beach, Alyssa
Completed: May 2016
Title: A Paleodepositional Reconstruction of Middle Miocene Cetacean Bonebeds from the Topanga Formation, Northern San Joaquin Hills, Orange County, CA

Kirton, Jennifer McCoy
Completed: June 2014
Title: Stromatolite Patch Reef From The Lower Triassic Virgin Limestone at Blue Diamond, NV: Paleoenvironmental and Paleoecological Significance

Kovtun, Rostilov
Completed: January 2020
Title: Early Triassic Paleoceanography Along Western North America: An Analysis of the Middle Member of the Union Wash Formation, East-Central California

Macias, Anthony
Title: Paleoceanographic changes across the Permian-Triassic interval along the northwestern margin of Pangea: A case study from Opal Creek, Alberta, Canada

Pilesky, William
Completed: November 2015
Title: A paleoceanographic and geochemical analysis of the Late Ordovician – Early Silurian Ely Springs Dolomite, east-central California.

Poncelet, Austin
Completed: November 2019
Title: A Determination of the Timing and Consequences Of The Late Ordovician Glaciation Using the Ely Springs Dolomite of East Central California

CURRENT MS STUDENTS

Kinder, Kelly
Topic: Major, minor, and trace element study of the Middle Member of the Union Wash Formation, Cerro Gordo, CA

COMPLETED BS THESES SINCE 2014

Amaya, Alec
Completed: June 2016
Title: Geochemical Analysis of the Lower Triassic (Griesbachian-Dienerian) Phroso Siltstone (Sulphur Mountain Formation): Paleoxygenation and Paleoproductivity along the southern edge of the Western Canada Sedimentary Basin

Avila, Mauricio
Completed: August, 2016
Title: Major, Minor, and Trace Element Analysis of the Montney Formation, Peace River Embayment (eastern Alberta, Canada) Following the Permian-Triassic Mass Extinction

Bergeland, Sam
Completed: August, 2016
Title: Post Permian-Triassic Extinction Productivity and Paleoxygenation within the Peace River Embayment of Eastern Alberta, Canada

Boeshart, Erin
Completed: January, 2019
Title: Sedimentologic Analysis of the Late Ordovician Lower Member of the Ely Springs Dolomite at Vaughn Gulch, Inyo County California

Chou, Charlie
Completed: June, 2016
Title: A Paleoenvironmental and Ichnologic Analysis of the Upper Mississipian Rest Spring Shale of Inyo County, California

Fullaway, Brian
Completed: August 2016
Title: A Determination of the Diagenetic History of the Sarvak Formation (mid-Cretaceous) of the Zagros Basin,Southern Iran

Grabow, Andrew:
Completed: August 2016
Title: Sedimentology and paleoecology of stromatolites from the Upper-Ordovician – Lower Silurian Ely Springs Formation

Macias, Anthony
Completed: June 2016
Title: Trace Elemental Analysis of Productivity and Oxygenation Conditions within the Western Canada Sedimentary Basin following the Permian-Triassic Mass Extinction

Moerer, Brandon
Completed: August 2020
Topic: Environmental Stress as a Cause for Prolonged Recovery following the Permian-Triassic Mass Extinction

Ortiz, Julie
Completed: June 2014
Title: Analysis of Trace Element Variations in Sedimentary Rock Samples from the Western Canada Sedimentary Basin following the Permian-Triassic Mass Extinction

Simpson, Samuel
Completed: June 2021
Title: The distribution of environmental stress following the End-Permian mass extinction: A geochemical study of the Lower Triassic Union Wash Formation

Slazas, Trevor
Completed: June 2016
Title: Sedimentology and paleoecology of stromatolites from the Upper-Ordovician – Lower Silurian Ely Springs Formation

CURRENT BS STUDENTS

Gallindo, Candice
Topic: Analysis of oncoids from the Lower Cambrian Chambless Limestone

Perkins, Kimberlin
Topic: Paleoenvironmental Analysis of the uppermost Upper Member of the Union Wash Formation

VISTING SCHOLARS SINCE 2014

Portella, Andressa, BSc Student, Brazil. January 2014 – January 2015.

Shi, Guo, Postdoctoral Researcher, East China University of Technology, Fu Zhou City, China. Spring 2014 – Spring 2015.

Deng, Baozhu, PhD Student, China University of Geosciences, Wuhan, China. Summer 2015.
Zhang, Liwei, PhD Student, Henan Polytechnic University, China. Winter, 2016.
Chang, Xiaolin, Postdoctoral Researcher, Chengdu University of Technology, China. April 2018 – April 2019
Li, Wentian, Postdoctoral Research, Mongolia University of Technology, China. October 2018 – October 2019.

INTRAMURAL GRANTS SINCE 2014

2018: CSU Special Fund for Research, Scholarship, and Creative Activity
Grant title: "Determining Environmental Stress in the Aftermath of the Permian – Triassic Mass Extinction: A Case Study from East-Central California"
Grant amount: $5000

PUBLICATIONS SINCE 2014: (student authors are underlined)

Journal articles:
In review or in prep:
Fang, Y., Chen, Z. – Q., **Woods, A.**, and Huang, Y., *in prep*. "Permian–Triassic boundary microbialites from Yudongzi Section, Sichuan Province, South China", *Palaeogeography, Palaeoclimatology, Palaeoecology.*
Mehmandosti, E. A., Asadi, A., Daneshian, J., **Woods, A. D.**, and Loyd, S., "Mid-Cretaceous Carbon Cycle Perturbations and OAE2 Recorded in Cenomanian to Middle Campanian Carbonates of the Zagros Fold/Thrust Belt Basin, Iran" *Turkish Journal of Earth Sciences*.
Mehmandosti, E. A., Abdolmaleki, S., Ghalavand, H., and **Woods, A. D.**, "Depositional environment, sequence stratigraphy and geochemistry of the Upper Cretaceous Ilam Formation of the Abadan plain, SW Iran". *Facies*
Monarrez, P.M., and **Woods, A.D.**, *in prep*. "Stable brachiopod diversity patterns across the Mississippian-Pennsylvanian global boundary stratotype section and point (GSSP): Further evidence against a late Mississippian mass extinction event in North America", *Paleobiology*.
Pilesky, W. and **Woods, A. D.**, *in prep*. "Short-Lived Upwelling and Vigorous Ocean Circulation Caused by a Brief Glacial Period During the Late Ordovician", *Palaeogeography, Palaeoclimatology, Palaeoecology* theme issue on the Ordovician.
Woods, A. D., *in prep*, Calcium carbonate crystal fans: Geologic occurrences and controls on growth. IAS Special Publication, Nucleation and growth of sedimentary minerals, Patrick Meister, Cornelius Fischer, Nereo Preto, eds.
Woods, A. D., Zonneveld, J.-P., and Wakefield, R., *in prep*. "Trace Metal Data from Lower and Lowermost Middle Triassic Rocks from Ursula Creek, British Columbia Reveals Persistent Anoxia and Variable Paleoproductivity History in the Aftermath of the Permian-Triassic Mass Extinction". *Geology*.
Published:
Kirton, J. M. and Woods, A. D., 2021. "Stromatolites from the Lower Triassic Virgin Limestone at Blue Diamond, NV USA: The Role of Dysoxia, Enhanced Calcification and Nutrient Availability in the Growth of Post-Extinction Microbialites". *Global and Planetary Change*, v. 198, 103429.
Chang, X., Hou, M., **Woods, A.**, Chen, Z. -Q., Liu, X., Liao, Z, Liu, Y., and Chao, H., 2021. "Late Ordovician paleoceanographic change: Sedimentary and geochemical evidence from Northwest Tarim and Middle Yangtze region, China". *Palaeoclimatology, Palaeoecology*, v. 562, 1100702.
Guo, S. **Woods, A. D.**, Yu, M. -Y., Li, X. -W., Wei, H. -Y., and Qiao, D., 2019. "Lower Triassic Limulid Trackways (*Kouphichnium*) from the Southwestern Margin of the Yangtze Carbonate

Platform: Paleoenvironmental And Paleoecological Implications". PALAIOS, v. 34, p. 229–243.

Maaleki-Moghadama, M., Rafieia, B., Richoz, S., **Woods A. D.**, and Krystyn, L., 2019. "Anachronistic facies and carbon isotopes during the end-Permian biocrisis: Evidence from the mid-Tethys (Kisejin, Iran). *Palaeogeography, Palaeoclimatology, Palaeoecology*, v.516, p. 364-383.

Li, M., Song, H., Algeo, T., Wignall, P., Dai, X., and **Woods, A.** , "A dolomitization event at the oceanic chemocline during the Permian-Triassic transition", *Geology*, v. 46, p. 1043-1046.

Li, M., Song, H., **Woods A. D.**, Dai, X., and Wignall, P., 2019. "Facies and evolution of the carbonate factory during the Permian–Triassic crisis in South Tibet, China". *Sedimentology*, doi: 10.1111/sed.12619.

Woods, A.D., Alms, P. D., Monarrez, P. M., and Mata, S., 2019. "The interaction of recovery and environmental conditions: a paleoecological and paleoenvionmental analysis of the outer shelf edge of western North America during the Early Triassic". *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 513, p. 52-64.

Li, M., Song, H., Tian,L., **Woods A. D.**, Dai, X., and Song, H., 2018. "Lower Triassic deep sea carbonate precipitates from South Tibet, China". Sedimentary Geology, v. 376 (2018) p. 60–71.

Feng, X., Chen, Z.-Q., **Woods, A.**, and Fang, Y., 2017. "Anisian (Middle Triassic) marine ichnocoenoses from the eastern and western margins of the Kamdian Continent, Yunnan Province, SW China: Implications for the Triassic biotic recovery". *Global and Planetary Change*, v. 157, p. 194 – 213.

Feng, X., Chen, Z.-Q., **Woods, A.**, Pei, Y., Wu, S., Fang, Y., Luo, M, and Xu, Y., 2017. "A Smithian (Lower Triassic) ichnoassemblage from Lichuan, Hubei Province, South China: implications for biotic recovery after the Late Permian mass extinction". *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 486, p. 123 – 141.

Deng, B., Wang, Y., **Woods, A.**, Li, S., Li, G., and Chen, W., 2017. "Evidence for rapid precipitation of calcium carbonate in South China at the beginning of Early Triassic". *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 474, p. 187 – 197.

Deng, B., Wang, Y., **Woods, A.**, Li, G., and Liao, W., 2015. "Lower Triassic anachronistic facies capping the Qinghai-Tibet Plateau seamount: Implications for the extension of extraordinary oceanic conditions deep into the interior Tethys Ocean". *Global and Planetary Change*, v. 132, p. 31-38.

Guo, S., **Woods, A.**, and Yu, M. Y., 2015. "Two Episodes of Evolution of Trace Fossils during the Early Triassic in the Guiyang Area, Guizhou Province, South China". *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 426, p. 275 – 284.

Li, F., Yan, J., Chen, Z.–Q., Ogg, J. G., Tian, L., Korngreen, D., Liu, K., Ma, Z., and **Woods, A.**, 2015. "Global oolite deposits across the Permian–Triassic boundary: a synthesis and implications for palaeoceanography immediately after the end-Permian biocrisis". *Earth Science Reviews*, v. 149, p. 163-180.

Woods, A. D., 2014. "Assessing Early Triassic Paleoceanographic Conditions Via Unusual Sedimentary Fabrics and Features: A Review". *Earth-Science Reviews*, v. 137, p. 6 - 18.

Meng, Z, Wang, Y, **Woods, A.**, Li, G., and Liao, W. 2014. "Calci-sponge biostrome in Late Permian deeper shelf settings along the northern margin of south China and its paleoecological significance". *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 401, pg. 132 – 141.

Invited Journal Articles/Book Chapters:

Woods, A. D., 2014. "Assessing Early Triassic Paleoceanographic Conditions Via Unusual Sedimentary Fabrics and Features: A Review". *Earth-Science Reviews*, v. 137, p. 6 - 18.

Field Trip Guides:

Woods, A. D., M., Alms, P. and Kinder, K. 2019. **"**Anatomy of Anachronistic Carbonate Platform: Environmental Conditions and Biotic Recovery in the Aftermath of the Permian – Triassic Mass Extinction". Fall Field Trip Guide, Pacific Section SEPM, Los Angeles, CA, 50 p.

Meeting abstracts:

Perkins, K., and Woods, A. D., 2021. "A Paleoenvironmental Analysis of the Upper Member of the Union Wash Formation, Darwin, CA: Environmental Conditions During the Late Post-Extinction Recovery Period", in 2021 Annual Meeting of the Geological Society of America Abstracts with Programs, v. 52, doi: 10.1130/abs/2021AM-368942

Woods, A. D., 2021. "Calcium carbonate crystal fans: Geologic occurrences and controls on growth", in vEGU21, the 23rd EGU General Assembly, held online 19-30 April, 2021, id.EGU21-9021

Moerer, B., and **Woods, A. D.**, 2020. "Environmental Stress as a Cause for Prolonged Recovery Following the Permian-Triassic Mass Extinction: A Geochemical Investigation of the Lower Triassic Union Wash Formation", in 2020 Cordilleran Meeting of the Geological Society of America Abstracts with Programs, v. 52.

Woods, A. D., Beach, A., Caesar, K., Chen, N. M., Hernandez, E. L., Leeper, R. J, and Santos, G. – P., 2020. "Sedimentology and Geochemistry of the Lower Triassic (Spathian) Silver Lake Formation", in 2020 Cordilleran Meeting of the Geological Society of America Abstracts with Programs, v. 52.

Kovtun, R., and **Woods, A. D.**, 2018. "Early Triassic Paleoceanography along Western North America: An Analysis of the Middle Member of the Union Wash Formation, East-Central California", in 2018 Annual Meeting of the Geological Society of America Abstracts with Programs, v. 50.

Woods, A. D., and Kinder, K., 2018. "Improved Benthic Oxygenation Across the Smithian – Spathian (Middle Early Triassic) Boundary the Result of Amelioration of Global Temperatures: An Analysis of the Union Wash Formation at the Cerro Gordo, CA Locality", in 2018 Annual Meeting of the Geological Society of America Abstracts with Programs, v. 50.

Macias, A., and **Woods, A. D.**, 2017. "Paleoceanographic Changes Across The Permian-Triassic Interval Along The Northwestern Margin Of Pangea: A Case Study From Opal Creek, Alberta, Canada", in 2017 Annual Meeting of the Geological Society of America Abstracts with Programs, v. 49.

Poncelet, A. P., **Woods, A. D.**, 2017. "A Determination Of The Timing And Consequences Of The Late Ordovician Glaciation Using The Ely Springs Dolomite Of East Central California", in 2017 Annual Meeting of the Geological Society of America Abstracts with Programs, v. 49.

Woods, A. D., Alms, P. D., Monarrez, P. M., and Mata, S., 2017. "The Interaction Of Recovery And Environmental Conditions: An Analysis Of The Outer Shelf Edge Of Western North America During The Early Triassic" in 2017 Annual Meeting of the Geological Society of America Abstracts with Programs, v. 49.

Avila, M., and **Woods, A. D.**, 2016. "Major, Minor, And Trace Element Analysis Of The Montney Formation, Peace River Embayment (Eastern Alberta, Canada) Following The Permian-Triassic Mass Extinction", in 2016 Cordilleran Meeting of the Geological Society of America Abstracts with Programs, v.48, doi: 10.1130/abs/2016CD-274193.

Beach, A. M., and **Woods, A. D.**, 2016. "A Taphonomic, Stratigraphic, and Geochemical Analysis of middle Miocene Cetacean Bonebeds from the Topanga Formation, Western San Joaquin Hills, Orange County, California", in 2016 Cordilleran Meeting of the Geological Society of America Abstracts with Programs, v. 48, doi: 10.1130/abs/2016CD-274623.

Chou, C. Y., and **Woods, A. D.**, 2016. "A Paleoenvironmental And Ichnologic Analysis Of The Upper Mississipian Portion Of The Rest Spring Shale Of Inyo County, California", in 2016 Cordilleran

Meeting of the Geological Society of America Abstracts with Programs, v.48, doi: 10.1130/abs/2016CD-274227.

Macias, A., and **Woods, A. D.**, 2016. "Trace Elemental Analysis of Productivity and Oxygenation Conditions within the Western Canada Sedimentary Basin following the Permian-Triassic Extinction", in 2016 Cordilleran Meeting of the Geological Society of America Abstracts with Programs, v. 48, doi: 10.1130/abs/2016CD-274336

Woods, A. D., and Pilesky, W., 2016. "Upper Ordovician – Lower Silurian Carbonates From the Southwestern United States Indicate Long-Term Global Cooling but a Short-term Gondwanan Glaciation", in 2016 Cordilleran Meeting of the Geological Society of America Abstracts with Programs, v. 48, doi: 10.1130/abs/2016CD-274516.

Pilesky, W. and **Woods, A. D.**, 2015. "The Paleogeographic Distribution of Cold Water Carbonates in Late Ordovician Sedimentary Rocks of the Southwestern United States", in 2015 Annual Meeting of the Geological Society of America Abstracts with Programs, v. 47, p. 714.

Pilesky, W. and **Woods, A. D.**, 2014. "Short-Lived Upwelling and Vigorous Ocean Circulation Caused by a Brief Glacial Period During the Late Ordovician", in 2014 Annual Meeting of the Geological Society of America Abstracts with Programs, v. 46, p. 626.

Woods, A.D., Monarrez, P.M., Mata, S. A., and Alms, P. D., 2014, "Shallow – Water Facies of the Union Wash Formation, East-Central California: Windows Into Recovery from the Permian – Triassic Mass Extinction", v. 46, p. 487.

INVITED TALKS SINCE 2014

December, 2015, UNLV, Department of Geosciences: Reconstructing the Mad Max World: The Lower Triassic of Western North America in the Aftermath of the Permian – Triassic Mass Extinction

SERVICE SINCE 2014

Departmental Service:
Chair: 2019 – present
Personnel Committee: 2014 – 2017; 2018-2019 (Chair: 2017-2018)
Undergraduate Committee: 2014 – 2019
Curriculum Committee: 2014 – 2017; 2018-2019 (Chair 2013 – 2017)

NSM Service:
Curriculum Committee: 2014 - 2018

Professional Service:
Treasurer, Pacific Section, SEPM (Society for Sedimentary Geology) (2008-present)
Associate Editor-in-Chief: Journal of Palaeogeography (2012 – 2016)
AAPG Society Representative (2014 – 2017)