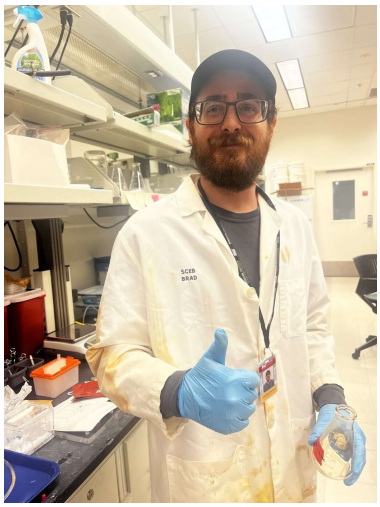
Impact Report

Biodesign Swette Center for Environmental Biotechnology





Left: Dr. Everett Eustance (Rittmann lab) prepares to instruct students in microscopy. Spring-25
Middle: Chris Muse (Technical expert/scientist for Swette Center) shares his expertise on the high-performance liquid chromatography. Right: Zachary Hubbard (Torres Lab) prepares his experiment at Biodesign labs. Fall 2025

Research Faculty Sean Lai and PhD students Genji Yao, Kartik Bhagat, and Winter Taniguchi demonstrate how we grow microbial communities to transform waste into useful resources through a fun game during ASU Open Door, February 2026.

Biochemistry student Jordyn Begay (right) and environmental engineering PhD student Maheen Mahmood observes a sample of 'PEARL' media, a sponge-based membrane that captures pollutants, in a lab at Biodesign A in Tempe on Nov. 7, 2025. (Photo by Samantha Chow/Arizona State University)

January - December 2024

Strategic Investment - Annual Impact Report

Using the building blocks of Nature's grand designs, our talented researchers are pushing the frontiers of knowledge and advancing research and discovery to make major impacts on improving the sustainability of our community, nation, and World.

Introduction

We are most grateful for the generous support and confidence that the Swette family has provided. The Swette Strategic Investment Fund supports the Biodesign Swette Center for Environmental Biotechnology (aka, Swette Center or BSCEB) as its researchers develop preliminary results, publish seminal papers, give talks across the world to eager audiences, and have time to seek funding for new projects. We have attracted outstanding researchers whose talents, energy, and inspiration are leading to new science discoveries and new technologies. The Swette's support greatly amplifies our achievements and their impacts.

This Impact Report documents the many activities and achievements within BSCEB for 2025, including researcher activities, awards received, degrees granted, papers published, grants awarded, and service rendered. Beyond summarizing our success in 2025, this impact report illuminates why BSCEB expects to attain even greater impacts in 2026 and beyond.

The Swette Strategic Investment Fund is advancing our ability to create new solutions to improve the sustainability of society.

Executive Summary

Funds from the Swette Strategic Investment Fund catalyze our efforts to perform high-impact research and obtain major research funding from multiple sources, both of which enhance the sustainability of our society. For example, BSCEB researchers are leaders in two NSF-supported centers: SouthWest Innovation Engine (SWIE) and the Science and Technology for Enhancing Sustainable Phosphorus (STEPS). Major funding in 2025 also came from the Department of Energy, Department of Defense, the National Science Foundation outside the centers, the State of Arizona, National Geographic Society, Spark Climate, and several industry partners, including the Taiwan Semi-conductor Manufacturing Company (TSMC).

Here are four examples of projects that have gained success due to the Swette funding:

1. We expanded our work with membrane-film reactors to bioremediate waters contaminated with per- and poly-fluorinated alkanoic substances (PFAS). Our hybrid systems integrate nanoparticle catalysis and biodegradation to create a practical means to detoxify the so-called "forever" contaminants. This area now has major research support from the Department of Defense, the NSF, and private industry.
2. Swette researchers are at the leading edge of the exciting area of valorizing CO_2 and CO through microbial biotransformation that produces valuable organic products. The microbial systems include ones that utilize bacteria that employ photosynthesis, electrochemistry, fermentation, and chain elongation.
3. We are active in developing novel anaerobic technology to recover renewable energy and nutrients from high-strength organic wastewaters, such as from dairy farms, wastewater sludge, confined animal feeding operations, food processing, and food waste. Recovering renewable energy and nutrients protects environmental quality, advances "circular economies," and makes pollution abatement a "profit center" that encourages industries and municipalities to take positive steps towards better sustainability.
4. We are advancing microbiological systems that remove and recover critical minerals from mine-influenced waters, such as from mining, ore-processing, and recycling. In all cases, the microbiological technologies protect environmental and human health, and in many cases also generate a large income stream from the recovery of valuable elements such as gold and palladium.

Center Mission

The Biodesign Swette Center for Environmental Biotechnology manages microbial communities that provide services to society. Most of the services make our society more environmentally sustainable, for example, by generating renewable energy, valorizing CO_2, and making polluted water and soil clean. The microbial services make humans healthier – directly and indirectly.

Our researchers apply the most advanced tools of molecular microbial ecology, chemistry, microscopy and mathematical modeling to think like the microorganisms and, in turn, create systems that allow microorganisms to provide beneficial services ranging from sustainable environmental processes to nutrient and energy recovery, to making humans healthier.

We are known for our culture of cross-disciplinary and team-based research. This culture begins with our diverse set of researchers, who come from many disciplines within engineering, life sciences, chemistry, and more. The researchers also come from many parts of the United States and abroad. Partnerships are common within the different research groups in the Center, as well as with other groups in ASU, national and international universities, and practitioners.

Center Goals

1. Be the leading global center in environmental biotechnology
2. Perform and disseminate transformative science and technology
3. Promote success so our people become leaders in their areas

TABLE OF CONTENTS

2025 HIGHLIGHTS

Hinsby Cadillo Quiroz (right) and Michael Pavia discovered that unique microbes in Amazonian peatlands could influence climate change. Their NSF-funded study underscores the urgent need to protect global tropical wetlands from human impact. LINK

Professor Hinsby Cadillo Quiroz in the field, collecting samples.

Edward Ardern (left, top row) and William Lockett (right, bottom row) were the inventors of the activated sludge process. They **discovered** this process in 1913-1914 at the Davyhulme Sewage Works in Manchester, UK.

Water-cleaning bacteria can produce health and economic benefits. LINK . This ASU News article focuses on Bruce Rittmann winning the Ardern-Lockett Award at the 2025 Microbial Ecology and Water Engineering Conference. Ardern & Lockett are credited with discovering the activated sludge process in 1914. The Ardern & Lockett Award recognizes achievements that link microbial ecology to practical applications.

Anca Delgado, Avery Brewer, and Caleb McLaughlin (pictured right) attended the 2025 International Chain Elongation Conference in Incheon, South Korea (November 2025). The ICEC 2025 program highlighted the latest innovations in harnessing microbial metabolic pathways to produce sustainable materials, chemicals, and other critical resources. Attendees had the opportunity to delve into novel methodologies, discuss emerging trends, and explore real world applications that push the boundaries of efficiency and environmental responsibility. Dr. Delgado gave a plenary talk. Avery and Caleb gave oral talks. Dr. Delgado will chair and organize tICEC 2027 in Tempe, AZ.

Hannah Collins (pictured right) was featured in an Arizona State University article about her three-time participation in the Summer Research Initiative (SURI) program (April 2025).

Kassandra Kellenberger (center of the picture to the right), Research Coordinator Sr., brought the latest mini-Swette into this world in September of 2025. Our members were extremely supportive, sending her a month's dinner service so she could focus on being a new Mom!

Alumnus Pat Pataranutaporn presents at MIT Media Lab Southeast Asia Forum (photo credit). LINK to his website.

An undergraduate researcher from a few years ago, Pat Patarnutaporn, recently completed his PhD at MIT. Subsequently, he was hired as an assistant professor at MIT. Pat wrote to say how valuable his experience was doing undergraduate research in BSCEB.

Top: Sanjay Giridharan (Torres Lab, mentored by Dr. Christine Lewis, Dr. Everett Eustance, and Dr. Omar Khdour) stands on the flight line prior to an aerospace training sortie.
Bottom Left: Sanjay navigates a lava tube during a subsurface planetary analog mission.

Bottom Right: Sanjay conducts a surface EVA simulation on Mars-analog terrain. Sanjay participates in these analog missions to study human performance and engineering constraints in extreme environments

Above: Hinsby Cadillo Quiroz (8th from right) was the co-lead organizer of the Workshop: Methane Alert: An Integrated Measurement Framework to Monitor Increasing Natural Methane Emissions, which took place from Oct 12th, 2025 - Oct 17th, 2025. The workshop explored greenhouse gas contributors and expanded research, measurement, and monitoring of natural methane emissions. LINK.

We brought the Biodesign Swette Center for Environmental Biotechnology (Director, Bruce Rittmann) together with spin-off Biodesign Center for Health Through Microbiomes (Director, Rosa Krajmalnik-Brown) for a party to ensure that new members of each center get to know each other and that we get to know each other's families and significant others. March 2025.

STAFFING in 2025

TOTAL MEMBERS = 99

TENURE-TRACK PROFESSORS = 4

Name	Academic Home/Program
Hinsby Cadillo Quiroz	School of Life Sciences (SoLS)
Anca Delgado	Fulton Schools of Engineering (FSE) School of Sustainable Engineering and the Built Environment (SEBE)
Bruce Rittmann	Fulton Schools of Engineering (FSE), School of Sustainable Engineering and the Built Environment (SEBE)
César Torres	Fulton Schools of Engineering (FSE), School of Engineering of Matter, Transport, and Energy (SEMTE)

FULL-TIME STAFF = 4

Name	Title	Lab
Carole Flores	Business Ops Manager	All BSCEB PIs
Kassandra Kellenberger	Research Coordinator Sr.	All BSCEB PIs
Christopher Muse	Research Specialist	All BSCEB PIs
Kyleigh Bachelor	Research Technician	Cadillo

RESEARCH PROFESSORS = 2

Name	Lab
Yen-Jung Sean Lai	Rittmann Lab
Everett Eustance	Rittmann Lab

RESEARCH SCIENTISTS = 2

	Lab
Wei Li	Rittmann Lab
Chenwei Zheng	Rittmann Lab

POSTDOCTORAL ASSOCIATES = 5

Name	Lab
Anwar Alsanea	Rittmann Lab
Seungyeob Han	Rittmann Lab
Jesus Alberto Perez Garcia	Torres Lab
Christine Lewis	Torres Lab
Juan Fausto Ortiz Medina	Torres Lab

Top: Dr Christine Lewis (Torres lab) pictured with presenters for the Arizona Postdoctoral Research Council. Dr Lewis was the Chair of the ASU Postdoc Council 2025-26. She cohosted and served on the selection and planning committee. Bottom: Dr. Juan Fausto Ortiz Medina (Torres Lab) served as a member of the ASU Postdoc Council and was a main coordinator on the selection and planning committee, as well as was a peer review judge for presentations and posters at the conference. He stands with another postdoc researcher, Dr. Squib Siddiqui.

PH.D. STUDENTS = 30

Biological Design, SEMTE = 3	
Name	**Lab**
Dorsa Daeizadeh	Delgado
Briana Paiz	Delgado
Winter Taniguchi	Rittmann
Biology and Society = 1	
Alice Sansonetti	Cadillo
Chemical Engineering, SEMTE = 4	
Amelia Bryan	Torres
Taylor Davis	Rittmann
Samuel Ferrante	Torres
Zachary Hubbard	Torres
Civil, Sustain., & Env Eng, SSEBE = 15	
Kartik Bhagat	Rittmann
Avery Brewer	Delgado
Hannah Collins	Rittmann
Katie Currier	Rittmann
Kelsie Herzer	Delgado
Maheen Mahmood	Rittmann
Jesus Marin	Cadillo
Caleb McLaughlin	Delgado
Alba Medina Benitez	Delgado
Eías Mindreau	Rittmann
Alireza Rahimi	Rittmann
Asma Sattar	Rittmann
Maya Suzuki	Rittmann
Genji Yao	Rittmann
Environmental Life Sciences, SOLS = 1	
Victor Hugo Ochoa Henriquez	Cadillo

MASTERS STUDENTS = 8

Name	**Lab**
Chemical Engineering, SEMTE = 2	
Atul Harimohan Ojha	Torres
Soham Sanghvi	Torres
Biological Design, SEMTE = 1	
Jacob Hackney	Torres
Environmental Engineering, SSEBE = 4	
Prapti Shetty	Rittmann
Anh Quan Truong	Delgado
Riley Berg	Delgado
Microbiology, SOLS = 1	
Julia Furedy	Cadillo

Image taken of Rittmann PFAS group members at the 2025 Arizona PFAS Forum
From left to right: Winter Taniguchi, Asma Sattar, Hannah Collins, Genji Yao, Muhammad Usman Saleem, and Iraj Shroff.

UNDERGRADUATES = 37

Cadillo Lab = 9	**Rittmann/Lai Labs = 9**
Aurely Sanchez Carrion (NSF REU)	Pranav Arun
Thomas Groenhert (NSF REU)	Jordyn Begay
Sasha Horvath (NSF REU)	Mia Copeland
Peter Herrick (NSF REU)	Santiago Flores
David Nguyen (NSF REU)	Manan Godhani
Luka Castillejo Olazabal (Honor Thesis)	Arzu Hasanova
Kyla Pikes (ASU Online NSF REU)	Rebekah Quan
Roberto Quintana (NSF REU)	Daria Sololova
Johanan Unchiasu	Grayson Young
	Fei Liu
Delgado Lab = 10	**Torres Lab = 9**
Genevieve Alexander	Aishah Alquran
Helene Budd	Ethan Dunne
Ashley Griffith	Ava Ferraro
Lesley Gutierrez	Sanjay Giridharan
Danika Haverkamp	Megan Langella
Paulina Lopez Torres	Joshua Tait
Jaden Lynch	Joshua Telepo
Natalie Pargmann	Ella Thorsen
Liliana Rivera	Mohammad Alquran

Chemical engineering student Grayson Young (right) and Bruce Rittmann, Biodesign Swette Center for Environmental Biotechnology director and professor, work together in a lab at Biodesign A in Tempe on Nov. 7, 2025. (Photo by Samantha Chow/Arizona State University)

Biochemistry student Jordyn Begay (right) and environmental engineering PhD student Maheen Mahmood look at a sample of 'PEARL' media, a sponge-based membrane that captures pollutants, in a lab at Biodesign A in Tempe on Nov. 7, 2025. (Photo

VISITING SCHOLARS = 13

Name	Lab	Affiliation
Tsu Chin Chou	Rittmann Lab	Institute of Analytical and Environmental Sciences, National Tsign Hua University, Taiwan
Menelisi Dlamini	Torres and Rittmann Labs	Institute of Nanotechnology and Water Sustainability, University of South Africa
Ruey An Doong	Rittmann Lab	Institute of Analytical and Environmental Sciences, National Tsign Hua University, Taiwan
Qingjiahui Fan	Rittmann Lab	School of Resources and Environmental Engineering, East China University of Science and Technology, Shanghai, China
Yong Gu	Rittmann Lab	Power Engineering and Engineering Thermodynamics, East China University of Science and Technology, Shanghai
Saira Kanwal	Torres Lab	National University of Sciences and Technology, Islamabad (NUST)
Ting Li	Rittmann Lab	School of Environmental Science & Engineering, Nankai University, PR-China
Zhi-Fu Lin	Rittmann Lab	Institute of Analytical and Environmental Sciences, National Tsing Hua University, Taiwan
Bo-Sheng Liu	Rittmann Lab	National Tsing Hua University, Taiwan
Chengkuo Tsai	Rittmann Lab	Emergency Response Information Center and Department of Chemical and Materials Engineering at the National Yunlin University of Science and Technology, Taiwan
Zia Ullah	Torres Lab	Institute of Environmental Sciences and Engineering (IESE), National University of Sciences and Technology (NUST), Islamabad, Pakistan
Megan Wheeling	Rittmann Lab	Chemical Engineering, University of Michigan
Ziwen Zhang	Rittmann Lab	School of Energy and Power Engineering Xi'an Jiaotong University, Xi'an, China

HIGH SCHOOL STUDENTS = 2

Name	Lab	Affiliation
Kaitlyn Pany	Rittmann Lab	BASIS Chandler
Iraj Shroff	Rittmann Lab	BASIS Chandler

Visiting Scholar Saira Kanwal (Torres Lab) and Center Business Manager Carole Flores

GRADUATES in 2025

Delgado Graduates

1. Riley Berg, MS Environmental Engineering

Riley Berg graduated in May 2025 with an MS in Environmental Engineering. Riley is now an engineer with Langan. Shown in the photo is Riley (left) and Dr. Delgado (right).

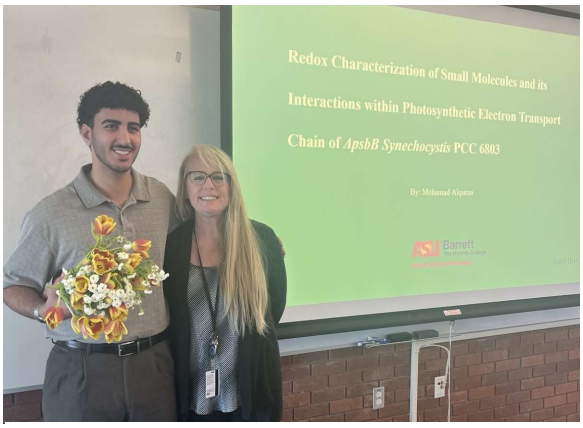
Rittmann Graduates:

1. Prapti Shetty, MS Environmental Engineering
2. Taylor Davis, PhD Chemical Engineering
3. Xiangxing Long, PhD Environmental Engineering

Taylor Davis, Rittmann advisee and graduate.

Torres Graduates:

1. Atul Ojha, MS Chemical Engineering
2. Megan Langella, BS in Biomedical Technology, grad with Honors at Barrett Honor's College
3. Ella Thorsen, BS in Biomedical Technology, grad with Honors at Barrett Honor's College
4. Mohammad Alquran, BS in Biomedical Technology, grad with Honors at Barrett Honor's College



Mohammad Alquiran (left) and Megan Langella (right) hold congratulatory flowers after successfully defending, presenting, and completing their Barrett Honor's College theses. They were mentored by Dr Christine Lewis, a postdoc in Torres lab. Both Theses are published in ASU KEEPS. Mahommad graduated and is preparing for MCATs for medical school. Megan graduated and is now a medical student at Stony Brook University in New

JOB PLACEMENTS IN 2025

Delgado Job Placements

1. Ashely Griffin (May 2025). Design Engineer, Wilson Engineers.
2. Riley Berg (May 2025). Environmental Engineer, Langan

Rittmann Job Placements

1. Taylor Davis (December 2025). EMD Electronics (Subsidiary of Merck KgaA)

Torres Job Placements

1. Soham Sanghvi (May 2025). Process Engineer, Organo, USA
2. Megan Langella (May 2025). Renaissance School of Medicine at Stony Brook University

AWARDS, HONORS, AND PROMOTIONS IN 2025

Awards

1. Avery Brewer's manuscript "Genetically Engineered Microbes for Bioremediation: Opportunities and Limitations in the Emerging Bioeconomy" was selected as a EBRC-*JSPG* Bioeconomy Special Issue Showcase Award Winner. This award included sponsored travel to the Engineering Biology Research Consortium Annual Meeting in Seattle, WA and the opportunity to present (April 2025).
2. Avery Brewer received the Conference Travel Award for Ph.D. Students through the School of Sustainable Engineering and the Built Environment, which she used to attend the International Chain Elongation Conference in Incheon, South Korea (October 2025).
3. Hannah Collins was inducted into the Arizona Beta Chapter of Tau Beta Pi Engineering Honor Society, which recognizes top engineering students who display both distinguished scholarship in technical fields and exemplary character (November 2025). Above is a picture of Hannah standing beside ASU's Tau Beta Pi bent statue following her induction.
4. Dr. Anca Delgado - Excellence in Research and Leadership Award, NSF Engineering Research Center for Bio-mediated and Bio-inspired Geotechnics (CBBG), May 2025
5. Dr. Everett Eustance, PhD, was awarded the Unsung Hero for contributions to the algae industry and dedication to the algae biomass organization (October 2025).
6. Sanjay Giridharan received the Red Sprite Gold Medal from the International Institute for Astronautical Sciences (IIAS) (Spring 2025).

Hannah Collins inducted into the Arizona Beta Chapter of Tau Beta Pi Engineering Honor Society.

7. Sanjay Giridharan was awarded the Most Creative Analog Astronaut Award from the Analog Astronaut Training Center (AATC) (Spring 2025).
8. Dr. Christine Lewis, PhD., was appointed as the Chair of the ASU Postdoctoral Council for 2025-26.
9. Dr. Christine Lewis, PhD, was awarded the Postdoc Council Travel Grant. Fall 2025.
10. Bruce Rittmann received the Emerson Distinguished Service Medal from the Water Environment Federation (October 2025).
11. Dr. Bruce Rittmann, PhD., received the Zhejiang Foreign Expert West Lake Friendship Award from Zhejiang Province, China (July 2025).
12. Dr. Bruce Rittmann, PhD., was made a Distinguished Fellow of the International Engineering and Technology Institute (November 2025).
13. Dr. Bruce Rittmann, PhD., was named a Lifetime Highly Rated Scholar in Engineering and Computer Science by Scholar GPS (June 2025).
14. Dr. Bruce Rittmann, PhD., received the Ardern & Lockett Award from the International Water Association (June 2025).

Bruce Rittmann received the Emerson Distinguished Service Medal from the President of WEF.

Events

1. Kartik Bhagat obtained his Engineer-in-Training certification from the board of Professional Engineers of California.
2. Dr. Christine Lewis and Dr. Juan Fausto Ortiz Medina were panelists in the ASU early career event hosted by the ASU Office of Professional Development.
3. The ASU Postdoc Council (including Dr. Christine Lewis, PhD., and Dr Juan Fausto Ortiz Medina) hosted and served on the planning committee for the 2025 Arizona Postdoctoral Research Conference that took place at Old Main, Arizona State University Tempe campus. September, 2025.
4. Dr. Christine Lewis, PhD, was an invited guest on the Unsung Heroes of ASU podcast. September 16, 2025.

Internships

1. Jordyn Begay was accepted for the 2025 STEPS REU Program in which he interned at North Carolina State University (May 2025 - August 2025).
2. Kartik Bhagat interned for Waterworks Engineers in summer 2025, a company based of Scottsdale, AZ, offering consultancy for wastewater treatment plants expansion, designs engineering, and construction monitoring

Promotions

1. YenJung Sean Lai was promoted to Associate Research Professor at BSCEB (Sept 2025).

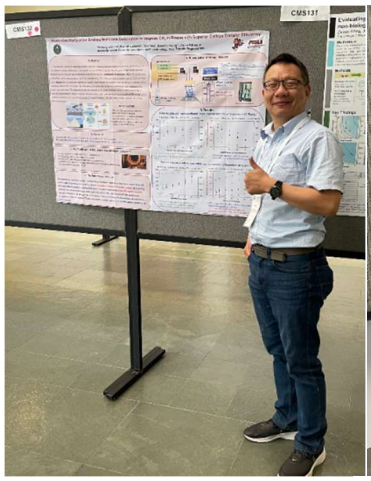
Scholarships & Fellowships

1. Jordyn Begay received the School of Molecular Sciences Ted Brown Memorial Scholarship from Arizona State University (March 2025).
2. Hannah Collins was awarded the 2025-2026 Phoenix/Scottsdale Groundwater Contamination Scholarship for Environmental Science from Arizona State University (May 2025).
3. Hannah Collins was awarded an Engineering Graduate Fellowship from Arizona State University (May 2025).
4. Hannah Collins received an Honorable Mention for her NSF Graduate Research Fellowship Program application (April 2025).
5. Sanjay Giridharan was awarded the Fulton Scholarship from Arizona State University (Fall 2025).
6. Briana Paiz was awarded a University Graduate Fellowship from Arizona State University (June 2025).
7. Maya Suzuki received the Arizona Women in Mining scholarship (May 2025).
8. Maya Suzuki received the National Association of Abandoned Mine Lands (NAAMLP) Graduate scholarship, for which she received a sponsored trip to the 2025 NAAMLP conference (July 2025).

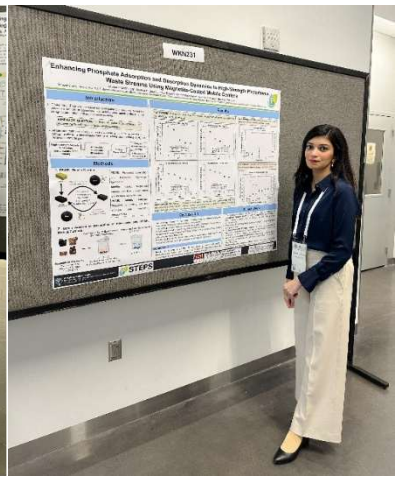
Posters

1. Giridharan, S. (2025). WhiskerSense: Decoding Hydrodynamic Trails for Covert Underwater Tracking. Poster presented at the Fulton Undergraduate Research Initiative (FURI) Symposium, Arizona State University, Tempe, AZ.
2. Giridharan, S. (2026). Innovative Modelling Driven Membrane-Free Microfluidic Separation of Microplastics Model Optimized with Machine Learning. Research seminar presented at the Microplastics Exposure and Human Health Conference 2026, University of New Mexico, Albuquerque, NM.
3. Lai YJ, Eustance E, Frias Z, Young M, Rittmann BE. Membrane Carbonation Promoted Biogas Valorization via Microalgal Cultivation. Algal Biomass Summit, Tempe, AZ, Oct 19-21, 2025
4. Lai YJ, Eustance E, Frias Z, Young M, Rittmann BE. Bleed-valve Manipulation Enables Membrane Carbonation to Upgrade CH_4 in Biogas with Superior Carbon Transfer Efficiency. AEESP, Duke, NC, May 20-22, 2025.
5. Langella, M., edited by Lewis, C., Eustance, E., Khdour, O., (2025). Flow Cytometry Analysis of Chlorella Vulgaris to Screen for the Effect of Small Molecule Ferroptosis Inhibition in Temperature-Related Cell Damage. *ASU Barrett, Honors Thesis,* ASU KEEP
6. Lewis, C., Interrogating Microbial Electrophotosynthesis. Poster presentation at the Asilomar Synthetic Communities Conference, hosted by Lawrence Livermore Berkeley National Laboratory. Pacific Grove, Ca. August 2025.
7. Lewis, C., Microbial Electrophotosynthesis. Poster presentation at the Algae Biomass Biofuels and Bioproducts Conference hosted by Elsevier, Tempe, Az. June 2025.

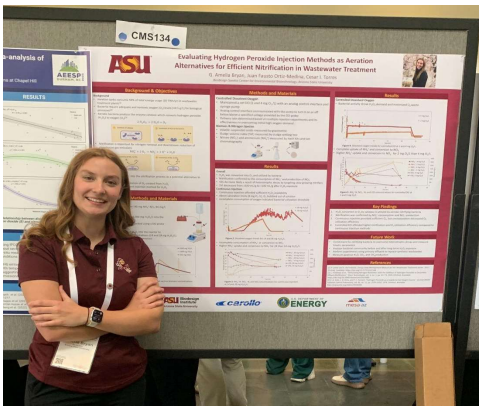
8. Lewis, C., presented a poster entitled, Interrogating Microbial Electrophotosynthesis. Poster presentation at the Algae Biomass Summit, hosted byASU, Tempe, Az., Oct. 2025.
9. Maheen Mahmood presented the poster, "Enhancing phosphate adsorption and desorption dynamics in high strength phosphorus waste streams using magnetite coated mobile carriers" at AEESP (Association of Environmental Engineering and Science Professors) Conference, at Duke University, NC (May 2025)
10. Mohamad, A., edited by Lewis, C. Khdour, O., (2025) *Redox Characterization of Small Molecule Tuning and its Interactions within Electron Transport of Cellular Systems, ASU Barrett, Honors Thesis,* ASU KEEP
11. Maya Suzuki presented the poster “Addressing Abandoned Mine Land Remediation with the Good Samaritan Act” at student poster competitions in the following conferences: Environmental Professionals of AZ, AZ Water, Biodesign Fusion.
12. Juan Fausto Ortiz Medina presented the poster, “Kinetic response of hydrogen peroxide addition as an alternative to aeration during activated sludge treatment” at AEESP Conference at Duke University, NC (May 2025).
13. Torres, C., Lewis, C., Ortiz Medina, J.F., Perez, J., Chapter 3: Extracellular electron transfer in microbial bioelectrocatalysis in Bioelectrocatalysis: From Electron Transfer Processes to Emerging Technological Applications, ECS Series, ed. 1, edited by Minteer, S., Grattieri, M., (Wiley, 2025)
14. Wang TH, Lai YJ*, Tsai CK, Fu H, Doong RA, Westerhoff P, Rittmann BE. A Novel dual-fiber platform Endorsing Efficient CO_2 conversion. ACS Spring 2025, San Diego, March 23-27, 2025.



Left: YenJung Sean Lai presented his research poster at AEESP Conference (May 2025)



Right: Maheen Mahmood presented her research at AEESP Conference (May 2025)



Amelia Bryan presented her research poster at the AEESP 2025

(Left to right) Amelia Bryan, Juan Fausto Ortiz-Medina, Anwar Alsanea, Maheen Mahmood, and Sean Yen-Jung Lai stand outside the Duke University Chapel during AEESP 2025.

Right: Juan Fausto Ortiz Medina, Anwar Alsanea, and Amelia Bryan at the AEESP photo booth, hamming it up!
So much learning and bonding goes on at conferences.

PUBLICATIONS in 2025

Total Number of Publications: 48

PI Name: Hinsby Cadillo-Quiroz, Professor
Total Number Published Papers: 5
1. Atwood, A., Ramesh, S., Amaya, J.A., Cadillo-Quiroz, H., Coaila, D., Chen, CM., West J.A. 2025. Landscape controls on water availability limit revegetation after artisanal gold mining in the Peruvian Amazon. *Commun Earth Environ* 6, 419. https://doi.org/10.1038/s43247-025-02332-y 2. Hettwer, C., Savage, K., Gewirtzman, J., Cadillo-Quiroz, H., Ruzol, R., Wason, J., Fraver, S. 2025 Methane flux from living tree stems in a northern conifer forest. *Biogeochemistry* 168, 66. Role: co-PI, project partner, manuscript development 3. Kelliher JM, Mirzayi C, Bordenstein SR, Oliver A, Kellogg CA, Hatcher EL, Berg M, Baldrian P, Aljumaah M, Miller CML, Mungall C, Novak V, Palucki A, Smith E, Tabassum N, Bonito G, Brister JR, Chain PSG, Chen M, Degregori S, Dundore-Arias JP, Emerson JB, Moreira C Fernandes V, Flores R, Gonzalez A, Hansen ZA, Jackson SA, Moustafa AM, Northen TR, Pariente N, Pett-Ridge J, Record S, Reji L, Reysenbach AL, Rich VI, Richardson L, Roux S, Schriml LM, Shabman RS, Sierra MA, Sullivan MB, Sundaramurthy P, Thibault KM, Thompson LR, Tighe S, Vereen E; STREAMS Consortium; Eloe-Fadrosh EA . 2025. STREAMS guidelines: standards for technical reporting in environmental and host-associated microbiome studies. Nat Microbiol. 2025 Dec;10(12):3059-3068. doi: 10.1038/s41564-025-02186-2. Epub 2025 Dec 1.PMID: 41326814 Review. 4. Metcalfe DB, Anders E, Axén H, Petter Axelsson E, Bermudez AE, Bartholomew DC, Butt N, **Cadillo-Quiroz H**, Chaudhary N, Callebaut T, Dahlsjö CAL, Dusenge ME, Feeley KJ, Wanger TC, Hwang BC, Hermans TDG, Jonsson M, Kardol P, Lindh A, Lussetti D, Lamba S, Mewett G, Mujawamariya M, Manzi OJL, Salinas N, Prevéy JS, Bargués-Tobella A, Tang J, Vought OK, Witteman M, Wallin G, Zhang W, Yan Y, Virkkala AM. 2025. Gaps in tropical science from unrepresentative distribution of sampling and citation across natural terrestrial environments. Nat Commun. 2025 Dec 20;16(1):11378. doi: 10.1038/s41467-025-67617-4.PMID: 41422069. 5. Wood, JD, Roman, DT, Griffis, TJ, Cadillo-Quiroz, H, Del Castillo, D. 2025. A large Amazonian peatland carbon sink was eliminated by photoinhibition of photosynthesis and amplified ecosystem respiration. Geophysical Research Letters 52 (13), e2025GL114642.

PI Name: Anca Delgado, Associate Professor
Total Number Published Papers: 2
1. Zhao, Z., Fu, H., Ling, L., Li, T., Brewer, A., Delgado, A. G., & Westerhoff, P. (2025). Control of Fungal Spores on Surfaces with UV-C Exposure Necessitates Complete Inactivation to Prevent Mycorrhizal Network Establishment. *Environmental science & technology*, *59*(17), 8800–8811. https://doi.org/10.1021/acs.est.4c12666 2. Skinner JP, Raderstorf A, Rittmann BE, **Delgado AG. 2025.** Biotransforming the "Forever Chemicals": Trends and Insights from Microbiological Studies on PFAS. Environ Sci Technol. 2025 Mar 25;59(11):5417-5430. doi: 10.1021/acs.est.4c04557. Epub 2025 Mar 11.PMID: 40067878 **Free PMC article.** Review.

PI Name: Bruce Rittmann, Center Director and Regents' Professor

Total Number Published Papers: 32

1. Alsanea, A., A. Bounaga, K. Lyamlouli, Y. Zeroual, R. Boulif, C. Zhou, and B. E. Rittmann (2025). Sulfate leached from phosphogypsum is transformed in a hydrogen-based membrane biofilm reactor. ACS ES&T Engineering 5: 468-474.
2. Alsanea, A., C. Zhou, and B. E. Rittmann (2025). Biofilm management to recover elemental sulfur in a sulfide-oxidizing oxygen-based membrane biofilm reactor. Chem. Engr. J. 521: 166427.
3. Boltz, J. P. and B. E. Rittmann (2025). Modeling aerobic granules in continuously flowing wastewater treatment processes. Water. Enviro. Res. 97: e11157.
4. Alsanea, A., A. Bounaga, K. Lyamlouli, Y. Zeroul, R. Boulif, C. Zhou, and B. E. Rittmann (2025). Sulfate reduction in the hydrogen-based membrane biofilm reactor receiving calcium-reduced phosphogypsum water. Biotechnol. Bioengr. 122: 2701-2808.
5. Cai, Y., J. P. Boltz, and B. E. Rittmann (2025). Modeling the performance of an anaerobic moving bed biofilm reactor. Biotechnol. Bioengr. 122: 1130-1141. https://doi-org.ezproxy1.lib.asu.edu/10.1002/bit.28938.
6. Cao, P., M. Long, Xiong Zheng, C. Zhou, Y. Chen, and B E Rittmann (2025). Selective regulation of product generation from CO2 hydrogenation on Pd-based catalysts: a critical review from a pathway perspective. Energy & Environmental Sustainability 1: 100020.
7. Dai, B., J. Zhou, Z. Wang, Y. Yang, Z. Wang, C. Liang, J. He, S. Xia, and B. E. Rittmann (2025). Hydrazine promoted nitrite reduction in partial-denitrification by altering the microbial community towards genera able to increase organic-substrate uptake and electron transport. Bioresource Technol. 418: 131991.
8. Davis, T. L. B. Dirks, E. A. Carnero, K. D. Corbin, S. R. Smith, A. Marcus, R. Krajmalnik-Brown, and B. E Rittmann. Modeling the microbial contribution to human Energy Balance using the Digestion, Absorption, and Microbial Metabolism (DAMM) model. medRxiv https://www.medrxiv.org/content/10.1101/2025.01.10.25320296v1.
9. Dirks, B., T. L. Davis, E. A. Carnero, K. D. Corbin, S. R. Smith, B. E. Rittmann, and R. Krajmalnik-Brown (2025). Methanogenesis associated with altered microbial production of short-chain fatty acids and human-host metabolizable energy. ISME J. 19 (1): wraf103.
10. Dirks, B., T. L. Davis, E. A. Carnero, K. D. Corbin, S. R. Smith, B. E. Rittmann, and R. Krajmalnik-Brown. Methanogens are associated with altered microbial production of short-chain fatty acids and human-host metabolizable energy. bioRXiv https://biorxiv.org/cgi/content/short/2024.12.31.630929v1.
11. Fan, Q., G.-J. Yao, Z.-H. Wang, W. Li1, Y.-D. Liu, and B. E. Rittmann. Enhanced sulfamethoxazole (SMX) Shewanella oneidensis MR-1 via a microbially driven Fenton reaction. J. Water Process Engr. 76: 108107.
12. Glass, S., H. Santiago, W. Chen, T. Zhang, J. Guelfo, B. E. Rittmann, T. Senftle, P. Vikesland, D. Villigran, H. Wang, P. Westerhoff, M. S. Wong, G. Jiang, G. Lowry, and P. J. J. Alvarez. Merits, limitations, and innovation priorities for catalytic platforms to destroy PFAS. Nature Water. https://doi.org/10.1038/s44221-025-00433-8.
13. Huang, M., H. Zhang, S. Chen, F. Liu, X. Gao, L. Chen, Y. Zhang, and B. E. Rittmann (2025). The roles of Paracoccus huijuniae for enhancing denitrification with N-methyl pyrrolidone as the electron donor. Intl. Biodet. Biodegr. 202: 106098.
14. Li, T., M. Lyu, B. Hu, Y. Li, Y. Zhang, H. Kou, B. Li, W. Li, and B. E. Rittmann. The fate of multiple antibiotics in a membrane aerated bioreactor carrying out short-cut nitrification and denitrification with treating saline wastewater. Chem. Engr. J. 525: 170444.

15. Li, W., J. Chen, Y. Gu, F. Yuan, Q. Yang, Y. Liu, D. Xu, and B. E. Rittmann (2025). Mass transfer limitations: an overlooked factor in the decline of anammox granular activity for treating sulfate-rich salinity wastewater. Environ. Sci. Technol. 59: 22029-22038.
16. Liu, F, D. Zhu, Y. Chen, J. Luo, Y. Zhou, F. Chen, Y. Zhang, and B. E. Rittmann (2025). Differentiating biosynthesis from heterotrophic nitrification/aerobic denitrification for total-nitrogen removal. Environ. Res. 285: 122498.
17. Liu. F., M. Huang, C. Li. C. Fu, Y. Zhang, and B. E. Rittmann (2025). Simultaneous N-methyl pyrrolione and total nitrogen removals in a a single aerobic process. Intl. J. Biodet. Biodegr. 205: 106189.
18. Long, M., J. Cheng, C. Zhou, and B. E. Rittmann (2025). Enhanced long-term reduction of high-level Au(III) with the presence of NO3- in a H2-based membrane biofilm reactor. Water Res. 274: 123013.
19. Long, M., J. Cheng, C. Zhou, and B. E. Rittmann (2025). Mechanistic insights into gold (Au) recovery and biosynthesis pathway in a hydrogen (H2)-based membrane biofilm. Resources, Conservation & Recycling 221: 108394. https://doi.org/10.1016/j.resconrec.2025.108394.
20. Shetty, P. (2025). Modeling the Dynamics of Biofilms Relevant to Saturated Rock Fills [ProQuest Dissertations & Theses]. Skinner, J. A. Raderstorf, B. E. Rittmann, and A. Delgado (2025). Biotransforming the "forever chemicals": trends and insights from microbiological studies on PFAS. Environ. Sci. Technol. 2025, 59, 11, 5417–5430. https://doi.org/10.1021/acs.est.4c04557.
21. Taşkan, B., E. Taşkan, E. Eustance, M. Mahmood, Y.-H. Y-J. S. Lai, and B. E. Rittmann (2025). Polyhydroxybutyrate (PHB) production and CH4 uptake by methane-oxidizing bacteria using membrane delivery of oxygen and methane. Chemosphere 385: 144590.
22. Upadhyaya, G., J. Brown, B, Noma, and B. E. Rittmann (2025). Anoxic biological treatment. Chapter 4 is Biological Drinking Water Treatment Committee (2025). Biological Drinking Water Treatment. Manual of Practices M80, American Water Works Assn., Denver, CO, pp. 111-156.
23. Wu, Y., Z. Chen, J. Dolfing, S. Zhuang, and B. E. Rittmann (2025). Storage protocol widely adopted for freshly collected soil samples significantly changes microbial community sequencing and analysis. Sci. Bull. S2095-9273(25)00570-5. doi: 10.1016.
24. Xu, Y., Y. Wu, J. Tao, Y. Song, X. Zou, J. Dolfing, and B. E. Rittmann (2025). Signal-guided population cooperation of microbial communities enhances the recovery of rare earth elements. J. Hazardous Matl. 495: 138974.
25. Yao, G.,K. Hong,T.P. Senftle,M.S. Wong., and B.E. Rittmann (2025). The Membrane Catalyst-Film Reactor (MCfR) Extends PGM Capability for Water Purification. Johnson Matthey Technol. Rev. doi: https://doi.org/10.1595/205651326X17550075510121
26. Zhang, H., Y. Ma, Fe. Liu, S. Chen, X Peng, F. Chen; Y. Zhang, and B. E. Rittmann (2025). How Rhodococcus ruber accelerated denitrification with soybean-processing wastewater as the electron donor. J. Hazardous Mat. 376: 124558.
27. Zhang, H., Q. Lu, G. Zhu, F. Liu, S. Chen, Q. Zhong, T. Chen, F. Chen, M. Li, N Yan, B. E. Rittmann, Y. Zhang (2025). Generating 2-hydroxyl quinoline from quinoline through a single mono-oxygenation by Delftia lacustris. Biochem. Engr. J. 222: 109835.
28. Zheng, C.-W., Y.-H. Luo, E. Eustance, M. Suzuki, H. Collins, Y.-J. S. Lai, and B. E. Rittmann (2025). Advanced intermittent air delivery in a membrane biofilm reactor achieves full biodegradation of a quaternary ammonium compound. Chem. Engr. J. 509, 161301.
29. Zheng, C.-W., M. Long, C. Zhou, and B. E. Rittmann (2025). Mitigating chromate toxicity through concurrent denitrification in the H2-based membrane biofilm reactor. J. Haz. Matl. 492: 138073.
30. Zhou, L. N. Dong, P. Ou, Y. Shen, Y. Jian, M. Winkler, Bruce E. Rittmann (2025). Granule deterioration triggers increased dissimilatory nitrate reduction to ammonium (DNRA) in anammox granular sludge. ACS ES&T Engr. DOI: 10.1021/acsestengg.5c00128.

31. Zhu C., L. Wu, D. Ning, R. Tian, S. Gao, B. Zhang, J. Zhao, Y. Zhang, N. Xiao, Y. Wang, M. R. Brown, Q. Tu, D. Acevedo, M. Agullo-Barcelo, J. C. de Araujo, E. F. de Abreu Mac Conell, K. Boehnke, P. Bond, C.B. Bott, P. Bovio-Winkler, R. K.,Brewster, F. Bux, A. Cabezas, L. Cabrol, S. Chen, C. Etchebehere, A. Ford, J. S. Gómez, J. S. Griffin, A. Z. Gu, M. Habagil, L. Hale, M. Harmon, H. Horn, Z. Hu, D. R. Johnson, D. G. Marcantini, A. Keucken, S. Kumari, C. D. Leal, Z. M. P. Lee, Y. Li, Z. Li, M. Li, Y. Liu, L. C. Mendonça-Hagler, F. G. R. de Menezes, A. J. Meyers, A. Palmer, P. Parameswaran, V. Reginatto, F. L. de los Reyes, S. Rossetti, J. Sidhu, K. Smith, O. V. de Sousa, K. Stephens, C. Sun, N. B. Tooker, J. D. Van Nostrand, S. Wakelin, B. Wang, J. E. Weaver, S. West, S.-G. Woo, J.-H. Wu, L. Wu, C. Xi, T. Yan, M. Yang, M. Young, C. Zhang, Q. Zhang, W. Zhang, W. Zheng, H. Zhou, W. Zhuang, F. Ju, G. F. Wells, J. Guo, Z. He, P. H. Nielsen, A. Wang, Y. Zhang, T. Chen, Q. He, C. S. Criddle, M. Wagner, J. M. Tiedje, T. P. Curtis, X. Wen, Y. Yang, L. Alvarez-Cohen, D. A. Stahl, P. J. J. Alvarez, B. E. Rittmann, & J. Zhou. Global diversity and distribution of antibiotic resistance genes in human wastewater treatment systems. Nature Communications 16, 4006 (2025). https://doi.org/10.1038/s41467-025-59019-3.
32. Zhou, L, N. Dong, P. Ou, Y. Shen, Y, Jian, M. K. H. Winkler, and B. E. Rittmann (2025). Granule deterioration triggers increased dissimilatory nitrate reduction to ammonium (DNRA) in anammox granular sludge. ACS ES&T Engr. 5: 1985-1994.

PI Name: César Torres, Asst. Center Director and Professor

Total Number Published Papers: 1

Publications:

1. Torres, C., Lewis, C., Medina, JF Perez, J., Chapter 3: Extracellular electron transfer in microbial bioelectrocatalysis in Bioelectrocatalysis: From Electron Transfer Processes to Emerging Technological Applications, ECS Series, ed. 1, edited by Minteer, S., Grattieri, M., (Wiley, 2025)

PI Name: Everett Eustance, Research Assistant Professor

Total Number Published Papers: 3

1. Lua, M., Eustance, E., Deshpande, A., McGowen, J., & Laurens, L. M. L. (2025). Elucidating operational drivers of CO2 transfer and utilization efficiency in photosynthetic algae cultivation systems. Journal of CO2 Utilization, 95, 103069. doi:https://doi.org/10.1016/j.jcou.2025.103069
2. Taskan, B., Taskan, E., Lai, Y. S., Eustance, E., Mahmood, M., Luo, Y.-h., & Rittmann, B. E. (2025). Polyhydroxybutyrate (PHB) production and methane uptake by methanotrophic bacteria in a membrane-based reactor. Chemosphere, 385, 144590. doi: https://doi.org/10.1016/j.chemosphere.2025.144590
3. Zheng, C.-W., Lai, Y. S., Luo, Y.-h., Eustance, E., Suzuki, M., Collins, H., . . . Rittmann, B. E. (2025). Advanced intermittent air delivery in a membrane biofilm reactor achieves full biodegradation of a Quaternary Ammonium Compound. Chemical Engineering Journal, 509, 161301. doi: https://doi.org/10.1016/j.cej.2025.161301

PI Name: Yen-Jung Lai, Research Associate Professor
Total Number Published Papers: 5

1. Fu H, Pan ZH, Lai YJ, Ananpattarachai J, Serpa M, Shapiro N, Zhao Z, Westerhoff P. Green hydrogen production via a photocatalyst-enabled optical fiber system: A promising route to net-zero emissions. *Energy and Climate Change*, **2025**. 6, 100175. https://doi.org/10.1016/j.egycc.2025.100175.
2. Fu H, Ryoma I, Lai YJ, Ananpattarachai J, Serpa M, Shapiro N, Zhao Z, Pan ZH, Westerhoff P. Bridging Materials Innovation with an Efficient Photocatalyst-Enabled Optical Fiber Reactor for H_2O_2 Production. *Environ. Sci. Technol.* **2025**. 59 (28), 14716-14727. https: //doi. org/10.1021/acs.est.5c04043
3. Lin ZF, Tsai CK, Lai YJ, Nguyen TB, Venkatesan P, Doong RA. S-scheme heterojunction of N-carbon dots/g-C3N4/MIL-101(Fe) photocatalytic membrane for peroxymonosulfate-activated photodegradation of enrofloxacin. *Chemical Eng. Journal*, **2025**, 522, 167477. https://doi.org/10.1016/j.cej.2025.167477
4. Taskan B, Taskan E, Lai YJ*, Eustance E, Mahmood M, Luo YH, Bruce E. Rittmann BE. Polyhydroxybutyrate (PHB) production and methane uptake by methanotrophic bacteria in a membrane-based reactor. Chemosphere. **2025**. 385, 144590. https://doi.org/10.1016/j.chemosphere.2025.144590.
5. Zheng CW, Lai YJ*, Luo YH, Eustance E, Suzuki M, Colins H, Muse C, Rittmann BE. Advanced Intermittent Air Delivery in a Membrane Biofilm Reactor Achieves Full Biodegradation of a Quaternary Ammonium Compound. *Chemical Eng. Journal*. **2025**. 161301. https://doi.org/10.1016/j.cej.2025.161301.

INVITED PRESENTATIONS 2025

Total Number of Presentations:

PI Name: Anca Delgado, Associate Professor
Total Number Presentations: 16
1. Avery M. Brewer. Genetically engineered microbes for bioremediation: opportunities and limitations. Engineering Biology Research Consortium Annual Meeting, Seattle, WA. May 1, 2025 (oral presentation). **2.** Caleb M. McLaughlin. From bench to field: Deploying chain elongation to overcome reductive dechlorination barriers at a Superfund site contaminated with chlorinated ethenes. International Chain Elongation Conference, Incheon, South Korea. Nov 5, 2025 (oral presentation). 3. Avery M. Brewer. Exploring the inhibitory, community-shifting, and product-driving effects of C3-C6 carboxylates and alcohols in chain elongation consortia. International Chain Elongation Conference, Incheon, South Korea. Nov 7, 2025 (oral presentation). 4. Briana Paiz. Biogenic Sulfide Mediates Metal Precipitation and Recovery in Sulfur-Rich Martian Regolith. American Society for Gravitational and Space Research Conference, Phoenix, AZ Dec 5, 2025 (poster presentation). 5. Alba Jin Medina Benitez. Ecological Succession of Microbial and Photosynthetic Microorganisms to Convert Martian Regolith to Soil. American Society for Gravitational and Space Research Conference, Phoenix, AZ Dec 6, 2025 (oral presentation). 6. Alba Jin Medina Benitez. Microbial Strategies for Perchlorate Mitigation in Martian Regolith.. American Society for Microbiology, Flagstaff, AZ May 26, 2025 (poster presentation). 7. Delgado AG, Medina Benitez AJ, Paiz BM, Lynch J, Pargmann N, Rajakaruna S, Edmonson F, Tfailly M, Palmer AG. From Earth to Mars and back again: bioweathering and soil genesis of Martian regolith. 2025 International Conference on Bio-mediated and Bio-inspired Geotechnics (ICBBG), May 2025, Tempe, AZ (*keynote presentation*). 8. Delgado AG, Medina Benitez AJ, Paiz BM, Lynch J, Pargmann N, Rajakaruna S, Edmonson F, Tfailly M, Palmer AG. Red Mars, green Mars: the role of microbiomes in detoxification and bioweathering of Martian regolith. 25 Aniversario IPICYT & XV Simposio de Avances de Tesis de Posgrado de Ciencia Ambientales, Instituto Potosino de Investigación Científica y Tecnológica (IPICYT), Apr 2025, San Luis Potosí, Mexico (*keynote presentation*). 9. Berg R, Delgado AG. Cometabolic degradation of chlorinated solvents in cultures fed with propane and methanol. 2025 International Conference on Bio-mediated and Bio-inspired Geotechnics (ICBBG), May 2025, Tempe, AZ. 10. McLaughlin CM, Robles A, Caveney A, Bennett P, Chu M-Y, Calhoun M, Delgado AG. Microbial chain elongation supports reductive dechlorination of chlorinated ethenes: Outlook from a study at a Superfund site. 2025 International Conference on Bio-mediated and Bio-inspired Geotechnics (ICBBG), May 2025, Tempe, AZ. 11. Daeizadeh D, Berg R, Mclaughlin CM, Nirmalkar K, Dirks B, Krajmalnik-Brown R, Delgado AG. Gut microbiome-driven production of caproate and caprylate. 64th Annual Meeting of the Arizona-Nevada Branch of the American Society for Microbiology (ASM), Apr 2025, Flagstaff, AZ. 12. Delgado AG. Bioweathering dynamics and ecophysiology of microbially catalyzed soil genesis of Martian regolith. NSF EFRI-ELiS Grantees Symposium, Dec 2025. (invited presentation)

13. Delgado AG~, Daeizadeh D, Rodriguez G, Berg R, Mclaughlin CM, Nirmalkar K, Dirks B, Krajmalnik-Brown R, Delgado AG. Production of medium-chain fatty acids by the human colon microbiome. 3rd International Chain Elongation Conference (ICEC) 2025, Incheon, South Korea, Nov 2025. (keynote presentation)
14. Delgado AG, Medina Benitez AJ, Paiz BM, Lynch J, Pargmann N, Rajakaruna S, Edmonson F, Tfailly M, Palmer AG. From Earth to Mars and back again: bioweathering and soil genesis of Martian regolith. Department of Civil and Environmental Engineering, The University of Vermont, Burlington, VT, Oct 2025 (invited presentation).
15. Li Y, Rajakaruna S, Medina Benitez AJ, Paiz BM, Delgado AG, Edmonson F, Palmer AG, Tfailly M. Metabolomic evidence of microbial perchlorate reduction in Mars regolith simulant. American Society for Gravitational and Space Research (ASGSR) 2025, Phoenix, AZ, Dec 2025. (poster presentation)
16. Edmonson F, Delgado AG, Palmer AG. Evaluation of microbially remediated Martian regolith simulants – The impact of perchlorate removal on plant growth and development. American Society for Gravitational and Space Research (ASGSR) 2025, Phoenix, AZ, Dec 2025. (poster presentation)

PI Name: Bruce Rittmann, Center Director and Regents' Professor

Total Number Presentations: 15

1. January 6 – PFAS: Status, Risk, and Opportunities. City of Mesa, AZ. (virtual)
2. February 24 – Recovering Highly Valuable Metals using Microbially Mediated Precipitation. Annual Conference of the Society of Mining and Metallurgical Engineers, Denver, CO
3. April 15 – How PhD Students Succeed in Environmental Engineering, Tongji University, Shanghai, China
4. April 18 – Making the MBfR Do More by Depositing Catalytic Nanoparticles. Northeast Normal University, Changchun, China
5. April 18 – Synergistic Defluorination and Mineralization of Perfluoroalkyl Substances (PFAS), Ji-Lin University, Changchun. China
6. April 22 – How PhD Students Succeed in Environmental Engineering, Eastern China University of Science and Technology, Shanghai, China
7. April 24 -- Synergistic Defluorination and Mineralization of Perfluoroalkyl Substances (PFAS), Technology Innovation Institute, Jiaxing, China
8. April 28 – How PhD Students Succeed in Environmental Engineering, Zhejiang University, Hangzhou, China
9. June 5 – Environmental Biotechnology: Getting and Giving Help. Ardern & Lockett Award Lecture, Microbial Ecology and Water Engineering Conference, Atlanta (virtual)
10. August 5 – Precient Technologies: Prescient About Our Precious Resources. Idealab Arizona, Scottsdale, AZ (virtual)
11. September 29 – Environmental Biotechnology: The power of partnering with microorganisms. WEFTEC AEESP Master Lecture, Chicago, IL.
12. October 17 – Valorizing Gas Streams Containing CO2 and CO. Jimmie Quon Lecture, Northwestern University, Evanston, IL.
13. November 6 – PFAS: Status, Risk, and Opportunities. Arizona Sanitarians Annual Conference (virtual)

14. December 18 – Making Wastewater a Resource of Economic Value. Keynote lecture, IWA Urban Water Sustainability Symposium, Tongji University, Shanghai (virtual)
15. Zheng, C. When Biotechnology Meets Catalysis, Special CEE Environmental Engineering Seminar Series, Stanford University, Feb 28, 2025

PI Name: César Torres, Asst. Center Director and Professor

Total Number Presentations: 5

1. Lewis, C., Interrogating Microbial Electrophotosynthesis. Poster presentation at the Asilomar Synthetic Communities Conference, hosted by Lawrence Livermore Berkeley National Laboratory. Pacific Grove, Ca. August 2025.
2. Lewis, C., Microbial Electrophotosynthesis. Poster presentation at the Algae Biomass Biofuels and Bioproducts Conference hosted by Elsevier, Tempe, Az. June 2025.
3. Lewis, C., presented a poster entitled, Interrogating Microbial Electrophotosynthesis. Poster presentation at the Algae Biomass Summit, hosted by ASU, Tempe, Az., Oct. 2025.
4. Ortiz Medina, J.F. "Understanding Microbial Metabolism to Design Effective Environmental Biotechnology Processes". Chemical and Environmental Engineering Department Seminar, University of Arizona. March 2025.
5. Ortiz Medina, J.F. "Defying paradigms: the importance of understanding microbial metabolism to design effective environmental biotechnology processes". Environmental Engineering Seminar Series. Arizona State University. November 2025.

PI Name: Yen-Jung Lai, Research Associate Professor

Total Number Presentations: 3

1. Lai YJ, Eustance E, Frias Z, Young M, Rittmann BE. Membrane Carbonation Promoted Biogas Valorization via Microalgal Cultivation. Algal Biomass Summit, Tempe, AZ, Oct 19-21, 2025
2. Lai YJ, Eustance E, Frias Z, Young M, Rittmann BE. Bleed-valve Manipulation Enables Membrane Carbonation to Upgrade CH_4 in Biogas with Superior Carbon Transfer Efficiency. AEESP, Duke, NC, May 20-22, 2025.
3. Wang TH, Lai YJ*, Tsai CK, Fu H, Doong RA, Westerhoff P, Rittmann BE. A Novel dual-fiber platform Endorsing Efficient CO_2 conversion. ACS Spring 2025, San Diego, March 23-27, 2025.

PI Name: Everett Eustance, Research Assistant Professor

Total Number Presentations: 1

1. Eustance E, Tan M, Geels A, Forrester J, McGowen J. "Fungal and Bacterial Parasites: Characterization and Treatment in Algae Cultures". 12-11-2025. AlgaEurope 2025, Riga, Latvia.

TECHNOLOGY TRANSFER OUTPUTS IN 2025

Total number of <u>submitted</u> patents for the center: 1

Patent Authors	Yen-Jung Lai, Chengkuo Tsai, Bruce Rittmann
Patent Title	A novel platform of multiple gas delivery for transforming CO2-to-formic acid
Patent #	Under review
Submitted	Nov. 26, 2025

SOLVING TRANSLATIONAL PROBLEMS IN 2025

The Biodesign Swette Center for Environmental Biotechnology is advancing microbially enabled science and technology to help our society mitigate impacts from some of the most difficult pollutants and generate renewable resources that make our society more sustainable. One example is the destruction of PFAS, or Per- and Poly-Fluorinated Alkyl Substances, also known as the "forever compounds." Swette Center teams are developing the science base and scaling up technology the combines nanoparticle catalysis with microbial biomineralization to destroy PFAS in water. A second example concerns several advancements to several anaerobic biotechnologies that convert the organics materials in high-strength waste streams to renewable methane gas (CH_4), hydrogen gas (H_2), hydrogen peroxide (H_2O_2), or organic acids, which displace fossil natural gas as the source.

Third, the Center is developing H_2-based and electrochemical biotechnologies to remove and recover highly valuable metals, such as gold and platinum-group metals from mining, ore-processing, and recycling wastewaters. Fourth, Center researchers are developing several biotechnologies to valorize CO_2, CO, and simple products of anaerobic digestion of organic biomass to valuable organic acids and alcohols. Fifth, the Center is pioneering biotechnologies to enable a human mission to Mars. Specifically, the Center is developing methods to detoxify the Mars regolith and convert it to a soil-like material to grow plants. These advancements and others are brought about by our funded research projects, advanced analytical capabilities, and scale-up activities with spin-off companies and industrial partnerships.

NEW ANALYTICAL CAPABILITIES IN 2025

1. Paiz, Briana developed a Silver/Sulfide Electrode Ionplus Sure-Flow Solid State Combination probe to quantify sulfide concentrations in bioreactors.
2. Ortiz-Medina, Juan Fausto and Muse, Chris developed a method to detect nitrous oxide (N_2O) through gas chromatography (GC) at the Swette Center, with the intent to quantify this gas in emissions from wastewater treatment reactors. The method can detect concentrations down to 250 ppb N_2O.
3. Yao, Genji, Zheng, Chenwei and Muse, Chris developed a reliable method using HPLC-MS/MS to measure 6 regulated PFAS compounds at levels as low as 10 ng/L. Their approach has shown consistent and reproducible results, making it a promising technique for accurate detection.

NEW PURE & MIXED MICROBIAL METABOLISMS

1. Mindreau, Elias is testing reproducibility of an adapted inorganic medium for growing model chemolithoautotrophic bacteria *Cupriavidus necator* in denitrification conditions.
2. Paiz, Briana is cultivating salt tolerant perchlorate reducers in Martian regolith simulant.
3. Taniguchi, Winter is studying the capability of the BioRx consortium, produced by Soil Genetics, to defluorinate PFAS and denitrify nitrate simultaneously in the H_2-based membrane biofilm reactor.

UPSCALED BIOPROCESSES IN 2025

1. McLaughlin, Caleb. First field-scale demonstration at a contaminated site in California of microbial chain-elongation as an H_2-producing bioprocess to drive *in situ* bioremediation of toxic chlorinated solvents in groundwater.
2. Han, Seungyeob. Nitrate and Nitrite Removal and Operating Condition Optimization via Single-Metal and Bimetallic Coatings in an 85-L MCfR System
3. Zheng, Chenwei. Optimized the propane co-metabolism based 1,4-D remediation in groundwater

SPECIALIZED TRAINING IN 2025

1. Paiz, Briana (2025 July). PANalytical Aeris Powder X-ray diffractometer (XRD) training.
2. Paiz, Briana (2025 July). EHS Radiation Producing Equipment training.

COLLABORATIONS

Collaborations within ASU

Your Name	***Collaborator Name, Title***	***ASU Department***
Avery Brewer	Emma Frow (Associate professor), Dalton George (Postdoctoral researcher)	SFIS, SBHSE

Your Name	***Collaborator Name, Title***	***ASU Department***
Anca Delgado	Otakuye Conroy-Ben	SSEBE
Anca Delgado	Paul Westerhoff	SSEBE

Your Name	***Collaborator Name, Title***	***ASU Department***
Everett Eustance	Ellie Fini	SSEBE
Everett Eustance	Peter Lammers	SSEBE

Your Name	***Collaborator Name, Title***	***ASU Department***
YenJung Lai	David Nielsen	SEMTE
YenJung Lai	Paul Westerhoff	SSEBE
YenJung Lai	Haiwei Gu	College of Health Solutions

Your Name	***Collaborator Name, Title***	***ASU Department***
Juan Fausto Ortiz-Medina, César Torres	Brent Nannenga (Associate Professor), Dewight Williams (Associate Research Scientist)	SEMTE, Eyring Materials Center

Your Name	***Collaborator Name, Title***	***ASU Department***
Bruce Rittmann	David Nielsen	SEMTE
Bruce Rittmann	Xuan Wang	SOLS
Bruce Rittmann	Paul Westerhoff	SSEBE

List and describe collaboration outside of ASU:

Your Name	***Collaborator Name, Title***	***Organization, City, Country (outside ASU)***
Anca Delgado	Matthew Scarborough, Associate Professor	University of Vermont
Anca Delgado	Andrew Palmer, Associate Professor	Florida Tech
Anca Delgado	Malak Tfailly, Associate Professor	University of Arizona
Anca Delgado	David Strik, Associate Professor	Wageningen University & Research, Wageningen, The Netherlands
Anca Delgado	Jacob Chu, Engineer, Consultant	Haley & Aldrich
Anca Delgado	Leonard Santisteban, Senior Researcher	Freeport-McMoRan Copper & Gold

Your Name	*Collaborator Name, Title*	*Organization, City, Country (outside ASU)*
Everett Eustance	Alina Corcoran	New Mexico State University
Everett Eustance	Omar Holguin	New Mexico State University
Everett Eustance	Claire Sanders	Los Alamos National Lab
Everett Eustance	Louis Brown	Los Alamos National Lab
Everett Eustance	Lieve Laurens	National Renewable Energy Lab
Everett Eustance	Jason Quinn	Colorado State University
Everett Eustance	Matthew Posewitz	Colorado School of Mines
Everett Eustance	Robin Gerlach	Montana State University
Everett Eustance	Todd Henson	NBO3
Everett Eustance	Jay McCarren	Viridos
Everett Eustance	Ike Levine	The Algae Foundation
Everett Eustance	Graham Peers	Colorado State University
Everett Eustance	Elise Wilbourn	Sandia National Lab
Everett Eustance	Michael Huesemann	Pacific Northwest National Lab
Everett Eustance	James Drouillard	Kansas State University

Your Name	*Collaborator Name, Title*	*Organization, City, Country (outside ASU)*
Seungyeob Han	Youngkun Chung	Rice University

Your Name	***Collaborator Name, Title***	***Organization, City, Country (outside ASU)***
YenJung Lai	Ruey-an Doong, Dean	National TsingHua University, TW
YenJung Lai	Tsu-Chin Chou, Ass Prof	National TsingHua University, TW
YenJung Lai	Hui Hsin Tseng	Taiwan Semiconductor Manufacturing Company Limited, Hsinchu, TW
YenJung Lai	Cheng-Kuo Tsai, Ass Res Prof	National Yunlin University of Science and Technology Science

Your Name	***Collaborator Name, Title***	***Organization, City, Country (outside ASU)***
Bruce Rittmann	Yongming Zhang	Shanghai Normal University, Shanghai, China
Bruce Rittmann	Siqing Xia, Min Long	Tongji University, Shanghai, Chinae
Bruce Rittmann	He-Ping Zhao	Zhejiang University, Hangzhou, China
Bruce Rittmann	Yihao Luo, Yuhang Cai, Dandan Zhou	Northeast Normal University, Changchun, China
Bruce Rittmann	Yonghong Wu	Chinese Academy of Sciences, Wuhan, China
Bruce Rittmann	Joshua Boltz	Woodard & Curran, Portland, ME
Bruce Rittmann	Ahmed Al-Omari, Jose Jimenez	Brown & Caldwell, Alexandria, VA
Bruce Rittmann	Aura Ontiveros-Valencia	IPICyT, San Luis Potosi, Mexico
Bruce Rittmann	Alex Schwarz	University of Concepcion, Concepcion, Chile
Bruce Rittmann	Ayoub Bounaga, Karim LYAMLOULI	UM6P, Ben Guerir, Morocco

Your Name	***Collaborator Name, Title***	***Organization, City, Country (outside ASU)***
Maya Suzuki	Olenka Forde, Charley Mumford	Regeneration/Resolve, SLR Consulting
Maya Suzuki	Natalie Muilenberg	Arizona Department of Environmental Quality
Maya Suzuki	Bryn Thoms	Oregon Department of Environmental Quality

SERVICE ACTIVITIES IN 2025

*List and describe service activities **within Biodesign**:*

Your Name	Date	Location (Center)	Activity
Chris Muse	Jan - Dec 2025	Biodesign Institute	Artists of Biodesign Committee Member
Carole Flores	Jan - Dec 2025	Biodesign Institute	Artists of Biodesign Committee Lead

*List and describe service activities **at ASU**:*

Your Name	Date	Location (Department)	Activity
Bruce Rittmann	2025	SSEBE International Water Assoc. International Water Assoc.	Chair, Awards Committee Management Committee for the Biofilm Specialists Group. Organizing Committee for the Biofilm Reactors 2026 Conference
Cesar Torres	2025	John Shufeldt School of Medicine and Medical Engineering (SOMME)	Curriculum Committee and development of new School.
Kassandra Kellenberger	2025	Tempe, AZ	Lab Innovation Safety Team member
Juan Fausto Ortiz Medina	2025	Tempe, AZ	Member and Social Events Coordinator of the ASU Postdoc Council
Christine Lewis	2025	Tempe, AZ	Member and President of the ASU Postdoc

			Council
Briana Paiz	April 2025	Tempe, AZ	Judge at the 32nd Annual SOLS Undergraduate Research Symposium
Maheen Mahmood	April 2025	Tempe, AZ	Judge at the 32nd Annual SOLS Undergraduate Research Symposium

*List and describe service activities within the **community and beyond**:*

Your Name	**Date**	**Location (City, State, Country)**	**Activity**
Everett Eustance	2025	Tempe, AZ	Algae Biomass Summit, Conference Chair
Everett Eustance	2025	Tempe, AZ	Board of Directors for Algae Biomass Organization
Briana Paiz	August 20 2025	Mesa, AZ	Guest Lecturer and Instructional Assistant at Canyon Valley School
Briana Paiz	October 2025 -current	Scottsdale, AZ	LifeTeen Core member at St. Patrick's
Briana Paiz	2025	Mesa, AZ	Mentor and community partner in the development of the RISE STEM pilot program, a classroom-based initiative aimed at expanding research opportunities for high school students—particularly those in credit recovery programs.
Avery Brewer	2024-present	Phoenix, AZ	Volunteer with various community agriculture

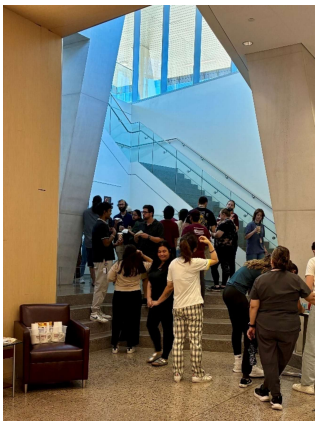
			initiatives in South Phoenix. Sites include community gardens, schools, and revitalized green spaces.
Anca Delgado	2025	Phoenix, AZ, USA	Scientific committee member, American Society for Gravitational and Space Research (ASGSR) 2025, Phoenix, AZ, Dec 2025
Anca Delgado	2025	Tempe, AZ, USA	Organizing committee member, 2025 International Conference on Bio-mediated and Bio-inspired Geotechnics (ICBBG), Tempe, AZ, May 2025
Anca Delgado	2025	Incheon, South Kores	Scientific committee member, 3rd International Chain Elongation Conference, Incheon, South Korea, Nov 2025
Anca Delgado	2025 – present		Editor, Journal of Environmental Chemical Engineering

Service Activity Photos


ASU forms a volunteer team (Swette Center's Aisha Alquran, Mohammad Alquran, and Dr Christine Lewis, PhD.) to volunteer for a second year witht the surgery team at the surgical mission in Caborca, Mexico, to give back and restore sight to 81 patients. Fall 2025


Swette Center Students and postdocs volunteer their time for STEM public outreach at ASU Open Door. Left: Sanjay Giridharan (Torres Lab, mentored by Dr. Christine Lewis) demonstrates how to spin like ATP. Middle: Megan Langella (Torres Lab, mentored by Dr. Christine Lewis) directs children into the noodle forest membrane. Right: Dr. Juan Fausto Ortiz Medina (Postdoc in the front).

Art Display by Chris Muse as part of the Fall 2025 Artists of Biodesign exhibition.



Chris Muse and Carole Flores are also part of the Artists of Biodesign leadership team, and plan two exhibitions plus two Meet the Artist events per year

PHOTOS - 2025

Here is a collection of photos our members chose to share for this report to you.

A quarterly birthday celebration to celebrate BSCEB members!
Left to Right: Sean Lai, Wei, Li, Max Han, Bruce Rittmann, Avery Brewer, Carole Flores, Fei Liu, Kartik Bhagat, Grayson Young, Usman Saleem, Jesus Alberto Perez Garcia.

Students work hard! So, they take a little break to bond and have some fun between experiments and classes.
Back Left: Alba Medina Benitez
Back Right: Avery Brewer
Front Left: Caleb McLaughlin
Front Right: Sam Ferrante

The Torres lab engineers and scientists congregate to brainstorm.
Left: Dr Juan Fausto Ortiz Medina, Dr Christine Lewis, Dr Jesus Alberto Perez Garcia, and Dr Cesar Torres. Middle: Dr. Torres and Dr Jesus Alberto Perez Garcia discuss electrochemistry applications. Right: Dr Juan Fausto Ortiz Medina and Dr Christine Lewis were panelists at the early career event hosted by the ASU Office of Professional Development.

Gathering of a few members for the Swette Center winter potluck held in late Dec. 2025. We have a core of social planners that work hard to create a strong network and have fun together.

Members of the Rittmann, Torres, and Delgado labs pose together at a farewell party for Juan Fausto Ortiz-Medina and Jesus Perez-Garcia.

Left: Dr Christine Lewis provides a Biodesign tour for participants of the International Conference on Algal Biomass, Biofuels and Bioproducts. Right: The Members of the Delgado and Torres lab celebrate the holiday season at an off-campus gathering. Fall 2025



Left: Dr. Christine Lewis (Postdoc in the Torres lab) reports successful triplicate studies on microbial electrophotosynthesis.
Middle: Fall 2025 Phd candidate, Nandini Kanoju, prepares reactors for the microbial electrophotosynthesis project. Nandini is a collaborator on a Swette Center project. She successfully completed her Ph.D. candidacy with this project in Fall 2025.
Right: Jacob Hackney (master student in Torres lab) smiles at the camera before preparing semipermeable membranes for microbial bioreactors. Fall 2025.

Top: Sanjay Giridharan (Torres Lab, mentored by Dr. Christine Lewis, Dr. Everett Eustance, and Dr. Omar Khdour) receives the IIAS Red Sprite Gold Medal Award. Bottom Left: Sanjay demonstrates spacesuit operations and pressurization protocols at a NASA facility in Florida. Right: As Analog Astronaut Vice Commander, Sanjay performs a technical climb during a simulated Extravehicular Activity (EVA) on the rugged terrain of Mauna Loa volcano. These training exercises focus on bioastronautics and operational geology in simulated space environments.

EXTERNAL FUNDING 2025

Funding Awards

PI	Title	Sponsor(s)	Award #	Total $	Start	End
Cadillo	Collaborative Research: MRA PanAm Peat: Understanding Water and Carbon Cycling across Pan-American Tropical Peatland Biomes	National Science Foundation (NSF)	2406963	860,741	9/1/24	8/31/29
Cadillo	Collaborative Research: Understanding Biophysical Drives of the CH4 Source Sink Transition in Northern Forests	National Science Foundation (NSF)	2208657	479,978	11/1/22	10/31/26
Cadillo	Biomapping of Tree-Based Atmospheric Methane Removal (TAMR) for Technological Development	ASU Foundation / Spark Climate Solutions	G12235-300	120,003	8/15/25	8/14/26
Cadillo	Hydrologic effects of gold mining in western Amazonia and their implications for mercury and greenhouse gas production	National Geographic Society	PFA-21-PP036	76,682	1/1/22	12/31/25
Cadillo	Monitoring the changes in methane (CH4) emissions and microbes of manipulated cells of the Salt River Landfill, an Arid Zone Landfill case study (SRL)	ASU: Center for Bio-Mediated and Bio-Inspired Geotechnics (CGGB) Consortium	AGR 10/1/2019	566,860	8/1/19	7/31/25
Delgado	Collaborative: Microbial chain elongation-mediated dehalogenation and carbon transformation	National Science Foundation (NSF)	2221805	294,904	9/1/22	8/31/26
Delgado	STC5: AMPED:	Freeport-	AGR	70,890	2/1/25	12/31/25

	Treatment of mining water and selective metal recovery using bioelectrochemical systems	McMoRan Copper and Gold	04/30/2025			
Delgado	CBBG Center Project: Enhanced Control of Microbial Activity and Substrate Delivery Via Inhibitors (Haley & Aldrich)	ASU: Center for Bio-Mediated and Bio-Inspired Geotechnics (CGGB) Consortium	AGR 10/1/2019	73,333	8/1/20	7/31/25
Delgado	EFRI ELiS: Bioweathering dynamics and ecophysiology of microbially catalyzed soil genesis of Martian regolith	National Science Foundation (NSF)	2223829	1,886,505	9/1/22	8/31/26
Lai	RAISE: CET: Enhancing Microbial CO2 Valorization toward Biofuels by a Dual-Fiber System Powered by Visible Light	National Science Foundation (NSF)	2401035	990,754	9/1/24	8/31/27
Rittmann	Mechanisms of Real-world PFAS Defluorination in Membrane Catalyst-film Reactors and Membrane Biofilm Reactors	US Department of Defense (DOD)	W912HQ24C0007	1,029,279	12/13/23	12/12/26
Rittmann	Modeling Metal-Reducing Bacteria, Nitrogenous Compounds, Metal Precipitation and Dissolution, Alkalinity and pH, and Counter-Diffusion Biofilms in a Saturated-Rock Fill	Elk Valley Resources	AGR 12/23/2024	997,169	11/1/24	8/31/26
Rittmann	Bioremediation of 1,4-Dioxane Using Cometabolic Bioreactors	US Department of Defense (DOD)/Arcadis	D22-332R1	254,313	8/26/22	8/4/26
Rittmann	Developing and Testing	DOI-USBR-	R23AC0031	265,240	6/1/23	3/31/26

	an Engineered Biological Control for Iron Oxidizing Bacteria in Water Wells	LCR: Yuma Area Office	5			
Rittmann	PFAS ASU Two Year Microbe Study	The Confederated Tribes of the Chehalis Reservation	AGR 3/29/2024	200,000	3/1/24	2/28/26
Rittmann	Destroying PFAS via Nucleophilic Reactions occurring in a Novel Membrane Catalyst-film Reactor	Taiwan Semiconductor Manufacturing Company Limited (TSMC)	TSMC Contract No. 202506060011	399,998	1/1/25	12/31/25
Torres	Microbial electro-photosynthesis (MEPS) as a bioelectronic platform for organic synthesis	DOD-NAVY: Office of Naval Research (ONR)	N00014-23-1-2104	420,996	1/1/23	12/31/25
Torres	Mainstream Aerobic Wastewater Treatment Using Process-Produced Hydrogen Peroxide	DOE: Office of Energy Efficiency and Renewable Energy (EERE)/ Carollo Engineers	203725	763,934	10/1/23	10/2/25