NEW MEXICO ALLIANCE FOR MINORITY PARTICIPATION

2026 NM AMP STUDENT RESEARCH CONFERENCE

October 23, 2026

Hosted by the NM AMP Lead Institution,
New Mexico State University

Held at Corbett Center Student Union
NMSU Main Campus
Las Cruces, New Mexico



NM AMP Statewide Institutional Partners 2024-2029

Lead Institution

2026 NM AMP Student Research Conference Program and Abstracts

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Categories: Computer Science & Information Technology, Engineering, Life Sciences, and Mathematics and Physical Science

Special Thanks and Acknowledgements

The NM AMP Team expresses our great appreciation for the administrators, staff, faculty, mentors, parents, and families for the time, support, and encouragement you have given to the students and their research projects included in this document.

Special thanks to NM AMP staff: Data Analysist Florence Nash, Financial Manager Luis Lopez, SCCORE and STEM PREP Coordinator Cyrena Ridgeway, and Student Assistants Brissia Terrazas and Zitlalic Rosales Terrones. They worked tirelessly and enthusiastically to organize the different aspects of the conference and make this event a success.

Thanks to the many volunteers who have assisted during the conference.

Acknowledgement of Sponsors

NM AMP acknowledges and thanks the following conference sponsors:

National Science Foundation, Award EES 2408898,
through the Louis Stokes Alliances for Minority Participation
(NSF LSAMP) program since 1993,
New Mexico Higher Education Department
through a Research and Public Service Project, and
New Mexico State University.

Any opinion, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation or other funding sources. This material was developed under NSF Award EES 2408898.

NOTE: *Pictures will be taken at all conference activities and events. Attendance implies permission to use these pictures in appropriate publications as determined by NSF and New Mexico AMP.*

2025-2026 New Mexico Alliance for Minority Participation Advisory Board

We thank the following representatives of the NM AMP Advisory Board who generously provide their service and time:

Advisory Board Chair: Dr. Joseph L. Bull, New Mexico State University (NMSU) Provost and Vice President for Academic Affairs, and NM AMP Principal Investigator (PI)

NM AMP Director: Dr. Paola Bandini, Professor, Department of Civil and Environmental Engineering, NMSU, and NM AMP Co-PI

Dr. Stephanie M. Arnett, Associate Professor, Department of Sociology, NMSU, and NM AMP Co-PI

Dr. Mary Ayala, Dean, College of Liberal Arts and Sciences, Eastern New Mexico University (ENMU)

Dr. Salim Bawazir, Professor and Associate Department Head, Department of Civil and Environmental Engineering, NMSU

Dr. Rachel Boren, Director, NMSU Southwest Outreach Academic Research (SOAR) and Evaluator, NM AMP Evaluator

Dr. Phame Camarena, Dean, NMSU Conroy Honors College, NMSU Crimson Scholars Program and TRIO McNair Scholars Program Director and Grant PI

Dr. Terry L. Cook, CT Education Evaluation and Consulting

Dr. Marcy E. Litvak, Professor, Department of Biology, University of New Mexico (UNM), NM AMP Co-PI

Dr. Adele B. Doser, Research and Development Manager, Sandia National Laboratories, Albuquerque, NM

Ling Faith-Heuertz, Executive Director, New Mexico MESA, Inc.

Dr. Benjamin Flores, Professor, Department of Electrical and Computing Engineering, University of Texas-El Paso (UTEP)

Dr. Dawn Garcia-Nunez, Engineering Director and MCVC Site Lead, Raytheon, White Sands, NM

Dr. Roxanne M. Gonzales, Professor of Education Leadership, New Mexico Highlands University (NMHU)

Dr. David Jáuregui, Professor of Civil Engineering and Interim Dean, College of Engineering, NMSU

Dr. J. Phillip King, Principal Engineer, King Engineering & Associates, Inc., former NM AMP Director

Dr. Enrico Pontelli, Regents Professor of Computer Science and Dean, College of Arts and Sciences, NMSU

Michelle Lonasee, Program Specialist, American Indian Program, NMSU

Cherylin Atcitty, Director, Indian Resources Development, College of Agricultural, Consumer, and Environmental Sciences, NMSU

Francisco Vigil, NM AMP Alum, R&D Engineer, Los Alamos National Laboratory, Los Alamos, NM

Michael Voegerl, Associate Director of Advancement, New Mexico Institute of Mining and Technology

Dr. Nadir Yilmaz, Department Chair and Professor of Mechanical Engineering, Howard University



Welcome from the Director, Dr. Paola Bandini

Welcome to the 2026 New Mexico Alliance for Minority Participation (NM AMP) Student Research Conference! This Conference provides students and faculty members the opportunity to share ideas, learn, network professionally, and showcase undergraduate research focused on Science, Technology, Engineering, and Mathematics (STEM). Students attending the NM AMP Conference can be part of a community where lasting friendships are developed. The NM AMP Conference is a forum for students to find a place of belonging, encouragement, and appreciation.

NM AMP is a statewide partnership of seven 4-year institutions in New Mexico with the goal of increasing the number of students who complete high-quality STEM baccalaureate degrees and preparing undergraduate students to enter the STEM workforce and pursue graduate education. In our 34th year of NM AMP, we are celebrating our students' accomplishments, like participating in research projects and internships, presenting at national conferences, and co-authoring research papers. NM AMP places great value on these accomplishments because undergraduate research experiences develop scientific identity, confidence, and technical competence, and facilitate persistence in STEM majors.

This year's Conference attendees will have the opportunity to meet and listen excellent speakers. At the Opening Session, Dr. Joseph Bull, NMSU Provost and Vice President for Academic Affairs, and Dr. David Jáuregui, NMSU College of Engineering Interim Dean, will welcome attendees to NMSU and highlight the importance of undergraduate research experiences and STEM education. The Breakfast Keynote Speaker, Dr. Cherie De Vore, Assistant Professor of Chemical and Environmental Engineering at the University of Arizona, will kick off the Conference with an engaging talk titled "Engineering from Abundance."

From 9:30 am to 11:45 am, attendees will have the choice to select two of three workshops and two Student Podium Presentation Sessions (Options 1, 2, 3, and 4 on the agenda). Dr. Sumira Phatak and Debbie Lee will present **Workshop 1**, titled "Beyond the bench: Making research matter." Dr. Frank A. Mier will present **Workshop 2**, titled "Building a career from undergraduate researcher to university professor." Dr. René O. Guillaume will present **Workshop 3**, titled "The hidden skills behind academic and career success: Emotional intelligence for emerging leaders" (offered at 10:45-11:45 am only). Simultaneously, Undergraduate Research Scholars (URS) will present their research projects in the **Podium Presentation Sessions**. At 9:30-10:30 am, New Mexico MESA program and TRIO Upward Bound program participants will attend a workshop (Track 1), which continues in the afternoon, facilitated by Anita Gonzales (New Mexico MESA, Inc. Deputy Director and NM Representative) and Robert Gomez (TRIO Upward Bound Program Director). Michael Voegerl will facilitate the **Community College Professional Development Workshops** (Track 2) (Day 1 at 9:30-11:45 am on Friday, Day 2 at 8:00 am-12:00 pm on Saturday).

The Luncheon Keynote Speaker is New Mexico Representative, the Honorable Representative Meredith A. Dixon, who will speak to encourage students to pursue STEM careers. During the Luncheon Session, the Faculty Mentor of the Year Awards will be presented. Two sessions of Student Poster Presentations will be at 1:30-2:30 pm and 2:30-3:45 pm (East Ballroom). During the Awards Session, 4:00-5:00 pm, NM AMP will recognize student presentation winners and present the Institutional Coordinator of the Year Award. At the Awards event, we will have an Ice Cream Sundae and Brownies Bar to make our own sundae! Raffle winners will be announced at the Luncheon Session and the Awards Session (you must be present to win).

We welcome staff, institutional coordinators, and students from TRIO STEM-H, McNair Scholars Program, New Mexico MESA, TRIO Upward Bound GISD/LCPS, New Mexico Space Grant Consortium, NMSU CAMP, Mescalero Apache High School, NMSU Honors College, G-RISE, B2B, and other programs, and graduate students and faculty, many serving as student presentation judges, statewide students from our Alliance's partner institutions, and the Summer Community College Opportunity for Research Experience (SCCORE) 2026 program participants.

Enjoy your time at the conference, meet friends and make new friends, learn and be inspired, and have fun!

~ NM AMP Director, Dr. Paola Bandini

2026 NM AMP Student Research Conference Agenda – *At a Glance*

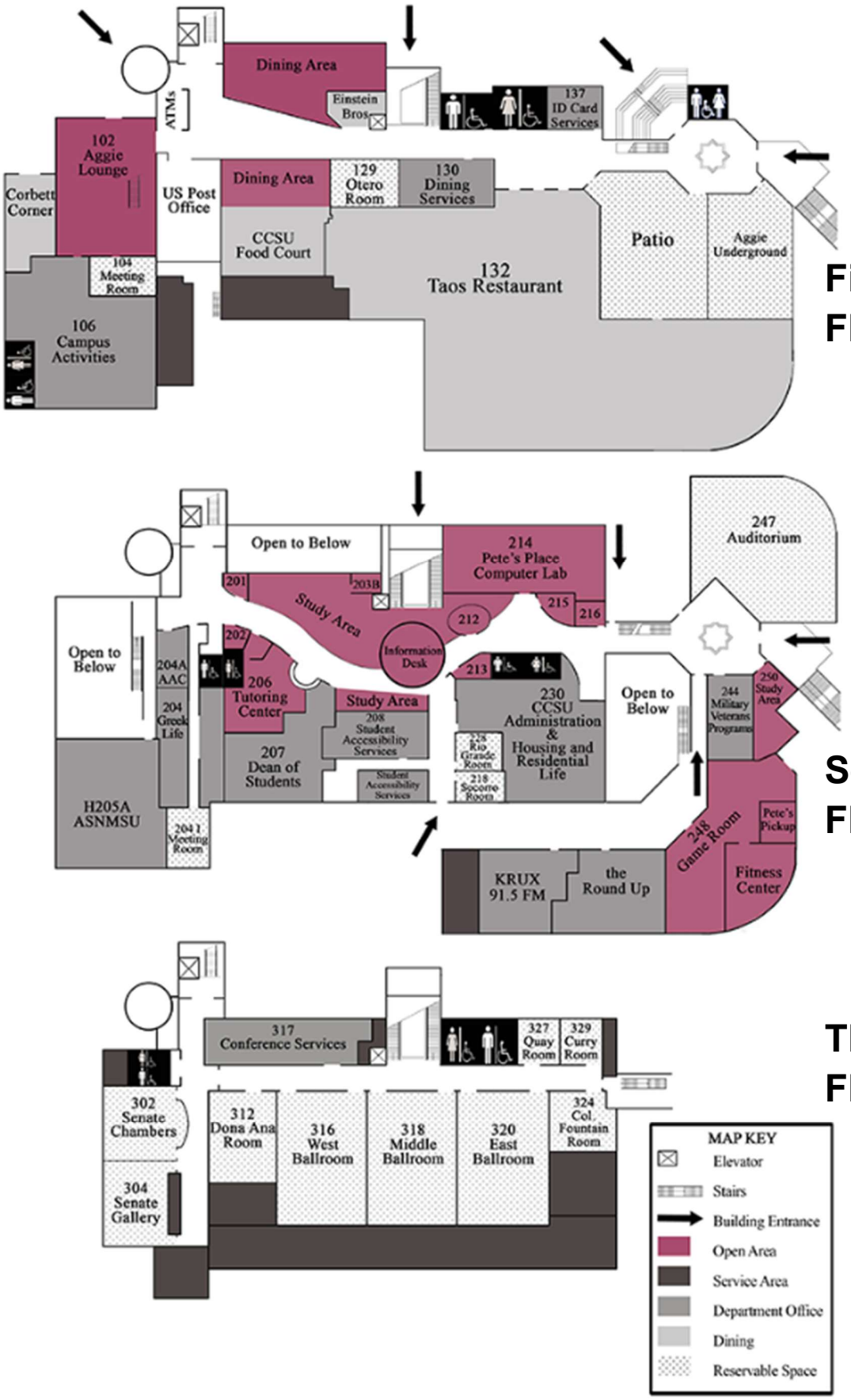
Corbett Center Student Union, NMSU Main Campus, Las Cruces, NM

Friday, October 23, 2026

7:00 am – 7:30 am	**Poster setup** by NM AMP student poster presenters (East Ballroom, 3rd Floor)						
7:15 am – 8:00 am	**Conference check-in, name badges pick-up** (Hall in front of Ballrooms, 3rd Floor)						
7:30 am – 8:00 am	**Breakfast** served for all attendees (West Ballroom, 3rd Floor)						
8:00 am – 9:15 am	**Opening Session and Keynote Address** (West Ballroom, 3rd Floor) Dr. Paola Bandini, NM AMP Director and Professor, New Mexico State University (NMSU) Dr. Joseph L. Bull, NMSU Provost and Vice President for Academic Affairs Dr. David V. Jáuregui, Professor and Interim Dean, NMSU College of Engineering **Keynote Speaker:** Dr. Cherie De Vore, Assistant Professor of Chemical and Environmental Engineering, University of Arizona; Core Faculty at UA Indigenous Resilience Center, and former NM AMP student scholar. **Keynote title:** ***"Engineering from Abundance."***						
9:15 am – 9:30 am	**Break**						
	Breakout Sessions and Meetings						
Location:	**Option 1** Middle Ballroom, 3rd Floor, Room 318	**Option 2** Senate Gallery Room, 3rd Floor, Room 304	**Option 3** Auditorium, 2nd Floor, Room 247	**Option 4** Col. Fountain Room, 3rd Floor, Room 324	**Track 1** Doña Ana Room, 3rd Floor, Room 312	**Track 2** Quay Room, 3rd Floor, Room 327	**Meeting** Conference Room, 2nd Floor, Room 204A
9:30 am – 10:30 am	**Workshop 1** (for all students) ***"Beyond the bench: Making research matter,"*** Sumira Phatak, PhD, and Debbie Lee	**Workshop 2** (for all students) ***"Building a career from undergraduate researcher to university professor,"*** Frank A. Mier, PhD		**Podium Student Presentations** (for all attendees)	**NM MESA and TRIO Upward Bound Programs,** Orientation and Workshop: ***"Navigating the Conference" and "Reading Research Abstracts and Abstract Exercises"***	**Community College (CC) Professional Development Workshop – Day 1 (*by invitation*).** Facilitator: Michael Voegerl, Associate Director of Advancement, NM Tech	**NM AMP Advisory Board Meeting (*by invitation*).** Advisory Board Chair: Provost Bull
10:30 am – 10:45 am	**Break** - *Choose to attend a different Session Option after the break*						
10:45 am – 11:45 am	**Workshop 1** (offered again, for all students) ***"Beyond the bench: Making research matter,"*** Sumira Phatak, PhD, and Debbie Lee	**Workshop 2** (offered again, for all students) ***"Building a career from undergraduate researcher to university professor,"*** Frank A. Mier, PhD	**Workshop 3** (for all attendees) ***"The hidden skills behind academic and career success: Emotional intelligence for emerging leaders,"*** René O. Guillaume, PhD	**Podium Student Presentations** (for all attendees)	*--High school students now go to Options 1, 2, 3, or 4*	**<u>Continued</u>: CC Professional Development Workshop – Day 1**	**<u>Continued</u>: NM AMP Advisory Board Meeting**
11:45 am – 12:00 pm	**Break**						
12:00 pm – 1:15 pm	**Lunch and Keynote Address** (West Ballroom, 3rd Floor) Introduction of Keynote Speaker by Clayton Abbey, NMSU Assistant VP of Government & Community Relations **Keynote Speaker:** The Honorable New Mexico Representative Meredith A. Dixon, Vice Chair of the House Appropriations & Finance Committee, and Member of the House Energy, Environment & Natural Resources Committee. **Award Presentations:** "NM AMP Faculty Mentor of the Year" Awards **Lunch Raffle Winners** *						
1:15 pm – 1:30 pm	**Break**						
	Breakout Sessions and Meetings						
Location:	**Poster Sessions** East Ballroom, Room 320				**Track 1** Doña Ana Room, 3rd Floor, Room 312	**Track 2** Quay Room, 3rd Floor, Room 327	**Meeting** Conference Room, 2nd Floor, Room 204A
1:30 pm – 2:30 pm	**Poster Session 1:** Presentations by SCCORE and university undergraduates				**Workshop for NM MESA and NMSU TRIO Upward Bound Programs**	*--Community College students attend Poster Sessions (East Ballroom)*	
2:30 pm – 3:45 pm	**Poster Session 2:** Presentations by university undergraduates				*--High school students attend Poster Session 2 (East Ballroom), <u>return</u> to Track 1 at 3:15 pm*	*--Community College students attend Poster Sessions (East Ballroom)*	**NM AMP Institutional Coordinators (IC) Meeting**
3:15 pm – 3:45 pm					**Feedback Session for NM MESA and TRIO Upward Bound Programs**		
3:45 pm – 4:00 am	**Break**						
4:00 pm – 5:00 pm	**Awards and Brownie-Sundae Bar Social** (West Ballroom, 3rd Floor) **Award Presentation:** "NM AMP Institutional Coordinator of the Year" Award **Awards to Research Presentation Winners** (Community College Category and University Category, Podium and Posters) Presented by Cyrena Ridgeway, NMSU Graduate Assistant, Conference Judging Lead and NM AMP Director Bandini **Final Raffle Winners** * and **Conference Closing**, NM AMP Director Bandini						

***NOTE:** For the Lunch and Awards Raffles, you MUST be present to WIN; otherwise, another winner will be drawn.*

Floor Plan of the Corbett Center Student Union



NM AMP Leadership

Dr. Paola Bandini, NMSU Professor of Civil Engineering, Director of the New Mexico Alliance for Minority Participation, and NM AMP Co-Principal Investigator



Dr. Paola Bandini, P.E. is the Wells-Hatch Endowed Professor in the Department of Civil and Environmental Engineering at New Mexico State University (NMSU). She earned her B.S. in geological engineering (1993) and B.S. in geology (1993) *summa cum laude* from the Universidad de Oriente (Venezuela), and M.S. (1999) and Ph.D. (2003) in civil engineering from Purdue University. Dr. Bandini joined the NMSU faculty shortly after her graduate studies. She was the NMSU Campus Lead and a Co-Principal Investigator (Co-PI) of the National Science Foundation (NSF)-funded Engineering Research Center for Bio-mediated and Bio-inspired Geotechnics (2015-2025). Dr. Bandini is a co-PI of the NSF grant that funds the NM AMP Programs and co-PI of the NSF S-STEM STAR project in the NMSU College of Engineering. She is a Region 6 Governor of the American Society of Civil Engineers (ASCE) and served as President of the ASCE New Mexico Section. She serves as Chair of the ASCE Geo-Institute's Technical Coordination Council. Dr. Bandini teaches undergraduate and graduate courses in geotechnical engineering and has graduated 11 Ph.D. and 32 M.S. students. She received several awards, including the Teaching-Research-Service Synergy Award (2024), Donald C. Roush Teaching Award for Teaching Excellence (2023), ACAGE Teaching Excellence Award (2021), Synergy Faculty Leadership Award (2018), Patricia Christmore Faculty Teaching Award (2007), and Outstanding Professor of the Year award in her department (five years).

Dr. Joseph Bull, Provost and Vice President for Academic Affairs, New Mexico State University (Lead Institution), and NM AMP Principal Investigator



Dr. Joseph L. Bull serves as the Provost and Vice President for Academic Affairs at NMSU since 2026. From 2001 to 2016, Dr. Bull was a Professor in the Department of Biomedical Engineering at the University of Michigan. In 2017, Dr. Bull joined Tulane University, where he held the John and Elsie Martinez Biomedical Engineering Chair. He later served as Associate Dean for Research in the School of Science and Engineering and assumed additional administrative responsibilities, including Interim Chair of the Department of Earth and Environmental Sciences. In 2022, Dr. Bull was appointed H. Chik M. Erzurumlu Dean of the Maseeh College of Engineering and Computer Science at Portland State University, becoming the first Native American engineering dean in the country. Dr. Bull earned his Ph.D. (2000) and M.S. (1995) in mechanical engineering from Northwestern University and his B.S. in mechanical engineering from the University of Wisconsin–Platteville in 1992, graduating *summa cum laude*.

His scholarly work focuses on biofluid mechanics and ultrasound with applications in cardiovascular and pulmonary systems and biomedical devices. Dr. Bull is an enrolled member of the Delaware Tribe of Indians and is a first-generation college graduate. In 2024, Dr. Bull received the Executive Excellence Award from the American Indian Science and Engineering Society (AISES) and the Distinguished Scientist Award from the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS).

Dr. David V. Jáuregui, Professor of Civil Engineering and Interim of the College of Engineering at New Mexico State University



Dr. David V. Jáuregui, P.E. has served as Interim Dean of the College of Engineering at New Mexico State University (NMSU) since April 2024, following service as Associate Dean of Academics and Department Head of Civil and Environmental Engineering. He provides leadership for the College's academic and research programs, student success initiatives, facilities, advancement efforts, and partnerships with industry and government. With more than 25 years of experience as an educator, researcher, and practicing engineer, his work has focused on bridge inspection, structural evaluation, load testing, and transportation asset management. Since 2008, he has directed the NMSU Bridge Inspection & Evaluation Program in partnership with the New Mexico Department of Transportation. Dr. Jáuregui earned B.S. and M.S. degrees in civil engineering from NMSU and a Ph.D. in structural engineering from The University of Texas at Austin.

2026 NM AMP STUDENT RESEARCH CONFERENCE

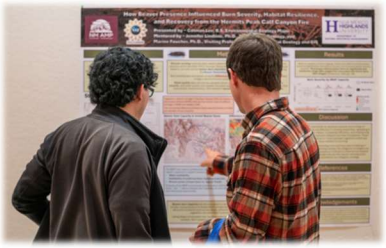


Keynote Speakers

Workshops



Student Presentations



Opening Session and Breakfast Keynote Speaker

Breakfast and Opening Session: 7:30 – 9:15 am

Dr. Cherie De Vore, Assistant Professor of Chemical and Environmental Engineering at the University of Arizona (UA)



Dr. Cherie De Vore, *Diné*, comes from the beautiful high desert community of Crownpoint, NM in eastern *Diné* (Navajo) Nation. Her clans are *Tł'ááshchi'í* (Red Bottom People), *Dziłt'áá' Kinyaa'áání* (Atop the Mountain Towering House), *Ashįįhí* (Salt People), and *Táneeszahníí* (Tangle People). She received her Ph.D. in civil and environmental engineering at the University of New Mexico under the mentorship of Professor José Cerrato. She was awarded a National Science Foundation (NSF) Earth Science Postdoctoral Fellowship to conduct research at Stanford University from 2020 to 2023. She examined ecological post-fire recovery in metal-rich and non-serpentine wildland landscapes in California. Dr. De Vore was also an associate postdoctoral fellow at SLAC National Accelerator Laboratory investigating colloidal transport of metals in the Floodplain Hydro-Biogeochemistry research focus group. Dr. De Vore now leads the *Níhí* Biogeochemistry Environmental Engineering laboratory group as a new Assistant Professor in the Department of Chemical and Environmental Engineering at the University of Arizona (UA). Her current work investigates biogeochemical mechanisms that affect the mobilization of inorganic contaminants and microbial community changes for the purpose of engineering bioremediation efforts in rural and underserved communities. She is also an associate faculty member of the Indigenous Resilience Center to address food, energy and water solutions in Indigenous communities.

Dr. De Vore is passionate about mentoring the generation of community leaders, offering a holistic approach that integrates multiple knowledge systems and praxis. She serves as the Vice President of the UA Native Faculty Group and is the co-advisor for the UA AISES Chapter. Outside of research, Dr. De Vore enjoys spending time with her family, coffee (campfire to craft), growing food, archery and marksmanship, hunting, martial arts, playing and collecting soul records, and participating in *Diné* ceremonies.

"Engineering from Abundance"

Abstract: Dr. De Vore explores an approach to environmental engineering grounded in abundance, relationality, and reciprocity. Beginning with the speaker's experience as an NM AMP student mentored by an NM AMP faculty, Dr. Jose Cerrato, she traces a pathway from participation in a relationship-centered STEM community to carrying that model forward through mentorship of the next generation of engineers and community leaders. This continuity provides a foundation for examining how relationships and relational accountability can shape both engineering education and research. As a Diné environmental engineering scholar, Dr. De Vore's bioremediation research centers community-engaged approaches to contaminated land and water, particularly in rural and Indigenous communities. Rather than framing contaminated environments solely through deficit, degradation, or technological intervention, their work considers the abundance already present within ecosystems, including microorganisms, fungi, plants, ecological processes, cultural knowledge, and community expertise, as sources of engineering insight and possibility. Through stories from research, mentorship, and community partnerships, Dr. De Vore examines "engineering from abundance" as both a technical and relational practice. The approach emphasizes reciprocity, responsibility, and respect for existing knowledge systems while developing bioremediation strategies.

Luncheon Session Keynote Address

Luncheon Session: 12:00 – 1:15 pm
West Ballroom, 3rd Floor

The Honorable New Mexico Representative Meredith A. Dixon



State Representative Meredith Dixon got her start in New Mexico politics as a field organizer for John Kerry's 2004 presidential campaign. She then served as New Mexico finance director for Governor Bill Richardson's 2008 presidential campaign. She spent the following years working for U.S. Senator Tom Udall, first as a field representative connecting constituents to federal resources and later as finance director for his campaign. She is the founder and managing partner of Blue Advantage Partners, an Albuquerque-based political consulting firm. She won election to House District 20 in November 2020 and was appointed vice chair of the House Appropriations & Finance Committee in 2023. She also serves on the House Energy, Environment, and Natural Resources Committee. Between sessions she sits on the Legislative Finance Committee, the Mortgage Finance Authority Act Oversight Committee, and the New Mexico Energy Affordability and Grid Reliability Council.

Her legislative record includes the establishment of the Technology and Innovation Division at the Economic Development Department, an increased annual disbursement from the Early Childhood Trust Fund, and the creation of the Opportunity Enterprise Fund and the Venture Capital Investment Fund.

NM MESA and TRIO Upward Bound GISD and LCPS Workshop

9:30 – 11:45 am and 1:30 – 3:45 pm
Doña Ana Room, 3rd Floor, Room 312

New Mexico Mathematics, Engineering, Science Achievement (NM MESA), Inc. and NMSU TRIO Upward Bound Workshop for NM MESA and TRIO Upward Bound GISD/LCPS Participants:

NOTE TO PARTICIPANTS: NM MESA and NMSU TRIO Upward Bound GISD/LCPS students will have a Workshop at 9:30-10:30 am facilitated by Anita Gonzales and Robert Gomez. After a break, at 10:45 am students will choose a workshop or research presentation session to attend in the 10:45-11:45 am timeslot. In the afternoon, from 1:30-2:30 pm, students will resume their workshop in Doña Ana Room. At 2:30 pm, students will attend Poster Session 2 in the East Ballroom (Room 320) and return to Doña Ana Room at 3:15 pm for the final Feedback Session. At 4:00 pm, the students will attend the Award Ceremony in the West Ballroom, 3rd Floor.

Anita Gonzales, Deputy Director, NM MESA, Inc. and New Mexico Representative, Serving the 70th House District



New Mexico Representative Anita Gonzales, a native New Mexican, was born in Las Vegas, NM to both the Lopez Family of Villanueva, NM and the Gallegos Family of Las Vegas, NM. She was recently elected to her second term in the New Mexico Legislature as a Representative. Representative Gonzales moved between Las Vegas and Albuquerque and graduated from the West Mesa High School. After completing most of her degree at Texas A&M University, she returned home to Las Vegas, NM to complete her bachelor's and master's degrees at New Mexico Highlands University. Representative Gonzales has worked at NM MESA for over 24 years – an organization that empowers and motivates New Mexico's culturally diverse students with science, technology, engineering, and math (STEM) enrichment. MESA supports student programs in middle and high schools throughout the state in six geographic regions and is in over 102 schools and 28 school districts.

Robert Gomez, Director, TRIO Upward Bound Program GISD/LCPS, New Mexico State University



Born in El Paso, TX and a graduate of Gadsden High School in southern New Mexico, **Robert Gomez** has dedicated his career to empowering students through education. Currently serving as the Program Director for TRIO Upward Bound at New Mexico State University (NMSU), he is committed to fostering academic success and personal growth for students in the Gadsden Independent and Las Cruces Public School (LCPS) Districts. Prior to this role, Mr. Gomez worked as a Student Program Coordinator with the Student Success Center at NMSU, where he helped develop programs to support student achievement and retention. His extensive teaching experience spans middle and high school levels, having served as an Intervention and Instructional Support Teacher. He was instrumental in founding the Fusion Reading Program with LCPS, a key initiative aimed at improving literacy skills for students. Mr. Gomez earned an undergraduate degree in Criminal Justice in 2004 and a master's degree in Curriculum and Instruction in 2017.

Community College Professional Development Workshops

Friday, October 23, 9:30 – 11:45 am
Saturday, October 24, 8:00 am – 12:00 pm
Quay Room, 3rd Floor, Room 327

NOTE TO PARTICIPANTS: These Community College (CC) Professional Development Workshops are held Friday, October 23 (the day of the conference), 9:30-11:45 am, and Saturday, October 24 (the day after the conference), 8:00 am-12:00 pm.

PARTICIPANTS: You must attend the Friday and Saturday sessions to receive a full stipend.

Workshops Facilitator: Michael Voegerl

Michael Voegerl, Associate Director of Advancement, Office of Advancement, New Mexico Institute of Mining and Technology



Michael Voegerl is the Associate Director for the Office of Advancement at the New Mexico Institute of Mining and Technology. He has spent 12 years working with New Mexico students to provide opportunities to enhance their educational journeys. Mr. Voegerl previously served as NM AMP Institutional Coordinator.

When not in the office, you can usually find Michael somewhere in the woods with his wife, Theresa, and their German Shepherd, Stella, or on the golf course chasing a little white ball.

Workshops and Podium Student Presentation Sessions

Choose two of the following workshops and presentation sessions to attend:

Workshop 1: Beyond the bench: Making research matter
Offered twice, at 9:30 – 10:30 am and 10:45 – 11:45 am
Location: Middle Ballroom, 3rd Floor, Room 318

Workshop 2: Building a career from undergraduate researcher to university professor
Offered twice, at 9:30 – 10:30 am and 10:45 – 11:45 am
Location: Senate Gallery Room, 3rd Floor, Room 304

Workshop 3: The hidden skills behind academic and career success: Emotional intelligence for emerging leaders
Offered at 10:45 – 11:45 am
Location: Auditorium, 2nd Floor, Room 247

Podium Student Research Presentations
9:30 – 10:30 am
10:45 – 11:45 am
Location: Col. Fountain Room, 3rd Floor, Room 324

MORNING WORKSHOPS AND SESSIONS





Workshop 1:

"Beyond the bench: Making research matter"

First Session: 9:30 – 10:30 am
Second Session: 10:45 – 11:45 am
Middle Ballroom, 3rd Floor, Room 318

Workshop presenters:

Sumira Phatak, Ph.D., Communications and Outreach Specialist, ARID Institute, and
Debbie Lee, Program Operations Director, ARID Institute, University of New Mexico

Workshop description: How can your research matter beyond the lab- and reach the people who can use it? This interactive science communication workshop, presented by the ARID Institute, invites students to explore how STEM research can connect with the priorities of communities, businesses, and public agencies. Participants will explore principles of community-based research, including listening to community perspectives, building reciprocal partnerships, and involving partners in shaping research questions and sharing findings. Through small-group exercises and individual reflection, students will identify potential partners, connect research interests with community priorities, and practice communicating scientific ideas in clear, audience-centered language. Participants will leave with a concise research message and practical next steps for incorporating meaningful community engagement into current or future projects.



Dr. Sumira Phatak is a nutritional toxicologist with expertise in transgenerational inheritance, endocrine disruption, and environmental exposures- particularly air pollutants, metal contaminants, and microplastics. She has a keen interest in outreach and enjoys sharing the cool science of others via multiple platforms, while promoting inclusive excellence. She is the host of Brains & Brews (B&B), a SciComm project with the mission to empower communities through accessible science. Having an appetite for adventure, she is also an avid outdoor enthusiast, experimental foodie, and aspiring artisan.



Debbie Lee is the Program Operations Director for the Accelerating Resilience Innovations in Drylands (ARID) Institute at the University of New Mexico (UNM), where she supports transdisciplinary research to inform climate resilience. She has 19 years of experience in environmental mediation and facilitation, coalition and partnership building, and science communication. Her career has been focused on supporting science-informed decision-making, specializing in ensuring clear communications between scientists, managers, and the public. Prior to joining UNM, she worked at an environmental consulting firm, an environmental conflict resolution non-profit, a summer camp, and a public butterfly garden. She holds a Master of Public Policy from the University of Maryland, and a Bachelor of Arts in History, Political Science, and Public Policy from St. Mary's College of Maryland.

Workshop 2:

"Building a career from undergraduate researcher to university professor"

First Session: 9:30 – 10:30 am
Second Session: 10:45 – 11:45 am
Senate Gallery Room, 3rd Floor, Room 304

Workshop presenter:

Frank Austin Mier, Ph.D., Assistant Professor, Department of Mechanical Engineering, New Mexico Institute of Mining and Technology

Workshop description: An undergraduate research project can put anyone on a career path that is difficult to imagine at the outset. This talk follows Austin Mier's work from undergraduate research at New Mexico Tech through graduate studies, postdoctoral research, industry, and back to New Mexico Tech as an Assistant Professor of Mechanical Engineering. Along the way, his work has included using cameras to reveal flows invisible to the naked eye, exploring technologies for reducing drag, and developing experiments to study high-speed phenomena.

Examples from his early research and projects his students are pursuing today illustrate how research interests develop and lead to new opportunities. A continuing thread is background-oriented schlieren (BOS), an imaging technique that first engaged him as an undergraduate and still presents questions that he and his students are working to answer. Returning to this ongoing effort, the talk reflects on how both the techniques and the researcher continue to develop. Through this journey, undergraduate researchers are invited to consider where their own interests might lead and how the questions they encounter today could sustain years of discovery.



Dr. Frank Austin Mier is an Assistant Professor of Mechanical Engineering at New Mexico Tech (NMT). Prior to beginning this position in August 2024, he was a Research Engineer at Wyoming Instrumentation Development, performing experimental fluid dynamics research assisting the commercialization of drag reduction technologies. This work is a continuation of efforts he joined as a Postdoctoral Researcher at the University of Wyoming. Austin has a passion for developing and performing unique experimental measurements of high-speed energetic and fluid phenomena. Austin received his education at NMT.

Workshop 3:

"The hidden skills behind academic and career success: Emotional intelligence for emerging leaders"

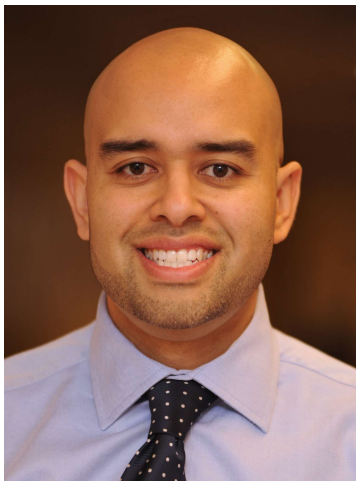
10:45 – 11:45 am

Auditorium, 2nd Floor, Room 247

Workshop presenter:

Dr. René O. Guillaume, Professor, Educational Leadership and Administration, New Mexico State University

Workshop description: Emotional intelligence, the ability to recognize, understand, and manage our own emotions and to read and respond to the emotions of others, is one of the strongest predictors of success in research, careers, and leadership, yet it is rarely taught. This interactive workshop blends the leadership science of why emotional intelligence matters with practical, research-based tools you can use right away: Participants map their own emotions on the Mood Meter, work through the five RULER skills (Recognize, Understand, Label, Express, Regulate), and leave with concrete strategies for communication, teamwork, resilience, and working effectively with mentors, peers, and colleagues.



Dr. René O. Guillaume is a Professor of Educational Leadership and Administration at New Mexico State University, where his work centers on emotional intelligence, leadership development, and supporting students, faculty, and staff as they navigate academic and professional life. His research and teaching span emotional intelligence, mixed-race identity development, qualitative research, mentoring, and work–life integration, with particular attention to helping emerging leaders from first-generation and underrepresented backgrounds thrive.

NM AMP Faculty Mentors of the Year (2025-2026)

Dr. Amanda K. Ashley, New Mexico State University



Amanda K. Ashley, Ph.D. is an Associate Professor of Chemistry and Biochemistry at New Mexico State University. She earned her B.S. (2001) at New Mexico State University and Ph.D. (2008) in Cell/Cellular and Molecular Biology and Toxicology at Colorado State University. Before joining the NMSU faculty, Dr. Ashley was a Postdoctoral fellow (2010) at Colorado State University. Her research focuses on replication of genetic information, a fundamental biological process common to all living organisms, and maintenance of its integrity. Currently, her lab is researching mechanisms to sensitize triple negative breast cancer (TBNC) cells to doxorubicin. TNBC is a clinical subtype disproportionately fatal to women of African American and Latina descent, in part due to the resistance they develop to the chemotherapeutic agent, doxorubicin. Their goal is to elucidate new targets in this highly fatal breast cancer subtype.

Nominated by: Lauren Wong, Undergraduate Research Scholar



Dr. David G. M. Mitchell, New Mexico State University

David G. M. Mitchell, Ph.D. is an Associate Professor in the Klipsch School of Electrical and Computer Engineering at New Mexico State University. He received his Ph.D. in Electrical Engineering (2009) from the University of Edinburgh, UK. Dr. Mitchell holds the IFT Professorship in Telecommunications. He previously held Visiting Assistant Professor and Post-Doctoral Research Associate positions in the Department of Electrical Engineering at the University of Notre Dame. He has also held visiting research positions at San Diego State University, the Vodafone Chair Mobile Communications Systems at TU Dresden, the Communication Theory Laboratory at École Polytechnique Fédérale de Lausanne, the Signal Theory and Communications Department at Universidad Carlos III de Madrid, and the Rhodes Information Initiative at Duke University. His research interests are in digital communications, machine learning, and quantum computing, with emphasis on error control coding and information theory. He received the National Science Foundation CAREER award in 2022 and the 2019 NMSU Early Career Award for Exceptional Achievements in Creative Scholarly Activity.

Nominated by: Matthew Domingo Ochoa, Undergraduate Research Scholar

NM AMP Institutional Coordinator of the Year (2025-2026)

Dr. David Torres, Northern New Mexico College



David Torres, Ph.D. is an Associate Professor of Mathematics at Northen New Mexico College (NNMC) in Española, NM. Dr. Torres formerly served as Department Chair of Mathematics and Physical Science and currently serves as Director of Assessment. He earned his Ph.D. in Mathematics (1995) at the University of New Mexico. Before joining the NNMC faculty, Dr. Torres worked as a postdoc at the New Mexico Institute of Technology and as a technical staff member at Los Alamos National Laboratory specializing in computational fluid dynamics and modeling.

Dr. Torres has served as the NM AMP Institutional Coordinator at NNMC since 2029 (17 years) and has mentored twelve NM AMP Undergraduate Research Scholars. His mentorship of NM AMP URS students has led to publications and has sparked new research interests. Dr. Torres has participated in all the annual NM AMP Student Research Conferences with his students and other NM AMP activities. He also participates in the regular IC meetings and contributes with data and information for the preparation of the annual reports to the program sponsors.

New Mexico Alliance for Minority Participation
Institutional Coordinators
Fall 2026



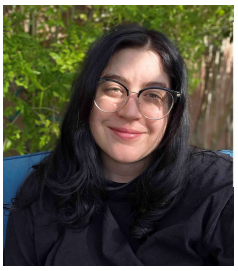
Brian Pasko, Ph.D.
Professor of Mathematics and Department Chair,
Eastern New Mexico College



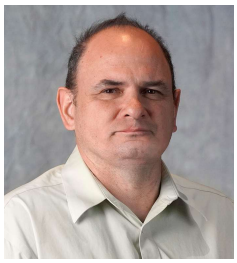
Lauren Bansbach
Instructor of Biology, Laboratory Manager, New Mexico Highlands University



Curtis O'Malley, Ph.D.
Assistant Professor,
Mechanical Engineering,
New Mexico Institute of Mining and Technology



Florence "Flo" Nash
NM AMP Database Analyst,
New Mexico State University



David Torres, Ph.D.
Associate Professor of Mathematics,
Northen New Mexico College



Debbie Lee
Program Operations Director,
Accelerating Resilience Innovations in Drylands (ARID) Institute, University of New Mexico



James Sanders, Ph.D.
Assistant Professor of Chemistry,
Westen New Mexico University

STUDENT POSTER ABSTRACTS

Lead Judge for Student Presentations: Cyrena Ridgeway

Student Poster Presentations: 1:30 – 3:45 pm
East Ballroom

COMPUTER SCIENCE & INFORMATION TECHNOLOGY

Amelia Sandoval, Information Engineering Technology
Northern New Mexico College
Mentor: Sadia Ahmed, PhD
Sponsored by: NM AMP (URS)

Study of the Impact of Artificial Intelligence on Society, Communities, and Quality of Life

There is no more denying of Artificial Intelligence (AI). It is here and it is here to stay. There is an aggressive push to integrate AI into every aspect of our day-to-day lives. Although some scientists and experts advised on the many pros and cons of AI, there has not been a comprehensive study to truly look into the impact of AI in our day-to-day lives, currently and in the future. This project will do a comprehensive study of the impact of AI on our day-to-day lives, and on society. This project will study the possible areas of AI integration, compare the before and aftereffects to determine the impact of AI in those areas of our day-to-day lives. One of the methods that would be applied is to compare the outputs of AI with the outputs of humans in terms of accuracy, cost, time, and labor. The capabilities of AI will be evaluated against human performances to determine which jobs will be replaced by AI and the impact of it on society. Effect of AI on human emotional wellbeing will be evaluated by utilizing effect of AI on human subjects.

Angel Garcia Vega, Computer Science and Electronics Engineering Technologies
Eastern New Mexico University
Mentor: Edgar Ceh-Varela, PhD
Sponsored by: NM AMP (URS)

Evaluating the Impact of Numerical Imputation on Distributional Integrity

In real-world machine learning, data is almost never "clean." Whether due to sensor failures, human error, or privacy concerns, we frequently encounter missing values. Most machine learning algorithms cannot handle these "holes" automatically, so we are forced to use imputation, the process of replacing missing data with substituted values.

Angelique Carrillo, Computer Science
New Mexico State University - Alamogordo
Mentor: Juie Shetye, PhD
Sponsored by: NM AMP (SCCORE)

Identifying Movements of G-Band Bright Points in DKIST Telescope

Magnetic Bright Points (MBPs) can be tracked from image data retrieved from the Daniel K. Inouye Solar telescope in Maui, Hawaii. Using a python algorithm that detects hundreds to thousands of pixel frame data, the algorithm tracks for both gradient and intensity over a normalized frame, with about 1329 frames in total [AC1.1]. This Python code aims to separate and define these MBPs from other surrounding brightness spots. This research can help researchers be closer at understanding behaviors of the Sun and possibly offer new insights into solar flare and space weather. Secondly, a manual detection of several

frames was done using simply the human eye. This was done to show the comparison and abilities of each method. The results showed that, although human eye is good at seeing broader bright points. There is room for improvement and the time spent was less efficient. The algorithm itself was beneficial and efficient. But as well as the manual detection, there is still chance for error. This data can lead to a ground-truth dataset that can benefit unsupervised or supervised machine learning. The results show that the computer algorithm detection is at least 50 times more efficient than if all the frames were done through manual detection, and the algorithm would take about 110 hours to track all 1329 frames.

Guillian Germino, Information Technology
Northern New Mexico College
Mentor: Sadia Ahmed, PhD
Sponsored by: NM AMP (URS)

Assessing the Effect of Environmental Changes on the Rio Grande River

The Rio Grande River originates in the Southern Colorado, USA, flows through the heart of New Mexico, USA, and finally meets the Gulf of Mexico. This River plays a vital role in replenishing the high and low deserts of New Mexico; western Texas, USA and the North-Eastern part of the country of Mexico. However, the Global Warming and climate change is affecting various freshwater systems including Rio Grande in a negative way. This study looks into various parameters of the Rio Grande River at different locations throughout its journey from its origin to the Gulf of Mexico. These parameters include, but not limited to, change in water level, change in water temperature, change in water quality, change in microbes in the water, and change in vegetation. This is a continuing project to collect and observe data over the length of 5 years beginning in the fall of 2026.

Thomas Gloria, Information Technology
Doña Ana Community College
Mentor: Katrick Kolachala, PhD
Sponsored by: NM AMP (SCCORE)

Asymmetric vs. Symmetric Encryption

Cryptography is the intricate process of taking text information and applying a protective barrier behind it during transmission. Many institutions make cryptography the foundation of data protection use these methods to defend against malicious intentions, e.g., banks, private messaging applications, and databases. Efficiency is another key factor in cryptography methods. Companies prefer to have cryptography speed over cryptography power methods. Symmetric encryption involves the use of one private key, and asymmetric encryption works a public key and private key. Worldwide users can have access to the public key, but not everyone can have access to the private key. Typically, symmetric encryption is more efficient than asymmetric encryption. Asymmetric encryption requires stronger cryptographic mathematical and computational power. Current experimentation wants to know if symmetric encryption holds the value of efficiency. A personal laptop device was used for the experiment. Two Python scripts were created for both test subjects, and each test subject was given four files: 1 KB, 10 KB, 100 KB, 1040 KB. Symmetric encryption ran AES-128, AES-256 bit, 3DES, and DES. Asymmetric encryption ran El Gamal and RSA encryption. Both test subjects required 1000 replications of each encryption and decryption process. RAM usage was also monitored regularly. 1000 replications were made to inhibit outliers in the data collection process. Measurements taken were the encryption and decryption averages and standard deviation of encryption and decryption averages. 1000 Replications were made to collect the averages and standard deviation. Encryption and decryption averages were taken and placed on data visualization software.

ENGINEERING

Alvin Birmingham-Monroe, Civil Engineering
New Mexico State University
Mentor: Runwei Li, PhD
Sponsored by: NM AMP (URS)

Audio-Visual Perception for Multimodal Safety and Security in Autonomous Vehicles

Agricultural wastewater from chili pepper processing in Chile contains high concentrations of capsaicin, organic matter, and chemical residues that resist conventional treatment methods. Capsaicin, the compound responsible for spiciness, is persistent, antimicrobial, and can disrupt local aquatic ecosystems if discharged untreated. While wastewater treatment research has advanced for general agricultural runoff, few studies address the unique challenges of capsaicin-rich water from chili farms. This project systematically evaluates physical filtration, chemical processing, and biological treatment methods to identify the most effective, scalable strategy for removing capsaicin and other contaminants from chili farm wastewater.

Benjamin Selph, Electrical Engineering
New Mexico Institute of Mining and Technology
Mentor: Krishna Roy, PhD
Sponsored by: NM AMP (URS)

Audio-Visual Perception for Multimodal Safety and Security in Autonomous Vehicles

Acoustic sensing offers information that may complement conventional visual and geometric perception in autonomous vehicles, particularly for events that are difficult to identify through line-of-sight sensors alone. A CARLA-based multimodal simulation environment integrates spatially distributed acoustic receivers with vehicle, camera, and environmental sensing to support controlled audio-visual experiments. Physics-informed vehicle and emergency-source audio incorporates spatial position, motion, attenuation, Doppler effects, and operating conditions to produce repeatable acoustic observations alongside existing autonomous-driving sensor data. The next phase focuses on training an audio-visual model to determine the contribution of acoustic information to autonomous vehicle perception and decision-making. Controlled scenarios will evaluate performance with and without acoustic input to quantify its value as an additional sensing modality. Cybersecurity testing will then examine vulnerabilities introduced by reliance on acoustic perception, including manipulated, misleading, or spoofed sound events. These experiments will characterize model robustness, identify failure modes, and evaluate the security implications of incorporating acoustic information into multimodal autonomous vehicle perception systems.

Cody Rice and Richard Salas
Mescalero Apache High School
Mentor: Nate Raynor, MAHS STEM Coordinator
Sponsored by: Mescalero Apache High School

Arduino Integrated Networks for Real-Time Wildfire Detection and Flash Flood Detection on Indigenous Lands

Wildfires threaten forests, natural resources, and cultural traditions on the Mescalero Apache Reservation. After researching tribal wildfire suppression practices, I identified a need for an early warning system to detect potential fires before they spread. Earlier detection could give firefighters more time to assess conditions, coordinate response procedures, and begin suppression. This project explores an Arduino-based monitoring system using an air quality sensor connected to an ESP32 microcontroller. The

sensor collects readings to identify changes that may indicate wildfire smoke. The system is designed to transmit data to a central monitoring point and generate alerts through a computer or application, notifying local fire agencies of a potential wildfire. Further testing is needed to evaluate sensor accuracy, communication reliability, and outdoor performance. Planned improvements will focus on detection capabilities and reducing false alerts. The proposed design will also be presented to tribal administration for consideration. The project aims to improve wildfire detection while protecting forests, traditional food sources, and resources important to Mescalero Apache ceremonies. Future research could explore preserving and restoring fir trees used in cultural traditions. By connecting STEM research with community needs, this project demonstrates how technology could help protect tribal lands and preserve Mescalero Apache traditions for future generations.

Emerald Davis, Mechanical Engineering
New Mexico State University
Mentor: Shabnam Mohammadshahi, PhD
Sponsored by: NM AMP (URS)

Superhydrophobic Hierarchical Silicon Coatings for Anti-icing Applications: Design and Characterization

This project aims to investigate the effects of microtextured surface geometry and nanoparticle-based hydrophobic coatings on the water-repellent and anti-icing performance of superhydrophobic surfaces. By systematically varying microstructure dimensions and applying low-surface-energy coatings, the study seeks to optimize surface design for reduced ice adhesion. The objective is to advance the understanding of how hierarchical roughness and surface energy modification contribute to ice-phobic behavior, with potential applications in aerospace environments where passive anti-icing strategies are critical for operational safety and efficiency.

Fabian Talavera, Aerospace Engineering
New Mexico State University
Mentor: Steven Sandoval, PhD
Sponsored by: NM AMP (URS)

Mechatronic Design and Model-Based Simulation Setup for an Omni-directional UAS

This work presents the development of an omnidirectional unmanned aerial system (OUAS), emphasizing the integration of mechanical, electrical, and simulation subsystems from a mechatronics perspective. A dynamic model is derived to characterize vehicle behavior, supported by a visualization of the forces and torques generated by the propulsion system. The mechanical structure is designed using computer-aided design (CAD) tools, and its structural integrity under expected operational loads is assessed through finite element analysis (FEA). The electrical architecture integrates propulsion, control, and navigation components. A vehicle model is implemented in the MuJoCo physics simulator and integrated with the Robot Operating System (ROS) to support communication, control, and virtual flight testing. The resulting platform provides a foundation for evaluating advanced attitude control strategies and investigating omnidirectional flight.

Genaro Garza, Industrial Engineering
New Mexico State University
Mentor: Chaitanya Mahajan, PhD
Sponsored by: NM AMP (URS)

Tracking Geometric Shrinkage in Copper Extrusion via Multi-Stage 3D Scanning

Metal material extrusion provides a cost-effective method for fabricating complex parts, but the necessary debinding and sintering post-processing introduces complex geometric shrinkage. To accurately understand this distortion, high-fidelity physical data must be captured across every manufacturing stage. This research establishes a comprehensive experimental workflow to fabricate, isolate, and dimensionally track copper filament benchmark parts. The methodology tracks truncated pyramids through three distinct physical phases: the raw printed state, the solvent and thermally treated debinded state, and the fully densified sintered state. At each interval, structured 3D scanning was utilized to acquire detailed, unaligned point cloud meshes of the surface topology. Ultimately, this multi-phase scanning workflow generates the high quality, physical dataset required to support future predictive models for dimensional compensation.

Javier Rincon-Troitiño, Mechanical Engineering
Doña Ana Community College
Mentor: Sarada Kuravi, PhD
Sponsored by: NM AMP (SCCORE)

Efficiency of Corrugated Channels in HDH Systems

As fracking continues to become a more prominent oil extraction method, its harmful byproducts such as wastewater continue to increase in the same capacity. Traditional treatment methods like filtration and chemical solutions prove to be lacking or economically unviable when scaled. That's where Humidifier-Dehumidifier (HDH) systems like this come to play. With these systems we can create a more scalable and economically efficient method for water treatment. The challenge within these systems resides within their dependency in doing away with the heat through heat convection to condense the now purified water. By employing new geometric systems to maximize the convection of heat in the most economically efficient way to help do away with the harmful waste of fracking and other water contaminating industries.

Jose Pinales, Mechanical Engineering
New Mexico State University
Mentor: Boris Drach, PhD
Sponsored by: NM AMP (SCCORE)

Detection of Subsurface Defects Using Thermographic Testing

There are multiple non-destructive testing methods used to detect defects such as air bubbles or delamination within engineered materials. One of these methods is Non-Destructive Thermography (NDT) testing. In laminated materials, air gaps heat up at a different rate than the successfully laminated material, and when imaged with a thermal or infrared camera the contrasts are apparent. By applying heat to the material and allowing the heat to propagate, thermal imaging can be used to identify defects within the material. This work aims to determine the maximum depth at which an air bubble can be detected within PLA (polylactic acid) using NDT. Specimens were designed to contain voids at varying depths and then 3D printed. The specimens were painted with matte black paint to prevent reflection, and halogen lights were used as a heat source. An infrared thermal camera was used to image the specimen as it was heated and cooled. Results showed that the maximum depth at which the defects could be detected was 5 mm.

Kayleen Kocharoff, Mechanical Engineering
New Mexico Institute of Mining and Technology
Mentor: Curtis O'Malley, PhD
Sponsored by: NM AMP (URS)

Octopus Inspired Dual Actuated Soft Robotic Muscle

A Pneumatic Artificial Muscle is a soft robotic actuator that uses compressed air to mimic a biological muscle. A tendon driven muscle uses cable-like materials to produce motion. Hybrid pneumatic-tendon powered muscles combine the pneumatic and tendon driven systems aimed at achieving precise movement, high speeds, and high dexterity. Similar dual-driven actuators are an emerging research area due to the complexity of its design and control. This soft robotic flexible digit is inspired by an octopus arm combined with the material characteristics of Silicone Flexible 50A. Digital Image Correlation (DIC) was used during uniaxial tensile testing to capture 3D strain distributions and generate the stress-strain curve of the Silicone Flexible 50A using MATLAB. This bioinspired digit is modeled by how an octopus solves problems and interacts with objects by maneuvering its tentacles. Pressurization and tendon displacement are varied to understand how motion is affected and to understand the limitations of a hybrid pneumatic-tendon system. This bio-inspired approach to a soft robotic digit yields the capabilities an octopus arm may provide, including a digit with multiple degrees of freedom.

Mario Saenz, Electrical Engineering and Computer Science
New Mexico State University
Mentor: Mario Renteria Pinon, PhD
Sponsored by: NM AMP (URS)

Comparative Analysis of Sense Amplifiers and Dual-Function Read-Write Driver Architectures for Low-Power SRAM Design

Conventional SRAM columns use separate sense amplifier and write driver circuits, although only one is active at a time. The Dual-Function Read-Write (DFR-W) driver proposed by Sharma and Hashmi merges both functions into one circuit to reduce area and power. Across two semesters of the New Mexico AMP URS program and the Intel Semiconductor Research Program at New Mexico State University, this work implemented a standard sense amplifier and write driver architecture and the DFR-W driver in Cadence Virtuoso (TSMC 65 nm), building each from a single bitcell to a shared 5-to-32 decoder and a 32×32-bit array. A parameterized testbench wrote and read a 1 and a 0 at each address. In simulation, DFR-W wrote more slowly than the standard design (0.138 ns vs. 0.043 ns) but read faster (0.047 ns vs. 0.109 ns), and drew about 52% more average power (0.866 mW vs. 0.569 mW). Schematic-level transistor gate area was about 6.6% smaller. These results partially support the source paper: DFR-W delivered on area and read speed, but not write speed or power. Future work includes separating supply rails, scaling the array, and testing mixed access patterns.

Matthew Ochoa, Electrical Engineering
Yair Barraza, Electrical Engineering
New Mexico State University
Mentor: David Mitchell, PhD
Sponsored by: NM AMP (URS)

Optimizing Sequential LDPC Decoders via Reinforcement Learning for Next-Generation Telemetry Systems

To meet the demands of next-generation deep-space telemetry, low-density parity-check (LDPC) decoders must overcome significant latency and power consumption barriers. This research addresses these barriers by replacing standard simultaneous "flooding" decoders with a sequential processing architecture. We show that the decoder schedule can be optimized via reinforcement learning (RL), in

which an agent chooses the node update sequence that maximizes the reward. To validate our approach, we test the decoder using the industry standard NASA CCSDS (128,64) LDPC code. In this work, we introduce two trained RL-driven schedules: a low-level and a high-level scheduler. Under identical channel noise conditions, our proposed RL trained decoders are shown to obtain an error-rate reduction of an order of magnitude over the random sequential and flooding baselines at high signal-to-noise ratios. Furthermore, we demonstrate that the high-level scheduler achieves comparable convergence speeds to the low-level scheduler while bypassing inner-loop memory bottlenecks, offering a pathway to efficient hardware implementation.

Matthew Watson, Electrical Engineering
New Mexico Institution of Mining and Technology
Mentor: Qingsong Cui, PhD
Sponsored by: NM AMP (URS)

One Dimensional Focusing of Incoherent Light Through Refractive Index Lensing on the Femtosecond Timescale

Iyer et al. demonstrated that ultrafast incoherent photoluminescence (PL) from a GaAs metasurface with embedded InAs quantum dots (QDs) can be steered along one dimension by modifying the emitter's local density of optical states (LDOS) through spatially structured optical pumping. Our long-term goal is to extend this approach from one-dimensional steering to beamforming of the PL emission. Fabrication began with a wafer grown by molecular beam epitaxy, that featured a GaAs resonator layer with embedded epitaxial InAs QDs in asymmetric quantum wells on a distributed Bragg reflector formed by alternating pairs of AlGaAs and AlAs, then moved to electron-beam lithography and inductively coupled plasma etching to create the nanopillar resonators. The device is then characterized through scanning electron microscopy (SEM) and through reflection and PL spectroscopy. We present the fabrication workflow and challenges, including charging effects and pillar collapse, which were resolved through a charge-dissipation coating and altered resist development, respectively. SEM and spectral measurements are compared against the design values of Iyer et al. This work prepares a platform for upcoming structured-pump experiments aimed at PL beamforming.

Maya Marquez, Mechanical Engineering
New Mexico Institution of Mining and Technology
Mentor: Wes Cook, PhD
Sponsored by: NM AMP (URS)

Los Alamos National Laboratory Glovebox Fire Prevention

New Mexico Institute of Mining and Technology partnered with Los Alamos National Laboratory to investigate air flow behavior and thermal characteristics within a large-scale glovebox system. The Los Alamos National Labs' Plutonium department houses a large system of connecting gloveboxes that are used to work with various radioactive materials under a monitored operational modality. A controlled experimental environment was created to replicate the onsite glovebox configurations while incorporating necessary testing scenario modifications. Data acquisition was supported through an integrated workflow involving CAD modeling in Autodesk Inventor, computational analysis using MATLAB, system programming with Arduino, C++, and LabVIEW, and precision machining for custom instrumentation. Interchangeable components were designed, approved, then manufactured to optimize testing setups to retrieve desired experimental outputs. This iterative approach allowed for isolating airflow patterns, quantifying heat transfer behaviors, and evaluating the reliability of the fire prevention sensors provided by the labs. To improve future testing processes, a comprehensive virtual model of the glovebox was created. This provides a foundation for optimized instrument selection, improved sensor placement, and expanded testing capabilities. The project research conducted throughout the coming academic year will be applied in the summer of 2027 through another set of fire prevention testing sequences.

Michael Kerns, Chemical Engineering
New Mexico Institution of Mining and Technology
Mentor: Michaelann Tartis, PhD
Sponsored by: NM AMP (URS)

Tracking of Shear waves in ANGUS Phantoms via Nonlinear Cross Correlation

During impacts to the skull, the brain can undergo a traumatic brain injury (TBI), sustaining long term damage. Previously our group designed, fabricated, and tested an anthropomorphic gyrencephalic unified standard (ANGUS) phantom, a model of the human brain enclosed in a 3D-printed skull and transparent acrylic windows, used for testing blunt and blast TBIs. The ANGUS phantom is composed of polyacrylamide hydrogel that is tuned to mimic brain tissue allowing optical visualization of tissue mechanics during impact. One method used to track the deformation of the tissue phantom is digital image correlation (DIC), which relies on using a random speckle pattern embedded in a transparent phantom, tracked with a high speed camera. This cannot be done in vivo with intact skulls; however, non-invasive transcranial ultrasound is regularly used in vivo to track blood flow in the brain. Our hypothesis is that high frame rate ultrasound can quantify tissue deformation using a process called nonlinear cross correlation (NCC), working similarly to DIC. By embedding ~50 micron glass spheres in the ANGUS phantom, a random yet consistent set of echos are received and tracked over time, creating a speckle pattern. Utilizing NCC, changes in the speckle pattern can quantify shear wave deformation.

Miles Kennington, Chemical Engineering
New Mexico Institution of Mining and Technology
Mentor: Michaelann Tartis, PhD
Sponsored by: NM AMP (URS)

Anisotropic Reinforcement of Polyacrylamide Hydrogel Brain Phantoms Using poly(Ɛ-caprolactone) Scaffolds

Traumatic brain injuries (TBIs) from head impacts are common but remain poorly understood at the cellular and tissue level. This is largely because limited access to the brain makes it difficult to measure in vivo deformation during live impacts, impeding characterization of injury mechanisms. Current brain phantoms rely on hydrogels, whose bulk mechanical properties fail to capture the anisotropy of brain tissue due to axon fiber networks. To introduce anisotropy into these hydrogels, fibrous scaffolds mimicking white matter structure made from poly(Ɛ-caprolactone) will be commercially sourced from VivoTex. These scaffolds will be embedded in hydrogel networks made of polyacrylamide (PAA) tuned to mimic the mechanical properties of brain tissue, creating an anisotropic substrate which will be subjected to various loading conditions from multiple angles while high-speed imaging captures deformation. This footage will be analyzed via digital image correlation (DIC) to generate full-field strain maps identifying regions of high and low strain concentration, including any fiber breakage within the scaffold. The resulting anisotropic strain distribution will be compared to fractional anisotropy values obtained in the literature from ex vivo white matter tissue via diffusion tensor imaging (DTI), the standard MRI-based metric for characterizing white matter directionality in human brain tissue.

Morgan Lee, Mechanical Engineering
New Mexico Institution of Mining and Technology
Mentor: Frank Austin Mier, PhD
Sponsored by: NM AMP (URS)

Research into Using Explosive-Based Methods for Advanced Metal Etching and Thin Metallic Film Explosion Welding

The physics of blast loading influences morphology, adhesion, and interfacial behavior of copper plates bonded to nickel-silver alloy foil contained within an explosively etched artistic design. Pre-detonation design parameters are hypothesized to be tunable thus able to produce predictable, desirable surface features. This work aims to establish reproducible relationships between explosion parameters, metal etching, foil welding, and general functional surface performance including resistance to weathering and oxidation. Existing knowledge is incorporated into the process by reviewing and analyzing previous methods and materials used in explosive etching at the Energetic Materials Research and Testing Center (EMRTC). Mechanical testing is performed using tensile and three-point bending tests to characterize the response of bonded samples under applied loading. The data collected during testing are used to evaluate the strength, deformation behavior and failure characteristics of the bonded interface.

Nathan Nevarez, Mechanical Engineering
New Mexico State University
Mentor: Borys Drach, PhD
Sponsored by: NM AMP (URS)

Evaluation of Dimensional Deviations in Additive and Subtractive Manufacturing Using 3D Scanning

All manufacturing processes have accuracy limits that result in deviations from design dimensions. Various inspection processes are used in industry to evaluate these dimensional deviations, enabling quality control and rejection of parts that fall outside acceptable tolerances. Structured light 3D scanning, a technique that reconstructs a digital model by capturing deformations of projected light patterns on a surface, is a versatile tool for metrology and reverse engineering. An Artec Micro II desktop 3D scanner is employed to acquire scan data for evaluating feature-based dimensional deviations from parts produced by various manufacturing techniques. Benchmark specimens designed based on to National Aerospace Standard 979 for high-precision tolerance requirements were manufactured via fused filament fabrication, computer numerical control machining, and polymer powder bed fusion to compare the dimensional accuracy of these processes. Reconstructed scan data were overlaid onto original computer-aided designs to evaluate surface flatness, geometric feature dimensions, and tolerances.

Ruwaa Al Aqtash, Civil Engineering
New Mexico State University
Mentor: Yanyan Zhang, PhD
Sponsored by: NM AMP (URS)

Rapid Screening of Unknown Aromatics in Treated Produced Water using AhR Cell Reporter

Produced water (PW) from oil and gas production can contain complex organic contaminants that may persist after treatment. This study evaluates a rapid cell-based approach for screening potential residual xenobiotic compounds of treated PW by measuring activation of the aryl hydrocarbon receptor (AhR). Treated PW samples from thermal and membrane-based treatment processes, including thermal distillate, membrane permeate, and post-treated water, were evaluated using the HepG2-Lucia AhR reporter assay and the Human AhR Reporter Assay System from Indigo Biosciences. Luminescence was measured as an indicator of AhR activation, with TCDD used as a reference ligand. Organic extracts of

selected treated PW samples were also evaluated to assess the presence of potential AhR agonists. Overall, membrane treatment reduced AhR activation, with post-treated samples exhibiting the lowest level of AhR activation. This screening approach can help identify residual xenobiotics that conventional chemical analysis may miss and support evaluation of treated PW for potential discharge or reuse applications, while considering potential environmental and human-health impacts.

Thomasina Johnson, Civil Engineering and Applied Mathematics
New Mexico State University
Mentor: Salim Bawazir, PhD
Sponsored by: NM AMP (URS)

Understanding and Predicting Bud Break and Senescence in Pistachio (Pistachio vera L.) of Golden Hills Cultivar

Pistachio (Pistacia vera L.) growth and productivity are strongly influenced by seasonal temperature conditions. Bud-break in pistachios marks the beginning of active spring growth, whereas senescence in the fall indicates the end of the growing season. Understanding the climate conditions associated with these events is important for predicting crop development and growth as well as irrigation management. This study focuses on the Golden Hills cultivar, grown in the Mesilla Valley of southern New Mexico. Plant temperature and meteorological conditions are monitored to identify the temperature thresholds associated with the timing of bud-break and senescence in the Mesilla Valley. The goal is to use the collected data in crop and irrigation management models to conserve water and support crop production under varying climatic conditions.

LIFE SCIENCE

Aneliese Cdebaca, Forensic Science
Eastern New Mexico University
Mentor: Patricia Cabrales, PhD
Sponsored by: NM AMP (URS)

Ranavirus Detection Using Loop-Mediated Isothermal Amplification (LAMP) Assay

Ranaviruses are a group of viruses in the family Iridoviridae that infect a diverse assemblage of ectothermic vertebrates, including fish, amphibians, and reptiles. These viruses are known to cause morbidity through tissue death and organ failure, which can lead to mass-mortality events. To rapidly detect ranavirus infection in amphibians, conservationists need an efficient, field-based assay. Here, we examine the role of a Loop-Mediated Isothermal Amplification (LAMP) assay as a rapid method for detecting ranavirus in amphibian field samples. A LAMP assay amplifies DNA with high specificity under isothermal conditions, providing rapid results. It has become a promising nucleic acid amplification technique for rapid pathogen detection, suitable for field applications; however, its use for detecting ranaviruses has been minimally tested. This technique utilizes eight primers to bind with and amplify specific regions of the target DNA sequence, which is the ranavirus major capsid protein sequence. The primers are added to a reaction mixture containing DNA, master mix, and the target DNA, which is then incubated at 65°C for 30–60 minutes to amplify the target DNA. The results are visualized using a straightforward colorimetric assay and gel electrophoresis. Here, we present the results of our efforts to validate and standardize the LAMP assay for detecting ranavirus, as well as results from testing tadpoles for the specific strain Frog Virus 3.

Angelina Espinoza, Wildlife Biology and Conservation
New Mexico Highlands University
Mentor: Jefferey Propster, PhD
Sponsored by: NM AMP (URS)

Ponderosa Pine in Pinon Juniper Physiology

Ponderosa pine usually occupies elevations between 5,700 and 6,800 feet in the Southwest, where cooler temperatures and higher moisture support its growth. In contrast, the piñon–juniper zone spans roughly 4,500 to 7,500 feet and presents a much warmer, drier climate. Because these environmental differences are expected to intensify under future climate conditions, understanding how ponderosa pine responds when pushed downslope has become increasingly important. In Arizona, ponderosa pine saplings were transplanted into piñon–juniper habitat and later transported to NMHU for detailed physiological and ecological measurements. These trees provide a valuable opportunity to examine how a major forest species adjusts when exposed to stress outside its typical elevational range. My project focuses on several traits that reflect both symbiotic relationships and plant function: ectomycorrhizal fungal associations, root and shoot biomass, osmotic potential, and stomatal density. Together, these data will help clarify how ponderosa pine responds to altered moisture and temperature regimes, offering insight into its potential resilience—or vulnerability—as climate change continues to reshape southwestern forest ecosystems.

Annie Acosta, Biochemistry
New Mexico State University
Mentor: Kevin Houston, PhD
Sponsored by: NM AMP (URS)

The Role of IGFBP4 in Breast Cancer Cell Invasion and Metastasis

Approximately 90% to 100% of breast cancer deaths result from metastasis, the spread of cancer cells from the breast to surrounding tissues. This makes it crucial to understand the mechanisms of metastasis for developing more effective and personalized treatments. Our research suggests that insulin-like growth factor-binding protein 4 (IGFBP4) promotes breast cancer metastasis. The goal of this project is to determine how IGFBP4 drives metastasis. Specifically, we will investigate how IGFBP4 regulates epithelial-to-mesenchymal transition, cancer cell invasion, and the molecular signaling pathways involved.

Berenice Moriel, Biology
Eastern New Mexico University
Mentor: Patricia Cabrales-Arellano, PhD
Sponsored by: NM AMP (URS)

Microplastic Monitoring in The Rio Grande: A Baseline Study

Microplastic contamination in the Rio Bravo/Rio Grande represents an emerging environmental threat with significant implications for both human health and aquatic ecosystems. As larger plastic debris degrades, it fragments into micro- and nano plastics that disperse widely through water systems, accumulate in organisms, and transfer along the food chain. Although the United States has implemented bans on certain microplastic sources, such as cosmetic microbeads, these pollutants remain highly persistent in the environment. Despite growing global concern, data on microplastic contamination in the Rio Grande remains limited, with only two previous local studies confirming their presence. To address this gap, the present study serves as a preliminary investigation aimed at establishing a baseline for the average concentration of microplastics per liter of water at multiple sites along the Rio Grande. Water samples were collected from ten locations between Las Cruces-New Mexico, and El Paso-Texas.

Samples were filtered, and microplastics ranging from 500 µm to 5 mm were quantified using stereoscopic analysis. Their chemical composition was further characterized by Fourier Transform Infrared Spectroscopy (FTIR). Our preliminary findings indicate that microplastic concentrations range from 3 to 84 particles per liter of water across the sampled sites. The most prevalent type of microplastic identified was fibers and fragments primarily composed of polypropylene. These results correspond to the first of four planned sampling periods and will contribute to building a more comprehensive understanding of microplastic distribution and sources in the Rio Bravo/Rio Grande system.

Cayla Totten, Forensic Anthropology
Eastern New Mexico University
Mentor: Corey Green, PhD
Sponsored by: NM AMP (URS)

The Generational Effects of PCB 126 on Zebrafish

Organic legacy contaminants such as PCBs remain environmentally ubiquitous and pose a significant risk to both humans and environmental health. Some populations survive exposure through evolutionary rescue, but recent data suggests that it comes at the cost of physiological fitness. Zebrafish are 70% genetically related to humans and have a short gestational period making them good candidates for a multi-generational study about the effects of PCBs. Our hypothesis is generational exposure will increase Zebrafish population contaminant resistance and decrease their physiological tolerance toward common abiotic factors. We determined an initial LC50 for PCB 126 in a hybrid line of wildtype zebrafish (F1), growing out survivors after exposure to the LC50 concentration (F2). In our F1 study, we recorded data on morphologic and cardiac endpoints. We also recorded physiological tolerance to temperature, hypoxia, salinity, and metabolic scope. We are in the process of collecting data from our F2 generation for comparison. We expect the F2 LC50 to be higher relative to the F1 generation and controls. We do not expect a change in physiological tolerance of abiotic factors between generations or from controls. Contaminant resistance is clearly displayed by surviving individuals, but physiologic change requires complexity beyond what can accrue within a single generation. These data provide insights into the evolution of contaminant resistance and the implications for conservation of species impacted by ubiquitous contaminants and climate change.

Eliha Hernandez, Microbiology
New Mexico State University
Mentor: Jared Mayers, PhD
Sponsored by: TRIO McNair Scholars Program

Investigating The Role of Gene PA3260 in The Lung Microbiome

Our microbiome is a key component of human health and disease. Studies of the gut microbiome revealed microbes can contribute to cancer development by inducing DNA damage or producing metabolites fueling cancer cells. Evidence suggests the lung microbiome may be similar, yet its low microbial biomass limits our ability to study microbial activity through conventional meta-omics. Studying Lung cancer is imperative, as it's the leading cause of cancer-related mortality. The Mayers Lab conducted a high-depth sequencing metagenomic and metatranscriptomic study in a lung adenocarcinoma cohort. While few bacterial reads were retrieved, several differentially expressed genes were detected, including PA3260, a probable transcriptional regulator in Pseudomonas aeruginosa, enriched in tumor samples. I hypothesize that PA3260 regulates bacterial metabolic programs within the tumor microenvironment, promoting microbial survival and possibly tumor development. To investigate PA3260's function, I constructed a P. aeruginosa strain where PA3260 is controlled by a rhamnose-inducible promoter. Then sampled for RNA-sequencing analysis. By comparing PA3260-induced strains to wild-type, I will identify the genes regulated by PA3260, providing insight into its role in P. aeruginosa metabolism.

Emily Arias, Biology
Eastern New Mexico University
Mentor: Jonathan Schmitt, PhD
Sponsored by: NM AMP (URS)

Estimating The Rates of Haemosporidian (Apicomplexa: Haemosporida) Infection and Turnover in Birds of Northwest New Mexico

Although commonly thought of as uniquely infecting humans in the tropics and causing the disease malaria, haemosporidians in fact parasitize a diversity of vertebrate hosts other than humans. Indeed, over 5,000 species of haemosporidians are known to infect birds, while 95% of human malaria cases are caused by only two species. Preliminary studies of haemosporidians infecting birds have demonstrated important impacts on the fitness, range limits, and community structure of birds; yet haemosporidians parasites remain unsurveyed in most bird species and communities. Indeed, haemosporidian infections in birds appear to be common, including here in New Mexico. I conducted a survey of haemosporidian parasites infecting birds in the Chuska mountains, a previously unstudied region of northwest New Mexico. Specifically, I screened 47 avian host individuals, representing 10 species. Within the Chuska mountains, I discovered a combined infection rate of 117%, which is higher than reported in any previous study of haemosporidians in New Mexico. At the host species level, I discovered that infection rates were also higher than previously reported for the avian species screened. Initial genetic analysis of these haemosporidian infections indicates a high diversity of rare species, rather than a small number of common species. While many of these haemosporidian species have been detected in previous studies, including within birds of New Mexico, I have also identified some putatively undescribed new species. These results highlight our nascent understanding of species diversity in haemosporidians and the need for continued screening. To that end, I am currently in the process of screening a larger sample of host individuals and comparing patterns of community turnover, or change in haemosporidian species composition, between the Chuska mountains and other mountain ranges in New Mexico. In conclusion, my research is generating a novel dataset and insights that will deepen our understanding of these important biotic interactions in New Mexico.

Esperanza Coriz, Biology
Northern New Mexico College
Mentor: Rhiannon West, PhD
Sponsored by: NM AMP (URS)

Mate Choice and Preferences in Cyprinodon Brontotheroides

Sexual selection is evident in many species and is fueled by preferences for various traits, including displays, parental care, genetics, or size. In some fish, these traits may include a preference for their own species or one closely related to it. These preferences may help prevent hybridization and maintain species boundaries. In pupfish, hybridization may be costly due to high mortality associated with hybrid morphology. We investigated whether male and female Cyprinodon brontotheroides prefer conspecifics over two closely related species. We gathered preference data from three species of pupfish (Cyprinodon spp.) found on San Salvador Island, The Bahamas. Focal fish were placed in the middle compartment of a three-compartment container, with conspecific or non-conspecific stimulus fish in the outer compartments. We recorded how long focal fish spent on either side of an established central line to determine preference. Our results showed no evidence of a strong conspecific preference, as neither male nor female C. brontotheroides spent substantially more time near conspecifics. These findings suggest that the natural environment of these wild-caught populations play a role in mate preferences. However, the mechanisms maintaining species boundaries in C. brontotheroides remain unclear and require further research.

Isabella Ramirez, Anthropology/Biology
New Mexico State University
Mentor: Maria Castillo, PhD
Sponsored by: TRIO McNair Scholars Program

Modulation of Thioester-Containg Proteins in Hemocytes of Biomphalaria Glabrata Snails Upon Exposure to Schistosoma Mansoni Products

Schistosomiasis is a neglected tropical disease caused by the parasitic flatworm Schistosoma mansoni. It affects millions of people worldwide, especially in areas with limited access to clean water and sanitation. The parasite's life cycle involves humans and freshwater snails such as Biomphalaria glabrata. Some snail strains are resistant to S. mansoni, while others are susceptible. Snail immune cells called hemocytes help defend against infection by recognizing and destroying parasite larvae. Hemocytes produce thioester-containing proteins (TEPs), which may help recognize and bind parasites. This project investigates TEP gene expression in two B. glabrata strains: BS90 (resistant) and BB02 (susceptible). RNAscope is being used to visualize and compare TEP expression within hemocytes. Hemocytes will also be exposed to S. mansoni larval transformation products (LTPs) to examine changes in TEP expression. We hypothesize that resistant BS90 hemocytes will show higher TEP expression after LTP exposure than susceptible BB02 hemocytes. Understanding TEP expression may provide insight into snail resistance mechanisms and help inform strategies to reduce schistosomiasis transmission.

Jade Collins, Biology and Computer Science
New Mexico State University
Mentor: Donovan Bailey, PhD
Sponsored by: TRIO STEM-H

Evolutionary History of Mimosine Production in Agriculturally Significant Legumes

Mimosine is an amino acid-like substance produced by plants in the mimosoid clade of the legume plant family for defense. Mimosoid legumes are important plants in the wild and to humans due to their geographic range, agricultural significance, and scientific contributions. The evolution of mimosine production in legumes remains unclear. This research explores the evolutionary history of the genes involved in mimosine production. This was done through the collection of 14 mimosoid genomes, 2 outgroup genomes, and 8 protein reference sequences of genes related to mimosine production/degradation. OrthoFinder was used to compare genomes and sequences and sort them into orthogroups, of which 3 were selected for further review. Preliminary results using the species and gene trees constructed by OrthoFinder as well as gene copies from each species in each tree show a possible Whole Genome Duplication (WGD) at the base of the mimosoid clade, excluding E. phaseoloides, resulting in the evolution of mimosine synthase from an extra copy of cysteine synthase. Future research includes confirming the gene duplication event identified is a WGD and confirming the evolutionary mechanism behind the evolution of mimosine and mimosinase (an enzyme to degrade mimosine).

Jalyn Brannon, Biology
New Mexico State University
Mentor: Julie In, PhD
Sponsored by: Undergraduate Pathway Network, UNM

Environmental Uranium-Bearing Dust Alters Gene Expression in Commensal E. coli

Over 160,000 abandoned hard rock mines across the Western United States continuously contaminate the surrounding sediment and groundwater, posing a significant public health concern. Heavy metals are primarily ingested or inhaled with direct exposure to the gastrointestinal tract, yet little is known about how heavy metals affect the microbiome. We sought to determine how uranium-bearing dust (UBD)

collected from the Paguate Village near the Jackpile Mine impacts gene expression in three E. coli strains. E. coli K-12 (laboratory-adapted), Nissle 1917, and HS (gut commensals) were grown in LB broth, inoculated at a starting OD 0.01 and UBD treated at the start of log phase (OD 0.2). RT-qPCR quantified expression of genes associated with quorum sensing, oxidative stress, and antimicrobial resistance. Growth did not differ between control and UBD-exposed cultures in all strains. Oxidative stress and quorum sensing genes were upregulated at earlier timepoints across multiple UBD concentrations in all three strains. Interestingly, all three strains upregulated genes associated with tetracycline and penicillin resistance. Our preliminary results indicate that environmental UBD induces oxidative stress, quorum sensing, and antimicrobial resistance gene expression in commensal E. coli, suggesting heavy metal exposure may drive commensals towards a pathobiont state.

Kayden Robey, Biology
New Mexico State University
Mentor: Immo Hansen, PhD
Sponsored by: NM AMP (URS)

Knockdown of IRS1 is Correlated with Lowered FOXO Expression and Reproductive Rates in Aedes Aegypti

Understanding components of female reproduction may provide allow us to enhance our mass-rearing methods for mosquitoes. This would create the means for more experimentation of these major vectors. The insulin signaling pathway regulates vitellogenesis and yolk protein precursor. The role of insulin receptor substrate 1 (IRS1) within this pathway is not fully understood. We investigated the role of IRS1 in female reproductive success and its effects on expression of the forkhead transcription factor (FOXO). Female mosquitoes were injected with dsRNA targeting IRS1 and GFP, then blood-fed two days later to begin the process of vitellogenesis. Egg production, larval hatch rate, ovary morphology, and FOXO expression were measured during vitellogenesis. IRS1 knockdown was assessed by RT-qPCR. IRS1 knockdown was correlated with fewer eggs, reduced egg hatch rates, and shorter ovaries at 48 and 72 h post-bloodmeal. FOXO gene expression was also significantly reduced following IRS1 knockdown.

Kimberly Villarreal, Biology
New Mexico State University
Mentor: Kathryn Hanley, PhD
Sponsored by: NM AMP (URS)

Impact of RNA Interference on Dynamics of Sylvatic (Wildlife) and Human-Endemic Strains of Dengue Virus in Mosquito Cells

Dengue virus is transmitted by infected Aedes mosquitoes, causing classical dengue fever as well as dengue hemorrhagic fever (HF), which can result in death. The four serotypes of dengue virus that circulate in humans have emerged independently from viruses circulating in a sylvatic cycle (wildlife). Heterologous infection with a second serotype of dengue virus greatly increases the likelihood of HF; thus, the potential for spillover of novel strains of the existing serotypes or even a novel serotype from the sylvatic cycle into human endemic strains is a major health concern. To interrogate the potential for sylvatic strains of dengue to spill over, we are quantifying the replication dynamics of both sylvatic and human-endemic dengue virus lineages in two cultured Aedes albopictus cell lines: (i) C6/36 cells, which lack a functional RNA interference (RNAi) response, and (ii) U4.4 cells, which possess a functional RNAi pathway. RNAi is the major antiviral defense in mosquitoes. To do this, we infect 24-well tissue culture plates containing confluent monolayers of each cell line with each strain from both the sylvatic and human-endemic DENV serotype 2 at multiplicity of infection of 5. We then harvest cell supernatants two wells per virus strain and cell line daily between days 0 and 8 post-infection, stabilize in 1X SPG, clarify by centrifugation, and store at -80˚C. We then quantify virus titer by inoculating 24-well plates containing

confluent monolayers of C6/36 cells with a tenfold serial dilution of each supernatant, incubate at 28˚C at 5% CO2 and 80% RH for 6 days, and then fix and immunostain each well. To date, we have completed the replication curve for sylvatic dengue 2 P8-1407 in C6/36 cells, which shows a rapid rise in titer to 8.3 log10pfu/ml after 3 days, after which titer plateaus through day 8. We predict that replication will be lower and slower in U4.4 cells and will differ between virus lineages in each cell line.

Lauren Wong, Genetics and Biotechnology/Biology
New Mexico State University
Mentor: Amanda Ashley, PhD
Sponsored by: NM AMP (URS)

Investigating the Ability of DNA-PKcs to Regulate R-loop Accumulation

R-loops are a natural phenomenon that form between double-stranded DNA and single-stranded RNA. Aberrant accumulation is associated with genomic instability and DNA damage, eventually leading to cancer and neurological diseases. Previous data suggest that DNA-PKcs decreases R-loop accumulation and increases cell survival, making it a potential cancer treatment. Our research focuses on how the presence of a DNA damage response kinase, DNA-PKcs, may mitigate R-loop homeostasis in cells. We treated M059K and M059J cell lines, which differentially express DNA-PKcs, with camptothecin, a chemical known to induce R-loops. R-loop presence was measured using immunofluorescence and quantified in ImageJ. Future research can investigate the specific regulatory mechanisms by which DNA-PKcs interacts with DHX9 and uncover additional potential therapeutic targets for both cancer and neurological diseases.

Lawrence Love, Pre-Environmental Science
University of New Mexico
Mentor: Jose Cerrato, PhD
Sponsored by: NM AMP (URS)

Comparing Organic and Dissolved Organic Matter Concentrations between Mine Waste Sediment, and Pinewood Ash

The aim of this project is to investigate and compare the organic matter content of pinewood ash and mine waste solids influencing the mobility of metals in water. The project's goal is to analyze water chemistry data for organic carbon. In the school year 2025-2026, organic carbon and matter data for pinewood ash and mine waste sediments were collected through thermogravimetric analysis (TGA), and loss on ignition (LOI). This summer additional batch reactor experiments were conducted to collect dissolved organic carbon data (DOC). This fall, data analysis will be performed on TGA, LOI, and DOC data collected previously. Data from these analyses will be used to explain mechanisms controlling organic carbon mobility between wildfire ash and mine waste sediments.

Michelle Kass, Psychology and Human Biology Minor
New Mexico State University
Mentor: Michael Hout, PhD
Sponsored by: TRIO STEM-H

Mixed Signals: How Feedback Cues Shape Memory Correction

In cognitive research, feedback has been shown to influence learning and memory. Error and corrective feedback can trigger processes of memory correction, whereby previously encoded information is updated or modified. However, little is known about how the perceptual properties of feedback, such as color, may influence memory correction processes. This study investigated matched and mismatched

feedback on memory performance. Participants completed a computerized generative word task, in which they were given categories (“Animal”) and generated a word that fit the presented category using a stated fill-in-the-blank cue (“_at”). Following each response, feedback was presented in a matched format (correct = green; incorrect = red) or a mismatched format (correct = red; incorrect = green). A recall test was given immediately after the task to measure memory retention of the words presented earlier. This study aims to understand whether learning and memory retrieval are impacted by the color of feedback.

Molly Decoteau, Forensic Chemistry
Eastern New Mexico University
Mentor: Juchao Yan, PhD
Sponsored by: NM AMP (URS)

Synthesis of a Dicarbonyl-Functionalized Ladder-Type Tetra(P-Phenylene)

With the rising demand for renewable energy sources, research on organic solar cells (OSCs) has also increased. Although many researchers have explored ways to optimize OSCs, they have only achieved efficiencies around 20%, with the bottleneck being a lack of understanding of and control over electron delocalization in conjugated molecules. A dicarbonyl-functionalized ladder-type tetra(p-phenylene) is designed to probe electron delocalization in a planar molecular backbone from the pendent infrared reporter of carbonyl groups by pulse radiolysis with time-resolved infrared spectroscopy. The synthesis of the target compound involves nine steps. This study focuses particularly on the synthesis and purification of the intermediate molecule, namely 2,10-dibromo-6,6,12,12,15,15-hexahexyl-12,15-dihydro-6H-cyclopenta[2,1-b:3,4-b']difluorene. This step in the pathway involves a bromination reaction the addition of bromine atoms to the molecular terminals), enabling the easy addition of functional groups. The successful synthesis of the intermediate molecule is critical to the complete synthesis of the target molecule and is expected to contribute to the fundamental understanding of charge transport, which is vital to OSCs and molecular electronics.

Reyna Marquez, Biology
New Mexico Highlands University
Mentor: David Donley, PhD
Sponsored by: NM AMP (URS)

Structural Analysis of Iron Regulation in Alzheimer’s Disease Using AlphaFold

Iron dysregulation is increasingly associated with Alzheimer’s disease (AD) and may contribute to cellular damage and disease progression. Maintaining proper iron balance depends on proteins that regulate iron storage, transport, and export within cells. Ferroportin is an important iron-export protein that plays a central role in maintaining cellular iron balance, and disruption of its function may lead to iron accumulation, or iron trapping, within cells. In AD, Ferroportin may interact with other proteins, including amyloid precursor protein (APP) and Tau, which may have roles in processes connected to iron regulation. Understanding how Ferroportin interacts with these proteins could provide insight into how changes in protein structure contribute to disrupted iron homeostasis in AD. AlphaFold, an artificial intelligence-based tool for predicting three-dimensional protein structures, can be used to investigate these potential protein interactions. This project will use AlphaFold to determine the predicted structural boundaries where Ferroportin interacts with Tau and APP and examine how specific AD-associated mutations may affect the stability of this protein assembly. The findings may help identify a possible structural mechanism connecting AD-associated protein changes with Ferroportin dysfunction and iron trapping, providing a foundation for future research into iron regulation in Alzheimer’s disease.

Sean Alcazar, Biology and Microbiology
New Mexico State University
Mentor: Maria Castillo, PhD
Sponsored by: NM AMP (URS)

Isolation of Potential Host-Specific Pathogens for Biomphalaria Glabrata Freshwater Snails, The Intermediate Host of The Parasite Schistosoma Mansoni

Schistosomiasis affects over 250 million people worldwide and is caused by the parasitic blood fluke Schistosoma mansoni, resulting in severe organ damage and economic stagnation. The current reliance on drugs as a treatment for schistosomiasis is insufficient for long-term control as patients face reinfection due to a lack of protective immunity. Furthermore, there is no vaccine for this disease. The life cycle of S. mansoni parasites requires two hosts, humans and a freshwater snail species such as Biomphalaria glabrata. Eradication of the disease has been difficult despite years of ongoing research strategies. This study aims to isolate and characterize a bacterial pathogen that is host-specific to B. glabrata, providing insight into the snail's immune system and the molecular mechanisms of parasite susceptibility. Bacterial isolation will be performed through inoculation of growth media with snail tissue homogenates and water from the snail's habitat (laboratory tanks). Isolated bacteria will be identified by sequencing the 16S rRNA gene and comparing the results with known sequences in the NCBI databases. Future research aims to evaluate the pathogenicity of the candidate isolates through survival assays in healthy B. glabrata populations.

Shaeann Ruybal, Range Science
New Mexico State University
Mentor: Magda Garbowski, PhD
Sponsored by: NM AMP (URS)

Assessing the Effects of Monsoons and Experimental Drought on Seedling Emergence from Dryland Seed Banks

This study was conducted to assess the effects of monsoonal rains and experimental water limitations on rangeland seed bank dynamics (i.e., species richness and diversity). Soil seed bank samples were collected pre- monsoon (June 2025) and post-monsoon (October 2025) from the Placitas Watershed, in southern New Mexico. 32 target sites were selected based on landscape contours throughout the watershed. Each site had 24 soil seed bank samples collected for a total of 768 samples. Soil seed bank samples were grown out in greenhouse conditions under two watering treatments: adequate water and drought. Seed bank samples that were collected in the spring had higher emergence of plants overall, with more forb than grass seedlings emerging. Experimentally imposed drought reduced emergence of both forbs and grasses from both spring and fall seed bank samples. These results suggest that a considerable amount of seeds emerge in natural conditions in response to monsoonal rains. However, because some seeds still germinated from fall samples, it appears that many seeds have a physiological dormancy period that prevents them from germinating prematurely or in response to isolated monsoonal rains. In the coming months, I will collect seeds and seedling traits and conduct a second greenhouse emergence trial.

Silviana Duran, Biology
New Mexico Highlands University
Mentor: Jeffery Prompster, PhD
Sponsored by: NM AMP (URS)

The Effects Climate Change has on Soil Bacterial Abundance

Soil microbial communities are essential to human, animal, and environmental health. They perform ecosystem functions such as decomposition, nutrient cycling, and can suppress pathogens. Climate change is known to impact soil microbial communities but its effects on the activity and abundance of human pathogenic bacteria in our region remain understudied. The purpose of this study is to quantify the effects of increased temperature and decreased precipitation on bacterial abundance across the Merriam Powell Elevation Gradient in Arizona. Established in 2002 and spanning four ecosystems, this experimental array includes intact plant soil cores that were transplanted downslope to simulate future warmer and drier conditions. We hypothesized that the number of bacteria would decrease due to environmental changes. Soil samples were collected from each core and frozen to preserve the microbes and DNA. DNA was extracted from 40 soil samples per ecosystem. Bacterial abundance was analyzed through quantitative PCR (qPCR) with primers targeting the bacterial 16S rRNA gene. Bacterial abundance is then compared across ecosystems and transplantation treatments. Future work will pair qPCR with amplicon sequencing, metagenomic sequencing, and pathogen assays to identify soil borne human pathogens and assess changes in soil virulence potential.

Sophia Rosa, Biomedical Science
New Mexico Institute of Mining and Thechnology
Mentor: Michaelann Tartis, PhD
Sponsored by: NM AMP (URS)

Surface Modification of Polyacrylamide Hydrogels with Chitosan and Polydopamine

Head impacts frequently cause traumatic brain injuries (TBIs), yet the cellular and tissue level mechanisms behind them are still not well understood. The brain's inaccessibility makes it difficult to measure deformation in vivo during live impacts, which limits efforts to characterize how injury occurs. To visualize and quantify tissue deformation during impact, we are developing an in vitro model in which a cerebral organoid is embedded in a bulk polyacrylamide (PAA) hydrogel that mechanically mimics brain tissue. Although this platform can image tissue deformation, the results vary because the organoid does not attach consistently to the hydrogel, a problem caused by the bioinert surface of PAA. To address this, we modified the hydrogel surface with chitosan (CS) and polydopamine (PDA), both of which are known to promote cell adhesion. CS was incorporated by copolymer grafting using surface treatment and swelling methods, and PDA was deposited by auto-oxidative polymerization under basic conditions. We then seeded U87 glioblastoma cells and NIH-3T3 fibroblasts onto the treated substrates and tracked cell growth by measuring percent surface area coverage in microscopy images. Comparing growth on treated and untreated substrates will guide the fabrication of the cerebral organoid-on-a-chip, enabling more reliable and consistent data that can be correlated with established markers of tissue damage. Ultimately, this improved model may help define injury thresholds, informing patient diagnostics, protective headgear design, and sports and military training policies where TBIs are a concern.

PHYSICAL SCIENCE AND MATHEMATICS

Creed Chavez, Chemistry
New Mexico Highlands University
Mentor: Melecio Perea, PhD
Sponsored by: NM AMP (URS)

Visible-Light-Induced β-Methylation of α, β-Unsaturated Ketones Using Palladium Catalysis

Methylation can strongly affect the chemical and biological properties of organic molecules, making selective methylation useful in both synthetic and medicinal chemistry. This project focuses on developing a visible-light-induced, palladium-catalyzed method for β-methylating α,β-unsaturated ketones. The research has two main goals: first, to develop and optimize the reaction; and second, to determine its usefulness among different enone substrates. The method unites photochemistry with palladium catalysis to generate radical intermediates that can introduce a methyl group at the β-position of an enone. To optimize the reaction, we will test different palladium catalysts, ligands, aryl bromides, solvents, and other reaction conditions. We will examine the products and reaction mixtures mainly by nuclear magnetic resonance (NMR) spectroscopy, and use infrared (IR) spectroscopy as an additional characterization method. The data collected will help determine which conditions are most effective, which substrates work well, and where the reaction has limitations. Overall, this project will help evaluate whether photoexcited palladium catalysis can be used as a practical approach for developing new radical-based methylation reactions.

Emilio Brown, Chemistry
New Mexico Institute of Mining and Technology
Mentor: Menake Piyasena, PhD
Sponsored by: NM AMP (URS)

Acoustic Focusing of Microplastics in Microfluidic Devices

Microplastics are a large pollutant and toxin that is becoming more widespread across that planet. It is emerging in almost every system including human, animal, and plant tissue in large amounts. The main problem is how toxic microplastics are and they affect the human body very adversely, leaving lasting damage over time. Not only are microplastics hard to remove from liquid and food they are very abundant and stay in systems for periods of time without leaving. Centrifugation is the current process for separating out these microparticles though is a very long multistep process that is expensive. The main focus of the project that I am going to involve is developing a method to separate nano and microparticles from aqueous samples in flow through format. The way this is being done for this project is through a microfabrication process where a microfluidic device is fabricated using photolithography and deep reactive ion etching and then introduce standing acoustic waves via a transducer. These acoustic waves can isolate microparticles. In my first semester as an undergraduate research scholar (URS), I will be learning how to make microfluidic devices and use them in microparticle separation. The skills and experience I gain this semester will prepare me to conduct independent research in the following semesters.

Gabriel Ruiz, Physics
New Mexico State University
Mentor: Rubi KM, PhD
Sponsored by: CAMP

Investigating Magnetocaloric Properties of $NdGaO_3$

$NdGaO_3$ is a rare-earth perovskite oxide that undergoes antiferromagnetic ordering below ~1.2 K. It is widely used as a substrate for the epitaxial growth of high-quality high-temperature superconducting thin films, including cuprates and the recently discovered nickelates. However, the intrinsic magnetic and magnetocaloric properties of the substrate can significantly influence measurements of these superconductors, particularly in high magnetic fields under adiabatic conditions, such as those employed at the pulsed Field Facility of National High Magnetic Field Laboratory (NHMFL). To evaluate the role of the substrate, we investigated the low-temperature magnetic and magnetocaloric properties of $NdGaO_3$ through magnetization measurements. We observe clear antiferromagnetic ordering below 1.2 K and a large magnetic entropy change arising from field-induced suppression of magnetic disorder. These results demonstrate that $NdGaO_3$ exhibits a pronounced magnetocaloric effect at low temperatures. Consequently, the substrate can undergo substantial temperature changes during pulsed-field experiments, potentially affecting the measured response of superconducting nickelate thin films. These findings underscore the importance of accounting for the magnetocaloric behavior of $NdGaO_3$ when interpreting low-temperature, high-field measurements of superconducting heterostructures. With this research we strive to extract the magnetization, phase transition and magnetocaloric effect from $NdGaO_3$.

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Sponsored by: NM AMP (SCCORE)

Evaluating Crystal/Melt Equilibrium Using Isotope Ratios

Dating crystal formation within lava flows can be a difficult task to perform accurately, but establishing accurate estimates of crystal formation can yield unique information about sub-surface materials or future lava flow compositions. Crystals are in equilibrium with the surrounding melt if they formed from that material. Through the isolation and differentiation of isotope ratios, crystal/melt equilibrium can be evaluated. Crystal/melt equilibrium can be used to inform future attempts at isotope decay dating. This research serves to determine crystal/melt equilibrium in a specific sample from the C11 eruption from the Azores Islands through sequential digestion and then dissolution, element isolation using column chromatography, and finally isotope ratio examination using Thermal Ionization Mass Spectrometry (TIMS). At the end of study, it was determined that the crystals were not in equilibrium with the melt. This informs researchers that focus should be on crystal- or melt-specific examination for future dating research.

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Geometrically Constrained Modeling of Zodiacal Light

Zodiacal light—sunlight scattered and thermally emitted by interplanetary dust—constitutes the primary foreground obscuring diffuse optical and infrared extragalactic background light. For space-based missions such as NASA's SPHEREx (Spectro-Photometer for the History of the Universe, Epoch of Reionization, and Ices Explorer), robust and high-precision subtraction of this emission across all-sky

spectral surveys is essential. Physical scattering models are often computationally intensive and struggle to fully capture dynamic variations across complex viewing geometries. We present a geometrically constrained neural network pipeline implemented in Julia with Flux.jl to model and predict SPHEREx zodiacal light intensities. The architecture embeds orbital ephemerides, solar elongation vectors, and line-of-sight constraints directly into feature transformations, enforcing physical consistency. Utilizing tailored learning rate schedules, including 1-cycle and cosine annealing policies, the network was rigorously evaluated across chronological, alternating, block, and mid-mission dataset splits to assess temporal stability and forecasting accuracy. The model achieves sub-3% median fractional error on holdout data, effectively eliminating systematic artifacts while preventing unphysical extrapolations in sparsely sampled ecliptic regions. This framework offers a rapid, highly scalable foreground modeling solution to enhance cosmic background extraction for the SPHEREx mission.

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Investigating the Role of Extracellular Vesicles in the Development of Tamoxifen Resistance in Breast Cancer Cells

Estrogen receptor-positive (ER+) breast cancer is the most common subtype of breast cancer. Tamoxifen is a commonly used treatment for this subtype; however, in some cases, cancer cells develop resistance to tamoxifen, reducing the drug's effectiveness. Identifying and understanding the development of resistance may help improve patient outcomes. Extracellular vesicles (EVs) are small membrane-bound particles that carry biological information from one cell to another. This study investigates whether tamoxifen resistance can be transferred between breast cancer cells through EVs. Our goal is to determine whether exposing tamoxifen-sensitive cells to EVs released by tamoxifen-resistant cells causes the sensitive cells to develop increased resistance to tamoxifen. If resistance is transferred through EVs, future studies could investigate the specific proteins, nucleic acids, or other molecules carried by EVs from tamoxifen-resistant cells that may contribute to the development of drug resistance.

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Design and Development of 3D Printed Microfluidic Peristaltic Pump

Microfluidic systems enable precise control of fluids at the microscale supporting biological, analytical, and medical applications. However, many microfluidic technologies rely on highly specialized and complex microfabrication processes which is a limiting factor. This research shows the design and development of our 3D printed microfluidic peristaltic pump built using commercially available tubing. A stepper motor driven camshaft actuates our 4-point pinch valve sequence to generate discrete levels of volume. Pump was characterized by measuring dispensed water mass over time at five different motor speeds (25-100 RPM), this revealed a linear relationship flow rate and motor speed (R2 = 0.9866). Pump was then inserted into an analytical application, where two pumps alternating out of phase at 180° delivered fluorescent dye and buffer, and fluorescence detection showed concentration waveforms whose frequency scaled with motor speed. Future work will optimize fluid dimensions to produce well resolved waveforms for integration into microfluidic platforms like brain-on-chip modeling and fluid signal processing for capillary electrophoresis and Taylor dispersion analysis.

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Sponsored by: NM AMP (URS)

Concentration and Entrapment of Micro and Nano Plastics Using Acoustic Wave-Based Microfluidic Devices with Microposts

The occurrence of nano and microplastics (MNPs) in the natural environment has emerged as a serious threat to human health. Various studies have demonstrated that MNPs can get into the human body via food and water. This can potentially degrade human health. Isolating small particles, especially in the sub-micron to nano range, has long been a challenge for researchers; it often involves lengthy, multi-step procedures that can be expensive and time-consuming. Therefore, this research project aims to develop an inexpensive, quick, flow-through method for separating MNPs. This can be accomplished using acoustic forces integrated in a microfluidic device with posts. A microfluidic device is first designed using CAD software, before being created on a silicon wafer via photolithography, followed by deep reactive ion etching and anodic bonding. An acoustic transducer attached to the microfluidic device generates acoustic forces that move the MNPs to central pressure nodes, where they are pinned against microposts. After the transducer is turned off, the trapped particles are released and flow back out of the microfluidic device.

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