

TRANSFORMING TOGETHER

The Newsletter of the SIRIUS II Project*



Photo: Andrea Palacio

YEAR 4 SIRIUS STEM CONFERENCE

The second SIRIUS II STEM Conference, held on March 26, 2024 at the Sacramento State Alumni Center, brought together over 100 students, faculty, administrators, and community supporters for an evening of sharing, celebrating, and networking. Students from the Los Rios Community Colleges and Sacramento State presented work from their course-based Authentic Learning experiences (cALEs) in the form of 17 posters and variety of other creative formats. The Northern California Chapter of the Society of Environmental Toxicology and Chemistry (NorCal SETAC) joined the event for the second year and shared information about their annual conference and other activities.

Networking was encouraged with a scavenger hunt that prompted students to meet SIRIUS members from other institutions and disciplines. The evening concluded with dinner and a raffle of prizes (College of NSM totes, notebooks, stickers). We appreciate all of the SIRIUS II participants and supporters who made this year's conference a fantastic event!

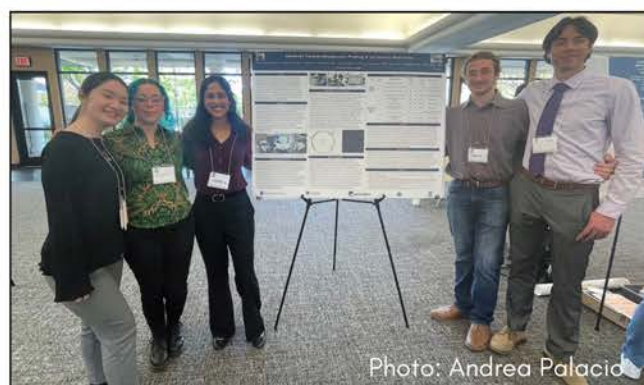


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RESEARCH HIGHLIGHTS FROM THE SIRIUS STEM CONFERENCE

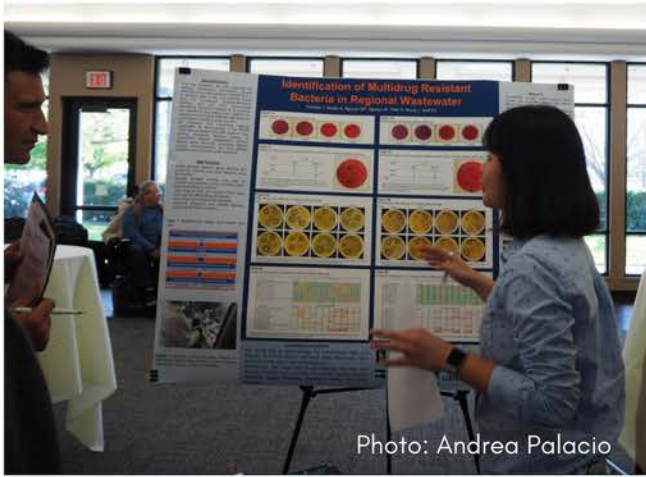


Photo: Andrea Palacio

Identification of Multidrug Resistant Bacteria in Regional Wastewater. J. Hosmer, A. Martin, D.P. Nguyen, M. Nguyen, T. Wong and E.S. Neff (CRC). Students in Professor Eric Neff's course at Cosumnes River College use molecular and microbiological tests, followed by bioinformatic analysis, to test for the presence of antibiotic-resistant coliform bacteria in the wastewater, effluent, and secondary treatment samples from Sacramento Regional Wastewater Treatment Plant.

Can We Be a Sponge Campus? A. Meusling, J. Seymour, R. Berg on behalf of ENV5 135. (CSUS) Professor Julian Fulton's Environmental California Water and Society class at Sacramento State is working in ecology, social science, and hydrology-focused groups to ask interdisciplinary questions and conduct their investigations. Through their cALE, they aim to make evidence-based recommendations about the campus' stormwater management strategies.



Photo: Andrea Palacio

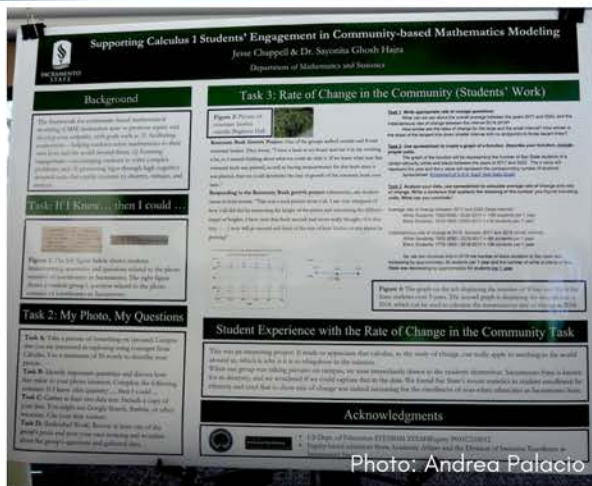


Photo: Andrea Palacio

Supporting Calculus 1 Students' Engagement in Community-based Mathematics Modeling. J. Chappell and S. Ghosh Hajra (CSUS) Professor Sayonita Ghosh Hajra's Calculus 1 course at Sacramento State is using a Community-based Mathematical Modeling lens to draw relationships between mathematics and the world around them - specifically as they apply what they know about quantities and rates of change. They employ observation, photography, brainstorming, calculations and peer feedback - and a lot of creative thinking!

Is There Excess Iron in the American River? (ARC) Students enrolled in Professor Brian Weissbart's CHEM 400, General Chemistry, class at American River College use a colorimetric method to analyze dissolved iron levels from water samples collected at the base of the Guy West Bridge. Students in CHEM 309 used the same samples to measure pH, water hardness, conductivity and dissolved oxygen. These data are providing baseline measures to compare to other sites potentially impacted by farming and other human activities.

Is There Excess Iron in the American River?

This project is being conducted by American River College students enrolled in Chemistry 400, General Chemistry with Dr. Brian Weissbart, as part of the SIRIUS II Project NSF Grant # 2012891

BACKGROUND

Iron is a very abundant element, and measurable concentrations of iron often exist in natural waters, particularly in well water. A variety of common minerals contain iron, including hematite (Fe₂O₃), pyrite (FeS₂), magnetite (Fe₃O₄), and some of the silicate minerals such as olivine (FeMgSiO₃) and feldspar, FeSiO₃. Although a high concentration of iron in drinking water will cause no real health problems, concentrations above 10 mg/L may cause the water supply for aesthetic reasons, since high concentrations of iron can make water appear murky, smell and taste bad, and stain plumbing fixtures.

Iron in water can occur in two oxidation states, Fe²⁺ or Fe³⁺. Iron (II) is the form of iron found in ordinary rust (iron oxide, Fe₂O₃). This form of iron is quite stable and will not react with oxygen in the air. In contrast, iron (III) is very reactive towards oxygen. If a solution of Fe²⁺ is left exposed to air for several hours, much of the Fe²⁺ will be oxidized to Fe³⁺ and a rusty-colored, gelatinous precipitate of iron (III) hydroxide, Fe(OH)₃, will form. Both oxidation states of iron form very insoluble hydroxides, with Fe(OH)₃ being much less soluble than Fe(OH)₂. Because of the extreme insolubility of Fe(OH)₃, very little iron Fe²⁺ will be dissolved in natural waters when the pH is in the 7.0-8.5 range. Most of the natural iron that contains high levels of iron are groundwater with high concentrations of the fairly soluble Fe²⁺. Since groundwater is protected from exposure to oxygen, any Fe²⁺ that dissolves from surrounding minerals is not oxidized to Fe³⁺. Because Fe²⁺ is so much more soluble than Fe³⁺, more iron can be dissolved in solution.

METHODS

American River water samples were collected and tested for dissolved iron via a colorimetric method using Ferric Chloride as a coloring agent. These water samples were also analyzed by a Chemistry 309 course for pH, water hardness, conductivity and dissolved oxygen.

Ferrous does not react with iron (III), so in the ferrous solution, a mild reducing agent, hydroxylamine (NH₂OH), is added to transform all iron (III) to iron (II). A pH 5 buffer is also added to ensure that the solution stays within the optimum pH range for reaction of ferrous reagent with iron (II). The ferrous solution is concentrated enough to ensure that essentially all the iron (II) reacts to form the deep purple iron (II) ferrous complex.

Because the intensity of this color is related to the amount of iron (II) present, we can measure the concentration of iron (II) in different solutions based on their color.

Future Work

The Spring 2024 Chemistry 400 students will be completing their analyses on the base of the Guy West Bridge, on the CNS side. Further students will look at iron concentrations at additional sites, possibly including above and below sites near the Sall Stern Farms drainage and other areas where there could be anthropogenic effects.

ACKNOWLEDGMENTS

We acknowledge the pH Analytical Methods team and the water samples at various locations along the American River.

The SIRIUS II Project, NSF Grant #2012891, funded this work.

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LOS RIOS
COLLEGE 2023

SIRIUS PROJECT
AN AMERICAN RIVER PROJECT

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Science Communication Projects for the Tiny Earth Network (BIO145). Professor Enid Gonzalez-Orta's students at Sac State illustrate the aims and findings of their cALEs to find antibiotic-producing bacteria in a variety of creative formats.



Professor Anna Klimaszewski-Patterson and students from Geography at Sacramento State remind all SIRIUS II classes to **SHARE THEIR DATA** on the Network Drive. As part of their cALE, the GEOG 155 class has designed a strategy for SIRIUS Project participants to manage and share data.

ACHIEVEMENTS TO CELEBRATE

Congratulations to **Professor Fran Keller**, from Folsom Lake College's Department of Biology. Professor Keller is conducting sabbatical work at UC Davis focused on wetland monitoring and applying eDNA technology to the silk of spiders from the coastal dunes. FLC students will certainly benefit, as Prof Keller plans to integrate some of what they are learning into cALE courses in the next academic year.

Congratulations to **Eric Pennino and Ethan Roberts**, who passed their exit exams and completed their Master's theses evaluating the impacts of the SIRIUS Project on students and faculty participants. Both will be graduating from the Department of Biological Sciences at Sacramento State in May 2024 and presenting their thesis work at the 2024 Annual Society for the Advancement of Biology Education Research conference in July (Minneapolis, MN).

We celebrate **Shelby Chandar**, who studied the impacts of cALEs on students with disabilities as an undergraduate. She is a recipient of a prestigious 2024 NSF Graduate Research Fellowship Program award that will support her through her Master's in Biological Sciences at Sacramento State.

We are thrilled to welcome 10 **Sierra College faculty** representing five STEM departments to the SIRIUS II community! They will be participating in a SIRIUS Summer Institute from May 20-23, 2024.

LOOKING AHEAD

SAVE THE DATE for ALE-apolooza III

August 16, 2024 from 9am - 5pm in the Tschannen Science Complex at Sacramento State.

QUESTIONS? CONTACT US!

<https://www.csus.edu/college/natural-sciences-mathematics/sirius/>

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