

CBE NEWSLETTER • Volume 26, Issue 3 • August 2023

## INDUSTRY

# CBE summer conference delivers impactful presentations

*Heveran, Gerlach deliver engaging workshop focused on the emerging field of Engineered Living Materials*

Speakers at the CBE-hosted 2023 Montana Biofilm Meeting delivered impactful presentations over the three-day conference. Session topics included multispecies biofilms, measuring biofilm, medical biofilms and the hospital environment, and biofilm and surfaces interactions.

Matthew Parsek, professor of microbiology at the University of Washington, delivered the keynote address, "What's a surface?: Surface sensing in *Pseudomonas aeruginosa*."

"All presenters shared quality new and exciting information," wrote one attendee in the post-conference survey. "And all were engaging and enthusiastic about their research and results." Another wrote, "This was an excellent conference. The presenters were all outstanding." Another attendee noted the strength of getting to meeting students, academic researchers, and representatives from industry under one roof. "[The conference was] great, as usual. Plus, I'm here to network, which is always very fruitful."

For the first time in recent memory, a CBE PhD student chaired a session. Madelyn Mettler, from the Department of Chemical & Biological Engineering, chaired Session 4: Biofilm and Surfaces Interactions."

The three-day conference also included a full-day workshop on the emerging field of Engineered Living Materials (ELM), chaired by CBE-affiliated assistant professor of mechanical and industrial engineering Chelsea Heveran. Heveran worked with CBE-affiliated faculty member Robin Gerlach to plan this session. [For a primer on what ELMs are and how they may lower construction costs and reduce emissions compared to concrete, please watch the seminar presentation Heveran gave earlier this year.](#) She provides an outstanding overview of this emerging field of scientific inquiry.

[Learn more information about the CBE's biofilm meetings.](#)

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## LATEST PUBLICATIONS

"1213. The effect of a prospective intervention program with automated monitoring on hand hygiene performance in long-term and acute care units at a veteran affairs medical center"

Arbogast, James W., Pamela Wagner, Susan E. Mahrer, Vanessa Christian, Barbara L. Lane, V. Lorraine Cheek, Gregory A. Robbins, W. Grant Starrett, **Albert E. Parker**, John M. Boyce, Hari Polenakovik

*Open Forum Infectious Diseases*, 2022, 9(Suppl 2): ofac492.1045.

[Read abstract](#)

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**George Platt, Davis, Katherine J., Schweitzer, Hannah D., Smith, Heidi J., Fields, Matthew W.**, Barnhart, Elliott P., **Gerlach, Robin**  
*Front Microbiol*, March 2023, 14:1097500.

[Read abstract](#)

"Bacterial transfer and biofilm formation in needleless connectors in a clinically simulated in vitro catheter model"

Ryder, Marcia, **Elinor deLancey-Pulcini, Albert E. Parker, Garth James**

*Infection Control & Hospital Epidemiology*, April 2023, 1-9.

[Read abstract](#)

"Calculating the limit of detection for a dilution series"

Sharp, Julia L., **Albert E. Parker, Martin A. Hamilton**

*J Microbiol Meth*, May 2023, 208:106723.

[Read abstract](#)

"Comparative genomics reveals electron transfer and syntrophic mechanisms differentiating methanotrophic and methanogenic archaea"

Chadwick, Grayson L, Connor T. Skennerton, Rafael Laso-Pérez, Andy O. Leu, Daan R.

Speth, Hang Yu, Connor Morgan-Lang, **Roland Hatzenpichler**, Danielle Goudeau, Rex

Malmstrom, William J. Brazelton, Tanja Woyke, Steven J. Hallam, Gene W. Tyson, Gunter

Wegener, Antje Boetius, Victoria J. Orphan

*PLoS Biol*, 2022, 20(1): e3001508.

[Read abstract](#)

"Culexarchaea, a novel archaeal class of anaerobic generalists inhabiting geothermal environments"

**Kohtz, Anthony J., Zackary J. Jay, Mackenzie M. Lynes, Viola**

**Krukenberg, Roland Hatzenpichler**

*ISME Comms*, 2022, 2(86): s43705-022-00175-8.

[Read abstract](#)

"De novo engineering of a bacterial lifestyle program"

Kong, Wentao, Yuanhao Qian, **Philip S. Stewart**, Ting Lu

*Nat Chem Biol*, 2023, 19: 488–497.

[Read abstract](#)

"Development of Martian saline seep models and their implications for planetary protection"

**Mettler, Madelyn K., Hannah M. Goemann, Rebecca C. Mueller**, Oscar A. Vanegas,

Gabriela Lopez, Nitin Singh, Kasthuri Venkateswaran, **Brent M. Peyton**

*Biofilm*, 2023, 5:100127.

[Read abstract](#)

"Functional and phylogenetic diversity of Cas10 proteins"

Wiegand, Tanner, Royce Wilkinson, Andrew Santiago-Frangos, **Mackenzie Lynes, Roland**

**Hatzenpichler**, Blake Wiedenheft

*CRISPR Journal*, April 2023, 6(2):152-162.

[Read abstract](#)

"Germ-Free C57BL/6 mice have increased bone mass and altered matrix properties but not decreased bone fracture resistance"

**Vahidi, Ghazal, Maya Moody, Hope D. Welhaven, Leah Davidson**, Taraneh Rezaee,

Ramina Behzad, Lamya Karim, Barbara A. Roggenbeck, Seth T. Walk, Stephen A. Martin,

Ronald K. June, **Chelsea M. Heveran**

*Journal of Bone and Mineral Research*, 2023, jbmr.4835.

[Read abstract](#)

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*Current Osteoporosis Reports, 2023, 21:11–20.*

[Read abstract](#)

“Seasonality, C:N ratio and plant species influence on denitrification and plant nitrogen uptake in treatment wetlands”

Chris R. Allen, **M.D. Burr**, **Anne K. Camper**, J.J. Moss, **Otto R. Stein**

*Ecol Eng, 2023, 191:106946.*

[Read abstract](#)

“Symmetry-breaking bifurcations of the information bottleneck and related problems”

**Parker, Albert E.**, Alexander G. Dimitrov

*Entropy, 2022, 24 (9): 1231.*

[Read abstract](#)

“The impact of automated hand hygiene monitoring with and without complementary improvement strategies on performance rates”

Arbogast, James W., Lori D. Moore, Megan DiGiorgio, Greg Robbins, Tracy L. Clark, T., Maria F. Thompson, Pamela T. Wagner, John M. Boyce, **Albert E. Parker**

*Infection Control & Hospital Epidemiology, 2022, 44(4): 638-642.*

[Read abstract](#)

View the comprehensive [CBE Publications Database](#) that contains 1,417 publications dating back to the 1970s.

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## OUTREACH

### MSU's College of Engineering recognizes Richards, Seymour



MSU's Norm Asbjornson College of Engineering recognized two CBE-affiliated faculty members in its annual awards ceremony. The college bestowed upon **Abbie Richards** its Deans' Award for Advancing an Inclusive Future. Richards is the department head of chemical and biological engineering. It also honored **Joseph Seymour** with its highest honor by naming him its 2023 Distinguished Professor. Seymour is a professor

of chemical and biological engineering.

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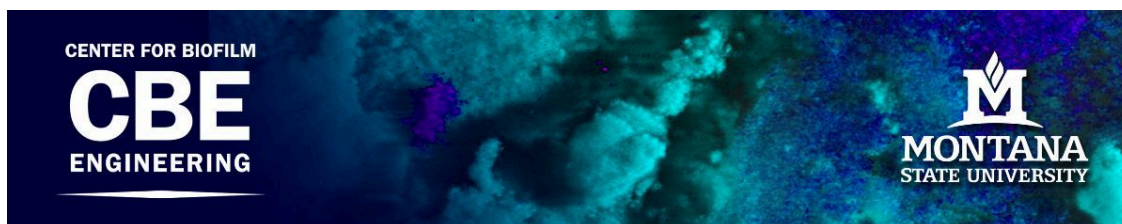
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**CBE NEWSLETTER • Volume 27, Issue 4 • 🎃 October 2023**

### **INDUSTRY**

## **Save the Date! Regulatory Pathways meeting booked for Jan. 31 in DC**



CBE's annual regulatory pathways meeting for members and invited guests will be held **Jan. 31–Feb. 1, 2024**, at the Marriott Renaissance Arlington Capital View Hotel in Arlington, Virginia. This important meeting will foster dialogue, build knowledge, and identify avenues to facilitate development of anti-biofilm technologies for the benefit of public health.

The 1.5-day meeting will feature talks on **chronic wounds, nontuberculous mycobacterial (NTM) lung infections, heater cooler units, food contact surfaces, and hard surface disinfection**. These topics will be presented in the context of FDA and EPA claims processes. Additionally, we'll devote a session to the topic of **self-regulating industries** including the dental and personal care products sectors. Our roster of speakers represents a cross-section of experts from industry, academia, and regulatory agencies. Registration opens by Nov. 1.

If you are interested in membership and would like an invitation to this meeting, please contact [Darla Goeres](#).

[Learn more information about the CBE's biofilm meetings.](#)

### **RESEARCH HIGHLIGHTS**

## **Hatzenpichler, Smith each win DOE-program award**



CBE researchers **Roland Hatzenpichler** and **Heidi Smith** were two of only 13 scientists to win funding through the Facilities Integrating Collaborations for User Science program to conduct biological and environmental research at Department of Energy user facilities. Smith's project is titled, "[Opening the black box of glacial carbon cycling—providing fundamental insight into impacts of a changing climate.](#)"

Hatzenpichler's project is titled, "[\(Eco\)Physiology of methanogens of the phylum Thermoproteota.](#)"



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and to work with experts at no cost following selection through a competitive proposal process.

## **PUBLICATIONS**

" $\alpha,\alpha$ -disubstituted  $\beta$ -amino amides eliminate *Staphylococcus aureus* biofilms by membrane disruption and biomass removal"

Ausbacher, D., **Lindsey A. Miller**, **Darla M. Goeres**, **Philip S. Stewart**, M.B. Strøm, A. Fallarero

*Biofilm*, 2023, 6: 100151.

[Read abstract](#)

"Biofilm.jl: A fast solver for one-dimensional biofilm chemistry and ecology"

Owkes, Mark, Kai Coblenz, Austen Eriksson, Takumi Kammerzell, **Philip S. Stewart**

*Computer Physics Comm*, 2023, 293:108890.

[Read abstract](#)

"Chapter 10-Use of epifluorescence widefield deconvolution microscopy for imaging and three-dimensional rendering of *Pseudomonas aeruginosa* biofilms and extracellular matrix materials"

**Smith, Heidi J.**, **Franklin, Michael J.** (2023) In V. Gurtler, M. Patrauchan (Eds.), *Biofilms* (Vol. 53, pp. 309-324). Methods in Microbiology.

[Read abstract](#)

"Monitoring biofilm growth and dispersal in real-time with impedance biosensors"

**McGlennen, Matthew**, **Markus Dieser**, **Christine M. Foreman**, **Stephan Warnat**

*J Ind Microbiol Biotechnol*, 2023, 50:kuad022.

[Read abstract](#)

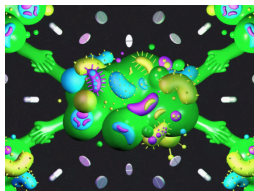
"Simulation of catalase-dependent tolerance of microbial biofilm to hydrogen peroxide with a biofilm computer model"

**Stewart, Philip S.**, M. Owkes

*NPJ Biofilms Microbiomes*, 2023 Aug 23; 9(1):60.

[Read abstract](#)

## **EDUCATION**



The Sept. 27, 2023, edition of *The Economist* news magazine [highlighted the CBE in a feature story about biofilms](#). The article is geared to enlighten its 35 million weekly readers as to what biofilm is and why they need to know about it. Center Director **Matthew Fields** is a key source for this story that appeared in the 180-year-old publication.

## **OUTREACH**

### **Valuable Resource Alert! CBE Image Library is FREE to use**



The [CBE Image Library](#) offers 54 high-quality biofilm conceptual graphics for educational use at no charge. For immediate downloads, simply fill out the form associated with the image of your choice. No waiting required.

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## Sandvik adds Novak to NASA EPSCoR project crew

CBE researcher Liz Sandvik recently added Ian Novak to her team working to reduce biofilm growth in the International Space Station's wastewater system. "We are testing different biocides and nutrient limitation strategies in hopes of reducing the growth of any/all of the five species in the wastewater consortia," Novak says. Born in Bozeman, Novak holds a BS in Biological Engineering from Montana State University. In addition to his undergraduate work in the CBE's Standardized Biofilm Methods Lab, Novak also worked as a technician at Bozeman-based Nature's Fynd, a company that uses an extremophile fungus found only in Yellowstone National Park to create protein-dense foods, which may be a renewable food source for NASA to provide to astronauts to grow and consume on the 18-month manned mission to Mars slated for the 2030s.

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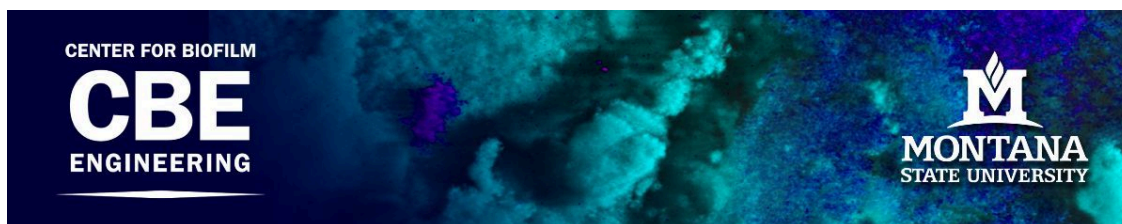
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**CBE NEWSLETTER**  
**Volume 26, Issue 5 • December 2023**



*Season's greetings from the faculty, staff,  
and students of the Montana State University  
Center for Biofilm Engineering!*

## **INDUSTRY**

### **Annual Regulatory Pathways meeting to start Jan. 31**

CBE's annual regulatory pathways meeting for members and invited guests will be held **Jan. 31–Feb. 1, 2024**, at the Renaissance Arlington Capital View Hotel in Arlington, Virginia. This important meeting will foster dialogue, build knowledge, and identify avenues to facilitate development of anti-biofilm technologies for the benefit

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The 1.5-day meeting will feature talks on **wounds, nontuberculous mycobacterial (NTM) lung infections, heater cooler units, food contact surfaces, and hard surface disinfection**. These topics will be presented in the context of FDA and EPA claims process. Additionally, we'll devote a session to the topic of **self-regulating industries** including the dental and personal care products sectors.

Our roster of speakers represents a cross-section of experts from industry, academia, and regulatory agencies. [See draft agenda](#).

### Registration Information

Registration Type	Early Registration (until Jan. 10, 2024)	Regular Registration (after Jan. 10, 2024)
Member	\$750	\$800
Invited Non-member	\$1,200	\$1,300
Academic	\$750	\$800
Government	Waived	Waived

[Click here to register for this meeting](#)

## PhaseOne Health joins CBE



**PhaseOne Health**, the creator of PhaseOne HOCI wound cleanser solution, has joined the CBE's longstanding Industrial Associates program as a small-business member. According to the product's website, "PhaseOne (HOCI) solution is effective at penetrating biofilm in order to mitigate its complications. PhaseOne is a broad spectrum non-toxic and non-irritating solution. What's more, it does not lead to anti-microbial resistance." Joe Starnes, PhaseOne's chief operating officer, is the company's designated representative to the CBE. We are proud of our partnerships with each of our [Industrial Associates](#).

## RESEARCH HIGHLIGHTS

### Heveran wins \$3 million grant to study emerging field of ELMs



CBE-affiliated faculty member **Chelsea Heveran** is leading a team of Montana State University experts that won a \$3 million Future Research Manufacturing Research grant from the National Science Foundation. The grant will further their exploration of using living materials to reduce the building industry's reliance on environmentally challenging cement and concrete. Its specific goal is to advance the ability to make complex, load-bearing structures by using mineral-producing microorganisms. It includes funding for three graduate student researchers and the establishment of an eco-manufacturing undergraduate student research and training program called [Eco-start](#), which is currently recruiting its inaugural cohort. Eco-start students will have the opportunity to work in campus labs and in related industries during the summers, Heveran said. Heveran is an assistant professor Mechanical and Industrial Engineering.

## RESEARCH PUBLICATIONS

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Hashimi, M., I.A. Sebrell, Jodi F. Hedges, Deann Snyder, **Katrina N. Lyon**, Stephanie D. Byrum, Samuel G. Mackintosh, Dan Crowley, Michelle D. Cherne, David Skwarchuk, Amanda Robison, **Barkan Sidar**, Anja Kunze, **Emma K. Loveday**, Matthew P. Taylor, Connie B. Chang, James N. Wilking, Seth T. Walk, Tony Schountz, Mark A. Jutila, **Diane Bimczok**  
*Nature Communications*, 2023 14:6882.  
[Read abstract](#)

"Detection of microbes in ice using microfabricated impedance spectroscopy sensors"  
**Kaiser-Jackson, Lauren B., Markus Dieser, Matthew McGlennen, Albert E. Parker, Christine M. Foreman**  
*ECS Sensors Plus*, 2023 2:042801.  
[Read abstract](#)

"Treatment performance and microbial community structure in an aerobic granular sludge sequencing batch reactor amended with diclofenac, erythromycin, and gemfibrozil"  
**Bodle, Kylie B., Rebecca C. Mueller, Madeline R. Pernet, Catherine M. Kirkland**  
*Front Microbiomes*, 2023, 2:1242895.  
[Read abstract](#)

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## EDUCATION

### Thesis Alerts

"Biocorrosion of copper *Oleidosulfovibrio alaskensis* G20 biofilms in static and dynamic environments," successful thesis defense by **Yagmur Keskin**, masters candidate, chemical and biological engineering, Montana State University, Nov. 30, 2023.  
[Read abstract](#)

"Comparing the mechanical properties of shale cores: Intact vs fractured and sealed with UICP," successful thesis defense by **Kayla Bedey**, masters candidate, civil engineering, Montana State University, Nov. 28, 2023.  
[Read abstract](#)

"Phycosomal dynamics in xenic cultures of the alkali-tolerant green microalga *Chlorella* sp. SLA-04," successful thesis defense by **Isaac Miller**, PhD candidate, microbiology and cell biology, Montana State University, Oct. 30, 2023.  
[Read abstract](#)

"Bio-trapping ureolytic bacteria on sand to improve the efficiency of biocementation," successful thesis defense by **Elif Ugur**, masters candidate, mechanical and industrial engineering, Montana State University, Aug. 22, 2023.  
[Read abstract](#)

"Feasibility study for field-scale use of ureolysis-induced calcite precipitation (UICP) for roadbed improvement," successful thesis defense by **Hudson Dorian**, masters candidate, civil engineering, Montana State University, July 20, 2023.  
[Read abstract](#)

"Influence of dose volume on nitrogen removal in a two-stage vertical flow treatment wetland: Bridger Bowl Ski Area case study," successful thesis defense by **Kristen Brush**, masters candidate, civil engineering, Montana State University, July 19, 2023.



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"Development and optimization of drop-based microfluidic devices and periphery equipment," successful thesis defense by **Humberto Sanchez**, PhD candidate, chemical and biological engineering, Montana State University, July 18, 2023.

[Read abstract](#)

"Distribution, diversity, and physiology of uncultured MCR-encoding microbial populations in Yellowstone Hot Springs," successful thesis defense by **MacKenzie Lynes**, PhD candidate, chemistry and biochemistry, Montana State University, July 6, 2023.

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## OUTREACH

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The [CBE Image Library](#) offers 54 high-quality biofilm conceptual graphics for educational use at no charge. For immediate downloads, simply fill out the form associated with the image of your choice.

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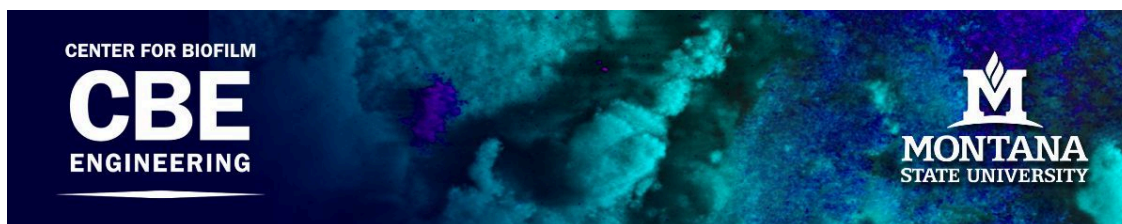
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## CBE NEWSLETTER Volume 27, Issue 1 • April 2024

### Remembering a friend and colleague

It is with great sadness that we mark the passing of **Dr. Paul Stoodley** on April 8 after an extraordinary fight against cancer. One of the world's premiere biofilm researchers, Paul got his start in biofilm research in the 1980s as the laboratory manager and imaging specialist at the CBE's precursor, the Institute for Process Analysis. He went on to receive his PhD from the University of Exeter (UK) and returned to the CBE in the 1990s where he made groundbreaking advancements in using image analysis to study biofilms. In addition to MSU, Paul held faculty positions at the Allegheny-Singer Research Institute, the Drexel University College of Medicine, the University of Southampton, and the Ohio State University. Paul's contributions to the study and understanding of biofilms have had broad impact in many areas, including surgical site infection, orthopedic implants, dental and industrial biofilms. While Paul's professional achievements rank among the world's best, he will also be remembered for his kindness, humility and genuine concern for his colleagues, staff and students. Paul's friendships span the globe, and his quick wit, easy smile and calm demeanor will be remembered by all who knew him.



If you would like to post a tribute, [visit Paul's page on the CaringBridge website.](#)

## **INDUSTRY**

### Register today for our biggest meeting of the year!

Registration is open for the 2024 Montana Biofilm Science and Technology Meeting happening July 10–12 in beautiful Bozeman, Montana. We're planning an engaging and informative event with a blend of fundamental and applied presentations on the advances of biofilm research happening at the CBE and other labs, and prescribed time for connection between industry and academia. The theme of this year's meeting "biofilm as a system," will be integrated throughout the session topics. [View draft agenda.](#)

[Read more about the meeting including costs and how to register.](#)

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## regulatory pathways meeting was a huge success



The 2024 Anti-Biofilm Technologies: Pathways to

Product Development meeting convened 70 industrial associates, potential members, academic research peers, and, of course, scientists and policymakers from the US EPA and US FDA. **Dr. Darla**

**Goeres**, who assumed the role of CBE Industrial Coordinator in July 2023, organized an agenda that attendees and presenters alike found to be informative and a valuable forum for networking, according to the post-conference survey results. Attendees especially favored the talks from the FDA and EPA presenters, finding them insightful and useful. Session topics during the 1.5-day gathering included Wounds and NTM Lung Infections, Self-Regulating Industries, and Hard Surface Disinfection.



MONTANA BIOFILM MEETING

## New Member Update

UMF Corporation, the creator of the brand name PerfectCLEAN®, has joined CBE's longstanding Industrial Associates program as a small-business member. PerfectCLEAN® was designed for the commercial infection control and environmental hygiene markets serving the healthcare, hospitality, food service and educational industries. According to their Linked In website, UMF Corporation's research and intellectual property have redefined "clean" ensuring safe environments. George Clarke, company president, is the CBE designated representative.



View the list of [CBE Industrial Members](#)

Read about the [CBE Membership Program](#)

## RESEARCH HIGHLIGHTS

### CBE doctoral student studying Trojan horse amoebas secures prestigious NIH fellowship

**Johnathan Shikany**, a Chemical & Biological Engineering doctoral student, was awarded a Graduate Partnership Program (GPP) Fellowship through the National Institutes of Health (NIH).

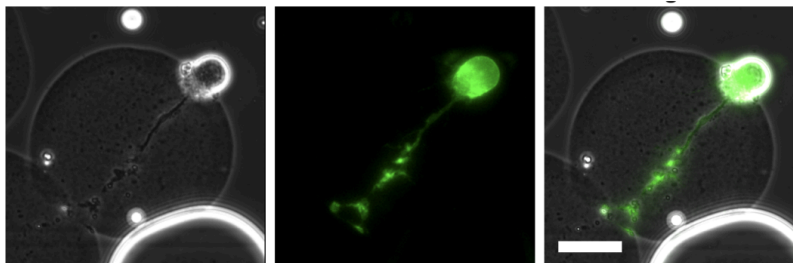
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## CBE faculty and students publish novel research on how individual cells respond to viral infection

Dr. Matthew Taylor, an associate professor in the Microbiology and Cell Biology, and **Dr. Connie Chang**, an affiliated CBE faculty member, have pushed a paper entitled "Single-cell herpes simplex virus type 1 infection

of neurons using drop-based microfluidics reveals heterogeneous replication kinetics" in *Science Advances*. Other CBE team members include: **Dr. Emma Loveday**, an assistant research professor, and **Drs. Jake Fredrikson** and **Shawna Pratt**, previous CBE PhD students.



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## RESEARCH PUBLICATIONS

"Comparison of quantification methods for an endoscope lumen biofilm model"

Haas, Bruno, Sarah James, Albert E. Parker, Marie-Claude Gagnon, Noémie Goulet, Philippe Labrie

*Biofilm*, 2023, 6:100163.

[Read abstract](#)

"Make engineered living materials carry their weight"

Heveran, Chelsea M., Christopher J. Hernandez

*Matter*, 2023, 6(11): 3705-3718.

[Read abstract](#)

"Pharmaceutical impacts on aerobic granular sludge morphology and potential implications for abiotic removal"

Bodle, Kylie B., Catherine M. Kirkland

*Chemosphere*, 2024, 350:141187.

[Read abstract](#)

"Physiological potential and evolutionary trajectories of syntrophic sulfate-reducing bacterial partners of anaerobic methanotrophic archaea"

Murali, Ranjani, Hang Yu, Daan R. Speth, Fabai Wu, Kyle S. Metacalfe, Antoine Crémière, Rafael Laso-Pérez, Rex R. Malmstrom, Danielle Goudeau, Tanja Woyke, Roland Hatzenpichler, Grayson L. Chadwick, Stephanie A. Connon, Victoria J. Orphan

*PLoS Biol.*, 2023, 21(9): e3002292.

[Read abstract](#)

"Seven genome sequences of bacterial, environmental isolates from Pony Lake, Antarctica"

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“The effect of a prospective intervention program with automated monitoring of hand hygiene performance in long-term and acute-care units at a Veterans Affairs medical center”

Starrett, W. Grant, Arbogast, James W., Albert E. Parker, Pamela T. Wagner, Susan E. Mahrer, Vanessa Christian, Barbara L. Lane, V. Lorraine Cheek, Gregory Robins, John M. Boyce, Hari Polenakovik

*Infect Control Hosp Epidemiol.*, 2024 Feb;45(2):207–214.

[Read abstract](#)[View CBE Publications Database](#)

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## EDUCATION

### CBE undergraduate student wins prestigious Goldwater scholarship



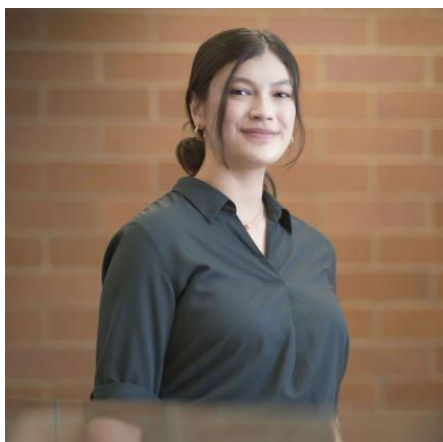
**Amanda Haab**, an undergraduate student in microbiology and cell biology, was among the four undergraduate students from Montana State University awarded prestigious scholarships given by the [Barry Goldwater Scholarship](#) and Excellence in Education Foundation.

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## OUTREACH

### CBE student wins civic engagement scholarship for volunteer work on campus



**Sophia Adams**, a biochemistry junior undergraduate student, has been awarded the [George M. Dennison Civic Engagement Scholarship Award](#).

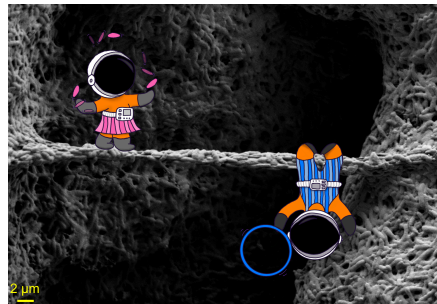
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**Maddie Mettler**, PhD student in chemical and biological engineering, earned an honorable mention in the Most Whimsical category of the NNCI "Plenty of Beauty at the Bottom" image contest. Maddie's image, "The Big Top Goes Micro," is described as an astro-batic performance featuring an astronaut juggling bacteria.

[Learn more about the NNCI Image Contest](#)



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## Visiting Scientist



**Giorgia Ghiara** will be studying at the CBE for six months as a visiting faculty on Fulbright Scholarship. Giorgia is working with Drs. Roberta Amendola and Matthew Fields on investigating electroactive properties of bacteria for biocorrosion prevention and bioenergetics applications. Her focus is on how microorganisms respond to an electrical stimulus. Giorgia hails from Torino, Italy and she received her doctorate degree in chemical sciences and technologies from the University of Genoa. When not in the lab, Giorgia likes to spend time playing the guitar, and getting outside for a hike and cross-country skiing. Welcome Giorgia!

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