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# 2025 APPENDIX

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Center for Biofilm  
Engineering

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Montana State University  
Bozeman

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Reporting Period:  
June 1, 2024–May 31, 2025

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RESEARCH:

## **CBE RESEARCH AREAS**

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**Research at the Center for Biofilm Engineering** is driven by industrial, environmental, and health issues of national importance. CBE research has contributed new insights into microbial processes in a wide variety of contexts.

### **CBE RESEARCH:**

- is motivated by industrial concerns and involvement of industry partners;
- is conducted at multiple scales of observation, from molecular to field-scale;
- involves interdisciplinary investigations;
- provides relevant research opportunities for undergraduate and graduate students;
- is enhanced by productive collaborations with researchers at other institutions;
- is funded by competitive grants and industrial memberships; and
- produces both fundamental and applied results.

The CBE's long history of research success results from **adaptability** to new information and analytical technologies, and **flexibility** in addressing biofilm issues in comprehensive ways, using its deep bench of **MSU researchers with diverse specialties** in biofilm studies.

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## **APPLIED RESEARCH AREAS & PROJECTS**

**Biofilm control strategies** antimicrobial efficacy | biocides | bioelectric effect | disinfectants | inhibitory coatings | bioactive compounds

**Energy solutions** biofuels | product souring | coal bed methane production | microbial fuel cells

**Environmental technologies** bioremediation | wetlands | CO<sub>2</sub> sequestration | biobarriers | biomineralization | microbes & mining issues

**Health/medical biofilms** chronic wound healing | catheter infections | oral health | food safety

**Industrial systems & processes** biofouling | biocorrosion | product contamination | microbe-metal interactions

**Standardized methods** product claims | regulatory issues | ASTM methods acceptance

**Water systems** drinking water quality | premise plumbing | water treatment | distribution systems

## **FUNDAMENTAL TOPICS**

**Biofilms in nature** microbes in hot & cold environments | role of biofilms in natural processes | biomimetics | biogeochemistry

**Cellular/intracellular** phenotype | genetics | metabolic pathways | proteomics

**Multicellular/extracellular** flow and transport in biofilm systems | material properties | quorum sensing | structure-function | heterogeneities | matrix

**Ecology/physiology** population characterization | spatial and temporal population dynamics | anaerobic systems

## **ANALYTICAL TOOLS & TECHNIQUES**

**Instrumentation** microscopy | nuclear magnetic resonance imaging | gas chromatography | microfluidics

**Methods development** experimental design | variability | ruggedness | repeatability | statistical evaluation

**Modeling** cellular automata modeling | mathematics | hydrodynamics | cohesive strength

**Basic microbiology techniques** total and direct counts | MIC determination | viable cell counts

**Molecular biology techniques** DNA extraction | PCR | DGGE | microarrays | sequencing

RESEARCH:

**2024–2025 CBE GRANT-FUNDED RESEARCH ACTIVITY**

Current CBE Research Grants for Fiscal Year 2025 (July 1, 2024 to June 30, 2025)			
Research Area	Title	Principal Investigator	Funding Agency
Biofilms in Nature	NASA FINESST: Madeline Garner Testing Solid-State Nanopore Technology for Detecting DNA and RNA in Laboratory and Field Experiments: Icy World Analogs	Foreman	NASA
Biofilms in Nature	Of ice and brine: Persistence strategies in a chaotropic, Antarctic exobiological analogue	Foreman	University of Tennessee
Biofilms in Nature	RAPID: Investigation of microbial: black carbon feedback processes that impact icefield melt in high latitude systems	Foreman	NSF
Biofilms in Nature	Electrochemical Impedance Sensors for Microbial Monitoring in Spacecraft Wastewater Systems	Foreman	NASA
Biofilms in Nature	MONET: Multispectral Organic Detection and Near Infrared Exobiology Tool	Foreman	Honey Robotics
Biofilms in Nature	Life in Ice: Probing microbial englacial activity through time	Smith	NSF
Biofilms in Nature	Mechanisms Enhancing Microbial Survival at Cold Temperature Phase Boundaries	Smith	US Army Research Office
Biofilms in Nature	Advancing Microbiological Research at Montana State University with High Throughput Single Cell Sorting for Precise Microbial Phenotyping of Viable Populations	Smith	MJ Murdock
Biofilms in Nature	Continued Monitoring of the Bridger Bowl Wetland System	Stein	Bridger Bowl
Biofilms in Nature	Bozeman Pilot Wetland - City	Stein	City of Bozeman
Biofilms in Nature	Bozeman Pilot Wetland - MDEQ	Stein	MT DEQ
Energy Solutions	Nitrate Dependent Iron Oxidation	Peyton	SRK Consulting
Energy Solutions	Coating Deterioration: Impacts of Multi-Domain Biofilms (MDB) and Preventative Measures	Peyton	Army Corp
Energy Solutions	Coal Organic Carbon Degradation	Peyton	Enviromin
Energy Solutions	SRF Closure Manuscript Development	Peyton	Enviromin
Energy Solutions	Analytical Support for NDFO for Bio-immobilization of Selenium and Nickel	Peyton	Enviromin
Energy Solutions	Enviromin - Technical Review of Bioremediation Projects	Peyton	Enviromin
Energy Solutions	EVR SRK Enviromin Projects	Peyton	Enviromin

<b>Current CBE Research Grants for Fiscal Year 2025 (July 1, 2024 to June 30, 2025)</b>			
<b>Research Area</b>	<b>Title</b>	<b>Principal Investigator</b>	<b>Funding Agency</b>
Environmental Substance Technologies	High pH/high alkalinity cultivation for Direct Atmospheric Air Capture and Algae Bioproducts	Gerlach	USDOE
Environmental Substance Technologies	MIM: Deciphering and Optimizing Cross-Domain Interactions to Increase Productivity in High pH-High Alkalinity Microalgae Communities	Gerlach	NSF
Environmental Substance Technologies	EFRI ELiS: Biofilm-functionalized and -maintained, living infrastructure systems	Gerlach	NSF
Environmental Substance Technologies	Minimizing organic carbon losses to improve net productivity in direct air capture cultivation	Gerlach	University of Toledo
Biofilm Sensing	Vantive, Microbial Sensor, Research	Warnat	Vantive
Medical Biofilms	Synergy between omics, symptoms, and healing trajectories of venous ulcers	Stewart	University of Florida
Medical Biofilms	Integrated Biofilm Control Strategies for Water Systems During Extended Space Flight	Stewart	NASA
Medical Biofilms	Mitigation and Prevention of Biofouling and Biofilm Growth in Wastewater Processing Assembly: Biocide and Nutrient Long-Term Assessment	Stewart	NASA
Medical Biofilms	RFA-080 Biofilm Remediation Strategies for Fouled Water Systems during Extended Space Flight (SMD, ESDMD)	Stewart	NASA
Medical Biofilms	Biofouling Mitigation with Hydrogen Peroxide	Stewart	NASA
Methods Development	Statistical Evaluation of Antimicrobial Test Methods and Related Data	Parker	EPA
Methods Development	Biofilm and Biomineralization Methods Development in Support of CRC 1313 Projects C04 and C05	Cunningham	Deutsche Forschungsgemeinschaft
Methods Development	Engineered Biological Cement for Surface Hardening in Semi-Aquatic Environments	Cunningham	Biosqueeze (DARPA)
Methods Development	Biocementation in Cold Regions for Ground Stabilization	Cunningham	BioMade
Physiology & Ecology	RII Track-2 FEC: Data Driven Material Discovery Center for Bioengineering Innovation	Fields	South Dakota School of Mines
Physiology & Ecology	Environmental Networks Integrated with Genomes and Molecular Assemblies	Fields	Lawrence Berkley National Laboratory
Physiology & Ecology	Monitoring and managing microbial water quality for food safety	Fields	USDA
Physiology & Ecology	Landscape survey of biomaterials to enhance ground stability	Fields	BioMade

<b>Current CBE Research Grants for Fiscal Year 2025 (July 1, 2024 to June 30, 2025)</b>			
<b>Research Area</b>	<b>Title</b>	<b>Principal Investigator</b>	<b>Funding Agency</b>
Biomechanics	Developing Community in Engineered Living Materials	Heveran	NSF
Biomechanics	FMRG Eco: Manufacturing, repairing, and re-using biomineralized infrastructure materials through low-energy biological processes	Heveran	NSF
Geotechnical	MICP for Sustainable Infrastructure in Cold Regions	Khosravi	Wright Patterson Airforce Base
Water Systems	Evaluation of bio-mineralization to mitigate acid mine drainage in the Great Falls-Lewistown coal field	Lauchnor	Montana Department of Natural Resources & Conservation

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**FY25 New CBE Research Grants (July 1, 2024 to June 30, 2025)**

<b>New CBE Research Grants Awarded in Fiscal Year 2025 (July 1, 2024 to June 30, 2025)</b>				
<b>Sponsor</b>	<b>Title</b>	<b>PI</b>	<b>Period</b>	<b>Award Amount</b>
Bridger Bowl	Continued monitoring of the Bridger Bowl wetland system*	Ellen Lauchnor	1 Yr	\$52,800
Lawrence Berkeley National Lab	Environmental networks integrated with genomes and molecular assemblies*	Mathew Fields	1 Yr	\$307,756
USDA	Monitoring and managing microbial water quality for food safety*	Matthew Fields	1 Yr	\$1,125,000
ARMYCOR	Coating deterioration: Impacts of multi-domain biofilms (MDB) and preventative measures	Brent Peyton	4 Yr	\$2,427,847
Enviromin	Coal organic carbon degradation	Brent Peyton	1 Yr	\$19,284
NIH	Real-time imaging of protein-protein interactions in bacterial biofilms	Heidi Smith	1 Yr	\$137,157
NASA	Mitigation and prevention of biofouling and biofilm growth in wastewater processing assembly: biocide and nutrient long-term assessment	Phil Stewart	6 mo	\$29,167
NASA	Electrochemical impedance sensors for microbial monitoring in spacecraft wastewater systems	Christine Foreman	4 yr	\$71,161
NASA	RFA-080 biofilm remediation strategies for fouled water systems during extended space flight (SMD, ESDMD)	Phil Stewart	1 Yr	\$100,000
Honeybee Robotics	Monet: Multispectral organic detection and near infrared exobiology tool	Christine Foreman	1.5 Yr	\$129,706
Enviromin	SRF closure manuscript development	Brent Peyton	6 mo	\$7,454
Enviromin	Analytical support for NDFO for bio-immobilization of selenium and nickel	Brent Peyton	1 Yr	\$14,568

<b>New CBE Research Grants Awarded in Fiscal Year 2025 (July 1, 2024 to June 30, 2025)</b>				
<b>Sponsor</b>	<b>Title</b>	<b>PI</b>	<b>Period</b>	<b>Award Amount</b>
EPA	Statistical evaluation of antimicrobial test methods and related data	Al Parker	3 Yr	\$27,930
BioMade	Landscape survey of biomaterials to enhance ground stability in Arctic environments	Mathew Fields	6 mo	\$363,636
NASA	Biofouling mitigation with hydrogen peroxide	Phil Stewart	1 yr	\$170,485
Enviromin	Enviromin-Technical review of bioremediation projects	Brent Peyton	1 yr	\$23,548
SRK & Elk Valley Resources	EVR SRK Enviromin projects	Brent Peyton	1 Yr	\$54,162
MJ Murdock	Advancing microbiological research at Montana State University with high throughput single cell sorting for precise microbial phenotyping of viable populations	Heidi Smith	2 Yr	\$224,500
AFRL	Biocementation in cold regions for ground stabilization	Al Cunningham	2.5 Yr	\$4,090,909
Vantive	Vantive, microbial sensor, research	Stephan Warnat	2 Yr	\$180,000
<b>Total Grant Awards to CBE in Fiscal Year 2025</b>				<b>\$9,557,070</b>

*\*Additional funding awarded to existing grants in FY25 (budget increased by the amount listed)*

***FY 2025 New Award Credit to CBE on next page***

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<b>New Research Grants with Credit Given to CBE FY2025</b>						
<b>Sponsor</b>	<b>Title</b>	<b>PI</b>	<b>Period</b>	<b>Award Amount</b>	<b>Credit %</b>	<b>Award Amount to CBE</b>
USDA NIFA	A novel biofilm-targeting vaccine to control mycoplasma Ovipneumoniae infection in sheep	Diane Bimczok	2 Yr	\$300,000	10%	\$30,000
New Mexico University	New Mexico IDeA Networks of Biomedical Research Excellence (INBRE)-Nitric oxide sensing and biofilm formation at the <i>V. cholerae</i> host-pathogen interface	Diane Bimczok	1 Yr	\$218,938	10%	\$21,894
USDOE	Ecophysiology of non-Euryarchaeotal methanogens and their impact on carbon cycling	Roland Hatzenpichler	1 Yr	\$263,472	20%	\$52,694
Johns Hopkins University	Non-BSL3 interrogating avian Influenza A diversity and host adaptation using drop-based microfluidics	Emma Loveday	2 Yr	\$32,489	50%	\$16,245
NIH	Single cell heterogeneity of influenza A virus genetic diversity and host adaptation using drop-based microfluidics	Emma Loveday	2 Yr	\$218,476	50%	\$109,238
NIH	Translational research to prevent and control global infectious diseases (Translational Global Infectious Diseases Research Center, TGIR)	Emma Loveday	1 Yr	\$290,000	50%	\$145,000
Johns Hopkins University	BSL3 Interrogating avian Influenza A diversity and host adaptation using drop-based microfluidics	Emma Loveday	2 Yr	\$154,814	50%	\$77,407
NSF	Biofilm sensor system in maple syrup production	Stephan Warnat	1 Yr	\$45,462	100%	\$45,462
<b>Total Grant Credit Awarded to CBE in Fiscal Year 2025</b>				<b>\$497,940</b>		

## RESEARCH:

**PUBLICATIONS****June 2024–May 2025****2024 Publications**

**Miller, I. R., Bui, H., Wood, J. B., Fields, M. W., & Gerlach, R.** (2024). Understanding phycosomal dynamics to improve industrial microalgae cultivation. *Trends in Biotechnology*, 42(6), 680-698. 24-018.

**Buckner, E., Buckingham-Meyer, K., Miller, L. A., Parker, A. E., Jones, C. J., & Goeres, D. M.** (2024). Coupon position does not affect *Pseudomonas aeruginosa* and *Staphylococcus aureus* biofilm densities in the CDC biofilm reactor. *J Microbiol Meth*, 223, 106960. 24-019.

**Vahidi, G., Boone, C., Hoffman, F., & Heveran, C.** (2024). Aging decreases osteocyte peri-lacunar-canalicular system turnover in female C57BL/6JN mice. *Bone*, 186, 117163. 24-020.

Dauenhauer, L. A., Hislop, B. D., Brahmachary, P., Devine, C., Gibbs, D., June, R. K., & **Heveran, C. M.** (2024). Aging alters the subchondral bone response 7 days after noninvasive traumatic joint injury in C57BL/6JN mice. *Journal of Orthopaedic Research*, 42(11), 2450-2460. 24-021.

**Heveran, C. M., Gerlach, R., Hernandez, C. J., Intemann, K., Meyer, A. S., Ajo-Franklin, C., Charrier, M., Srubar, W. V., Joshi, N., Nelson, A., & Fields, M. W.** (2024). Unlocking the societal potential of engineered living materials. *Matter*, 7(9), 2846-2858. 24-022.

**Willett, M. R., Bedey, K., Crandall, D., Seymour, J. D., Rutqvist, J., Cunningham, A. B., Phillips, A. J., & Kirkland, C. M.** (2024). Beyond the surface: Non-invasive low-field nmr analysis of microbially-induced calcium carbonate precipitation in shale fractures. *Rock Mech Rock Eng*, 24-023.

**Kohtz, Anthony J., Nikolai Petrosian, Viola Krukenberg, Zackary J. Jay, Martin Pilhofer, Roland Hatzenpichler,** Cultivation and visualization of a methanogen of the phylum Thermoproteota, *Nature*, July 2024, 632:1118-1123. 24-024.

Murali, R., Pace, L. A., Sanford, R. A., Ward, **L. M., Lynes, M. M., Hatzenpichler, R.,** Lingappa, U. F., Fischer, W. W., Gennis, R. B., & Hemp, J. (2024). Diversity and evolution of nitric oxide reduction in bacteria and archaea. *PNAS*, 121(26), e2316422121. 24-025.

Yuan, Y., Ellis, P., Tao, Y., **Bikos, D. A., Loveday, E. K., Thomas, M. M., Wilking, J. N., Chang, C. B., Ye, F., & Weitz, D. A.** (2024). Digital droplet RT-LAMP increases speed of SARS-CoV-2 viral RNA detection. *Smart Medicine*, 3(2), e20240008. 24-026.

Promi, S. I., Gardner, C. M., & **Hohner, A. K.** (2024). Biodegradability of unheated and laboratory heated dissolved organic matter [10.1039/D3EM00383C]. *Environ Sci: Proc Impacts*, 26(8), 1429-1439. 24-027.

**Lyon, K., Sidar, B., Strupulis, C., Helm, R., Davis, B., Brown, J., Wilking, J., Bansil, R., & Bimczok, D.** (2024). Human gastric organoid-derived mucus shares key properties with native gastric mucus and inhibits motility of *Helicobacter pylori*. *Physiology*, 39(S1), 2011. 24-028.

**Ayotte, S. H., Wallace, S. J., Allen, C. R., Weber, K. P., Stein, O. R., & Lauchnor, E. G.** (2024). Microbial community dynamics in a two-stage treatment wetland: Insights from treating seasonal ski resort wastewater. *Bioresour Technol Rep*, 27, 101885. 24-029.

Lee, K. S., Landry, Z., Athar, A., Alcolombri, U., Pramoj Na Ayutthaya, P., Berry, D., de Bettignies, P., Cheng, J.-X., Csucs, G., Cui, L., Deckert, V., Dieing, T., Dionne, J., Doskocil, O., D'Souza, G., Garcia-Timmermans, C., Gierlinger, N., Goda, K., **Hatzenpichler, R., . . . Stocker, R.** (2024). MicrobioRaman: An open-access web repository for microbiological Raman spectroscopy data. *Nat Microbiol*, 9(5), 1152-1156. 24-030.

Hendry, M. J., Kirk, L., Warner, J., Shaw, S., **Peyton, B. M., Schmeling, E., & Barbour, S. L.** (2024). Selenate bioreduction in a large in situ field trial. *Sci Total Environ*, 933, 172869. 24-031.

**Krukenberg, V., Kohtz, A. J., Jay, Z. J., & Hatzenpichler, R.** (2024). Methyl-reducing methanogenesis by a thermophilic culture of Korarchaeia. *Nature*, 632(8027), 1131-1136. 24-032.

**Moore, L. D. ‡, Arbogast, J. W., Robbins, G., DiGiorgio, M., & Parker, A. E.** (2024). Drastic hourly changes in hand hygiene workload and performance rates: A multicenter time series analysis. *Am J Infect Contrl*, 52(12), 1371-1376. 24-033.

**Smith, H. J., Dieser, M., & Foreman, C. M.** (2024). Eight genome sequences of bacterial, environmental isolates from Canada Glacier, Antarctica. *Microbiol Resour Announc*, 13(8), e01130-01123. 24-034.

**Lyon, K., Bansil, R., & Bimczok, D.** (2024). Profiling luminal pH in three-dimensional gastrointestinal organoids using microelectrodes. *JoVE*, 209, 1940-087X. 24-035.

Alsoubani, M., Chow, J. K., Rodday, A. M., McDermott, L. A., **Walk, S. T.**, & Snyderman, D. R. (2024). The impact of 30-day antecedent antibiotic exposure on *Clostridioides difficile* ribotype patterns and the relationship with clinical outcomes: A single center study. *Anaerobe*, 89, 102894. 24-036.

Darabi, A., & **Cox, L. M.** (2024). Through-thickness modulus gradient and pattern fidelity of uv-cured thiol-acrylate films. *ACS Appl Poly Mats*, 6(16), 9512-9520. 24-037.

Ormsbee, R. C., Winchell, A., English, J., Martian, A., Craig, M. L., Michaels, N. M., **Haab, A.**, Girardot, A., Winter, L., Reed, P., Hendricks, C. J., Gaarsland, A., D'Amico, E.H., Southworth, A. K., Blevins, L., Saam, T., Cox, G. R. (2024). Undergraduate student process reflections on utilizing photovoice to learn principles of feminist research. *Feminist Pedagogy*, 5(1), Article 1. 24-038.

Turner, E., **Khosravi, M.**, Toomani, P., Matteson, K., Plymessenger, K., McKittrick, L., & Jackson, J. (2024). Numerical evaluation of applying geothermal bridge deck deicing systems to mitigate concrete deterioration from temperature fluctuations. *J Bridge Eng*, 29(10), 04024075. 24-039.

**Gaur, G.**, Predtechenskaya, M., Voyich, J. M., **James, G.**, **Stewart, P. S.**, & **Borgogna, T. R.** (2024). Assessing the effects of surgical irrigation solutions on human neutrophil interactions with nascent *Staphylococcus aureus* biofilms. *Microorganisms*, 12(10), 1951. 24-040.

Coenye, T., Ahonen, M., Anderson, S., Cámara, M., Chundi, P., **Fields, M.**, Foidl, I., Gnimpieba, E. Z., **Griffin, K.**, Hinks, J., Loka, A. R., Lushbough, C., MacPhee, C., Nater, N., Raval, R., Slater-Jefferies, J., Teo, P., Wilks, S., Yung, M., & Webb, J. S. (2024). Global challenges and microbial biofilms: Identification of priority questions in biofilm research, innovation and policy. *Biofilm*, 8, 100210. 24-041.

**Stewart, P. S., Kim, J., James, G.**, Yi, F., Stechmiller, J., Weaver, M., Kelly, D. L., **Fisher, S.**, Schultz, G., & Lyon, D. (2024). Association of biofilm and microbial metrics with healing rate in older adults with chronic venous leg ulcers. *Wound Rep Reg*, 32(6), 858-871. 24-042.

**Bedey, K., Willett, M. R.**, Crandall, D., Rutqvist, J., Matteson, K., **Phillips, A. J., Cunningham, A. B., & Kirkland, C. M.** (2024). Splitting tensile strength of shale cores: intact versus fractured and sealed with ureolysis-induced calcium carbonate precipitation (UICP). *Geomech Geophys Geo-Energy Geo-Resour*, 10(1), 181. 24-043.

Nou, N. O., Covington, J. K., Lai, D., Mayali, X., Seymour, C. O., Johnston, J., Jiao, J.-Y., Buessecker, S., Mosier, D., Muok, A. R., Torosian, N., Cook, A. M., Briegel, A., Woyke, T., Eloef-Fadrosch, E., Shapiro, N., Bryan, S. G., Sleezer, S., Dimapilis, J., . . . **Carlson, R. P.**, Hedlund, B. P. (2024). Genome-guided isolation of the hyperthermophilic aerobe *Fervidibacter sacchari* reveals conserved polysaccharide metabolism in the Armatimonadota. *Nat Comm*, 15(1), 9534. 24-044.

Altman-Kurosaki, N. T., Pratte, Z. A., **Stewart, F. J.**, & Hay, M. E. (2025). Coral-algal competition: Allelopathy, temporal variance, and effects on coral microbiomes. *Coral Reefs*, 44(1), 49-62. 24-045.

**Willett, M. R., Codd, S. L., Seymour, J. D., & Kirkland, C. M.** (2024). Relaxation-weighted MRI analysis of biofilm EPS: Differentiating biopolymers, cells, and water. *Biofilm*, 8, 100235. 24-046.

Crowther, T. W., Rappuoli, R., Corinaldesi, C., Danovaro, R., Donohue, T. J., Huisman, J., Stein, L. Y., Timmis, J. K., Timmis, K., Anderson, M. Z., Bakken, L. R., Baylis, M., Behrenfeld, M. J., Boyd, P. W., Brettell, I., Cavicchioli, R., Delavaux, C. S., **Foreman, C. M.**, Jansson, J. K., . . . van Galen, L. G. (2024). Scientists' call to action: Microbes, planetary health, and the Sustainable Development Goals. *Cell*, 187(19), 5195-5216. 24-047.

**Acharjee, A., Keskin, Y., Peyton, B. M., Fields, M. W., & Amendola, R.** (2024). Effect of surface roughness on the microbiologically influenced corrosion (MIC) of copper 101. *Front Mats*, 11. 24-048.

**Stanley, M. A., Jayaratne, J. S., Codd, S. L., Bajwa, D. S., Wilking, J. N., & Seymour, J. D.** (2024). Rheo-NMR velocimetry of nanocrystalline cellulose suspensions. *Appl Rheol*, 34(1). 24-049.

**Schaible, G. A., Jay, Z. J.**, Cliff, J., Schulz, F., Gauvin, C., Goudeau, D., Malmstrom, R. R., Ruff, S. E., Edgcomb, V., & **Hatzenpichler, R.** (2024). Multicellular magnetotactic bacteria are genetically heterogeneous consortia with metabolically differentiated cells. *PLOS Biology*, 22(7), e3002638. 24-050.

**EGgers, M. J., Grant, M., Rivas, M. G., Camper, A. K., Olson, J., Doyle, J., & Lewis-Patrick, M.** (2024). Clean Water for All. In *Environmental Health: Foundations for Public Health*. (pp. 235-271). Springer Publishing Company. 24-051.

Smythies, L. E., Belyaeva, O. V., Alexander, K. L., **Bimczok, D.**, Nick, H. J., Serrano, C. A., Huff, K. R., Nearing, M., Musgrove, L., Poovey, E. H., Garth, J., Russ, K., Baig, K. R. K. K., Crossman, D. K., Peter, S., Cannon, J. A., Elson, C. O., Kedishvili, N. Y., & Smith, P. D. (2024). Human intestinal stromal cells promote homeostasis in normal mucosa but inflammation in Crohn's disease in a retinoic acid-deficient manner. *Mucosal Immunol*, 17(5), 958-972. 24-053.

Jacobson, B. T., DeWit-Dibbert, J., Selong, E. T., Quirk, M., Throolin, M., Corona, C., Sonar, S., Zanca, L., Schwarz, E. R., & **Bimczok, D.** (2024). Innovative methodology for antimicrobial susceptibility determination in mycoplasma biofilms. *Microorganisms*, 12(12), 2650. 24-054.

## 2025 Publications

Tan, G., LeCates, C. N., Simpson, A., Holtzen, S., Parris, D. J., **Stewart, F. J.**, & Stockton, A. (2025). Amplicon sequencing reveals diversity in spatially separated microbial communities in the Icelandic Mars analog environment Mælifellssandur. *Astrobiology*, 25(1), 72-81. 25-001.

**Ketteler, H. M.**, Johnson, E. L., **McGlennen, M.**, **Dieser, M.**, **Foreman, C. M.**, & **Warnat, S.** (2025). A simulated microgravity biofilm reactor with integrated microfabricated sensors: Advancing biofilm studies in near-space conditions. *Biofilm*, 9, 100263. 25-002.

Inskeep, W. P., **Jay, Z. J.**, **McKay, L. J.**, & Dlakić, M. (2025). Respiratory processes of early-evolved hyperthermophiles in sulfidic and low-oxygen geothermal microbial communities. *Nat Comms*, 16(1), 277. 25-003

**Miller, I. R.**, **Bui, H.**, Maddi, B., Viamajala, S., **Gerlach, R.**, & **Fields, M. W.** (2025). Phycosome dynamics during successive outdoor microalgae cultivation from late summer to fall. *Aquaculture*, 595, 741627. 25-004.

Bergstrom, A. R., Glimm, M. G., Houske, E. A., Cooper, G., **Viles, E.**, Chapman, M., Bourekis, K., **Welhaven, H. D.** <sup>^</sup>, Brahmachary, P. P., Hahn, A. K., & June, R. K. (2025). Metabolic profiles of encapsulated chondrocytes exposed to short-term simulated microgravity. *Ann Biomed Eng*, 53(3), 785-797. 25-005.

Jacobson, B. T., DeWit-Dibbert, J., Zanca, L., Sonar, S., Hardy, C., Throolin, M., Brewster, P. C., Andujo, K., Jones, K., Sago, J., Smith, S., Bowen, L., & **Bimczok, D.** (2025). Pathogen delivery route impacts disease severity in experimental *Mycoplasma ovipneumoniae* infection of domestic lambs. *Vet Res*, 56(1), 10. 25-006.

**Loveday, E. K.**, Welhaven, H., Erdogan, A. E., Hain, K. S., Domanico, L. F., **Chang, C. B.**, June, R. K., & Taylor, M. P. (2025). Starve a cold or feed a fever? Identifying cellular metabolic changes following infection and exposure to SARS-CoV-2. *PLoS one*, 20(2), e0305065. 25-007.

Xiang, T., **Khosravi, M.**, Khosravi, A., Bokuniewicz, H., & Farhadzadeh, A. (2025). Hydromechanical factors influencing erosion and recession of compacted sandy bluffs under random waves actions. *Eng Geol*, 348, 107957. 25-008.

Anello, K. <sup>‡</sup>, **Parker, A. E.**, Porter, L. <sup>‡</sup>, Purevdorj-Gage, L. <sup>‡</sup>, & Xu, Q. <sup>‡</sup> (2025). An enhanced, statistically repeatable method for screening antimicrobial formulations in laundry applications, an adaptation of BSI EN 17658. *Sci Rep*, 15(1), 10535. 25-009.

**Anjum, S.**, Parks, K., Clark, K., **Parker, A.**, **Heveran, C. M.**, & Gerlach, R. (2025). Strengthening biopolymer adhesives through ureolysis-induced calcium carbonate precipitation. *Sci Rep*, 15(1), 3453. 25-010.

**Mettler, M. K.**, **Espinosa-Ortiz, E. J.**, **Goeres, D. M.**, & **Peyton, B. M.** (2025). Considerations for testing anti-fouling coatings designed for implementation into Earth-based and spacecraft water systems. *Biofouling*, 41(3), 225-243. 25-011.

Saxena, P., Samanta, D., Thakur, P., Goh Kian, M., Subramaniam, M., **Peyton Brent, M.**, **Fields, M.**, & Sani Rajesh, K. (2025). pH-dependent genotypic and phenotypic variability in *Oleidesulfobvibrio alaskensis* G20. *Appl Environ Microbiol*, 91(4), e02565-02524. 25-012.

Moore, R. G., & **Crawford, J. M.** (2025). Isolated and paired metal sites in zeolites using solid-state ion exchange. *Angewandte Chemie Int Ed*, 64(23), e202505186. 25-013.

**Bodley, K. B.**, & **Kirkland, C. M.** (2025). Environmentally-grown aerobic granular sludge performs more complete pharmaceutical biodegradation and wastewater treatment than lab-grown granules. *Int Biodeterior Biodegradation*, 202, 106081. 25-014.

**Viles, E.**, **Heyneman, E.**, Lin, S., **Montague, V.**, Darabi, A., **Cox, L. M.**, **Phillips, A.**, **Gerlach, R.**, **Espinosa-Ortiz, E. J.**, & **Heveran, C.** (2025). Mycelium as a scaffold for biomineralized engineered living materials. *Cell Rep Phys Sci*, 6(4), 102517. 25-015.

<sup>‡</sup> Industrial or Federal Agency Co-author

\*Previous Visiting Researcher

# Previous Staff/Faculty

<sup>^</sup> Undergraduate Student

RESEARCH:

**PRESENTATIONS**  
**June 2024–May 2025**

**2024 Presentations**

**Stephan Warnat**, Faculty, “Micro-Sensor Technology for Biofilm Detection,” Pretty Porous Science Lecture, University of Stuttgart, 2024-06-06, Virtual, Invited talk.

**Jake Marquis**, Graduate Student, “Microfluidic platforms for the simulation of bacterial transport through a contaminated aquifer,” Pretty Porous Science Lecture, University of Stuttgart, 2024-06-06, Virtual, Invited talk.

**Michael Neubauer**, Graduate Student, “Measuring mechanical properties of chondrocyte cells using microfluidics,” Pretty Porous Science Lecture, University of Stuttgart, 2024-06-06, Virtual, Invited talk.

**Haley Ketteler**, Graduate Student, “An Overview of Spacecraft Water Recycling Systems and Biofouling Concerns,” Pretty Porous Science Lecture, University of Stuttgart, 2024-06-06, Virtual, Invited talk.

**Sabine Olds**, Graduate Student, “Ammonium By-product Management via Zeolite Adsorption and Struvite Precipitation,” Pretty Porous Science Lecture, University of Stuttgart, 2024-06-06, Virtual, Invited talk.

**Robin Gerlach**, Faculty, “Biotechnology, biomineralization and biofilms in porous media,” InterPore Academy Webinar, 2024-06-25, Virtual, Invited Talk.

**Phil Stewart**, Faculty, “Science of Biofilm Control,” Dynamics of Biofilm Microbiome and Novel Techniques in Biofilm Research, Indonesian Biofilm Research Collaboration Center, 2024-08-07, Virtual, Seminar Talk.

**Phil Stewart**, Faculty, “Biofouling and the Science of Biofilm Control,” NASA Special Seminar, 2024-08-21, Virtual, Seminar Talk.

**Mike Franklin**, Faculty, “Interactions between hibernation promoting factors and ribosomes in *Pseudomonas aeruginosa*,” Intl Biennial Pseudomonas Conf., Microbiol. Society, 2024-09-01, Copenhagen, Denmark, Poster.

**Phil Stewart**, Faculty, “Biofilm Mitigation Overview,” Biofilm & Dormancy-Technical Interchange Meeting, 2024-09-12, Virtual, Seminar Talk.

**Phil Stewart**, Faculty, “Mechanisms of persistence and eradication,” Cystic Fibrosis Foundation Microbial Eradication and Persistence Symposium, 2024-09-25, Boston, MA, Invited Talk.

**Hossein Khadivar**, Graduate Student, “Engineering microbialites for infrastructure materials,” Material Research Society Fall Meeting, 2024-12-03, Boston, MA, Invited Talk.

**2025 Presentations**

**Jake Marquis**, Graduate Student, “Stimulating bacterial attachment kinetics in a contaminated aquifer,” MSU MCB Research in Progress-Student Seminar, 2025-02-14, Bozeman, MT, Seminar Talk.

**Bear Wood**, Graduate Student, “Understanding microalgae phycosome dynamics for beneficial biofuel production,” MSU MCB Research in Progress-Student Seminar, 2025-02-14, Bozeman, MT, Seminar Talk.

**Jacob Schimetz**, Graduate Student, “Single-cell metabolic activity profiling of the human fecal microbiome,” MSU MCB Research in Progress-Student Seminar, 2025-02-28, Bozeman, MT, Seminar Talk.

**Alexis McDonnell**, Graduate Student, “Microbial mediated basalt weathering in Iceland”, MSU MCB Research in Progress-Student Seminar, 2025-03-07, Bozeman, MT, Seminar Talk.

**Kathryn Zimlich**, Graduate Student, “Investigating synthetic biofilm population dynamics using flow cell microscopy,” MSU MCB Research in Progress-Student Seminar, 2025-03-07, Bozeman, MT, Seminar Talk.

**Madeline Garner**, Graduate Student, “Probing icy worlds: Characterization of brinicles and the detection of biosignatures with solid-state nanopores,” MSU Biochemistry Graduate Student Seminar, 2025-03-07, Bozeman, MT, Seminar Talk.

**Gauri Gaur**, Graduate Student, “Defining a new role for complement in the pathogenesis of *Staphylococcus aureus*,” MSU MCB Research in Progress-Student Seminar, 2025-03-28, Bozeman, MT, Seminar Talk.

**Jennifer Crandall**, Graduate Student, “Microbially driven chemical cycling in the folfo dulce oxygen minimum zone,” MSU MCB Research in Progress-Student Seminar, 2025-04-11, Bozeman, MT, Seminar Talk.

**Molly Shreve**, Graduate Student, “Mind the gap: Linking microbial physiology and ecology in a contaminated aquifer,” MSU MCB Research in Progress-Student Seminar, 2025-04-25, Bozeman, MT, Seminar Talk.

**Darla Goeres**, Faculty, “Creating pathways to drive biofilm innovation: Building consensus on biofilm regulatory decision making”, Biofilms 11, 2025-05-15, Cardiff, UK, Invited talk.

**Phil Stewart**, Faculty, “Combined nutrient limitation and biocide strategy for biofilm prevention in a water system in space”, Biofilms 11, 2025-05-14, Cardiff, UK, Invited talk.

**Matthew Fields**, Faculty, “Building and quantifying synthetic biofilm”, Biofilms 11, 2025-05-14, Cardiff, UK, Invited talk.

**Kelli Buckingham-Meyer**, Staff, “Dry biofilms contribute to bacterial persistence on environmental surfaces”, Biofilms 11, 2025-05-15, Cardiff, UK, Poster.

## **MSU Research Celebration April 24, 2025**

### **Undergraduate Posters:**

**Nicole Krysiak** “Unraveling oxidative stress pathways in *Psychrobacter cryohalolentis*: insights from silica induced metabolic changes”

**Addison Bahr** “Small-molecule aptamer selection via a restriction enzyme-based SELEX (RE-SELEX)”

**Grace Baker** “Defining sex differences in osteocyte turnover of the bone matrix”

**Colette Niglio** “Comparing strain and osteocyte activity in male and female rat femurs”

**Avery Auth** “Utilizing bio-mineralization to mitigate acid mine drainage and heavy metal runoff”

**Kalena Awram** “Methods to evaluate biofilm removal from coupons in the Industrial Surfaces Biofilm Reactor, a novel system for industrial coating defacement testing”

**Taylor Carey** “Engineering value-added biodegradable plastics from bio-based polyhydroxyalkanoates”

**Molly Coonfield** “Lens-less microscopy: A subpixel shifting light source for super-resolution imaging”

**Sidhee Sarit Das** “Microfluidic chip optimization for higher flow rate testing for precise extracellular vesicle isolation”

**Grace Ducharme** “Droplet-based qPCR: A microfluidic device for single-cell gene expression analysis”

**Anna Gates** “Comparing enzyme oxidative decarboxylase to iron-zeolites”

**Cora Rose Hannigan** “Optimizing zeolite for nitrogen contaminant removal: the impact of antibiotics and viruses on adsorptive efficiency”

**William Hyatt** “Application of colloidal silica gels for permeability control in enhanced geothermal systems”

**Anna Johnson** “Optimizing cryopreservation of algal cultures for more sustainable and effective practices”

**Hannah O’Connell** “Understanding the influence of thermochemical pretreatments on metal-zeolite catalysts synthesized from chlorides”

**Jess Rahn** “Microbially Induced Calcite Precipitation (MICP) for cold region soil stabilization applications”

**Amanda Haab** “Bacterial-fungal interactions in multidomain biofilms: Implications for biofouling in the ISS Wastewater Recycling System”

**Andrew May** “Evaluating the interactions between *Burkholderia contaminans* and *Coniochaeta mutabilis* within a biofilm”

**Abby Novak** “Optimizing the lipid production of Hidden Lake algae for biofuel applications”

**Calla Castro** “Advancing undergraduate research through systems of shared governance”

### **Graduate Student Poster:**

**Hannah Lavoie** “Perceived concerns and benefits of engineered living materials: a qualitative approach”

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## RESEARCH:

**CBE Affiliated Faculty and Their Specialties, 2024–2025**

NAME	DEPARTMENT	SPECIALITY
Abbie Richards	Chemical & Biological Engineering	Environmental biotechnology
Adrienne Phillips	Civil Engineering	Environmental biotechnology
Al Cunningham	Civil Engineering	Subsurface biotechnology and bioremediation
Albert Parker	Mathematical Sciences	Mathematics and statistics
Amanda Hohner	Civil Engineering	Water quality; drinking water treatment
Brent Peyton	Chemical & Biological Engineering	Environmental biotechnology and bioremediation
Catherine Kirkland	Chemical & Biological Engineering	Environmental technologies
Cecily Ryan	Mechanical & Industrial Engineering	Polymers & composites
Chelsea Heveran	Mechanical & Industrial Engineering	Biomechanics
Chris Jones	Chemical & Biological Engineering	Biofilm interaction with surfaces
Christine Foreman	Chemical & Biological Engineering	Microbial ecology in cold temperature environments
Dana Skorupa	Chemical & Biological Engineering	Microbes in extreme environments
Darla Goeres	Chemical & Biological Engineering	Standardized biofilm methods
Diane Bimczok	Microbiology & Cell Biology	Mucosal immunology
Ellen Lauchnor	Civil Engineering	Wastewater Systems
Emma Loveday	Microbiology & Cell Biology	Virology
Frank Stewart	Microbiology & Cell Biology	Aquatic microbiology
Garth James	Chemical & Biological Engineering	Medical biofilms
Heidi Smith	Microbiology & Cell Biology	Correlative analytical imaging
Iwona Beech	Center for Biofilm Engineering	Biocorrosion
James Crawford	Chemical & Biological Engineering	Environmental catalysis
Jeffrey Heys	Chemical & Biological Engineering	Fluid-structure interactions
Jennifer Brown	Chemical & Biological Engineering	Rheology and biofilm mechanics
Joseph Seymour	Chemical & Biological Engineering	Magnetic resonance imaging, biofilm transport phenomena, gels and colloids
Kelly Kirker	Chemical & Biological Engineering	Medical biofilms
Kevin Cook	Mechanical & Industrial Engineering	Tool and machine design
Laura Jennings	Microbiology & Cell Biology	Bacterial Pathogenesis
Lewis Cox	Mechanical & Industrial Engineering	Polymer science
Markus Dieser	Chemical & Biological Engineering	Ecology
Martin Hamilton	Mathematical Sciences	Mathematics and statistics
Matthew Fields	Microbiology & Cell Biology	Environmental biofilms
Michael Franklin	Microbiology & Cell Biology	Molecular genetics, gene expression, alginate biosynthesis; <i>Pseudomonas</i>
Mohammad Khosravi	Civil Engineering	Geotechnical earthquake engineering and Ground improvement
Otto Stein	Civil Engineering	Engineered waste remediation

<b>NAME</b>	<b>DEPARTMENT</b>	<b>SPECIALITY</b>
Patrick Secor	Microbiology & Cell Biology	Bacteriophages, host-pathogen interactions, infectious disease
Phil Stewart	Chemical & Biological Engineering	Biofilm control strategies
Reetika Chaurasia	Microbiology & Cell Biology	Microbial Pathogenesis, Immunotherapeutics & Vaccine Development
Roberta Amendola	Mechanical & Industrial Engineering	Material science and technology
Robin Gerlach	Chemical & Biological Engineering	Environmental and industrial biotech., bioremediation, living materials
Roland Hatzenpichler	Chemistry & Biochemistry	Microbial activity
Ross Carlson	Chemical & Biological Engineering	Metabolic engineering, metabolic networks; chronic wounds
Sarah Codd	Mechanical & Industrial Engineering	Magnetic resonance imaging
Saswati Ray	Civil Engineering	Geoenvironmental Engineering & Material Science
Scott McCalla	Mathematical Sciences	Applied Dynamic systems
Stephan Warnat	Mechanical & Industrial Engineering	MEMS, sensors and actuators
Tianyu Zhang	Mathematical Sciences	Mathematical modeling

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## EDUCATION:

**Undergraduate Students: Summer 2024, Fall 2024, Spring 2025**

\*Graduating

\*Native American

1.	Adams, Adele (Griffin)	F	Film & Photography	Spring Park, MN
2.	*Adams, Sophia Kouko (Loveday)	F	Chemistry & Biochemistry	Maple Valley, WA
3.	Albrecht, Emma (Fields)	F	Microbiology & Cell Biology	Stillwater, MN
4.	Anderson, Alexandra (Gerlach)	F	Chemical & Biological Engineering	Billings, MT
5.	Aspholm, Liv (Heveran)	F	Mechanical Engineering	Winthrop, WA
6.	Auth, Avery (Lauchnor)	F	Civil Engineering	Spokane, WA
7.	Awram, Kalena (Peyton)	F	Chemical & Biological Engineering	North Vancouver, Canada
8.	Bahr, Addison (McCalla)	F	Chemical & Biological Engineering	Polson, MT
9.	*Baker, Grace (Heveran)	F	Chemical & Biological Engineering	San Leandro, CA
10.	Baker, Tate (Stewart)	F	Biomedical Engineering	North Bend, WA
11.	Bayse, Lauren (Carlson)	F	Civil Engineering	Gilbert, AZ
12.	Bomber, Allyson (Phillips)	F	Civil Engineering	Corvallis, OR
13.	Boyles, Genesis (Gerlach)	F	Civil Engineering	McAllister, MT
14.	*Butler, Cara (Kirkland)	F	Civil Engineering	Fort Collins, CO
15.	Carey, Taylor (Peyton)	F	Chemical & Biological Engineering	Wasilla, AK
16.	*Castro, Allison (Peyton)	F	Microbiology & Cell Biology	Erie, CO
17.	Coonfield, Molly (Warnat)	F	Electrical Engineering	Wenatchee, WA
18.	Das, Sidhee (Carlson)	F	Chemical & Biological Engineering	Kharagpur, India
19.	Delker, Katherine (Stewart)	F	Microbiology & Cell Biology	Soldotna, AK
20.	Donaldson, Callie (Huth)	F	Health & Human Development	Denton, MT
21.	*Ducharme, Grace (Loveday)	F	Chemical & Biological Engineering	Coeur D'Alene, ID
22.	Ferguson-Reiner, Emma (Fields)	F	Chemical & Biological Engineering	Kalispell, MT
23.	Gates, Anna (Crawford)	F	Chemical & Biological Engineering	Helena, MT
24.	Griffis, Tyler (Phillips)	M	Civil Engineering	S. Lake Tahoe, CA
25.	*Haab, Amanda (Fields)	F	Microbiology & Cell Biology	Helena, MT
26.	Hampton, Lydia (Secor)	F	Microbiology & Cell Biology	Gilber, AZ
27.	Hannigan, Cora Rose (Phillips)	F	Civil Engineering	Lake Stevens, WA
28.	Hanson, Regan (Stewart)	F	Microbiology & Cell Biology	Livingston, MT
29.	Hoogerheide, Dylan (Lauchnor)	M	Chemical & Biological Engineering	Helena, MT
30.	*Hyatt, William (Phillips)	M	Civil Engineering	Whitefish, MT
31.	*Jackson, Ruby (Warnat/Foreman)	F	Mechanical & Industrial Engineering	Kalama, WA
32.	Johnson, Anna (Gerlach)	F	Nursing	Cranberry Township, PA
33.	Karaman, Imre (K. Connolly/H. Smith)	F	Chemical & Biological Engineering	Istanbul, Turkey
34.	Knutson, Keigan (Stewart)	M	Microbiology & Cell Biology	Kalispell, MT
35.	Kominsky, John (Secor)	M	Chemistry & Biochemistry	Bozeman, MT
36.	Kreiter, August (Warnat)	M	Mechanical Engineering	EastWenatchee, WA
37.	*Krysiak, Nicole (Foreman)	F	Chemistry & Biochemistry	Arvada, CO
38.	LeBrun, Kathrine (Heveran)	F	Chemical & Biological Engineering	Laurel, MT
39.	Lord, Alexa (Phillips)	F	Civil Engineering	Lakewood, CO
40.	*May, Andrew (Peyton)	M	Chemical & Biological Engineering	Castle Pines, CO
41.	Mayers, Sophia (Warnat)	F	Mechanical & Industrial Engineering	Anchorage, AK
42.	McAnaney, Sean (Lauchnor)	M	Civil Engineering	Minneapolis, MN
43.	McNutt, Georgia (Peyton)	F	Mechanical Engineering	Evansville, WY
44.	Meyer, Britta (Heveran/Gerlach)	F	Chemical & Biological Engineering	Eau Claire, WI
45.	Mulder, Isabella (Secor)	F	Microbiology & Cell Biology	Three Forks, MT
46.	*Myxter, Alexander (Peyton)	M	Land Resources and Environmental Sciences	Fort Collins, CO
47.	Nelson, Anders (Heveran)	M	Mechanical Engineering	Edgartown, MA
48.	Niglio, Co (Heveran)	F	Chemical & Biological Engineering	Dillon, MT
49.	Novak, Abby (Fields)	F	Plant Sciences & Plant Pathology	Wasilla, AK
50.	O'Connell, Hannah (Crawford)	F	Chemical & Biological Engineering	El Dorado Hills, CA
51.	Phelps, Olivia (Foreman)	F	Chemical & Biological Engineering	Eugene, OR
52.	Rahn, Jessica (Phillips)	F	Civil Engineering	Pawnee, CA
53.	Rasch, Rory (Warnat)	M	Mechanical & Industrial Engineering	Bozeman, MT

54. Reiter, Claire (Gerlach)	F	Chemical & Biological Engineering	Rapid City, SD
55. *Renner, Konrad (James)	M	Microbiology & Cell Biology	Eagle River, AK
56. Ritter, Kadin (Warnat)	M	Mechanical & Industrial Engineering	Golden, CO
57. Robles, Grayson (James)	M	Microbiology & Cell Biology	Highlands Ranch, CO
58. Roemig, Grace (Heveran)	F	Mechanical & Industrial Engineering	Excelsior, MN
59. Schultz, Marika (Phillips)	F	Civil Engineering	Bozeman, MT
60. Smith, Kaydin (Connolly/Smith)	F	Biomedical Engineering & Applied Mathematics	Spokane, WA
61. Solberg, Rylee (Lauchnor)	F	Civil Engineering	Bozeman, MT
62. Swenson, Jacob (Heveran)	M	Mechanical & Industrial Engineering	Billings, MT
63. Tasdemir, Sofia Irem (Gerlach)	F	Chemical & Biological Engineering	Umraniye, Turkey
64. *Trivitt, Victoria (Jones)	F	Chemical & Biological Engineering	Puyallup, WA
65. Trofimczuk, Kaleb (Warnat)	M	Mechanical & Industrial Engineering	Edmonds, WA
66. Trudnowski, Anna (Heveran)	F	Mechanical & Industrial Engineering	Butte, MT
67. Tucker, Sadie (Jones)	F	Ecology	Advance, NC
68. Underwood, Evelyn (Jennings)	F	Microbiology & Cell Biology	Corte Madera, CA
69. Walde, Kyle (Stewart)	M	Chemical & Biological Engineering	Edmonds, WA
70. Ward, Maya (Connolly/Smith)	F	Chemical & Biological Engineering	Missoula, MT
71. Wichmann, Cade (Heveran)	M	Mechanical Engineering	Rapid City, SD
72. Wyant, Peyton (Connolly/Smith)	F	Biomedical Engineering	Arvada, CO
73. Young, Andrew (Phillips)	M	Civil Engineering	Lynnwood, WA

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## Undergraduates Summary: 2024–2025

Department	Male	Female	Total
Biomedical Engineering		3F	3
Chemical & Biological Engineering	3M	19F	22
Chemistry & Biochemistry	1M	2F	3
Civil Engineering	4M	10F	14
Ecology		1F	1
Electrical & Computer Engineering		1F	1
Film & Photography		1F	1
Health & Human Development		1F	1
Land Resources & Environmental Sciences	1M		1
Mechanical & Industrial Engineering	7M	6F	13
Microbiology & Cell Biology	3M	8F	11
Nursing		1F	1
Plant Sciences & Plant Pathology		1F	1
<b>Totals</b>	<b>19M</b>	<b>54F</b>	<b>73</b>

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## EDUCATION:

**Graduate Students: Summer 2024, Fall 2024, Spring 2025**

‡ Native American \*Received degree

**Masters Candidates**

1.	Ahmed, Nihal (Warnat)	M	Mechanical & Industrial Engineering	Chandpur, Bangladesh
2.	*Arpali, Handenur (Warnat/Foreman)	F	Chemical & Biological Engineering	Istanbul, Turkey
3.	*Culp, Matthew (Warnat)	M	Mechanical & Industrial Engineering	Maple Valley, WA
4.	*Davidson, Leah (Heveran)	F	Mechanical & Industrial Engineering	Boise, ID
5.	Denk, Jesse (Warnat)	M	Electrical Engineering	Golden, CO
6.	Heyneman, Ethan (Heveran)	M	Chemical & Biological Engineering	Fishtail, MT
7.	*Johnson, Lura (Lauchnor)	F	Civil Engineering	Kenne Valley, NY
8.	*Kessler, Kendall (Carlson)	F	Chemical & Biological Engineering	Kalispell, MT
9.	*Kettler, Haley (Foreman/Warnat)	F	Electrical & Computer Engineering	Pierre, SD
10.	*Martin, Caroline (Hohner)	F	Civil Engineering	Burlington
11.	Mosher, Audrey (Heveran)	F	Chemical and Biological Engineering	Alamosa, CO
12.	Nichols, Winifred (Fields)	F	Land Resources & Environmental Sci.	Bozeman, MT
13.	*Palen, Thomas (Warnat)	M	Mechanical & Industrial Engineering	Kenne, NY
14.	Rudaiba, Adnina (Heveran)	F	Civil Engineering	Dhaka, Bangladesh
15.	*Sherazi, Haider (Khosravi)	M	Civil Engineering	Sardogha, Pakistan

**PhD Candidates**

1.	Acharjee, Amit (Amendola/Fields)	M	Mechanical & Industrial Engineering	Dhaka, Bangladesh
2.	Alonge, Babatunde (Ryan)	M	Chemistry & Biochemistry	Lagos, Nigeria
3.	Arnold, Adrienne (Carlson)	F	Microbiology & Cell Biology	Charleston, WV
4.	Aviles Zuniga, Tadeo (Loveday)	M	Computer Science	Burbank, CA
5.	*Ayotte, Stephanie (Lauchnor/Stein)	F	Civil Engineering	Saco, ME
6.	Bedey, Kayla (Phillips/Kirkland)	F	Civil Engineering	Madisonville, LA
7.	Boles, Bruce (Foreman)	M	Chemical & Biological Engineering	Knoxville, TN
8.	Brown, Kenna (Heveran)	X	Mechanical & Industrial Engineering	Grand Junction, CO
9.	Caruso, Kathryn (Foreman)	F	Microbiology & Cell Biology	Danville, PA
10.	Christian, William (Hatzenpichler)	M	Chemistry & Biochemistry	Grand Rapids, MT
11.	Crandall, Jennifer (Fields/F. Stewart)	F	Microbiology & Immunology	Wallingford, CT
12.	Darrow, Cheyenne (Foreman)	F	Microbiology & Cell Biology	Hemet, CA
13.	Demeritte, Amethyst (Stewart/Livinghouse)	F	Chemistry & Biochemistry	New Providence, Bahamas
14.	Du, Martina (Carlson)	F	Chemical & Biological Engineering	Kent, WA
15.	Faith, Dominick (Secor)	M	Microbiology & Cell Biology	Kalispell, MT
16.	Fuad, Nasim Mahmud (Ryan)	M	Mechanical & Industrial Engineering	Noakhali, Bangladesh
17.	Garner, Madeline (Foreman)	F	Molecular Biosciences	Cookeville, TN
18.	Gattiker, Jasper (Bimczok)	M	Microbiology & Cell Biology	Watkinsville, GA
19.	Gaur, Gauri (P. Stewart)	F	Microbiology & Cell Biology	Gurgaon, India
20.	Griffin, Gabriel (Gerlach)	M	Chemical & Biological Engineering	Hancock, MI
21.	*Hoffman, Carter (Chang)	M	Chemical & Biological Engineering	Carlsbad, CA
22.	Holcomb, Charles (Gerlach)	M	Chemical & Biological Engineering	Great Falls, MT
23.	Islam, Touhid (Ryan)	M	Mechanical & Industrial Engineering	Rangpur, Bangladesh
24.	Joshi, Pukar (Phillips/Khosravi)	M	Civil Engineering	Morang, Nepal
25.	Joyce, Alex (Secor)	M	Microbiology & Cell Biology	Warrenton, VA
26.	Kaffer, John (Peyton)	M	Microbiology & Cell Biology	Madison, AL
27.	Kane, Seth (Ryan/Phillips)	M	Mechanical & Industrial Engineering	Fairbanks, AK
28.	Keskin, Yagmur (Carlson)	F	Chemical & Biological Engineering	Istanbul, Turkey
29.	Kettler, Haley (Foreman/Warnat)	F	Mechanical & Industrial Engineering	Pierre, SD
30.	Khadivar, Hossein (Gerlach)	M	Civil Engineering	San Marcos, CA
31.	*Koepnick, Hannah (Peyton)	F	Chemical & Biological Engineering	Sherman, TX
32.	Kohtz, Anthony (Hatzenpichler)	M	Chemistry & Biochemistry	Omaha, NE

33. *Lyon, Katrina (Wilking/Bimczok)	F	Microbiology & Cell Biology	Highwood, IL
34. Marquis, James (Fields)	M	Microbiology & Cell Biology	Mill Valley, CA
35. McLean, Anthony (Hatzenpichler)	M	Microbiology & Cell Biology	Bozeman, MT
36. *Mettler, Madelyn (Peyton)	F	Chemical & Biological Engineering	Littleton, CO
37. Mikesell, Logan (Stewart)	M	Chemistry & Biochemistry	Onsted, MI
38. Molacek, Lea (Foreman)	F	Chemistry & Biochemistry	Bozeman, MT
39. Mozaffari, Arash (Stein/Lauchnor)	M	Civil Engineering	Qazin, Iran
40. *Neubauer, Michael (Warnat)	M	Mechanical & Industrial Engineering	Rogers, MN
41. Olds, Sabine (Phillips)	F	Civil Engineering	Great Falls, MT
42. Opp, Breuklyn (Foreman)	X	Chemical & Biological Engineering	Charles City, IA
43. Putnam, Campbell (Carlson)	M	Chemical & Biological Engineering	Hattiesburg, MS
44. Schimetz, Jacob (Hatzenpichler)	M	Microbiology & Cell Biology	Plymouth, MN
45. Sherazi, Haider (Khosravi)	M	Civil Engineering	Sardogha, Pakistan
46. Shikany, Johnathan (Peyton)	M	Chemical & Biological Engineering	Bellingham, WA
47. Shreve, Molly (Fields)	F	Microbiology & Cell Biology	Louisville, KY
48. *Stanley-Thompson, Maribelle (Seymour/ Wilking)		Chemical & Biological Engineering	Corvallis, OR
49. Strupulis, Chloe (Bimczok/Wilking)	F	Chemical & Biological Engineering	Anchorage, AK
50. Tate, Emma (F. Stewart)	F	Land Resources & Environmental Science	West Lafayette, IN
51. *Thomas, Mallory (Chang)	F	Microbiology & Cell Biology	Elkhart, IN
52. *Thornton, Isaak (Wilking)	M	Mechanical & Industrial Engineering	Great Falls, MT
53. Vallie, James (Carlson)	M	Chemical & Biological Engineering	Crow Agency, MT
54. Van Beek, Joeline (Hatzenpichler)	F	Microbiology & Cell Biology	Afton, WI
55. Vega-Matos, Nicole (Hatzenpichler)	F	Chemistry & Biochemistry	San Juan, PR
56. Viles, Ethan (Heveran)	M	Mechanical & Industrial Engineering	Veradale, WA
57. Wijerathna, Samantha (Hohner)	F	Civil Engineering	Kandy, Sri Lanka
58. Willett, Matthew (Kirkland)	M	Chemical & Biological Engineering	Puyallup, WA
59. Wood, Jessica (Fields)	F	Microbiology & Cell Biology	Lafayette, IN
60. Zimlich, Kathryn (Fields)	F	Microbiology & Cell Biology	Dublin, OH

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EDUCATION:  
**Graduate Students, 2024–2025**

**19: Chemical & Biological Engineering**

**MS: 4**

1 M Heyneman, Ethan: MS, *Heveran*

3 F \*Arpali, Handenur: MS, *Warnat*

\*Kessler, Kendall: MS, *Carlson*

Mosher, Audrey: MS, *Heveran*

**PhD: 15**

8 M Boles, Bruce: PhD, *Foreman*

Griffin, Gabriel: PhD, *Espinosa-Ortiz/Gerlach*

\*Hoffman, Carter: PhD, *Chang*

Holcomb, Charles: PhD, *Gerlach*

Putnam, Campbell: PhD, *Carlson*

Shikany, Jonathan: PhD, *Peyton*

Vallie, James: PhD, *Carlson*

Willett, Matthew: PhD, *Kirkland*

6 F Du, Martina: PhD, *Carlson*

Keskin, Yagmur: MS, *Carlson*

\*Koepnick, Hannah: PhD, *Peyton*

\*Mettler, Madelyn: PhD, *Peyton*

\*Stanley-Thompson, Maribelle: PhD, *Seymour/Wilking*

Strupulis, Chloe: PhD, *Wilking*

1 X Opp, Breuklyn: PhD, *Foreman*

**7: Chemistry & Biochemistry**

**PhD: 7**

4 M Babatunde, Alonge: PhD, *Ryan*

Christian, William: PhD, *Hatzenpichler*

Kohtz, Anthony: PhD, *Hatzenpichler*

Mikesell, Logan: PhD, *Stewart/Livinghouse*

3 F Demeritte, Amethyst: PhD, *Stewart/Livinghouse*

Molacek, Lea: PhD, *Foreman*

Vega-Matos, Nicole: PhD, *Hatzenpichler*

**12: Civil Engineering**

**MS: 4**

3 F Rudaiba, Adnina: MS, *Heveran*

Johnson, Lura: MS, *Lauchnor*

\*Martin, Caroline: PhD, *Hohner*

1M \*Sherazi, Haider: MS, *Khosravi*

**PhD: 8**

4 M Joshi, Pukar: PhD, *Phillips*

Khadivar, Hossein: PhD, *Gerlach*

Mozaffari, Mohammed: PhD, *Lauchnor*

Sherazi, Haider: MS, *Khosravi*

4 F \*Ayotte, Stephanie: PhD, *Lauchnor*

Bedey, Kayla: PhD, *Phillips/Kirkland*

Olds, Sabine: PhD, *Phillips*

Wijerathna, Samantha: PhD, *Hohner*

**1: Computer Science**

**PhD: 1**

1M Aviles Zuniga, Tadeo: PhD, *Loveday*

**3: Electrical & Computer Engineering**

**MS: 2**

1M Denk, Jesse: MS, *Warnat*

1 F \*Kettler, Haley: MS, *Foreman/Warnat*

**2: Land Resources & Environmental Sciences**

**MS: 1**

1 F Nichols, Winifred: MS, *Fields*

**PhD: 1**

1 F Tate, Emma: PhD, *F. Stewart*

**13: Mechanical & Industrial Engineering**

**MS: 4**

3 M Ahmed, Nihal: MS, *Warnat*

\*Culp, Matthew: MS, *Warnat*

\*Palen, Thomas: MS, *Warnat*

1 F \*Davidson, Leah: MS, *Heveran*

**PhD: 9**

7 M Acharjee, Amit: PhD, *Amendola/Fields*

Fuad, Nasim Mahmud: PhD, *Ryan*

Islam, Touhid: PhD, *Ryan*

Kane, Seth: PhD, *Ryan/Phillips*

\*Neubauer, Michael: MS, *Warnat*

\*Thornton, Isaak: PhD, *Wilking*

Viles, Ethan: PhD, *Heveran/Gerlach*

1F Kettler, Haley: PhD, *Foreman/Warnat*

1 X Brown, Kenna: PhD, *Heveran*

**18: Microbiology & Cell Biology**

**PhD: 18**

- 7 M     Faith, Dominick: PhD, *Secor*  
           Gattiker, Jasper: PhD, *Bimczok*  
           Joyce, Alex: PhD, *Secor*  
           Kaffer, John: PhD, *Peyton*  
           Marquis, James: PhD, *Fields*  
           McLean, Anthony: PhD, *Hatzenpichler*  
           Schimetz, Jacob: PhD, *Hatzenpichler*
- 11 F     Arnold, Adrienne: PhD, *Carlson*  
           Caruso, Kathryn: PhD, *Foreman*  
           Crandall, Jennifer: PhD, *F. Stewart/Fields*  
           Darrow, Cheyenne: PhD, *Foreman*  
           Gaur, Gauri: PhD, *Stewart*  
           \*Lyon, Katrina: MS, *Bimczok/Wilking*  
           Shreve, Molly: PhD, *Fields*  
           \*Thomas, Mallory: PhD, *Chang*  
           van Beek, Joelle: PhD, *Hatzenpichler*  
           Wood, Jessica: PhD, *Fields*  
           Zimlich, Kathryn: PhD, *Fields*

**1: Molecular Biosciences**

**PhD: 1**

- 1 F     Garner, Madeline: PhD, *Foreman*

**TOTALS –**

**Total Grads: 75**

Total MS: 15                   6 M / 9 F  
 Total PhD: 60                   31 M / 27 F / 2 X

Total Male: 37  
 Total Female: 36  
 Total Non-Binary: 2

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EDUCATION:

**Graduating with advanced degrees: June 2024–June 2025**

**2024**

**Kendall Rhea Kessler, MS, Bioengineering, November 2024**

Biorecovery of rare earth elements and critical minerals via *Gluconobacter oxydans*

**Katrina Lyon, PhD, Microbiology & Immunology, November 2024**

Human organoid modeling of gastric mucus layer physiology

**Mohammad Hosein Mozaffari, MS, Civil Engineering, November 2024**

Nitrification in treatment wetlands: Influence of seasonality and optimizing operations

**Michael Neubauer, PhD, Mechanical & Industrial Engineering, November 2024**

Viscoelastic characterization of chondrocytes with a 3d-printed variable-height fluidic device

**Isaak John Thornton, PhD, Mechanical & Industrial Engineering, November 2024**

Applications of 3d printing in biofilm engineering and high-throughput diagnostics development

**2025**

**Mallory Thomas, PhD, Microbiology & Cell Biology, March 2025**

Development of droplet microfluidic technologies for negative-strand RNA viruses

**Handenur Arpali, MS, Chemical & Biological Engineering, April 2025**

Design and evaluation of an additive-manufactured microfluidic device for observing initial biofilm attachment on copper surfaces

**Stephanie Hall Ayotte, PhD, Civil Engineering, April 2025**

Analysis of nitrogen processes and dynamics in a sub-alpine climate constructed wetland

**Matthew Joseph Culp, MS, Mechanical & Industrial Engineering, April 2025**

Design optimization and validation of simulated microgravity biofilm reactor for simulating spacecraft wastewater systems

**Leah Kirsten Davidson, MS, Mechanical & Industrial Engineering, April 2025**

Alternative binders to improve hempcrete material properties and microbial viability

**Carter Hoffman, PhD, Chemical & Biological Engineering, April 2025**

A parallelized, ultrahigh-throughput droplet microfluidic platform for single-cell antimicrobial susceptibility testing and heteroresistance detection

**Haley Marie Ketteler, MS, Electrical & Computer Engineering, April 2025**

Characterization of microfabricated resistance temperature detectors for electrochemical measurements

**Hannah Koepnick, PhD, Chemical & Biological Engineering, April 2025**

Microbially-mediated nitrate-dependent iron oxidation for selenium bioremediation

**Caroline Grace Martin, MS, Civil Engineering, April 2025**

Title Unavailable

**Madelyn Mettler, PhD, Chemical & Biological Engineering, April 2025**

Material coatings and strategies for biofilm mitigation in spacecraft water systems

**Syed Haider Sherazi, MS, Civil Engineering, April 2025**

Machine learning based feasibility analysis of geothermal bridge deck deicing systems

**Maribelle Anastasia Stanley, PhD, Chemical Engineering, April 2025**

RheoNMR as a technique to study shear-induced transitions in nanocolloidal suspensions

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EDUCATION:

**Center for Biofilm Engineering**

**Seminar Series: Fall 2024**

Thursdays, 2:10 p.m. MDT

Roberts 301, Montana State University

Date	Speaker	Affiliation	Presentation Title
10/3 *Virtual	Dr. Erin Baker	Associate Professor, Chemistry, University of North Carolina at Chapel Hill	Assessing chemical exposure with multidimensional analytical measurements
10/17	Dr. Phil Stewart	Regent's Professor, Chemical & Biological Engineering, Montana State University, Center for Biofilm Engineering	Cystic fibrosis: A paradigm biofilm infection in a new era
10/24	Dr. Mandi Hohner	Assistant Professor, Civil Engineering, Montana State University, Center for Biofilm Engineering	Wildfire implications for drinking water systems
10/31	Dr. Robin Gerlach	Professor, Chemical & Biological Engineering, Montana State University, Center for Biofilm Engineering	Biofilm and biotechnology insights through models and machine learning
11/14	Ana Barbosa	Visiting PhD Student, University of Porto	mRNA PNA-FISH: A new tool for studying gene expression and spatial organization in biofilms
11/21	Dr. Pat Secor	Associate Professor, Microbiology & Immunology, Montana State University, Center for Biofilm Engineering	Small molecule adjuvants that enhance biofilm sensitivity to phage infection
11/28	No Seminar – Fall Break		

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## EDUCATION:

**Center for Biofilm Engineering  
 Seminar Series: Spring 2025**

Thursdays, 2:10 p.m. MDT

BARNARD 108, Montana State University

Date	Speaker	Affiliation	Presentation Title
01/23* @9:00 a.m. via Webex	Dr. Eleanora Secchi	Senior Scientist, Biomatter Microfluidics, ETH Zurich	The role of fluid dynamics in driving biofilm formation, rheology, and clogging dynamics
01/30	No Seminar		
02/06	No Seminar		
02/13	Dr. Luke McKay	Manager, Systems Biology, LanzaTech	Creating a circular carbon economy through bacterial gas fermentation
02/20	No Seminar		
02/27	Dr. Chelsea Heveran	Asst. Professor, Mechanical & Industrial Eng., MSU, CBE	Lessons from bone in the design of living building materials
03/06	No Seminar		
03/11* @1: 00 p.m. Barnard 126	Dr. Bruce Fouke	Ralph E. Grim Professor, Earth Science & Environmental Change, Univ. of Illinois Urbana- Champaign	Mammoth Hot Springs travertine: A lexicon for deciphering the hydrology and last flow of ancient Rome's Anio Novus Aqueduct
03/20	No Seminar – Spring Break		
03/27	CBE Undergraduate Researcher Day Featuring: Amanda Haab  Thomas McCarthy  Grayson Robles	Microbiology & Cell Biology, MSU, CBE Advisor: Dr. Elizabeth Sandvik  Applied Mathematics, MSU, CBE Advisor: Dr. James Crawford  Cell Biology & Neuroscience, MSU, CBE Advisor: Dr. Garth James	Development of tagged consortium for the study of microbial interaction and colonization patterns between fungus and bacteria relevant to the ISS  Automated Enzyme-MOF comparisons: Leveraging computational tools for biomimetic design  Evaluation of novel irrigation solutions for biofilm reduction in long-term foley catheters
04/03	Dr. Jerod Skyberg	Asst. Professor, Microbiol. & Cell Biology, MSU	Metabolic control of brucellosis
04/10	No Seminar		
04/17	Daniel Juliano  Jessica Murdock	Director, Technology Transfer Office, MSU Program Manager, Tech. Transfer Office, MSU	Sealed with silence: Navigating the power of a Non-Disclosure Agreement (NDA)
04/24	Roos Goedhart	PhD candidate, TU Delft, Water Management	How bacteria treat our drinking water
05/01 *2:00 p.m. start	Dr. Taylor Ware	Assoc. Professor, Biomedical Engineering, Materials Science & Engineering, Texas A&M University	Proliferation-driven function in engineered living materials

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TECHNOLOGY TRANSFER:

**Industrial Associates, 2024–25**

Bold, new \*Small business member

**Albemarle**

Arxada

**ASP**

Avant Guard LLC\*

**Bausch + Lomb**

Baxter Healthcare

**BD Medical**

BioSure North America\*

CardioQuip\*

Church & Dwight

Company

DeLaval

**Diversey**

**Hydrite Chemical**

ICU Medical, Inc.

**Kenvue**

Johnson & Johnson

Masco Corporation

NASA

Newell Brands

Next Science

**PerfectCLEAN\***

PhaseOne Health\*

Procter & Gamble

Company

ProEdge Dental\*

Quest Medical

Sanuwave Health\*

Sherwin-Williams

Company

**Solventum**

Sterilex\*

STERIS

**Vantive**

Zimmer Biomet

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TECHNOLOGY TRANSFER:  
**2024 MBM**  
**Montana Biofilm Meeting**



7/16/2024 2:57 PM

**FINAL AGENDA**

**Tuesday**  
**July 9**

**6:00–8:30 pm**  
**Registration & Welcome Reception** Larkspur Foyer

**Wednesday**  
**July 10**

**7:00–8:00 am** CBE & IA Members  
**Coffee Talk** Goldenrod Boardroom

**7:30–8:00 am**  
**Registration & continental breakfast** Larkspur Foyer

**Meeting:** Larkspur Ballroom

**8:00–8:10**  
**Opening Remarks**  
Matthew Fields, Director, CBE;  
Professor, Microbiology &  
Cell Biology, MSU  
Darla Goeres, Coordinator of  
Industrial Development, CBE

**8:10–8:50**  
**Industrial Associate Introductions**

**SESSION 1: Biofilm as a System**

**8:50–9:00**  
**Session Introduction**  
Darla Goeres

**Keynote Presentation**

**9:00–9:45**  
**A fascination with phenazines**  
Dianne Newman, Gordon M.  
Binder/Amgen Professor of  
Biology and Geobiology,  
Caltech

**9:45–10:15** **Networking Break**

**10:15–10:45**  
**Biofilms: The first bio-systems?**  
Matthew Fields

**10:45–11:15**  
**Systems Biology 101: From the basics to biofilms**  
Ross Carlson, Professor, Chemical  
& Biological Engineering, MSU,  
CBE

**11:15–12:00**  
**Panel: Biofilm as a System**  
Dianne Newman  
Matthew Fields  
Ross Carlson  
Moderator: Darla Goeres

**12:00–1:30** **Networking Lunch**

**SESSION 2: Kill, Remove, Prevent**

**1:30–1:35**  
**Session Introduction**  
Liz Sandvik, Research Engineer,  
CBE

**1:35–2:05**  
**Development of a test method to evaluate antibiofilm treatments of dental unit water lines**  
Chris Jones, PI, Standardized  
Biofilm Methods Laboratory,  
CBE

**2:05–2:35**  
**A method for evaluating the antimicrobial efficacy of residential laundry products**  
Laura Gage, Senior Microbiology  
Manager, Arxada

**2:35–3:05**  
**Microbial survival and comparison of shutdown procedures for dormant water recovery systems for spaceflight**  
Liz Sandvik

**3:05**  
**Transport to CBE laboratories**

**Poster Session and Lab Open House**

**3:30–5:30**  
3rd Floor Barnard Hall, MSU  
Schedule available onsite

**Thursday**  
**July 11**

**7:00–8:00 am** CBE & IA Members  
**Coffee Talk** Goldenrod Boardroom

**7:30–9:00 am**  
**Registration & continental breakfast** Larkspur Foyer

**Meeting:** Larkspur Ballroom

**8:00–9:00** **IA+CBE Connect**

**9:00–9:05**  
**Opening remarks**  
Matthew Fields, Darla Goeres

**SESSION 3: Innovative Techniques for Biofilm Analysis**

**9:05–9:10**  
**Session Introduction**  
Heidi Smith, Manager, Bioimaging  
Facility, CBE; Assistant  
Research Professor,  
Microbiology & Cell Biology,  
MSU

**9:10–10:10**  
**Three 20-minute talks**

**Label-free identification of microorganisms using spontaneous Raman spectroscopy**  
Bruce Boles, PhD Student,  
Civil Engineering, MSU,  
CBE

**Imaging multispecies biofilms**  
Erika Espinosa-Ortiz,  
Assistant Professor,  
Biological Engineering,  
Utah State University

**Using stimulated Raman spectroscopy to study the human fecal microbiome**  
Jacob Schimetz, PhD  
Student, Microbiology &  
Cell Biology, MSU

**10:10–10:40** **Networking Break**

(Continues on next page)

**10:40-11:10**

**Microsensors and food processing**

Stephan Warnat, Associate Professor, Mechanical & Industrial Engineering, MSU, CBE

**11:10-11:40**

**Electrochemistry as a tool to understand biocorrosion**

Giorgia Ghiara, Visiting Faculty, Fulbright Scholar, MSU, CBE

**11:40-12:00**

**CBE Awards & IA Milestones**

**12:00-1:00 Lunch**

**SESSION 4: Biofilms and Water Quality**

**1:00-1:05**

**Session Introduction**

Catherine Kirkland, Assistant Professor, Civil Engineering, MSU, CBE

**1:05-1:30**

**Monochloramine induces release of DNA and RNA from bacterial cells: Quantification, sequencing analyses, and implications**

Sakcham Bairoliya, Research Fellow, Civil and Environmental Engineering, Singapore Centre for Environmental Life Sciences Engineering, Nanyang Technological University  
**\*Young Investigator Awardee**

**1:30-1:55**

**Biofilm dynamics in treatment wetlands**

Ellen Lauchnor, Associate Professor, Civil Engineering, MSU, CBE

**1:55-2:25 Networking Break**

**2:25-2:55**

**Pathogenic free-living amoeba: Interactions with biofilms in natural and engineered systems**

John Shikany, PhD Student, Chemical & Biological Engineering, MSU, CBE

**2:55-3:20**

**Biofilms and public health**

Joe Sexton, Team Lead, Biofilm and Microbial Control Laboratory, Clinical and Environmental Microbiology Branch, CDC

**Strategic Planning Meeting for CBE Members**

**3:45-5:00**

Hilton Garden Inn

**BBQ Dinner**

**6:00 pm**

Big Yellow Barn, Bozeman

**Friday July 12**

**8:00-8:30 am**

**Registration & continental breakfast**

Larkspur Foyer

**Meeting:** Larkspur Ballroom

**8:30-8:35**

**Opening Remarks**

Matthew Fields, Darla Goeres

**SESSION 5: Medicine and Healthcare**

**8:35-8:40**

**Session Introduction**

Kelly Kirker, Assistant Research Professor, Chemical & Biological Engineering, MSU, CBE

**8:40-9:10**

**Revisiting the biofilm model of wound infection**

Phil Stewart, Regents Professor, Chemical & Biological Engineering, MSU, CBE

**9:10-9:35**

**Crafting polymicrobial wound biofilm models through microbiome analysis**

Jontana Allkja, Postdoctoral Researcher, Dental School and Hospital, University of Glasgow  
**\*Young Investigator Awardee**

**9:35-10:05 Networking Break**

**10:05-10:35**

**2-aminoimidazoles as antibiotic adjuvants: A piece to the AMR puzzle**

Amethyst Demeritte, PhD Student, Chemistry & Biochemistry, MSU, CBE

**10:35-11:05**

**One is not the loneliest number: Using new tools to study virus infections at a single cell level**

Emma Loveday, Assistant Professor, Microbiology & Cell Biology, MSU, CBE

**11:05-11:35**

**Bacterial hibernation: A mechanism for biofilm antibiotic tolerance**

Mike Franklin, Professor, Microbiology & Cell Biology, MSU, CBE

**11:35-11:45**

Meeting wrap-up



**Mark your calendar!**  
**CBE Pathways to Product Development Meeting**  
 January 29-30, 2025  
 Washington, D.C.

*The Center for Biofilm Engineering gratefully acknowledges the support from these meeting sponsors:*

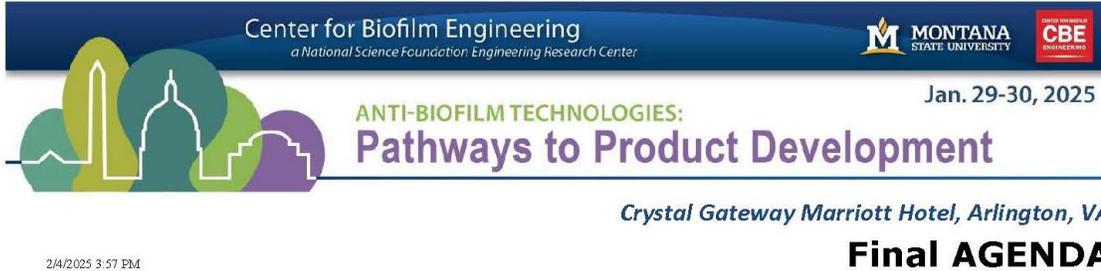


**SYMCEL<sup>o</sup>**

TECHNOLOGY TRANSFER:

**2025 PPD**

**Anti-Biofilm Technologies: Pathways to Product Development Meeting**



Center for Biofilm Engineering  
a National Science Foundation Engineering Research Center

MONTANA STATE UNIVERSITY

Jan. 29-30, 2025

**ANTI-BIOFILM TECHNOLOGIES:  
Pathways to Product Development**

Crystal Gateway Marriott Hotel, Arlington, VA

**Final AGENDA**

2/4/2025 3:57 PM

**Wednesday  
January 29**

**7:30–8:00**  
**Cont. Breakfast** [Sky View](#)

**Registration/Name badge pick-up** Salons DE

**8:00**  
**Meeting Start** Salons DE

**8:00–8:10**  
**Introductory Remarks**  
Matthew Fields, Director, CBE; Prof., Microbiology and Cell Biology, MSU  
Darla Goeres, Industrial Coordinator, Regulatory Research Professor, CBE

**SESSION 1: Healthcare Associated Infections**

**8:10–8:15**  
**Session Introduction**  
Garth James, PI, Medical Biofilms Laboratory, CBE; Assoc. Research Professor, Chemical and Biological Engineering, MSU

**Keynote Presentation**

**8:15–9:00**  
**Wastewater environment as a complex reservoir for AMR-causing hospital acquired infections and mitigation strategies**  
Shireen Kotay, Research Scientist, Div. of Infectious Diseases & Int'l Health, School of Medicine, University of Virginia

**9:00–9:30**  
**Needleless connector design and infection risk: Confirming the in-vitro through publicly reported surveillance data**  
Jason Battle, Senior Clinical Specialist, Research, ICU Medical

**9:30–10:00**  
**Antimicrobial silver**  
Garth James

**10:00–10:30 Break** [Sky View](#)

**10:30–11:00**  
**Navigating the medical device regulatory landscape: From concept to market**  
Jeanne Lee, Vice President, Quality, Clinical and Regulatory Affairs, Next Science

**11:00–11:30**  
**Enzymes, antibiotics, and bacteriophage: Creating combinations to disperse and kill biofilms of antibiotic-resistant bacteria**  
Kristi Frank, Associate Professor, Microbiology and Immunology, Uniformed Services University of the Health Sciences

**11:30–12:00**  
**Mimicking bacterial contamination in the surgical operating room**  
Matt Libera, Professor, Chemical Engineering and Materials Science, Stevens Institute of Technology

**12:00–12:10**  
**Session Closing Remarks**

**12:10–1:40 Lunch** [Sky View](#)

**SESSION 2: Current and Emerging Needs in Surface Disinfection**

**1:40–1:45**  
**Session Introduction**  
Chris Jones, PI, Standardized Biofilm Methods Laboratory, CBE

**Keynote Presentation**

**1:45–2:30**  
**What might volatile metabolites tell us?**  
Jane Hill, CEO, Shirley Diagnostics; Associate Professor, Chemical and Biological Engineering, University of British Columbia

**2:30–3:00**  
**Dry biofilms**  
Liz Sandvik, Research Engineer, CBE

**3:00–3:30 Break** [Sky View](#)

**3:30–4:00**  
**Dual-species biofilm formation by bacterial pathogens and their removal by sanitizers**  
Jitu Patel, Lead Scientist, Environmental and Microbial Food Safety Laboratory, USDA-ARS

*Continued next page*

**4:00–4:30**

**Biofilm love in the subsurface: New methods and insights**

Birthe V. Kjellerup,  
Professor, Civil and Environmental Engineering, University of Maryland at College Park

**4:30–5:00**

**The impact of test variability on regulatory decisions for hand hygiene**

Al Parker, Biostatistician, CBE; Associate Research Professor, Mathematical Sciences, MSU

**5:00–5:10**

**Session Closing Remarks**

**5:10–7:10 Networking Reception** Sky View

## Thursday January 30

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**8:00–8:30**

**Cont. Breakfast** Sky View

**Registration/Name badge pick-up** Salons DE

**8:30**

**Meeting Start** Salons DE

**8:30–8:35**

**Introductory Remarks**

Matthew Fields  
Darla Goeres

### Keynote Presentation

**8:35–9:05**

***Pseudomonas aeruginosa* initiates a rapid and specific transcriptional response during surface attachment**

Chris Jones

### SESSION 3: Methods in Action

**9:05–9:10**

**Session Introduction**

Darla Goeres

**9:10–9:30**

**Creating pathways to drive biofilm innovation: Building consensus on biofilm regulatory decision making**

Darla Goeres

**9:30–10:00**

***Acanthamoeba*, biofilms, and pathways toward standardization of contact lens care products**

William Domm, Senior Research Scientist, Vision Care Research and Development, Bausch + Lomb

**10:00–10:30 Break** Sky View

**10:30–11:00**

**Biofilms in manufacturing environments**

Charles Pettigrew, Research Fellow, Arxada

**11:00–11:20**

**Regulatory science and biofilms: Methods for biofilm soil formation on reusable stainless steel medical device material**

Bruno Haas, Scientific Group Leader, Infection Prevention Technologies R&D, STERIS

**11:20–11:40**

**Models for wound infection research**

Erin Gloag, Assistant Professor, Microbiology, Virginia Technological University

**11:40–12:00**

**Session and Meeting Closing Remarks**

Darla Goeres

## SYMCEL<sup>®</sup>

*The Center for Biofilm Engineering gratefully acknowledges Symcel for its meeting sponsorship.*



**Mark your calendar!**  
CBE's Montana Biofilm Meeting  
July 9–11, 2025  
Bozeman, MT

## Visiting Researchers

<b>Name</b>	<b>Title</b>	<b>Home University</b>	<b>CBE Host</b>
Giorgia Ghiara	Fulbright Scholar	Polytechnic University of Turin	Roberta Amendola
Thomas Cronimus	Masters Student	Ecole Normale Supérieure de Lyon	Ross Carlson
Ana Barbosa	PhD Student	University of Porto	Chris Jones/Darla Goeres
Roos Goerdhart	PhD Student	Delft University of Technology	Catherine Kirkland
Bahadir Ozturk	PhD Student	Auburn University	Adrienne Phillips/Mohammad Khosravi
Kerem Bozkurt	PhD Student	University of Stuttgart	Robin Gerlach
Felix Weinhardt	Research Fellow	Helmholtz Centre for Environmental Research (UFZ)	Robin Gerlach
Dona Adjahoungbeta	EB-REU Student	Augustana College	Diane Bimczok
Aidan Boyle	EB-REU Student	College of the Desert	Brent Peyton
Marissa Chavira	EB-REU Student	California State Polytechnic University, Pomona	Scott McCalla
Tyler McCann	EB-REU Student	Diablo Valley College	Robin Gerlach
Theo Murphy	EB-REU Student	California State Polytechnic University, Humboldt	Christine Foreman
Isabella Ramirez	EB-REU Student	Wellesley College	Anja Kunze/Dana Skorupa
Charlotte Rodina	EB-REU Student	Western Colorado University	Matthew Fields
Nehemiah Strawberry	EB-REU Student	Xavier University of Louisiana	Brian Bothner
Hannah White	EB-REU Student	Arizona State University	Chris Jones/Brent Peyton
Keilly Zelaya	EB-REU Student	University of Texas at San Antonio	Kelly Kirker
Jacob White	MLOxE-REU Student	University of Central Florida	Robin Gerlach/Chelsea Heveran

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OUTREACH:

## **Web image library usage 2024-2025**

Total image downloads: **85**

Requests for CBE graphics were submitted from **15** of the U.S. states:

Arkansas

California

Georgia

Maryland

Massachusetts

Montana

New Hampshire

New Jersey

North Dakota

Ohio

South Dakota

Tennessee

Texas

Washington, DC

Virginia

There were requests from an additional **11** countries:

Australia

Belgium

Canada

China

Czech Republic

France

Germany

India

Italy

Japan

Turkey

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## FACILITIES:

**Center for Biofilm Engineering Facilities Overview**

Located in Barnard Hall next to the Strand Union Building, the Center for Biofilm Engineering comprises more than 20,000 square feet, and includes offices and conference rooms for faculty, staff, and students; and 13 fully equipped research laboratories. See below for a comprehensive list of shared equipment available.

**Bioimaging Core**

The microscopy and chemical imaging facilities are coordinated by the Bioimaging Core Manager who maintains the equipment and trains and assists research staff and students in capturing images of *in situ* biofilms via optical microscopy, fluorescent and Raman confocal microscopy. The microscopy facilities include four separate laboratories which are detailed below.

- **Leica Thunder widefield microscope** optimally configured for allow real-time, high-sensitivity, high-throughput imaging. This microscope is equipped with a cMOS Camera, a tunable multiline LED Light Source, an ultraprecise, triggerable stage, has complete Hardware Synchronization and is fully enclosed to maintain temperatures between ambient 5-50°C ( $\pm 0.1^\circ\text{C}$ ), humidity (specifically designed to prevent condensation), and CO<sub>2</sub>/Air or hypoxic/hyperoxia conditions.
- **Leica DM6 upright fluorescent microscope** that is a fully automated with constant color temperature and fully automated transmitted light- and fluorescence axis, with motorized Z-focus.
- **A Nikon Eclipse E-800 research microscope** equipped with a Photometrics MYO cooled CCD camera and Universal Imaging Corporation's MetaVue software (v7.4.6)
- **Leica M 205 FA computer-controlled stereomicroscope** and Leica DFC3000G fluorescence camera
- **Nikon SMZ-1500-barrel zoom stereomicroscope** equipped with a color camera.
- **Leica CM1800 cryostat**
- **Dry ice maker**
- **Inverted Leica DMI8 Stellaris CSLM** with Digital Lights Sheet and Stimulated Raman Spectroscopy (SRS) capabilities This instrument enables lifetime and chemical imaging in real-time of intact biological samples under environmentally relevant conditions. This system is one of only three available at public universities and is equipped with a white light laser. The white light laser enables light gating to be applied to any excitation line from 460-660nm in combination with single photon imaging. This system is capable of lifetime imaging (FLIM-FRET). The digital light sheet module is ideal for sensitive 3D imaging of intact and complex samples. SRS uses two synchronized pulsed laser beams to coherently excite the selected molecular vibration of interest. SRS allows for extremely fast acquisition (10<sup>3</sup>-10<sup>6</sup> faster than other classical Raman techniques) enabling close to real-time observation of cells. The inverted CSLM is also fully enclosed and contains an environmental control chamber to control temperature, humidity, CO<sub>2</sub>/Air or hypoxic/hyperoxia. Instrument is capable of high-resolution imaging (120nm of lateral resolution and 250nm of axial resolution).
- **Upright Leica DM6 Multiphoton CSLM**, equipped with a white light laser. This CSLM enables cutting-edge, real-time, high-sensitivity imaging of intact, complex biological samples. Like the inverted CSLM, this instrument is equipped with a white light laser enabling excitation within any line from 460-660nm in combination with single photon imaging. This system is capable of lifetime imaging (FLIM-FRET). The Multi-Photon Hyperspectral imaging (4-Tune) system on the upright CSLM will impact biofilm imaging by enabling increased penetration (>500  $\mu\text{m}$ ) and allow for label free imaging of mixed microbial samples. An Extended IR laser enables MP excitation from 680nm to 1300nm and MP imaging of red-shifted fluorophores (e.g., Alexa 568, 594). This upright CSLM is also fully enclosed and contains an environmental control chamber to control temperature and humidity.

- **ThorLabs Ganymede Series 200 Spectral Domain OCT** (Optical Coherence Tomography). OCT enables a stain-free, non-invasive, high resolution, real-time imaging of thick intact samples. This technique is well suited for imaging thick specimens. The OCT light source centered around 930 nm with a bandwidth >100 nm and has a scan rate of up to 36 kHz with an axial field of view of 2.9 mm / 2.2 mm. Depending on the scan objective the field of view (FOV) and resolution can be adjusted and vary between a larger FOV of 16x16 mm<sup>2</sup> at 12 μm resolution, and a FOV of 10x10 mm<sup>2</sup> with a higher resolution of 8μm.
- **Leica LMD6 Laser Microdissection Microscope**. The system enables the precise isolation of cells or specific regions of interest that can then be subjected to further downstream analysis (e.g., transcriptomics, isolation, and proteomics). This system is equipped with a color camera, fluorescence filter cubes (FITC, TRITC, DAPI), and a UV laser for sample dissection.
- **FlowCam 8100 Fluid Imager** is a flow imaging microscopy system that combines the benefits of digital imaging flow cytometry, and microscopy into a single platform. The system utilizes a color camera and digital imaging to image, size, and count passing particles in a liquid sample. Designed for aquatic research, the FlowCam 8100 can process 1mL samples in approximately 6 minutes to characterize suspended particles in a size range of 2μm to 1mm, surpassing the upper size limits of flow cytometry equipment on campus targeted to analyze single cells. The system has 2X, 4X, 10X, and 20X objectives and associated flow cells to assess single cells to larger particle sizes.
- **Modified Horiba Scientific LabRam HR Evolution NIR fully integrated high resolution Raman confocal microscope** equipped with optical tweezers and fast-mapping fluorescence capability with 450 mW 532 nm laser and a 100 mW 785 nm laser and ultra-low frequency filters for Stokes and anti-Stokes measurements.
- Two custom high-performance image analysis workstations are in the Center for Biofilm Engineering's Bioimaging Facility and are dedicated to image analysis and are equipped with state-of-the-art image analysis programs. All instruments are connected to 10 Gigabit networking for high-speed data transfer and coordinate with campus Research Computing (RCI) to offer large scale data storage and state of the art computational resources.

## **Analytical Core**

- **Ion Chromatography**. Two ion chromatographs are available including a state-of-the-art **Dionex ICS-6000 HPIC** that can sequentially pull sample from one vial to analyze both cations and anions simultaneously using small sample volumes ~10 mL with two independent conductivity detectors. Alternately, the user can choose to analyze transition metals or lanthanides instead of cations with automated post column derivatization and a variable wavelength detector. For fast anion analysis without sample volume limitations, **the Dionex ICS 1100 anion IC** can be used to quantify most anions to parts per million levels with a conductivity detector.
- **Gas Chromatography**- Two gas chromatographs from SRI instruments are available for quantification of permanent gases by manual injection. The **SRI 8610C with thermal conductivity detector** is equipped for analysis of methane-producing cultures at 5-50% of atmospheric partial pressure. For lower detection limits **the SRI Multi-Gas 5 with TCD and FID methanizer** can quantify down to 0.1 ppm of CH<sub>4</sub> on FID and 0.1 ppm and H<sub>2</sub> on TCD with N<sub>2</sub> carrier gas. Nitrogen fixation can also be monitored on this instrument via a traditional acetylene reduction assay, with quantification by GC of acetylene and ethylene in less than ten minutes per sample.
- **Liquid Chromatography**. Two highly modular liquid chromatographs are available. **The Dionex Ultimate 3000SD with VWD and RID** has a basic programmable autosampler, quaternary pump for complex gradients and two in-line detectors capable of quantifying most compounds that are excited by UV light (variable wavelength detector-UV) or that change the refractive index of the mobile phase (refractive index detector), encompassing organic acids, alcohols and sugars. For samples requiring a specific excitation and emission wavelength, the **Dionex Ultimate 3000RS with fluorescence detector** is tuneable and can detect across four different spectra simultaneously. The autosampler is programmable to accommodate in-needle derivatization methods such as OPA and FMOC pre-column derivatization of primary and secondary amines.

- **Total Carbon and Total Nitrogen.** Two carbon analyzers allow for measurements of non-purgeable organic carbon and dissolved inorganic carbon. **The Shimadzu TOC-L CPH** can also measure TN at the same time as NPOC. This high sensitivity instrument is reserved for analysis of pure samples with low TDS/salinity below 20 mg/L of C with a detection limit of 4 mg/L C making it ideal for drinking water and glacial ice analysis. For higher salt samples and 10 to 1000 mg/L C, **the Skalar LAS160** can perform technical replicates in about ten minutes per sample.
- **Spectrophotometry.** Two advanced plates readers from Biotek (now Agilent) can both perform analysis across the UV and visible spectrum in addition to bioluminescence assays. The **Synergy Hybrid H1MF MultiMode** reader has the full suite of capabilities including end point or kinetic scans and is compatible with the Take3 Plate for nucleic acid quantification. **The Synergy Neo2 MultiMode reader** is a faster, more sensitive plate reader that allows for incubation up to 65°C and can be used for high throughput screening with the addition of a plate stacker. Two basic UV-Vis spectrometers are available for other sample vessels. These **Genesys 10S UV-VIS scanning spectrophotometers** can accommodate cuvettes or test tubes.

### **Radioisotope Lab**

- Liquid Scintillation Counter-Hidex 300SL

### **Microbiology/Media Preparation Lab**

- Autoclave- Primus Gravity Eagle P ET21-104-00203
- Autoclave- Consolidated
- Autoclave- Consolidated 20x20x38 with nickel clad chamber SSR-3A-PB
- Micro Balance- Mettler Toledo MT5
- Dishwasher- Napco Floor Model NLW-200
- 2 Centrifuge- Sorvall Legend XTR CF8
- Water Purification System- Millipore Advantage A10
- Oven- Thermo Fisher Scientific 664
- ESPEC Benchtop Environmental Chamber
- 2 Shaking Incubators- VWR-Troemner, Ambient +5°C to 60°C
- Incubators at 30°C and 37°C

### **Molecular Biology Laboratory**

- **Oxford Nanopore MinION** sequencing technology is transportable for use in the field or the lab where DNA and RNA can be sequenced directly, eliminating amplification bias and making it a valuable tool for studying modifications like methylation. It can be used for whole genome sequencing, targeted sequencing, RNA sequencing, metagenomics and epigenetics with read lengths determined by sample, from short to ultra-long reads (>4Mb).
- **QuantStudio 7 Pro Real-Time PCR system.** This advanced qPCR system is capable of multiplexing with 6 optical channels and 6 emission filters that are decoupled from excitation, allowing for 21 filter combinations for real time PCR analysis of complex samples. Excitation at 470, 520, 550, 580, 640 and 662 nm and emission at 520, 558, 586, 623, 682 and 711 nm. The 96 well block can hold plates or strip tubes for 0.1 mL volume and has 6 isolated zones with independent and precise temperature control capability. High sensitivity allows for detection of gene expression changes as small as 1.5-fold and a wide dynamic range of up to 10 log allows for tracking of broad changes in expression also.
- **PCR and gel analysis** equipment includes a gel documentation system with Point Grey Chameleon3 CM3-U3-31S4M Camera, two Eppendorf Mastercycler ep gradient thermocyclers and NanoDrop- Spectrophotometer ND1000 or Fluorospectrometer ND3300 for fast nucleic acid qualification. An Agilent Bioanalyzer 2100 is available for more in depth quantification and qualification of nucleic acid extractions for sequencing QA.

## Specialized CBE Laboratories

### Ecology/Physiology Laboratory (PI: Matthew Fields)

The Ecology/Physiology Laboratory headed by Dr. Matthew Fields has general microbiology equipment, anaerobic gassing stations in two lab spaces, Shimadzu UV-VIS spectrophotometer, Ultra-Centrifuge, Anaerobic Chamber, biofilm reactors, protein and DNA electrophoresis, Qubit fluorometer, two Eppendorf Mastercylcers, incubators, laminar/fume hoods, microcentrifuges, table-top centrifuges, and a microcapillary gas chromatograph with dual TCDs. The lab has two light-cycle controlled photo-incubators as well as photo-bioreactors for the cultivation of algae and diatoms and maintains two -20°C freezers and three -70°C freezers for sample storage. Additionally, the lab has a large capacity refrigerated incubator (5-70°C) for temperature critical studies.

### Bacteriophage Pathobiology (PI: Pat Secor)

The Secor Lab investigates how bacteriophages reprogram bacterial physiology, shape biofilm architecture, and drive infection dynamics. They combine molecular genetics, high-resolution imaging, and biophysical and in vivo models to define phage-induced changes in virulence, immune interactions, and antibiotic tolerance. Their current projects span *Pseudomonas aeruginosa* chronic infections, phage-mediated inflammatory signaling in the gut, and phage-host regulation in vector-borne pathogens such as *Borrelia burgdorferi* and other spirochetes including *Leptospira*. Through this broad, systems-level approach, the Secor Lab advances the CBE's mission by uncovering fundamental mechanisms of biofilm behavior and developing phage-enabled strategies to modulate microbial biofilm communities.

### Biofilm and Biotechnology Laboratory (PI: Robin Gerlach)

Dr. Gerlach's laboratory is focused on biofilm- and biotechnology research related to industry, energy and the environment. Research and development activities related to the production of algal biofuels & bioproducts, biocement, extremophiles, and engineered living materials are ongoing. Dr. Gerlach's laboratories are equipped with fume hoods, biosafety cabinets permitting biosafety level 2 work, incubators, a variety of bio- and biofilm-reactors, raceways, chemostats, pumps (high and low pressure syringe and piston pumps, peristaltic pumps, impeller pumps), plate readers, pH, ORP and conductivity meters, balances, including an ultramicrobalance, a ThermoFisher gas chromatograph with autosampler and mass spectrometric detector (GC-MS), an automated titrator, an elemental (CHNS/O) analyzer, a thermogravimetric analyzer (EA), a Fourier Transform Infrared (FTIR) Spectrometer, and other equipment and materials necessary to support the research in Dr. Gerlach's research group.

### Medical Biofilm Laboratory (PI: Garth James)

The Medical Biofilm Laboratory (MBL) has earned a reputation for being a university lab that focuses on industrially relevant medical research and testing as it relates to biofilms. Dr. Garth James (PhD, microbiology) and Dr. Kelly Kirker (PhD, bioengineering) are the leaders of this respected and adaptable lab group. The MBL team also includes two full-time research associates and one undergraduate research assistant. In addition to conducting research in support of NIH and DOD grants, the MBL has completed projects for over 100 companies. These projects have included the evaluation of antimicrobial wound dressings, wound washes and surgical lavages; the development of single-species and polymicrobial in-vitro biofilm models including biofilm/cell culture models; the characterization of biofilms from human and animal specimens; the evaluation of venous access catheters, needleless connectors, peritoneal dialysis catheters, urinary catheters, and catheter lock solutions; the evaluation of cochlear implants, neurostimulators, and other implanted medical devices; the testing of novel antibiofilm compounds and biomaterials; and the evaluation of root canal irrigants, mouthwashes, and toothpastes. The MBL is a prime example of integration at the CBE, bringing together applied biomedical science, biofilm microbiology, industrial interaction, and student educational opportunities.

### Biofilm Persistence (PI: Laura Jennings)

The Jennings Lab investigates how bacteria in biofilms persist despite repeated antibiotic treatment and host immune pressure. Combining microbiology and genetic approaches, the lab defines how stress responses shape biofilm dynamics at the molecular and community levels. A major focus is the biofilm matrix, particularly bacterial polysaccharides, which are key drivers of resilience. The lab characterizes polysaccharide structure and function and develops tools to visualize specific matrix components within biofilms and at sites of infection. In parallel, the lab studies how bacterial epigenetics generates phenotypic diversity within biofilms, focusing on how DNA methylation alters gene expression to increase the chances of

survival under fluctuating conditions. Together, this work reveals how biofilm matrix construction and epigenetic regulation cooperate to drive biofilm persistence and highlights new targets for antibiofilm strategies.

### **Standardized Biofilm Methods Laboratory (PI: Chris Jones)**

The Standardized Biofilm Methods Laboratory (SBML) was designed to meet research and industry needs for standard analytical methods to evaluate innovative biofilm control technologies. SBML staff and students develop, validate, and publish quantitative methods for growing, treating, sampling, and analyzing biofilm bacteria. The SBML members work with international standard setting organizations (ASTM International, IBRG, and OECD) on the approval of biofilm methods by the standard setting community. Under a contract with the U.S. Environmental Protection Agency (EPA), the SBML provides statistical services relevant to the EPA's Office of Pesticide Programs Microbiology Laboratory Branch to assess the performance of antimicrobial test methods—including those for biofilm bacteria. The SBML received funding from the Burroughs Wellcome Foundation to develop a method for assessing the prevention of biofilm on surface modified urinary catheters. In addition, they conduct applied and fundamental research experiments and develop testing protocols for product specific applications. Methods include: design of reactor systems to simulate industrial/medical systems; growing biofilm and quantifying microbial abundances and activity; testing the efficacy of chemical constituents against biofilms; and microscopy and image analysis of biofilms. SBML staff offer customized biofilm methods training workshops for CBE students, collaborators, and industry clients.

### **Microbial Ecology and Biogeochemistry Laboratory (PI: Christine Foreman)**

Research in the Microbial Ecology and Biogeochemistry Laboratory ([www.foremanresearchgroup.com](http://www.foremanresearchgroup.com)) lies at the intersection of microbial and ecosystem ecology and uses a combination of field and laboratory studies, as well as approaches ranging from the single cell to the community level. Researchers in this lab have expertise in microbiology, molecular biology, biofilms, organic carbon characterization, and instrument validation for life detection. They are interested in understanding how the environment controls the composition of microbial communities and how, in turn, those microbes regulate whole ecosystem processes such as nutrient and organic matter cycling. Ongoing research examines carbon flux through microbial communities, with the long-term goal of improving predictions of carbon fate (metabolism to CO<sub>2</sub>, sequestration into biomass, long-term storage in ice) in the context of a changing environment. Additionally, they are interested in physiological adaptations to life in extreme environments, as extremophiles are natural resources for the discovery of pigments, biosurfactants, novel enzymes, and other bioactive compounds of biotechnological relevance.

### **Biometric Heterogeneous Catalysts Laboratory (PI: James Crawford)**

The Crawford lab investigates the fundamental interactions between engineered surfaces and adsorbates/reactants. Their group is focused on a central theme of developing biomimetic abiotic materials that tolerate the extreme conditions found in many industrial settings. They synthesize engineered microporous materials including metal-organic frameworks, zeolites, and porous carbons, developing throughlines between natural and synthetic catalysts. Employing a wide range of in situ spectroscopic measurements, they are able to qualitatively and quantitatively measure the similarity between biological and heterogeneous catalysts. Specifically, they utilize in situ diffuse reflectance UV-VIS and infrared spectroscopy to probe their catalyst surfaces. They couple these in situ capabilities with online mass spectrometers to interrogate catalyst mechanisms and fundamental surface properties including acidity, basicity, dispersion, pore volume, pore size, and more.

### **OTHER Montana State University facilities available for collaborative research**

<https://www.montana.edu/research/corefacilities/red-cf.html>

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