

Center for Biofilm Engineering
News Update:
September 2016
Volume 19, Issue 3

Industry Highlights

Highlights from the July 2016 Montana Biofilm Meeting

Eighty-seven industry representatives and academic visitors met in Bozeman for updates and discussion about recent developments in biofilm science and engineering. The July 2016 Montana Biofilm Science and Technology Meeting included presentations on fungal biofilms, industrial biofilms, methods, multi-species biofilms, wounds, and device-related biofilms. CBE's open house, held on the afternoon of Tuesday, July 19, provided opportunities for interaction through lab demonstrations and poster presentations. Attendees experienced hands-on learning in several CBE labs including standard methods, biofilm control, medical biofilms, and microbial ecology. The CBE also hosted a pre-meeting workshop on Monday, July 18 "The Scale of Biofilm Studies."

The next CBE biofilm science and technology meeting "Pathways to Product Development," will be held in Washington D.C. January 31–February 1, 2017. Registration will open at the beginning of November 2016.

The July 2017 Montana Biofilm Science and Technology Meeting is scheduled for July 18–20 in Bozeman. Agenda and registration will be available starting May 2017.

For more information on both meetings, please contact Paul Sturman (paul_s@montana.edu)

Links to the July meeting agendas:

[Meeting agenda](#) (pdf)

[Workshop agenda](#) (pdf)

Research Highlights

MSU team recognized for technology that seals oil and gas leaks

CBE faculty **Adrienne Phillips**, **Robin Gerlach**, and **Al Cunningham** were recently featured by *MSU News* for their research that has demonstrated the potential for biofilm and mineral-

producing bacteria to stop tiny, hard-to-reach leaks in underground oil and gas wells. Read the article at *MSU News*: [MSU team shows biofilm and mineral-producing bacteria have potential for plugging oil and gas leaks](#)

The story was also featured in the *Bozeman Daily Chronicle*: [MSU research shows bacteria could plug oil and gas leaks](#)

CBE biostatistician part of landmark study correlating hand-washing and health insurance claims

Al Parker, CBE biostatistician, provided statistical analysis on an important study that is the first to prove a direct link between the availability of a comprehensive hand hygiene program and a reduction in healthcare insurance claims tied to hand hygiene preventable illnesses. The study was conducted by Medical Mutual of Ohio and GOJO, a leading producer of skin health and hygiene solutions for commercial use. The full article “Impact of a comprehensive workplace hand hygiene program on employer healthcare insurance claims plus costs, absenteeism, and employee perceptions and practices,” is featured in the June 2016 issue of *Journal of Occupational and Environmental Medicine*.

Related press release: [PURELL® hand sanitizer and hand sanitizing wipes in workplace helped reduce healthcare insurance claims for cold and flu by 24%](#)

Citation: Arbogast JW, Moore-Schiltz L, Jarvis WR, Harpster-Hagen A, Hughes J, Parker A, “Impact of a comprehensive workplace hand hygiene program on employer healthcare insurance claims plus costs, absenteeism, and employee perceptions and practices,” *J Occup Environ Med*. 2016 Jun; 58(6):e231–e240.

CBE faculty member to study biofilms and draught beer lines

CBE faculty **Darla Goeres**, associate research professor in chemical and biological engineering, recently partnered with the Brewers Association and NSF International Applied Research Center (ARC) to conduct a draught beer line study. This groundbreaking study will draw on the combined expertise of the ARC and the CBE, which includes decades of experience researching biofilm in industrial settings and internationally recognized quality standards related to public health and sanitation. “By combining the method development expertise of the CBE with the unique, rapid testing ability of the NSF International Applied Research Center, we are confident that a reliable, reproducible method will be created to assist the brewing industry with an effective draught beer line standard cleaning method,” stated Goeres.

Read more about this project at: [BA addresses draught beer quality best practices with groundbreaking study](#)

CBE researchers receive grant to address water issues on Crow Reservation

CBE researchers **Mari Eggers**, research scientist, and **Anne Camper**, Regents Professor in civil engineering, are part of a team that recently received a \$5 million grant to address well water issues on the Crow Reservation in southeastern Montana.

Read the full story at *MSU News*: [MSU, Little Big Horn College researchers receive grant to address well water issues on Crow Reservation](#)

Latest Publications

Arbogast JW, Moore-Schiltz L, Jarvis WR, Harpster-Hagen A, Hughes J, **Parker A**
“Impact of a comprehensive workplace hand hygiene program on employer healthcare insurance claims plus costs, absenteeism, and employee perceptions and practices”
J Occup Environ Med. 2016 Jun; 58(6):e231–e240.

[Read abstract](#)

Beck A, Hunt KA, Bernstein HC, Carlson RP

Book chapter: “Interpreting and designing microbial communities for bioprocess applications, from components to interactions to emergent properties”

Book title: Biotechnologies for Biofuel Production and Optimization, 1st edition.

Eckert CA, Trinh CT (eds.) Elsevier 2016; pp. 407–432.

[Read abstract](#)

Bell TA, Prithiviraj B, Wahlen BD, Fields MW, Peyton BM

“A lipid-accumulating alga maintains growth in outdoor, alkaliphilic raceway pond with mixed microbial communities”

Front Microbiol. 2016 Jan 7; 6:1480.

[Read abstract](#)

Carlson RP, Oshota O, Shipman M, Caserta JA, Hu P, Saunders CW, Xu J, Jay ZJ, Reeder N, Richards A, Pettigrew C, Peyton BM

“Integrated molecular, physiological, and in silico characterization of two Halomonas isolates from industrial brine”

Extremophiles 2016 May; 20(3):261–74.

[Read abstract](#)

Maier RS, Nybo E, **Seymour JD, Codd SL**

“Electroosmotic flow and dispersion in open and closed porous media”

Transp Porous Med., 2016 May; 113(1): 67–89.

[Read abstract](#)

Richards CL, Broadaway SC, **Eggers MJ**, Doyle JT, Pyle BH, **Camper AK**, Ford TE

“Detection of pathogenic and non-pathogenic bacteria in drinking water and associated biofilms on the Crow Reservation, Montana, USA”

Microb Ecol., 2015; Mar 22. [Epub ahead of print] PubMed PMID: 25796498.

[Read abstract](#)

Phillips AJ, Cunningham AB, Gerlach R, Hiebert R, Hwang C, Lomans BP, Westrich J, Mantilla C, Kirksey J, Esposito R, Spangler L

“Fracture sealing with microbially-induced calcium carbonate precipitation: A field study”

Environ Sci Technol. 2016; 50(7) pp. 4111–4117.

[Read abstract](#)

Santillana GE, Smith HJ, Burr M, Camper AK

“Archaeal ammonium oxidation coupled with bacterial nitrite oxidation in a simulated drinking water premise plumbing system”

Environ. Sci.: Water Res. Technol. 2016 July; 2: 658–669.

[Read abstract](#)

Smith HJ, Foreman CM, Akiyama T, Franklin MJ, Devitt NP, Ramaraj T

“Genome sequence of *Janthinobacterium sp.* CG23_2, a violacein-producing isolate from an Antarctic supraglacial stream”

Genome Announc. 2016 Jan-Feb; 4(1).

[Read abstract](#)

Smith HJ, Schmit A, Foster R, Littmann S, Kuypers MMM, Foreman CM

“Biofilms on glacial surfaces: Hotspots for biological activity”

npj Biofilms and Microbiomes 2016 June; (2):16008.

[Read abstract](#)

Stewart PS, Zhang T, Xu R, Pitts B, Walters MC, Roe F, Kikhney J, Moter A

“Reaction–diffusion theory explains hypoxia and heterogeneous growth within microbial biofilms associated with chronic infections”

npj Biofilms and Microbiomes 2016 June; (2):16012.

[Read abstract](#)

Teske A, de Beer D, McKay LJ, Tivey MK, Biddle JF, Hoer D, Lloyd KG, Lever MA, Røy H, Albert DB, Mendlovitz HP, MacGregor BJ

“The Guaymas Basin hiking guide to hydrothermal mounds, chimneys, and microbial mats: Complex seafloor expressions of subsurface hydrothermal circulation”

Front Microbiol., 2016 Feb 18; 7:75.

[Read abstract](#)

Villa F, Stewart PS, Klapper I, Jacob JM, Cappitelli F

“Subaerial biofilms on outdoor stone monuments: Changing the perspective towards an ecological framework”

Bioscience 2016 April 1; 66(4): 285–294.

[Read abstract](#)

Education

MSU-CBE students awarded fellowships from the National Science Foundation (NSF)

NSF's East Asia and Pacific Summer Institutes Program (EAPSI)

The NSF EAPSI award provides U.S. graduate students in science, engineering, and education first-hand research experiences in Australia, China, Japan, Korea, New Zealand, Singapore, or Taiwan; an introduction to the science, science policy, and scientific infrastructure of the respective location; and an orientation to the society, culture, and language. It is expected that EAPSI awards will help students initiate professional relationships to enable future collaboration with foreign counterparts. MSU-CBE recipients are:

Sarah Mailhiot, PhD student, mechanical & industrial engineering

Visiting university: Victoria University of Wellington in New Zealand

Research project: How collagen in human joint cartilage affects fluid-solid interactions

MSU advisors: Drs. Ron June, mechanical & industrial engineering, Joe Seymour, chemical & biological engineering, and Jennifer Brown, associate professor, chemical & biological engineering

Jeffery Simkins, PhD student, chemical & biological engineering

Visiting university: University of Western Australia in Perth

Research project: Non-invasive magnetic resonance method for detection of biofouling (microbial degradation) in reverse osmosis membranes.

MSU advisors: Drs. Phil Stewart and Joe Seymour both professors in chemical & biological engineering

NSF's Graduate Research Opportunities Worldwide Program (GROW)

The GROW program is a collaboration between NSF and international partners to provide NSF Graduate Research Fellows with expanded opportunities to enhance professional development through research collaborations at top-caliber science and engineering research sites overseas. MSU-CBE recipient:

Cat Kirkland, PhD student, chemical & biological engineering

Visiting university: Delft University of Technology, Delft, The Netherlands

Research project: Using magnetic resonance imaging to probe the internal structure and mass transfer properties of aerobic granular sludge (AGS).

MSU advisor: Dr. Sarah Codd, professor in mechanical & industrial engineering

NSF's Graduate Research Fellowship

This NSF program recognizes and supports outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based Master's and doctoral degrees at accredited US institutions. MSU-CBE recipient:

Eric Troyer, 2016 graduate, bachelor's degree in Chemical & Biological Engineering
Area of study: Using microorganisms to remediate contaminated groundwater
Graduate school: University of California at Berkeley

Thesis Alert

“Ultra high-throughput fluorescence detection for single cell applications in drop microfluidics,” successful thesis defense by **Robert Schaefer**, Masters candidate, chemical & biological engineering, June 2016.

[Read abstract](#)

“Effects of Triclosan exposure on nitrification in activated sludge, biofilms, and pure cultures of nitrifying bacteria,” successful thesis defense by **Kylie Bodle**, Masters candidate, civil engineering, July 2016.

[Read abstract](#)

View [thesis database](#)

Employee News

New Staff

The CBE recently welcomed three new staff:

Niranjan Ghimire is a postdoctoral researcher working for Dr. Phil Stewart, professor of chemical and biological engineering. Niranjan earned his PhD in biomedical engineering from the University of South Dakota in May 2016. His research focus was developing antimicrobial orthopedic titanium material. Most recently, Niranjan worked as a research assistant in the Department of Biomedical Engineering at the University of South Dakota. While at the CBE, he will be researching neutrophil-biofilm interactions in Dr. Stewart's lab. Niranjan hails from Bharatpur in Chitwan district, Nepal. When he's not in the lab, Niranjan likes to watch soccer and play tennis.

Roland Hatzenpichler is an assistant research professor in MSU's Department of Microbiology & Immunology. He received his PhD in microbial ecology from the University of Vienna in Austria in 2011, and recently completed a postdoctoral scholar position in geobiology at the California Institute of Technology. Roland's research interest is in the function and activity of the “uncultivated majority” of microorganisms, and how their physiology impacts the environment across a range of scales, from micron to global. For more information on Roland's work visit his website: www.environmental-microbiology.com

Coltran Hophan-Nichols joined the CBE as a computer systems analyst. Coltran graduated from Montana State University in May 2015 with a bachelor's degree in computer science. He has over four years of work experience in the information technology sector, both in operations

and customer service. Coltran will be the CBE's go-to person for IT analysis and support including desktop and server support, security, computer hardware and devices, and user training. In his free time, Coltran enjoys Montana's outdoor activities including skiing, mountain biking, and hiking.

Outreach

Standardized Biofilm Methods training videos now online

The Center for Biofilm Engineering, in collaboration with Montana State University's Department of Visual Media and BioSurface Technologies, is excited to announce the first series of Standardized Biofilm Methods training videos. Continuing the technology transfer initiative that began with the CBE's [Knowledge Sharing Articles](#), which describe the statistical calculations associated with standardized methods development, the Standardized Biofilm Methods Training Videos are designed to assist researchers in the set-up and operation of the biofilm reactors referenced in the ASTM Standard Methods and the BioSurface Technologies Operators Manuals. Read more at: <http://www.biofilm.montana.edu/standardized-biofilm-methods-training-videos.html>

MSU American Indian Research Opportunities (AIRO) BRIDGES program

James Vallie worked at the CBE in summer 2016 as part of the American Indian Research Opportunities (AIRO) BRIDGES program. The program's objective is to build an educational experience between reservation-based colleges and Montana State University and, in the process, increase the number of underrepresented Native American students successfully transferring from the two-year tribal colleges to MSU and pursuing academic studies in the biomedical and other health-related sciences. Vallie earned his associates degree in business from Little Big Horn College in Crow Agency, Montana. While in the BRIDGES program, he studied algal biofuels under Dr. **Brent Peyton**, professor of chemical and biological engineering. Vallie is now enrolled as a student at Montana State University and will continue his work studying alternative fuel resources.

CBE visiting researcher explains black film on Jefferson Memorial

Dr. **Federica Villa**, long-time CBE visiting researcher from the University of Milan, was recently featured in an article in the *Washington Post*. The article "A grimy, black biofilm is starting to cover the Jefferson Memorial, and it can't be killed," focuses on the research that Villa and her collaborators at the US National Park Service are doing on national monuments. They are evaluating the black film that is appearing on many stone monuments and if the film will cause damage to the structures or could be a protective barrier.

Read more at the *Washington Post*: [A grimy, black biofilm is starting to cover the Jefferson Memorial, and it can't be killed](#)

CBE Industrial/Agency visits

Diane Walker, CBE research engineer, made two visits in Missoula, MT, on May 18, 2016. Walker visited with Cliff Bradley, president of Montana BioAgriculture, Inc. and Andrea Stierle, research professor in University of Montana's Department of Biomedical & Pharmaceutical Sciences.

Phil Stewart visited 3M and presented "The science of biofilm control with antimicrobial agents," in St. Paul, MN on May 19, 2016.

Visiting Scholars

CBE is pleased to welcome the following visiting scholar:

Maria Clara Tarifa, PhD student

Hometown: Bahia Blanca, Buenos Aires, Argentina

Area of study/Home university: Biology, Universidad Nacional Del Sur, Bahia Blanca, Buenos Aires, Argentina

Research at the CBE: Microrheology of yeast biofilms

CBE Supervisor: **Phil Stewart**, professor, chemical & biological engineering

Industrial/Agency Visitors

On May 19, 2016, CBE affiliated faculty member **Garth James**, associate professor in chemical and biological engineering, hosted Dr. **Ondrej Slaby** of Masaryk University Central European Institute of Technology, in Brno, Czech Republic, and Dr. **Manu N. Capoor** of Rockefeller University Lab of Bacterial Pathogenesis and Immunology, in New York, New York. The guests toured the Center and discussed possible testing projects.

CBE tours

July 24, 2016:

Fifteen undergraduates from the China University of Geosciences in Beijing

Sponsor: MSU's Office of International Programs

CBE Hosts: **Shipeng Lu**, CBE postdoctoral researcher and **Kristen Brileya**, CBE technical operations manager

People in Action

Phil Stewart, professor, chemical & biological engineering, presented “The biofilm defense: Physics, chemistry, biology,” at University of Minnesota, Minneapolis, MN, May 20, 2016.

Juliana D’Andrilli, assistant research professor, chemical & biological engineering, delivered an oral presentation “Integrating chemistry, microbiology, and ecosystem ecology to discern the nature and fate of dissolved organic matter in streams,” at Society for Freshwater Science, Sacramento, CA, May 22–26, 2016.

Heidi Smith, postdoctoral research associate, presented “Microbial formation of labile organic matter” at Environmental Sciences: Waters Gordon Research Conference, Holderness School, Boston, MA, June 24–July 1, 2016.

The following CBE researchers presented their work at Goldschmidt Conference, Yokohama Japan, June 26–July 1, 2017:

Marnie Feder, CBE postdoctoral researcher, presented “Advancing ureolysis driven mineral sealing strategies for environmental engineering applications.”

Robin Gerlach, professor, chemical & biological engineering, presented “Biofilm-mediated mineral precipitation technology—From the microscale to the field-scale.”

Matthew Fields, CBE director, presented “Does forced cooperation lead to improved productivity in a multispecies biofilm?” at Biofilms7 Conference, Porto, Portugal, June 26–28, 2016.

The following CBE PhD students presented research at 6th Annual Conference on Algal, Biomass, Biofuels, and Bioproducts, June 26–29, San Diego, CA:

Tisza Bell, PhD student, microbiology & immunology, platform presentation “Monitoring community ecology in wastewater treatment lagoons for the production of algal biodiesel.”

Karen Moll, PhD student, microbiology & immunology, presented the poster “Genomics of novel high biofuel-producing diatom.”

Muneeb Rathore, PhD student, chemical & biological engineering, presented two posters: “Novel algal biofilm reactor with harvesting mechanism for enhanced biomass production” and “Promoting lipid accumulation in *Chlorella vulgaris* UTEX395 using nitrogen limitation and bicarbonate amendment under different nitrogen regimes.”

Adrienne Phillips, assistant professor, civil engineering, presented a poster “Biom mineralization: A promising method to improving wellbore integrity,” at the Workshop on Well Integrity for Natural Gas Storage in Depleted Reservoirs and Aquifers, Denver, CO, July 12–13, 2016.

The following CBE researchers presented at the Ecosystems and Networks Integrated with Genes and Molecular Assemblies (ENIGMA) meeting in Berkeley, CA, August 1–6, 2016:

Sara Altenburg, CBE research lab manager, presented the poster “Particle size impacts carrying-capacity for biofilm via reduction of free pore space and limitation for required resource ratio.”

Laura Camilleri, PhD candidate, microbiology & immunology, presented the poster “Differential activity levels for bacterial and archaeal populations in an interdomain biofilm.”

Matthew Fields, CBE director, delivered an oral presentation “Soil particle mesogenomics—‘Microparticles’.”

Lauren Franco, PhD candidate, microbiology & immunology, presented the poster “Resource ratio impacts *Desulfovibrio vulgaris* reduction and response to Cr(VI).”

Gregory Krantz, PhD candidate, microbiology & immunology, presented the poster “Bulk phase resource ratio alters electron transfer mechanisms in sulfate-reducing biofilms grown on metal.”

Gregory Krantz also presented “Bulk phase resource ratio alters electron transfer mechanisms in sulfate-reducing biofilms grown on metal” at the International Symposium on Microbial Ecology (ISME) Conference in Montreal, Quebec, Canada, August 21-26 2016.

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