

# The CBE at MSU leads the world in researching deadly, costly biofilms



The Center for Biofilm Engineering leads the world in discovering how biofilms – microbial communities protected by a self-produced slime – function. Every day we learn more about how to mitigate the many ways these biofilms wreak havoc on human health, infrastructure, industry, and Earth's ecology. Until recently, scientists only knew microbes to exist as planktonic, or free-floating, beings. However, scientists around the world are discovering what we at the CBE have known for decades: There are more microbes living in biofilms – than living planktonically. Disinfectants and other mitigation methods that work well fighting planktonic bacteria are far less effective combatting those living within biofilms. This new fundamental understanding of microbes' preferred living condition is critical to reducing their destructive impact on our world.

## 3 REASONS WE ARE THE GLOBAL LEADER

### We created the field of biofilm research

Biofilm research did not exist as a field of scientific inquiry until 1990, when the Center for Biofilm Engineering was established at Montana State University.

### We lead the world in publications & citations

Our researchers publish more biofilm-related publications than any other biofilm research center in the world. We are also the global leader in citations.

### Females have been leaders since Day 1

The CBE has championed female leaders long before "Women in STEM" became a hashtag. Today, 65% of our students are female, as are half of our faculty.

## EXAMPLES OF BIOFILMS AFFECTING OUR LIVES



### Healthcare

Biofilms contribute heavily to hospital-acquired infections. One in 25 hospital patients will experience an infection caused by their medical care, and 1 in 9 of those patients will die during their stay. The direct and indirect costs from HAIs in the US are estimated to be \$118 million PER DAY!



### Surfaces

Destructive biofilms live just about everywhere there is moisture, including your home, plumbing devices, and artificial joints and implants. Even the International Space Station! And they are notoriously hard to kill or remove. We are working to change this.



### Regulatory Leadership

The CBE developed a biofilm-testing method approved by the US EPA that products must pass before they can make a biofilm-removal claim about their product.



### Greenhouse Gasses

Concrete and its production contributes a staggering 8% of all greenhouse gasses in our atmosphere. Thus, we are upcycling discarded plastic with calcifying biofilms to create an eco-concrete without sacrificing strength. We also recognize that fossil fuels are leading sources of harmful greenhouse gasses contributing to climate change. That's why the CBE is actively developing promising new technologies to make biofuels an eco-friendly alternative to oil and its byproducts.



### Industrial Interests

From biocorrosion that caused \$500 billion in damage worldwide in 2015, to municipalities' costly struggle to keep our drinking water clean, biofilms are viscous foes in industrial settings. These and dozens of other concerns are why companies from a broad swath of sectors and government entities pay up to \$35,000 each year to participate in our highly successful Industrial Associates program.

## CREATING SUCCESS ONE STUDENT AT A TIME

Madelyn Mettler joined the CBE as an undergraduate researcher. Today, she is a PhD student at the CBE helping NASA put footprints on Mars.

Maddie is one of 113 students working to find real-world solutions to biofilm problems in one of our 12 labs. Each of these students contribute meaningfully to our transdisciplinary research. Our students work daily with researchers from multiple departments at MSU, instilling into them that collaboration is their most important research tool.



And thanks to our highly successful Industrial Associates program, our students have the opportunity to work with – and present to – Fortune 500 companies and small-business Industrial Associates alike. And when they graduate, they have potential employers they know will be happy to provide references – and possibly a job.

And those potential employers will undoubtedly appreciate the fact that our students' lab experiences include hands-on work in our field-leading bioimaging facility that recently underwent a \$2.75 million upgrade.