



CENTER FOR  
BIOFILM  
ENGINEERING

**Matthew W. Fields, PhD**

Director

matthew.fields@montana.edu

406-994-7340

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The CBE is the  
world's first, largest,  
and best-known  
biofilm research center

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CBE researchers have been  
cited ~60,000 times, far  
exceeding any other biofilm  
research center

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CBE Industrial Associates help  
steer research projects toward  
real-world solutions  
to real-world problems

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1,087 graduate  
and undergraduate students  
have trained at the  
CBE since 1990.

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 **MONTANA**  
STATE UNIVERSITY  
[www.biofilm.montana.edu](http://www.biofilm.montana.edu)

*Biofilms are 3.4 billion years old.*

*Biofilm research is 30 years old.*

# It's urgent that we catch up.

Biofilms are collections of microscopic organisms – often harmful – that live out their lives in self-produced slime. The research being conducted at the Center for Biofilm Engineering at Montana State University is defining this emerging field of science. Our researchers are providing an understanding into a self-created ecosystem that arguably harbors more than half of the world's bacteria. Yet, everyday, physicians and engineers alike use tools and techniques that are simply incapable of preventing symptoms and damages that stem directly from biofilms. Learn more about biofilms at <http://bit.ly/cbe-documentary>.



CBE Documentary

## Biofilms are notoriously difficult to control



Biofilm's slime is remarkably effective at protecting the microbes contained within from disinfectants and antibiotics while making its removal, at times, impossible. Whether it's emerging antimicrobial products or coatings designed to prevent them from forming on surfaces, the CBE works with industry and governments alike to develop and test biofilm control strategies. In fact, the CBE developed the standard method the U.S. EPA requires companies use to test the efficacy of anti-biofilm products.

## Biofilms create costly – and deadly – medical problems

Biofilms in urinary catheters are responsible for 13,000 deaths nationally and add \$340 million to treatment costs annually. Similarly, biofilms are often the reason chronic wounds such as diabetes-related foot ulcers fail to heal. But few clinicians know this. Every day, well-meaning physicians enact hopelessly ineffective treatments that all too often lead to amputations when biofilm-centric protocols may have enabled the wounds to heal – *potentially saving 296 limbs per day in the U.S. alone.*



## \$500 billion spent annually in fight against biocorrosion



In 2013, the U.S. government and private industry combined to spend \$500 billion fighting biofilm-related metal corrosion in pipes and elsewhere – that's equivalent to 3 percent of the U.S. GDP! CBE researchers are working toward solutions to this global problem every day. The CBE is also working to keep drinking water safe from biofilms.

## CBE develops microbes to seal leaking oil wells

Some biofilms can be beneficial. For instance, the CBE recently engineered a biofilm capable of sealing leaking gas and oil wells hundreds of feet below ground. This technology, which has significant commercial potential, is part of an emerging field that engineers microbes for a task. Research into biofilm-based alternative fuel sources currently being undertaken at CBE also shows promise.



**To support this critical research, please contact  
Matthew Fields at [matthew.fields@montana.edu](mailto:matthew.fields@montana.edu)**