1077-92-2794 **Jared A. Hicks*** (jared.hicks@northwestern.edu), Engineering Sciences and Applied Mathematics, Northwestern University, 2145 Sheridan Road, Evanston, IL 60208-3125, and **David L. Chopp**. *A continuum model for the simultaneous growth and deformation of biofilms.*

Bacterial biofilms are aggregates of cells that adhere to solid/fluid interfaces. While many biofilms have harmful effects, including industrial damage and nosocomial infection, certain species are now generating renewable energy in Microbial Fuel Cells (MFCs). In a MFC, bacteria consume organic waste and, as they respire, produce electrons. To do so efficiently, the bacteria must operate at peak metabolic activity, for which they require an ample nutrient supply. But existing MFCs face several nutrient delivery problems, including clogging and downstream depletion.

Ameliorating these problems will require a better understanding of the interplay between structural evolution and the surrounding fluid flow. In addition to delivering nutrients that affect biofilm growth, the fluid exerts stresses that cause erosion and deformation. These structural changes, in turn, affect the flow and alter the nutrient distribution. To capture this feedback, we have developed a novel continuum model that couples the growth and deformation processes. Our model augments an existing growth model with evolution equations derived from morphoelasticity theory. These models track the evolving biofilm surface using a combination of the level-set method and the eXtended Finite Element Method (XFEM). (Received September 22, 2011)