DEPARTMENT OF AEROSPACE ENGINEERING  
COLLEGE OF ENGINEERING  
SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE WOMEN  
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PROJECT TITLE: 2. Combustion Control and Flameless Combustion

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Project Description

Considerable amount of work in the area of passive and active combustion control for gaseous and liquid fueled combustion has been reported during the last two decades. These studies have dealt mostly with bluff-body-stabilized combustor and dump combustors where the recirculation induced by a bluff-body or by a sudden expansion is used to stabilize the flame and were more recently extended to swirl stabilized combustors. Active control strategies have been used to suppress thermo-acoustic instabilities resulting from a coupling between the heat release and the acoustic modes in the combustor. These control strategies have generally relied on modulating the fuel injection and phase shifting it so as to decouple the pressure rise and heat release with respect to each other. Control strategies have also looked at improving fuel efficiency and reducing pollutants, and in extending flammability limits. Our research deals with the control of gas-turbine gaseous and liquid fuel combustors with swirlers, bluff body stabilizers and distributed fuel injection for rapid mixing and stabilization. It focuses on investigating the mixing patterns and flame structure in these combustors and developing control strategies for improved performance of gas-turbine combustors.