ENGINEERING ABSTRACT

(civil engineering)

Design and Construction of a Control System
for Wind-Sensitive Structures

In a simplified sense, a tuned mass damper (TMD) is a mechanical device consisting of a mass, a spring, and some type of damper. With variations to its design, the TMD is used in many large flexible structures to reduce dynamic effects. This undergraduate research project focuses primarily on the use of TMDs to alleviate the dynamic effects of wind loading on civil engineering structures. To understand dynamic wind loading, the nature of wind loads and how they excite structures are closely investigated. Furthermore, examples are given of existing buildings that utilize TMDs, and structures that failed because they did not have them.

Lars Wagner '03

Third Place, 2003 Undergraduate Research Symposium

LIBERAL ARTS ABSTRACT

(history)

The Boer War and the American Civil War:
A Comparison of Women's Support of the War

Facing an opponent whose military and economic capabilities far exceeded its own, both the Boers in 1899 and the Confederacy in the 1860's needed to draw from every possible resource at their disposal. History has traditionally recognized the contribution of women in both societies as pivotal factors in prolonging the war effort. Indeed, female support for their husbands, particularly at the beginning of the conflict, was instrumental in maintaining the men's effectiveness in the field. Derived from an almost religious backing for the "cause", women provided economic stability and a base of political legitimacy for their respective nations. That support persisted through drastic social upheaval in which their very ways of life were threatened.

Thus the image of the faithful Southern plantation wife and the fierce Afrikaner protecting the commando's farm has been ingrained into popular memory. However, by no means is that classic conception entirely accurate. Rather the nature and extent of Boer and Confederate support was intensely varied and logically could not have been as one-sided as postwar hagiography might suggest. The "Bread Riots" of 1863 and the inevitable effects of the British concentration camps are merely the most famous examples of the resiliency of womanhood being tested in each culture.

This paper will attempt to analyze the role of women from a more balanced perspective.

Charles Cowherd '03

First Place, 2003 Undergraduate Research Symposium

SCIENCE ABSTRACT

(biology)

Induction of Autogamy in Paramecium: Apoptosis Like Nuclear Degeneration in a Unicellular Organism

Paramecium tetraurelia can be induced to enter autogamy, an apoptosis-like nuclear degeneration, when they are deprived of nutrients. The mechanisms that drive this nuclear degeneration in ciliates have not been characterized. A well-fed culture will show few cells in a state of autogamy. Cells that do show signs of a degraded macronucleus after being introduced to freshly bacterized media probably have not been through sufficient cell divisions to clear the macronuclear debris from a previous autogamous division. We have found that by two days post-introduction to bacterized media that most cells have been through enough fission events to clear the evidence of starvation-induced autogamy. We have decided that these cells are the best candidates to study the mechanisms that initiate starvation-induced autogamy. Our data indicate that a significant (40%) number of cells from these cultures will enter autogamy between twelve and twenty-four hours of starvation. Fluorescent caspase inhibitors show that caspase activity may be present in Paramecium at the twenty-four hour starvation point. We believe that a caspase may play a critical role in this nuclear degeneration. A time-course study must be initiated throughout the starvation period, in conjunction with studies inhibiting autogamy with caspase inhibitors, before significant conclusions about the mechanisms initiating autogamy can be fully understood.

James Maxey '03

Second Place, 2003 Undergraduate Research Symposium

CROSS-DISCIPLINE ABSTRACT

(mechanical engineering/biology)

Computer Simulation of a Thrombotic Femoral Artery

The purpose of this project is to show the potential for using a computer model in place of an experimental model to analyze blood pressure on a thrombotic femoral artery wall with and without a stent. The analysis consists of constructing a finite volume CFD model using FLUENT/UNS along with an experimental representation of the model. The experimental model was used to validate the results given by the FLUENT simulation. The key elements in the experimental model are the artery test section, stent, and fluid. The test section was constructed out of machining wax. An epoxy mold was then made around the wax which was subsequently melted out. The epoxy provided a hard enough surface on which to place pressure transducers for the measurement of pressure along the artery. In order to correctly model blood, a fluid with a similar viscosity to that of blood was used. The four fluids selected for use were: glycerol, glycerin, olive oil, and corn syrup. A simple spring was used to approximate the effect of a stent on artery wall pressure. It was anticipated that when this spring was placed in the test section, pressure on the artery wall would decrease.

Dennis Drinkwater '03 & Scott Trask '03

2003 Undergraduate Research Symposium