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Tuesday, April 9, 2002

University Research Scholar project abstracts

The following information highlights the abstracts submitted by the students selected for University Research Scholar awards on March 25.

OU Student:
Timothy Bruggeman, Department of Biological Sciences
Faculty Mentor:
Professor Rasul Chaudhry, Department of Biological Sciences
Project:
Isolation and Characterization of Putatively Detoxifying Plasmids from Pseudomonas sp. 50432
Abstract:
Pseudomonas sp. 50432 has been shown to detoxify a widely used pesticide, carbofuran, which is a potent inhibitor of acetylcholinesterase and highly toxic. Study of the Pseudomonas sp. has shown that carbofuran is degraded both by hydrolytic and oxidative pathways into metabolites, which also may be toxic. Therefore, it is important to understand the biochemical mechanisms and genetic determinants involved in the detoxification of carbofuron in this organism. Previous investigations of this bacteria have shown that it contains at least seven plasmids of various sizes. We hypothesize that some or all of these plasmids carry genes for the degradation of carbofuran. I propose isolating all seven of these plasmids as a first step towards characterizing their structure and function.

OU Student:
Allen Comfort, School of Engineering and Computer Science
Faculty Mentor:
Professor Gary Barber, School of Engineering and Computer Science
Project:
Characterization of Heavy-Duty Diesel Engine Frictional Properties Affecting Fuel Efficiency
Abstract:
The goal of the proposed research is to characterize the frictional losses of heavy-duty diesel engines. This information will be important to the development of bench tests to discriminate between heavy-duty diesel engine oils on the basis of their energy conserving properties. Research methods will include a comprehensive review of the scientific literature, followed by a systematic breakdown of a modern diesel engine into subsystems, and an analysis of each subsystem to identify its basic frictional characteristics and their contribution to efficiency loss.

OU Student:
Pulak Ghosh, Department of Mathematics and Statistics
Faculty Mentor:
Professor Ravindra Khattree, Department of Mathematics and Statistics
Project:
A Bayesian Approach to Bioequivalence
Abstract:
In recent years, bioavailability studies for assessment of bioequivalence between two or more formulation of a drug have become very popular in drug development. However the current practice for the assessment of bioequivalence suffers from some serious drawback. For example, sometimes these tests fail to control the consumer's risk. In this work, a new methodology for solving bioequivalence problem will be proposed. We will show how our method can be applied to complex bioequivalence problem that have received little attention in the literature. We will compare our findings with the existing methods by using certain real data sets from FDA.

OU Student:
Charles Gross, Department of Art and Art History
Faculty Mentor:
Professor Tamara Machmut-Jhash, Department of Art and Art History
Project:
Russian Icon Exhibit

Abstract:

The project will be a Russian icon exhibit at Meadow Brook Art Gallery. The show has been scheduled to appear in the gallery during February and March of 2003. The icons that will be exhibited will be drawn upon from a local collection. Research will be necessary to identify and categorize the icons to create a cohesive and logical exhibition.

OU Student:

Yelena Isayenko, Department of Chemistry

Faculty Mentor:

Professor Roman Dembinski, Department of Chemistry

Project:

Design and Synthesis of multicyclic Modified Nucleosides as Potential Antiviral Drugs

Abstract:

To come

OU Student:

Nick Jacobson, Department of Chemistry

Faculty Mentors:

Professor Maria Bryant and Professor Mark Severson, Department of Chemistry.

Project:

Monte Carlo Simulations of Van der Waals Clusters with Many-Body Potentials

Abstract:

This project will involve simulations of the process of solvation of the water molecule by Ar atoms from the first principles—by combining the ab initio electronic structure theory with diffusion Monte Carlo approach. The ground-states of clusters of varying size will be calculated using the potential energy functions evaluated by highly-accurate ab initio calculations and fitted to an appropriate analytical form. All previous simulations of such systems used only pair-wise potential functions. This work will for the first time attempt to include the three-body interactions into the potential energy. These three-body interactions are very important to the structural and dynamical properties of van der Waals clusters. The simulations will be carried out using the rigid-body diffusion Monte-Carlo (RBDMC) approach, which is capable of evaluating vibrationally averaged structures and rotational constants.

OU Student:

Ashley McGhee, Department of Sociology and Anthropology

Faculty Mentor:

Professor Jo Reger, Department of Sociology and Anthropology

Project:

An Analysis of a Third Wave Feminist Music Subculture and the Redefinition of Femininity

Abstract:

This study will fill a gap in current literature on third-wave feminism by examining the ways in which young women today engage in challenging and redefining society's traditional notions of femininity through a music subculture. Using a triangulation of methods, data for this research will be collected using content analysis, participant observation and interviewing. I draw from social construction theorists who argue that individuals are gendered through socialization, creating traditional gender norms of femininity, to investigate how young women engage in challenging and redefining these accepted norms within the music subculture. I hypothesize that young women today continue to define themselves as feminists, drawing on cultural forms of protest, such as redefining femininity in a third wave music subculture.

OU Student:

Meredith Nusbaum, Department of Biological Sciences

Faculty Mentor:

Professor Gabrielle Stryker, Department of Biological Sciences

Project:

A DNA Vaccine for Trypanosoma Cruzi which Expresses Two distinct Antigens

Abstract:

Trypanosoma cruzi is a parasitic protozoan that causes significant mortality and morbidity throughout Latin America. Both the paraflagellar rod (PAR) proteins and the trypomastigote surface antigen-1 (TSA-1) isolated from T. cruzi have demonstrated excellent vaccine potential. Mice immunized with these proteins survive an otherwise lethal challenge with the parasite. DNA vaccines have distinct advantages over the conventional protein vaccinations, especially when immunizing in third world countries, primarily low cost and increased stability. This project proposes to create a DNA vaccine constructs containing both the par3 gene and the tsa-1 gene to induce a protective response against T. cruzi.

OU Student:

Louis Rawlins, Department of Mathematics and Statistics

Faculty Mentor:

Professor Andrea Eis, Department of Art and Art History.

Project:
Conversation Piece

Abstract:
The Conversation Piece project is a series of audio/video installations that explore the effect of conversation in everyday life. Through the use of manipulated sounds and imagery, I would like to gain a better understand of creating such pieces. This knowledge, I feel, will come from observation of peoples' reactions as well as the interaction a project of this scale will require.

OU Student:
Matt Rizzo, School of Engineering and Computer Science

Faculty Mentor:
Professor Ka C. Cheok, School of Engineering and Computer Science

Project:
Design and Construction of an Intelligent Ground Vehicle

Abstract:
The purpose of the project is to design and build an autonomous ground vehicle that will compete in the 10th annual Intelligent Ground Vehicle Competition (IGVC) that will be held at Walt Disney World in July 2002. The ground vehicle being built will navigate using only onboard sensors, which will include GPS (Global Positioning System), an omni-directional vision system and a custom built scanning laser ranging system. The final product will be able to navigate by itself to multiple pre-assigned waypoints or targets, and avoid all obstacles that are within its path.

OU Student:
Julia Schroeder, Honors College

Faculty Mentor:
Professor John Cameron, Department of Art and Art History

Project:
The Glass Stereographs of Ferier, Soulier & Levy

Abstract:
This project aims to establish the corpus of glass stereographs made by Ferier, Soulier & Levy (FSL from 1850 until the firm's demise ca. 1919). FSL views, largely topographical, are the clearest and finest made in the nineteenth century of their kind. The firm's coverage (ca. 30,000 views) was immense. Only about one quarter of their work has been published. The result of this project will be a "union catalogue," pieced together from ca. 40 small "stock-lists" integrated into the numerical series of the five general catalogues.

OU Student:
Tara Terry, School of Engineering and Computer Science

Faculty Mentor:
Professor Serge Kruk, Department of Mathematics and Statistics

Project:
Derivatives of Matrix Functions

Abstract:
Applied mathematics, especially optimization with the development of semi-definite programming, has seen a renewed interest in functions of matrices. The applications under current scrutiny are varied and interesting and the solution techniques rely on classical tools well known to undergraduates. Yet, the standard definition of derivatives is inadequate in a number of engineering problems. We revisit definitions of the derivative to choose one more appropriate to our needs and show how it is widely applicable. We then develop symbolic computational tools to extend to functions of matrices the standard derivative functions. This extension is new and involves research crossing the boundaries between analysis, algebra and computational mathematics.

SUMMARY
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Created by CareTech Administrator (webservices@caretechsolutions.com) on Tuesday, April 9, 2002
Modified by CareTech Administrator (webservices@caretechsolutions.com) on Tuesday, April 9, 2002
Article Start Date: Monday, November 10, 2003