University of Houston-Downtown

PROGRAM

6th ANNUAL
GRADUATE SCHOOL AND INTERNSHIP FAIR

Sponsored by the UHD Scholars Academy

Funded by the National Science Foundation, U.S. Army Research Office, University of Houston-Downtown

Friday, November 4, 2005
UHD Special Events Center

Welcome Address

On behalf of the UHD Scholars Academy and the College of Science & Technology, we would like to welcome you to the 2005 Scholars Academy Graduate School & Internship Fair. The UHD Scholars Academy (SA) is a competitive academic program for undergraduates majoring in science, technology, engineering and mathematics (STEM) fields. The SA works to increase the number of academically capable students graduating with degrees in STEM fields and to increase the number of those choosing to pursue graduate study in these fields. This year the Scholars Academy has grown to 190 students. Most of these students are in attendance today along with other students majoring in the STEM fields.

This year, we are proud to announce the inclusion of a Student Poster Presentation Session as part of the Graduate School and Internship Fair. The research work presented in these select scientific posters are the result of independent student research conducted on the UHD campus or at collaborating institutions. Our student driven research has served as a springboard for presentations at regional and national scientific conferences. All students in the SA are encouraged to participate in an independent research project during their undergraduate career and approximately 50% of the SA students do. This past summer, 60 students participated in independent research activities, with 13 off-campus interns at the Texas Medical Center, Rice University, and UTMB, as well as out-of-state research facilities. Last academic year, Academy students presented research posters to the regional/national Sigma XI, Texas Academy of Sciences, MAA, SACNAS, and additional local meetings within their disciplines, and won ten awards for their work.

We hope you enjoy your time at UHD with our students and Scholars, and we all look forward to collaborating with you and your institutions in the future.

Sincerely,

Vicky Estrera, Ph.D.
Director of the UHD Scholars Academy

Akif Uzman, Ph.D.
Chair, Dept. of Natural Science

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Program Schedule
Friday, November 4, 2005

8:00 - 8:30 am	Registration and Check-in
8:30 - 10:00 am	Student Poster Session and Breakfast Mixer
10:00- 12:30 pm	Graduate School and Internship Exhibits
12:30- 2:00 pm	Lunch for invited guest, faculty and student poster presenters

Conference Organizers:

Dr. Vicky Estrera, Director, Scholars Academy, UHD
Mr. Rene Garcia, Program Coordinator, Scholars Academy, UHD
Dr. Akif Uzman, Chairman, Department of Natural Sciences, UHD

UHD Scholars Academy Co-Directors:

Dr. Richard Alo, Executive Director, Center for Computational Science
Dr. Alberto Gomez-Rivas, Chairman, Department of Engineering Technology
Dr. Kenneth Oberhoff, Assistant Dean, College of Sciences and Technology
Dr. Dennis Rodriguez, Chairman, Department of Computer and Mathematical Sciences
Dr. George Pincus, Dean, College of Sciences and Technology
Dr. Larry Spears, Director, Urban Center for Student Success in STEM
Dr. Akif Uzman, Chairman, Department of Natural Sciences

SJCN Scholars Academy:

Mr. Lamar McWaine, Director, San Jacinto College North Campus

Graduate School and Internship Programs in Attendance:

American Society for Microbiology
    Education Department

Association for Women Geoscientists - Lonestar Chapter

Baylor College of Medicine
    Department of Molecular and Human Genetics
    Graduate School of Biomedical Sciences

Continental Airlines
    Technology Division

Kaplan Test Prep and Admissions
    Graduate Programs

Kelly Scientific Resources

New Mexico Tech
    Graduate Admissions

Our Lady of the Lake University
    Graduate Admissions

Prairie View A & M University
    Department of Computer Science

Rice University
    Department of Statistics
    Ecology and Evolutionary Biology

Sam Houston State University
    Department of Biological Sciences

Stephen F. Austin State University
    Graduate Program in Biotechnology

Student Conservation Association
    Houston Conservation Collaborative

Texas A & M University
>   Department of Biochemistry and Biophysics

Texas Southern University
>   Academic Affairs and Student Services

Texas Tech University
>   Graduate School Recruiting Office

University of Houston-Central
>   Admissions and Recruitment, College of Pharmacy
>   College of Engineering
>   Department of Biology and Biochemistry
>   Department of Mathematics

University of Houston-Clear Lake
>   Office of Admissions

University of North Texas Health Science Center at Fort Worth
>   McNair Scholars Program

University of Texas at Austin
>   Office of Graduate Studies

University of Texas - MD Anderson Cancer Center
>   Center for Research on Minority Health

University of Texas Health Science Center Houston
>   Graduate School of Biomedical Sciences
>   School of Health Information Sciences
>   School of Nursing Houston
>   School of Public Health
>   Summer Research Programs

University of Texas Medical Branch
>   Graduate School of Biomedical Sciences
>   Office of Student Affairs and Admission in the School of Medicine
>   School of Allied Health Sciences
>   School of Nursing

The following institutions have provided materials for dissemination:

Hispanic Association of Colleges and Universities
   Corporate Internship Program

Indiana University, Purdue University Indianapolis, School of Science
   Summer Research Program

Iowa State University
   College of Engineering, Summer Undergraduate Research Program

National Oceanic & Atmospheric Administration, Educational Partnership Program

The Rockefeller University
   Office of Graduate Studies, Summer Undergraduate Research Program

University of New Mexico Health Sciences Center
   Biomedical Research Education Program

University of Texas Southwestern Medical Center at Dallas
   Division of Basic Sciences

University of Washington
   Medical Scientist Training Program (M.D. / Ph.D.)

Vanderbilt University
   Graduate Programs in Biomedical Sciences

Student Poster Abstracts:

1. **Using Stella Software to Model Glucose Levels in Response to Daily Meals and Exercise**
    Karla Alvarez
    Ms. Mitsue Nakamura, Research Mentor, Department of Computer and Mathematical Sciences, UHD
    Dr. Akif Uzman, Research Mentor, Department of Natural Sciences, UHD
    Abstract: The computer modeling program, STELLA, was chosen to help develop a computer simulation of blood glucose levels, which constantly change throughout the day depending on the dietary and exercise status of the individual. The model is interactive and allows users (e.g., students) to study the effects of altered glucose metabolism, with the ultimate goal to allow users to study the dynamics of glucose metabolism in diabetics. In order to conduct this project a literature research was done on kinetic parameters of glucose metabolism. The major hormones responsible for oscillations in blood glucose levels are insulin and glucagon, which keep the glucose level between 90-100 mg/dl. When the level of blood glucose falls below 90 mg/dl glucagon is secreted by the pancreas to increase glucose levels. Insulin has the opposite effect and reduces blood glucose levels when they rise too high. Difference equations were tested based on known data of glucose tolerance tests to find the most accurate rate of blood glucose increase and decrease. The current STELLA model simulates normal blood glucose regulation and blood glucose changes after the consumption of 3 meals, 2 snacks, and 2 sessions of exercise and returns blood glucose levels to 90-100 mg/dl with kinetics similar to that observed in the literature.

2. **Investigating Mutant Y451F in GluR4 Binding Site Using Vibrational Spectroscopy**
    Imene Bokhetache
    Dr. Vasanthi Jayaraman, Research Mentor, Department of Integrated Biology and Pharmacology, The
        University of Texas Medical School at Houston, Texas
    Dr. Akif Uzman, Faculty Mentor, Department of Natural Sciences, UHD
    Abstract: Glutamate receptors (GluR) are excitatory ligand-gated ion channels in the brain. We used Fourier transform infrared spectroscopy to characterize the unbound and the glutamate bound states of mutant Y451F in GluR4 subunit. Our results showed that environment of carboxylate groups of glutamate ligand is similar in both wild type and mutant in the glutamate bound state, and that glutamate induces similar secondary structural changes in both mutant and wild type. We saw differences however between the two proteins in the unbound state. These results suggested that the mutant glutamate bound form is similar in structure to wild-type, and that the unbound state is more stable in the mutant relative to wild type.

3. **Analysis Of Microsatellite Variations Inside And Outside Of The Genes Of** *Dictyostellium Discoideum*
    Prince Buzombo
    Dr. Akif Uzman, Faculty Mentor, Department of Natural Sciences, UHD
    Dr. Gad Shaulsky, Research Mentor, Department of Molecular and Human Genetics, Baylor College of
        Medicine
    Abstract: Microsatellites sequences are known for their high rate of mutation, a characteristic that makes them good genetic markers for forensics studies. The abundance of microsatellites in the social amoeba called *Dictyostellium discoideum* (D. discoideum), including many in coding regions, has made this organism suitable for investigating genetic variations across the genome. Selection normally acts to reduce the amount of variation in coding sequences, so our we predict that microsatellites will be less variable in the coding regions and highly variable non-coding regions. Surprisingly, for 15 pairs of loci with microsatellite sequences, we found the coding microsatellites are actually more variable (though not significantly). This is contradictory to the theory of selection removing less fit variants in the coding regions. Therefore we conclude that there is no evidence to show stronger selection on the microsatellites found inside the coding regions.

4. **Investigation of Extraction, Analyses, and Characterization of Bacterially-Produced Biopolymers**
    Jannie Marie Dilber and Martina Maier
    Dr. Poonam Gulati, Research Mentor, Department of Natural Sciences, UHD
    Dr. Byron Christmas, Research Mentor, Center for Applied Polymer Science Research, UHD
    Abstract: Bacteria seldom exist as planktonic (free-floating) organisms. In most areas of the environment, such as soil, streams, oceans, and even in one's refrigerator, bacteria survive in biofilms. Biofilms consist of intricate structures with organizations of microbial microcolonies adhering to each other by exopolymers, which are made by the microbes and dispersed by aqueous channels or pathways. These exopolymers provide bacteria with safety from harsh and toxic conditions and a greater resistance to antibiotics. The most efficient method of exopolymer extraction from bacterial cells was evaluated and the thermal properties of these exopolymers were examined using Differential Scanning Calorimetry (DSC). The data related to the chemical composition and structure of the biofilm exopolymers may provide information for advances in antibiotic treatment of bacteria, toxic waste clean-up, and many other medical and biotechnological applications.

5. **Bionformatic And Experimental Analysis Of Gene Regulation During Early Neural Development In Xenopus**
Ngan Ha
Dr. Akif Uzman, Faculty Mentor, Department of Natural Sciences, UHD
Abstract: Gene regulation plays an important role in the development of the central nervous system. Our working hypothesis is that genes expressed at the same time and place will share common transcription factor binding sites. To test this hypothesis the upstream regulatory regions (URR) of several genes in the Organizer in *Xenopus tropicalis* (e.g., *goosecoid*, *noggin*, and *chordin*) will be obtained from the TIGR database. The URR of these genes in other vertebrates, such as puffer fish, mouse, rat, chick, chimp, and human, will also be analyzed in an attempt to find conserved transcription factor binding sites. The URRs of these genes in *X. tropicalis* will be obtained using PCR and then inserted into luciferase reporter vectors to analyze appropriate gene expression in *Xenopus laevis* embryos.

6. **Influences of Basket and Stellate Cells on Cerebellar Purkinje Cells**
William Holtkamp and William Stegall
Dr. Richard Alo, Research Mentor, Center for Computational Sciences, UHD
Abstract: The cerebellum is vital to motor actions in everyday activities. In the cerebellum, the Purkinje cells are the only output (consisting of voltage spikes which are also called action potentials) which responds to the rest of the brain. There are two types of cells, basket and stellate, which inhibit the Purkinje cell. Not many studies have focused on these cells, and their functions remain unknown. What do these cells do? Why are they in the body? This study tries to explain these questions, utilizing biophysically detailed computational models developed using NEURON 1. New models were created of basket and stellate cells, using known physiological parameters, and these were incorporated with preexisting models of Purkinje cells. The simulations reveal that basket and stellate cells seem to act as a fuse in order to not allow the Purkinje cells to receive mass amounts of excitation. Our tests prove this theory to be true and in fact prove the interneuron cells (basket and stellate) to have great effects on Purkinje cells to firing rates and excitability.

7. **Behavior of Cancer Cells in a Mathematical Model**
Adewale Giwa and Juan Leon
Dr. Edwin Tecarro, Research Mentor, Department of Computer and Mathematical Sciences, UHD
Abstract: A system of ordinary differential equations is used to describe specific components of the mammalian cell cycle network. The system concentrates on seven different proteins which are known to be significant players in the development of cancer. We focus particularly on the effects of two tumor suppressor proteins –p21 and p53- on the cell cycle. We present simulation results which may provide insight into prospective biological studies of the cell cycle and cancer.

8. **Distributed Network Security Lab**
Adnane Kidari and Mohammad Hassan
Dr. Ping Chen, Research Mentor, Department of Computer and Mathematical Sciences, UHD
Abstract: DNSL is an emerging research facility at UHD for the development in computer networks' security field. DNSL UHD is working in collaboration with a security lab at the University of Houston - Clearlake and New York Poly Technic Institute for the development of modular based courses for smaller institutions. In just one year we have completed numerous projects including the setup of the lab and investigated and took action against security breaches in the fields of WIFI security, Intrusion Detection Systems, Secure Ethernet Design, Operating System Security, VPNs, and Database Security. The primary focus of the DNSL UHD lab is to provide students the chance for hands on learning in an out of class setting focused on computer and network security.

9. **Percutaneous Lumbar Discectomy Using the DekompressorTM Device in Virtual Reality Environment with Haptic Device**
Ruby Mendez
Dr. Ongard Sirisaengtaksin, Research Mentor, Department of Computer and Mathematical Sciences, UHD
Mr. Lac Nguyen, Research Mentor, NASA Quest Laboratories
Abstract: Percutaneous Lumbar Discectomy is a minimal invasive non-surgical option to treat back and leg pain. To perform this procedure, where a surgeon is forced to look away from his hands at a TV monitor, and many others in the large MIS market there's obviously a need for training simulators. With the use of VR to this application surgeons can train for this area of work and get feedback of their performance for personal analysis and improvement. This work is done on the modeling of the DekompressorTM Device with the use of 3D Studio Max software and its integration NASA's Spinal Cord model. The user can interact with the models by the use of a haptic device for data input to a virtual environment created with the use of software, including: GHOST SDK, 3D Touch SDK, and Visual Studio C++. Feedback is given through graphic displays and haptic responses as well.

10. **Activities of Parallel Fibers on Cerebellar Purkinje Cells**
Aaron Murray
Dr. Richard Alo, Research Mentor, Center for Computational Sciences, UHD
Abstract: In the cerebellum, Purkinje cells are very large, flask-shaped cells with huge dendrites extending upward to the molecular layer of the cerebellar cortex. Research on Purkinje cell models by Erik De Schutter and James M Bower, in their paper, "*Simulated responses of cerebellar Purkinje cells",* implied that Purkinje cell responses are independent of the dendritic location of the granule cell synaptic inputs. We systematically tested the validity of this theory with biophysically detailed models built using the *Neuron* modeling software package developed by Michael Hines and John W. Moore at the Department of Neurobiology, Duke University. An important addition was that of inhibitory collaterals between groups of Purkinje cells, a fact ignored in the original De Schutter and Bower study. The result of these studies indicated that collaterals should enhance small differences in excitation between Purkinje cells. These small differences could represent those in granule cell excitation, or even their location of excitation on the dendrites.

11. **Cheater Genes Involved in Discriminative Social Behavior in** *Dictyostelium Discoideum*
Moses Osoro and Helen Travis
Dr. Akif Uzman, Faculty Mentor, Department of Natural Sciences, UHD
Dr. Gad Shaulsky, Research Mentor, Department of Molecular and Human Genetics, Baylor College of
    Medicine
Abstract: *Dictyostelium discoideum* fruiting bodies contain spores and a stalk of dead cells. When two strains form chimeras, it has previously been observed that one strain may develop more spores than the other, taking advantage without paying the cost. The Shaulsky lab is interested in determining gene function by generating insertional mutations in most *Dictyostelium* genes; use a microarray of the genome, parallel phenotyping and by expression analysis. My project involved mixing different strains, isolating and cloning mutants that resisted cheating. Mutants were selected from a pool of cells generated by Restriction Enzyme Mediated Integration. To screen for resistor cells, different pools were mixed with known unrelated wild strains at a 9:1 ratio. Morphological differences were determined through a screening assay. Results showed wild strain cells had taken over the population at 99% to 1%. Interestingly, when axenic strain (AX4) was mixed with its parental derivative (NC4), no cheating was observed.

12. **Structural Analysis and Design of Post Tensioned Concrete T-Beam**
Fabian Ramirez and Peter Villarreal
Dr. Jorge Tito-Izquierdo, Research Mentor, Department of Engineering Technology, UHD
Abstract: The design process of various structures have been modified through time in order to provide higher safety levels for the general public. This poster exhibits the various stages of the post tensioned concrete t-beam that was designed, manufactured, and test under scaled real life load factors. Various software packages were used to simulate the loading conditions that the beam would endure during the test, and were incredibly close to the theoretical values. Finally the test proved that the beam was able to sustain the designed load applied, and that the post tensioned cable helped maintain the beam's unity even after obtaining a very high deflection.

13. **Acoustic Behavior Of Sperm Whales In The Gulf Of Alaska In The Presence And Absence Of Longline Fishing Activity**
Patricia Ramon
Aaron Thode, Research Mentor, Scripps Institution of Oceanography, UCSD, La Jolla, CA
Abstract: Historical whaling records indicate that sperm whales off southeast Alaska incorporate fish into their diets, particularly black cod (Anoploploma fimbria). Since 1995, this concerns fisheries because of increased depredation encounters between longline fishermen and approximately 40 individual sperm whales. Since 2002 the Alaska Sperm Whale Avoidance Project (SEASWAP) has studied this phenomenon using fishermen reports, photo-ID, and biopsies. In 2004 and 2005, both passive acoustic towed arrays and autonomous recorders mounted on longline deployments have provided an opportunity to monitor and track sperm whale acoustic activity, whenever fishing vessels were present and absent. By using acoustic multipath, the range and depths of foraging whales can be determined from a single hydrophone. We analyzed hydrophone data for clues about the diving cycles of sperm whales. Preliminary results indicate that whenever fishing vessels are absent, sperm whales are foraging at mid-depth in the water column (e.g., 250m to 500m), and that their dive cycle durations are similar to those reported in other areas. Whenever animals are around fishing vessels, however, the dive cycles are typically much shorter (e.g., 15 minutes or less) and position fixes on vocally active animals tend to be much shallower (e.g., 50m). There is increasing evidence that distinctive acoustic cues made by hauling longline vessels attract the animals to longline activity. These cues do not seem to be associated with sounds made by specialized longline equipment, but rather relate to how the vessel is handled during a longline haul.

14. **Dissecting the Role of Interleukin-8 Binding to Glycosaminoglycans for In Vivo Neutrophil Recruitment**
Jose Sandoval

Dr. Krishna Rajarathnam, Research Mentor, Department of Human Biological Chemistry & Genetics,
   University of Texas Medical Branch, Galveston, TX

Abstract: Interleukin-8 (IL-8), a member of the chemokine super-family, initiates leukocyte activation and an inflammatory response. IL-8 has two binding regions, one for G Protein Coupled Receptors (GPCR) and the other for glycosaminoglycans (GAGs). An imbalance in IL-8 response has been implicated in various inflammatory and autoimmune diseases such as arthritis and osteoporosis. Therefore, a better understanding of how chemokines recruit neutrophils in vivo is important for therapeutic drug engineering. Previous in vitro studies have shown that positively charged residues, arginine and lysine, are essential for GAG binding. This study explores the importance of these residues for GAG binding in the context of in vivo function. Two mutants, R60A and K64A, were generated and their neutrophil recruitment studied in a mouse peritoneum model. Results from this study will provide critical knowledge for designing decoys which could interfere with chemokine-GAG binding and so serve as lead compounds for inflammatory/autoimmune diseases.

15. **Dynamic Web Designing Technology**
Ping Tang

Dr. Hong Lin, Research Mentor, Department of Computer and Mathematical Sciences, UHD

Abstract: The project focuses on how to design dynamic web pages by integrating the browser side scripting language, the server side scripting language and database language via the latest dynamic web designing technology JSP (JSTL-JaveServer Pages Standard Library). My project aims at how to manipulate mySQL database and how to modify the webpage contents in mySQL database dynamically by JSP technology through Tomcat server which supports JSP. NetBeans IDE is bundled with Tomcat server and supports communication technology with mySQL database server. Therefore, I can write and run scripting program by using browser side scripting language, server side language (JSP), SQL (database) within single NetBeans IDE environment. By writing user interfaces (web pages) to allow that non computer professionals can modify the web page contents in mySQL database at any time. It transforms the high-tech job to low-tech job and keeps the web pages updated all the time.

16. **Simulation using Coin3D**
Horacio Villarreal

Dr. Ongard Sirisaengtaksin, Research Mentor, Department of Computer and Mathematical Sciences, UHD

Abstract: Virtual reality is the immersion of a user into a given environment in which all of the user's senses are involved. Virtual reality is widely used in areas such as training for military, medical training, education and prototyping. Developing a graphically simulated environment is one of the problems a scientist has to encounter. One way to approach it is using Scene Graph technology in Coin3d toolkit. Scene Graph Technology consists of hierarchically organizing and managing the contents of spatially oriented scene.

17. **Reinforced Concrete Beam Analysis**
Peter Villarreal and Fabian Ramirez

Dr. Jorge Tito-Izquierdo, Research Mentor, Department of Engineering Technology, UHD

Abstract: The ACI code book provides various guideless for concrete construction. Using a theoretical approach for T-beam design, one can predict the beam's behavior when under load. The T-beam was tested under monotonic and static loading conditions in order to compare the theoretical behavior. Multiple tests were also conducted in order to record the natural frequency and strain of the concrete beam. The shear and moment cracks were recorded in chronological order, so that we can then simulate the product using various engineering software packages. This Poster illustrates various design phases that lead to the manufacturing and testing of the reinforced concrete T-beam.