University of Houston-Downtown

PROGRAM

7th 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 3, 2006
UHD Special Events Center

One Main Street, 725-North; Houston TX 77002-1001
Phone: 713-222-5344; Fax: 713-222-5356; scholars@dt.uh.edu; www.uhd.edu/scholars

UH-Downtown

7th Annual
Graduate School and Internship Fair

Welcome Address

On behalf of the UHD Scholars Academy and the College of Science & Technology, we would like to welcome you to the 2006 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 182 students. Most of these students are in attendance today along with numerous 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 independent research projects during their undergraduate career and approximately 66% of the SA students do. This past summer, 60 students participated in independent research activities, with 18 off-campus interns at the Texas Medical Center, Duke University, Rice University, Sam Houston State Univ., Univ. of Nebraska, Univ. of Southern Mississippi, and UTMB, as well as out-of-state research facilities.

Last academic year, Academy students presented approximately 100 posters at local and national meetings. Within this time period, Academy students presented research posters to the regional/national Sigma XI, Texas Academy of Sciences, WAESO, MAA, RadTech, SACNAS, and additional local meetings within their disciplines, and won seventeen 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 3, 2006

9:00 - 9:30 am	Registration and Check-in
9:30 - 10:30 am	Student Poster Session and Breakfast Mixer
10:30- 12:00 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 Manager, 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. 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

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Graduate School and Internship Programs

Association for Women Geoscientists – Lonestar Chapter

Baylor College of Medicine
Graduate School of Biomedical Sciences
SMART Program: Summer Undergraduate Research Training

Case Western Reserve University – School of Medicine
Office of Multicultural Programs

City of Houston – Health and Human Services

City of Houston – Houston Crime Lab

Cleveland Clinic Lerner College of Medicine

Continental Airlines – Technology Division

Environmental Protection Agency, Office of Research and Development

Federal Bureau of Investigation, Houston Division

Hispanic Association of Colleges and Universities
National Internship Program

Kaplan Test Prep and Admissions – Graduate Programs

Kelly Scientific Resources

Our Lady of the Lake University, Graduate Admissions

Rice University, Alliances for Graduate Education and the Professoriate (AGEP)

Stephen F. Austin State University, Graduate Program in Biotechnology

Subsurface Computer Modeling, Inc.

Texas A & M University, Department of Biochemistry and Biophysics

Texas Southern University, Academic Affairs and Student Services

Texas Tech University, Graduate School Recruiting Office

Texas Women's University, Office of Admissions

United Space Alliance

Universidad Autonoma de Guadalajara, School of Medicine

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University of Houston-Central
- **Admissions and Recruitment, College of Pharmacy**
- **Department of Mathematics**

University of Texas at Austin, Graduate Recruitment and Outreach

University of Texas - MD Anderson Cancer Center
- **Center for Research on Environmental Disease**

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

University of Texas Medical Branch
- **Biochemistry and Molecular Biology Graduate Program**
- **Graduate School of Biomedical Sciences**
- **Neurology and Cell Biology**

The following institutions have provided materials for dissemination:

Iowa State University
- **College of Engineering, Summer Undergraduate Research Program**

The Rockefeller University
- **Office of Graduate Studies, Summer Undergraduate Research 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**

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Student Poster Abstracts:

1. **Preliminary Investigation of Cauliflower Mitochondria as a Model System to Study Doxorubicin-Induced Cardiomyopathy, Mitochondrial Reactive Oxygen Species Production and Mitochondrial Toxicity**
   Betul Akin, Sean Hattenbach, Nadia Lera, Claudia Mendez and Jerry Johnson, Ph.D.
   Dr. Jerry Johnson, Research Mentor, Department of Natural Sciences, UHD
   Abstract: The mitochondrion is the site of oxidative phosphorylation in eukaryotic cells. Complexes I and III of the mitochondrial respiratory chain produce reactive oxygen species (ROS) as the byproduct of electron transport ATP production. ROS cause cellular damage under conditions of oxidative stress, despite antioxidant systems. In addition, ROS production can also be induced by chemotherapy drugs, such as Doxorubicin, that accumulate in the mitochondria. Specifically, doxorubucin has high affinity for cardiolipin, an acidic phospholipid of the inner mitochondrial membrane, which stabilizes the activity of respiratory chain protein complexes. It is hypothesized that doxorubicin accumulates and complexes with cardiolipin, causing mitochondrial ROS production and eventual cardiomyopathy. To investigate the site of ROS production and characterize ROS induction, we will isolate cauliflower mitochondria as a preliminary source and subject samples to doxorubicin and common respiratory inhibitors. Since cauliflower is inexpensive and readily available, it is used as an initial mitochondria model.

2. **Integrin α6β4 in Pancreatic Carcinoma Invasion**
   Karla Alvarez
   Zobeida Cruz-Monserrate, Sealy Center for Cancer Cell Biology
   Kathleen L O'Connor, Ph.D., Sealy Center for Cancer Cell Biology; Department of Surgery, University of Texas Medical Branch at Galveston, Texas
   Abstract: Pancreatic cancer is a lethal human cancer due to its high incidence of invasion and metastasis. The molecular mechanisms of this lethality and aggressiveness are unclear. Recently, we discovered that the α6β4 integrin is highly upregulated in human pancreatic cancers and is involved in its migratory and invasive phenotype. We hypothesize that the activation of the molecule phosphoinositide-3-kinase (PI3-K) by the α6β4 integrin promotes the invasive phenotype. Using specific siRNAs designed to target components of the PI3-K pathway delivered by cell electroporation, we knocked down the expression of PI3-K and components of this pathway to determine their effects on cell migration towards the mitogenic hepatocyte growth factor (HGF). We find that the PI3-K pathway is required for pancreatic cancer cell migration towards HGF in cells that express high levels of integrin α6β4. In summary, we conclude that integrin α6β4 may play an important role in the migratory phenotype of pancreatic carcinoma cells by the activation of the PI3-K pathway.

3. **Dynamic Control of Structures**
   Adolfo Aranzales
   Drs. Alberto Gomez-Rivas and Weining Feng, Research Mentors, UHD Department of Engineering Technology
   Abstract: The main goal of this project was to develop a comprehensive instrumentation system for vibration control of a structural frame. To start off this challenging project, the first task consisted of studying and understanding the process of designing the complete controlling system. Therefore, the initial task in this research project was to analyze the fundamentals of the instrumentation. This assignment included determining which instruments will provide better results, studying sensors and their characteristics, running different tests, data acquisition and simulation of sensors in a software platform called LabVIEW from National Instruments. A comprehensive instrumentation system for monitoring the load, deflection and vibration of the structural frame was ultimately developed.

4. **Geology Research at the University of Houston-Downtown**
   Norma Ascencio
   Dr. Kenneth Johnson, Research Mentor, Department of Natural Sciences, UHD
   Abstract: This poster presentation is a synopsis of geological and geochemical research currently underway by the faculty and undergraduate students at the University of Houston-Downtown. A wide variety of research problems are being addressed, in such areas as igneous, metamorphic, and sedimentary petrology, stratigraphy, paleontology, aqueous geochemistry, geomicrobiology, thermal petrophysics, and ore deposit geology. The Department of Natural Science houses state-of-the-art laboratory facilities that are accessible to student researchers. Undergraduate students play an integral role in advancement and completion of these research projects, and gain valuable experience that better prepares them for research in graduate school or for careers in the geosciences.

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5. **An Alpha Taxonomic Study of the Summer Flora of Buffalo Bayou**
   Floribel Beiza, Robin May
   Dr. Deana McCullough. Research Mentor, Department of Natural Sciences, UHD
   Abstract: The Buffalo Bayou Partnership (BBP) is charged with restoring and maintaining the natural flora of the bayou. To effectively do this, it was necessary to survey the existing flora and note invasive species, natural species, and introduced species. We collected representative specimens from Buffalo Bayou from Shepard Drive to the Turning Basin. The specimens were preserved, identified and mounted on herbarium sheets as a permanent record. These represent summer taxa that were either flowering or in fruit. The herbarium sheets will be transferred from UHD to the BBP when their herbarium is created.

6. **Copolymerizing Vinyl Ethers with Acrylates Using Thiol-ene Polymerization Process**
   Daisy Cherian
   Dr. Byron Christmas. Research Mentor, Department of Natural Sciences, UHD
   Abstract: Acrylate and vinyl ether polymer and copolymer systems have shown instability in the presence of thiol. Furthermore, the low viscosity of the formulations has proven problematic in producing solid films of reasonable thickness. Experimenting with different inhibitors and varying their concentrations has resulted in the development of more stable systems. Also, switching from a urethane to a higher viscosity epoxy-based oligomer has improved polymer film formation. These systems have been tested for relative reactivity using differential photocalorimetry (DPC) and the thermal properties of the polymerized films have been analyzed using differential scanning calorimetry (DSC). The results of this study indicate that thiol-ene processes can be utilized to produce vinyl ether/thiol "homopolymers" and copolymers of vinyl ethers with acrylate/thiol systems.

7. **Web-Enabled Real Time Control System**
   Grantley Christie
   Dr. Weining Feng, Research Mentor, Department of Engineering Technology, UHD
   Abstract: Web-enabled real time control provides the opportunity for several persons to monitor and change the parameters of an active process. Several persons will be able to monitor the process, while one person will have interactive control. The controlling observer will be able to adjust the process parameters, and everyone will observe the process response in real time. As a result, engineering, management, maintenance, and financial personnel can, retrieve and update system operation and production data from and an active process, and observe the response in real time. This project studies the development of a real time Proportional Integral Derivative (PID) control system, with remote access, using the National Instruments PCI 7030/6040E Real Time Control Card, on the LabVIEW 7.1 platform. A Sallen-Key low pass filter was used to simulate the process. A Web server was established on the host computer to enable client terminals to gain online access using compatible LabVIEW platforms, or a web browser with LabVIEW run-time engine.

8. **Comparing EMAN Using Condor, Batch Queues With Performance Models, and PBS**
   Emily De La Garza
   Dr. Charles Koelbel, Research Mentor, Department of Computer Science, Rice University
   Abstract: Many scheduling methods and programs exist for the Grid, but the advantages and disadvantages of these are still unknown. The Grid environment is one that takes advantage of large networks of computers where the user can distribute the workload across a parallel infrastructure. Using the Electron Micrograph Analysis (EMAN) program, which takes noisy 2D images and creates a 3D model of the particle, I will test three different scheduling methods on the Grid, Condor, Batch Queues with performance models, and Portable Batch System (PBS). I will to compare and contrast these three scheduling methods and test how well we can predict the performance of computers on the Grid using batch queues with performance models.

9. **Primordial Black Holes and Structure Formation**
   Adam Drake
   Dr. Youn-Sha Chan, Research Mentor, Department of Computer and Mathematical Sciences, UHD
   Abstract: Primordial Black Holes (PBHs) were first proposed by Zel`dovich & Novikov (1967) and Hawking (1971) as a consequence of the extremely high densities that occur in the Big Bang model. They differ from other black holes in our universe in that they do not have stellar progenitors and have a wide range of possible masses. It is also well-established that supermassive black holes (SMBHs) reside in most galactic centers. These SMBHs have grown largely through accretion but it is still unclear how they formed. We examine the properties of PBHs in an effort to determine the relation (if any) between PBHs and the formation of structure in our universe.

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10. **Simulating an E-Learning Environment using a SQL Server**
    Fernando Fernandez
    Dr. Hong Lin, Research Mentor, Computer and Mathematical Sciences, UHD
    Abstract: Over the last two decades, computer technology has increased tremendously not only in hardware, but also in software design. Computers can process data in virtually no time, becoming powerful tools in our everyday life. This rapid change has addressed the need for better methods to store large amounts of data. Databases address this need, by providing a way to store and manipulate massive amount of information in a structured and organized way based on the user's needs.

11. **Strength, Temperature, and Steel Bond Behavior in High Strength Concretes with Different Proportions of Cement and Fly-Ash**
    Mario Jesus Garza
    Dr. Jorge Tito-Izquierdo, Research Mentor, Department of Engineering Technology, UHD
    Abstract: This paper describes the test series performed with high-strength concretes using different proportions of cement and fly-ash class F. Strength and Temperature are studied using a control group (100% cement) and three other groups with a 25%, 50%, and 60% fly ash content respectively. Different water/cementitious (w/c) ratios were used, producing concretes with compressive strengths between of 6,000 psi and 12,000 psi. Nearly 600 cylinders are used for this study. In addition, steel bond behavior was studied using a control group and 50% fly ash group.
    The concrete with fly-ash reaches the same strength as the control group, but need more time, depending on the fly-ash content. It was also found that concretes with high content of fly ash produce less hydration heat than the control group. Relative to bar anchorage, similar behaviors were observed for control group and group with 50% fly ash. Additionally, concretes with fly-ash improve their workability, reducing the necessity of water and super-plasticizer in the mix.
    Research on Concretes with high content of fly ash (>50%) is in progress. Concrete strength and stress transfer between rebar and concrete are part of these studies.

12. **Intelligent Traffic Controllers**
    William Holtkamp, Jonathan Keele, Troy Mason
    Dr. Ongard Sirisaengtaksin, Research Mentor, Computational and Mathematical Sciences, UHD
    Abstract: Traffic controllers are machines that dictate how traffic will flow from one street to another. Since most highly urbanized areas have traffic lights based on timing sequences, there becomes a need for a traffic controller which can adapt to its surrounding environment. This environment includes automobile traffic, pedestrians, and neighboring traffic controllers. In order to fill this need, this project is focused on building a new, adaptive controller based on a multi-agent framework and TCP/IP inter-connectivity.

13. **Rootkits**
    Aaron Murray
    Dr. Ping Chen, Research Mentor, Department of Computer and Mathematical Sciences, UHD
    Abstract: Rootkits have been referred to as "the root of digital evil." This collection of software binaries or patches modify the existing code giving the owner of a well designed rootkit unadulterated access to a system, usually without leaving a trace. This presentation shall focus on the basic design of most Windows rootkits and how they achieve some of their tasks while remaining undetected.

14. **Mathematical Analysis of HIV**
    Quynh Nguyen
    Dr. Jeong-Mi Yoon, Research Mentor, Department of Computer and Mathematical Sciences, UHD
    Abstract: HIV/AIDS is one of the global epidemics, and it is far from under control. Mathematical models have proven valuable in understanding the dynamics of HIV. By comparing these models, it has been possible to determine many quantities features of the interaction between HIV virus and the cells that are infected by the virus. In this research, we show how dynamical modeling and parameter estimation techniques have uncovered these important features of HIV.

15. **Thiol-ene/Cationic Dual Cure**
    Moriam Ojelade, Qin Li, & Huanyu Wei
    Dr. Charles Hoyle, Research Mentor, School of Polymers and High Performance Materials, University of Southern Mississippi
    Abstract: When their respective monomers are multifunctional, thiol-ene photopolymerization produces a cross-linked polymer with a highly uniform cross-link density (homogeneous network matrix), while cationic photopolymerization produces a cross-linked polymer with an irregular cross-link density (heterogeneous network matrix). Our interest was in how the integration of a homogeneous network matrix (thiol-ene) and a heterogeneous network matrix (cationic) in the same

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formulation will impact the properties of the resultant polymer. In our study, the kinetics and physical properties of thiol-ene/cationic dual cure systems were investigated using multifunctional thiols and vinyl ethers as monomers. Most of the results collected suggested that the properties of the dual cure systems are proportional to the amount of each polymerization in the reaction system. However, a piece of data collected towards the end of this study suggested that the resultant properties obtained depend on the conditions under which the photopolymerization is done.

16. The *Myxococcus xanthus* DegS Protease is a Regulator of *4445* Developmental Gene Expression

Moses Osoro and Kristina Szentirmay

Dr. Heidi Kaplan, Research Mentor, Department of Microbiology and Molecular Genetics, The University of Texas at Houston Medical School

Abstract: *Myxococcus xanthus* is a Gram-negative soil bacterium that undergoes multicellular development upon starvation at high density. Expression of the *4445* gene begins 2 hr after the initiation of development and is controlled by the EcfA/ResA/ReaB signaling pathway. This pathway is analogous to the *E. coli* SigE/RseA/RseB signaling system that is activated by envelope stress through the degradation of the RseA anti-sigma factor by the DegS protease. To test if *4445* gene expression is controlled in a similar way, a *M. xanthus degS* homologue was identified, mutated and its effect on *4445* expression was tested. If the *M. xanthus* DegS acts by a mechanism similar to that of *E. coli*, an envelope stress signal would bind to its PDZ domain activating its trypsin-like protease and eventually permit *4445* transcription. The *M. xanthus degS* gene was mutagenized by insertion of an internal fragment. The *degS* mutants were selected by growth on nutrient plates containing kanamycin and were overlaid with X-gal. The *degS* mutant colonies were Lac^- (tan) indicating that they were unable to transduce the inducing signal so that the *4445* gene was not expressed. Expression of *4445* in the *degS* mutant was quantitated by an *in-vitro* □-galactosidase assay confirming the hypothesis.

17. Thermal Analysis of Ionic Liquids

Nicole Patterson

Dr. Maria Benavides, Research Mentor, Department of Natural Sciences, UHD

Abstract: The main objective of this project was to determine whether or not four synthesized ionic liquids could potentially be used in solar cells. All four ionic liquids each contained iodine and a phosphorus atom with four organic chains attached to it. The samples were tested using the Netzsch 409 STA, which showed us how the mass of the compound changed with increased heat as a function of time. After analyzing the data, we observed that all samples exhibited significant thermal stability appropriate for use in solar cells. Their masses generally remained constant until the point of decomposition. All four samples decomposed at high temperatures ranging from 250^o C to 315^o C.

18. The Role Of The 30s 'GP' Motif In Interleukin-8 Stability, Structure, Function, And *In Vivo* Physiology

Mesias Pedroza

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

Abstract: CXC chemokines, such as interleukin-8 (IL-8), recruit neutrophils via proper structural 'presentation' of the variable N-loop residues (site-I) and the highly conserved Glu-Leu-Arg (ELR) residues (site-II). CXC chemokines also reveal that the 30s loop 'GP' residues are highly conserved, involved in the β-turn formation, and adjacent and tethered via the disulfides to the functionally important N-terminal and N-loop residues. In this study, we have addressed the role of 'GP' motif for structure-function, by creating four IL-8 mutants (G31A, G31V, P32A, and P32G) using site-specific mutagenesis. For all mutants, we used fluorescence spectroscopy to measure guanidine hydrochloride-induced unfolding to assess their relative stabilities; we used NMR spectroscopy to assess the consequence of the mutation on the tertiary structure; we determined the binding affinities to the CXCR1 receptor to assess their relative activities, and measured their ability to recruit neutrophils in a mouse peritoneum model to assess their *in vivo* function. These results together provide insights into the interrelationship of how the 30s GP motif mediates stability, fold, structure, and function.

19. The Use of the Oxygen Bomb Calorimeter

Brian Terry

Dr. Alberto Gomez-Rivas, Research Mentor, Department of Engineering Technology, UHD

Abstract: The main goal is to learn how to use the Oxygen Bomb Calorimeter to find properties of the heat of combustion of fuels. I had to learn how to operate the Oxygen Bomb Calorimeter to see how this apparatus is used find the heat of combustion. I would develop a manual indicating the proper operation of the device and how to compute the heat of combustion. The instruction manual would be used by students in the Safety and Fire Protection program to opera the device and use it to find the heat of combustion. My work in this project involved all necessary steps from selection of the equipment, installation in a new laboratory, obtaining necessary supplies and performing experiments.