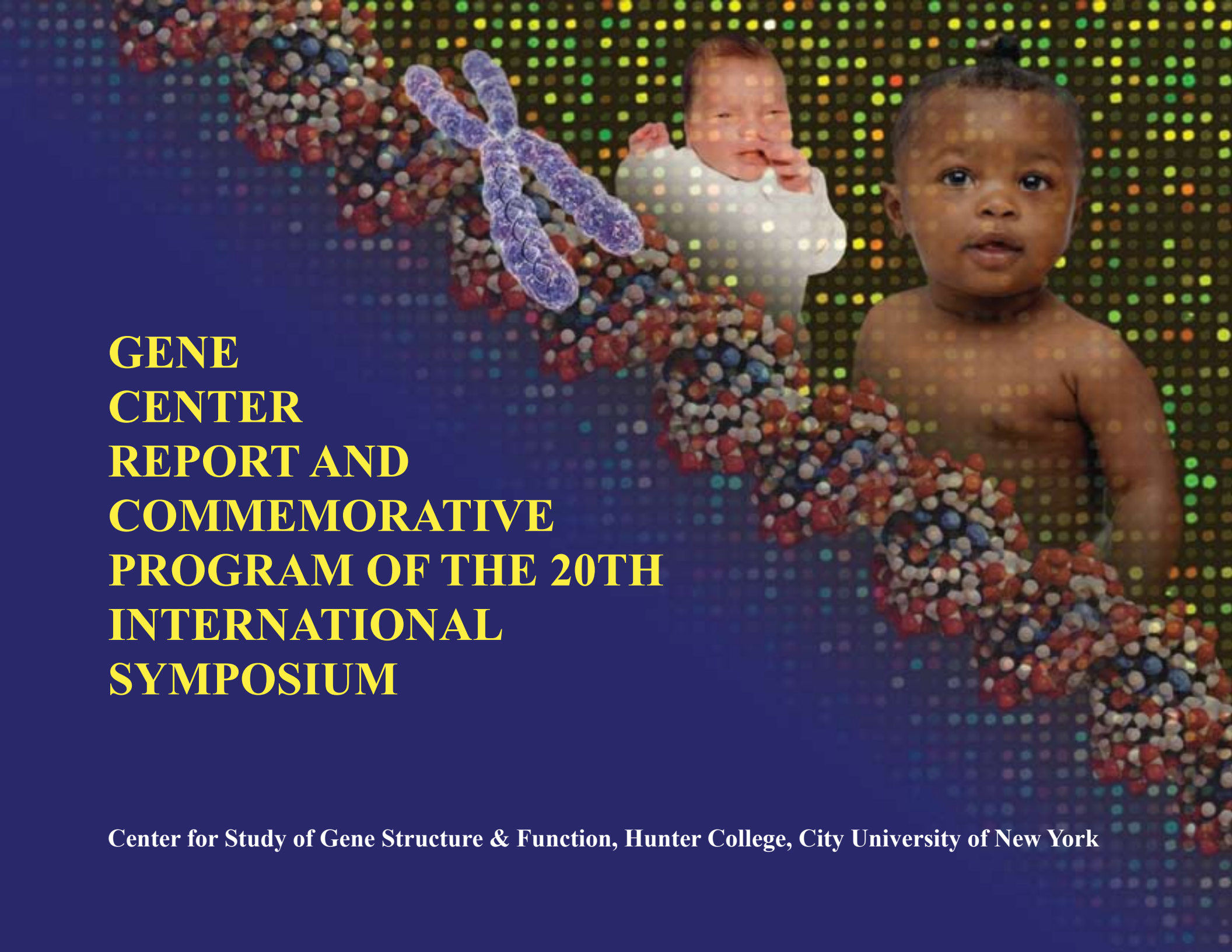

GENE CENTER REPORT AND COMMEMORATIVE PROGRAM OF THE 20TH INTERNATIONAL SYMPOSIUM

Center for Study of Gene Structure & Function, Hunter College, City University of New York

HUNTER COLLEGE PRESIDENT

JENNIFER RAAB
President
Hunter College, CUNY
Principal Investigator

It is with the greatest enthusiasm that I congratulate the Center for Study of Gene Structure and Function on the publishing of this report and the celebration of the 20th International Symposium. For more than two decades, the Gene Center has been an integral and invaluable part of the Hunter community. This commemorative report highlights the Center's many achievements including its highly successful annual symposia.

The Center has provided intellectual support for research initiatives, opportunities for collaboration across the sciences, recruited award-winning and inspiring faculty who in turn encourage the development of young scientists and minorities who have previously been underrepresented in the field, and significantly advanced our collective knowledge of diseases and strategies to combat them.

We here at Hunter are proud of the outstanding contributions the Gene Center has made to the scientific community at large, and their unstinting championship of emerging scientists. We look forward to their future accomplishments and achievements with great excitement.

Sincerely,
Jennifer J. Raab, President, Hunter College
Principal Investigator

HUNTER COLLEGE PROVOST

VITA RABINOWITZ
Provost
Hunter College, CUNY

I am delighted to contribute to the Gene Center Report and Commemorative Program of the 20th International Symposium. It is not an exaggeration to say that were it not for the RCMI grant that has funded the Gene Center for the past twenty years, Hunter College's outstanding achievements in the sciences would not have been possible. The Gene Center has enabled us to build and maintain a science infrastructure for attracting, supporting, and retaining top scientists, including minority scientists. At the same time, it fosters collaboration among the science departments within Hunter and between Hunter and other great science and health institutions in the city. The Gene Center also helps us support science students at all levels, from undergraduates to post-docs.

I especially want to recognize the efforts of Robert Dottin, longtime director of Hunter's Gene Center, whose vision, leadership, and dedication to supporting excellent science in a minority-serving institution has made Hunter's Gene Center an acknowledged national leader among all RCMI-supported institutions. Thank you, Robert, for all you do for the College and for our students.

Sincerely,
Vita Rabinowitz
Provost, Hunter College

ADMINISTRATION

JOHN ROSE
Acting Dean for Diversity and Compliance
Hunter College, CUNY

ROBERT BUCKLEY
Director of Research Administration
Hunter College, CUNY

FROM THE DIRECTOR

This special commemorative report celebrates the 21st anniversary of the Center for Study of Gene Structure and Function (Gene Center) at Hunter College and the 20th Anniversary of it's International Symposium. It highlights the activities of the Gene Center and its impact on science research.

The Gene Center, was established in 1985 with funding from the National Center for Research Resources (NCRR) of the National Institutes of Health (NIH). We are indebted to James Wyche and Richard Mawe for their vision in developing this enterprise. It is a consortium of researchers within Hunter College of The City University of New York – one of the largest public universities in the nation.

At the heart of the Gene Center's mission is an imperative to build unique collaborations among biologists, chemists, biopsychologists, biophysicists, and bioanthropologists; to recruit and equip outstanding faculty, including minorities underrepresented in science research; to develop core research facilities; and to enhance strategies for networking among scientists. Addressing health afflictions and redressing health disparities are important goals of the Gene Center.

Our benchmarks of success include the growing number of papers published in peer-reviewed journals and increased external grant funding obtained by the faculty. Our frequent research colloquia by guest scientists and our annual international symposia are major events of the scientific calendar of metropolitan New York.

Our symposia have attracted outstanding scientists from many parts of the world. The 2007 symposium entitled Evolution, Health, and Disease challenged medical practitioners and scientists to understand the yin and yang of pathogen and host evolution, and to view health from an evolutionary perspective. These important annual symposia are also highlighted in the commemorative report.

The Gene Center also develops bright undergraduate scientists in its Summer Program for Undergraduate Research (SPUR), and supports the most qualified American nationals/permanent residents to conduct graduate research as Gene Center Fellows. It fosters nationwide networking and professional development of junior and senior scientists through the JustGarciaHill science website.

We appreciate the leadership of Jennifer Raab, Principal Investigator and President of Hunter College, the guidance of Vita Rabinowitz, Provost, and John Rose, Acting Dean of Diversity. We benefit from the fiscal expertise of Robert Buckley, Director of Research Administration and the network expertise of Franklin Steen, Chief Information Officer & Assistant Vice President for ICIT. We value the contributions of all the members of the Gene Center, as well as Ellis Rubinstein, Rashid Shaikh, Bill Silberg, Chris Williams and Angela Lin of the New York Academy of Sciences. We are indebted to the vision and assistance of Barbara Alving, Director of NCRR, Sidney McNairy, Jr.Director of Research Infrastructure, NCRR, and Shelia McClure of Research Centers in Minority Institutions Program (RCMI) of NCRR.

We thank Matthew Goldstein, Chancellor of The City University of New York and Ernesto Malave, Vice Chancellor for Budget and Finance, Selma Botman, Executive Vice Chancellor and University Provost and the City University of New York for matching funds and support.

We hope that this report will enhance your understanding of our goals, achievements and collaborations, as well as our interactions with the national agencies that support our mission.

We appreciate your support for our continued success.

Sincerely,

Robert P Dottin
Professor of Biology
Director, Center for Study of Gene Structure and Function.
http://genecenter.hunter.cuny.edu

Program and graphics designed by Stan Povelikin
tel. (212) 865-3759 cell (646) 678-1256 stan@spdesign.org www.spdesign.org

Gene Center Report and Commemorative Program edited by Denise Charles and Assistant Editors, Leah Abraha, Jeanne Waxman and Tammy Scozzafava.

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ABOUT THE GENE CENTER

MISSION

- To develop and prepare the next generation of American scientists, including minorities under-represented in the sciences
- To recruit and equip outstanding faculty, including minorities
- To develop and share core research facilities
- To implement strategies for scientific networking
- To build unique collaborations among biologists, chemists, biopsychologists, biophysicists and bioanthropologists

GOALS

- Continue to increase and diversify the research faculty with emphasis on:
  - Recruitment of faculty historically underrepresented in the sciences
  - Mentoring of junior faculty to increase their competitiveness in acquiring extramural support and enhancing their visibility as researchers
  - Improve the research environment by increasing the contributions of post-doctoral fellows and graduate students in the research enterprise
- Sponsor complementary activities, such as colloquia, workshops and symposia
- Strengthen the research infrastructure

CHAIRS OF MAJOR PARTICIPATING DEPARTMENTS

GORDON BARR
Psychology Department

YING-CHIH CHEN
Department of Physics

GARY QUIGLEY
Chemistry and Biochemistry Department

SHIRLEY RAPS
Department of Biological Sciences

GENE CENTER MEMBERS

Jesus Angulo

Associate Professor. Neuropeptide Regulation and Function in Nigrostriatal and mesolimbic pathways.

Jill Bargonetti-Chavarria

Professor. DNA Damage Signaling to p53 and Mdm2.

Gordon Barr

Professor Chair, Psychology Department. Developmental Psychology, Opiate drug effects, Microarrays, Bioinformatics, Transgenics.

Diana Bratu

Assistant Professor. Live cell fluorescence imaging; microRNAs and RNA transport during *Drosophila* oogenesis.

Chris Braun

Associate Professor. Neuroethology of sensory function, especially audition and electroreception in fishes; Multisensory integration; Evolution of the vertbrate brain and sense organs.

Derrick Brazill

Associate Professor. Signal Transduction During Development in Dictyostelium Discoideum.

Richard Chappell

Professor. Neural Interactions of the Retina.

Ying-Chih Chen

Professor. Experimental optics, laser physics, laser devices and spectroscopy.

Tracy Dennis

Assistant Professor. Neural markers for emotion regulation, development and mental health consequences of emotion regulation, emotion-attention interactions.

Jason Dictenberg

Assistant Professor. Visualization of gene expression dynamics in living neurons and the regulation of synaptic plasticity

Robert Dottin

Professor, Director. Reversible Protein Phosphorylation and Signal Transduction in Development.

Mike Drain

Professor. Supramolecular chemistry, materials, photonics, photodynamic therapeutics.

Noel Goddard

Assistant Professor. Understanding the informational basis of cellular state, especially how intra- and extracellular perturbations affect that state.

Laurel Eckhardt

Hesselbach Professor. Molecular Genetics of Lymphocyte Development and Differentiation.

Paul Feinstein

Associate Professor. Using targeted mutagenesis and mouse genetics to study how the brain functions.

Maria Figueiredo-Pereira

Professor. The Ubiquitin Pathway and Neurodegeneration.

Marie Filbin

Distinguished Professor. Molecular interactions of Myelin Formation in the Nervous System.

David Foster

Professor. Oncogenes and Signal Transduction.

Lynn Francesconi

Professor. Inorganic Biochemistry; Medical applications of Inorganic Chemistry.

Nicholas Freudenberg

Professor. AIDS, drugs and community health.

James Gordon

Professor. Visual psychophysiology.

Dixie Goss

Professor. Protein-Nucleic Acid Interactions and their role in Regulation of Biological Functions.

Nancy L. Greenbaum

Professor. RNA Structural Biology; investigation of RNA, metallo-RNA, and protein-RNA complexes by solution NMR and other spectroscopic techniques.

Steve Greenbaum

Professor. Magnetic resonance (NMR, EPR) spectroscopy; materials science; energy storage applications.

Klaus Grohmann

Professor. Synthetic investigations of novel theoretically significant molecules; study of compounds with unusual properties.

Cheryl Harding

Professor. Neuroendocrine modulation of behavior, effects of mold exposure on cognition and brain function.

Wayne Harding

Assistant Professor. Medicinal and Natural Products Chemistry

Adjie Henderson

Professor. Molecular biology of the human chromosome; Electromagnetic field effects on human cells.

Shirzad Jenab

Associate Professor. Signal transduction pathways as related to abuse drugs, especially cocaine.

Akira Kawamura

Associate Professor. Genomic analysis of natural products; Molecular probes of chemical proteomics.

GENE CENTER MEMBERS

Frida Kleiman

Assistant Professor. Coordinated nuclear response to DNA damage.

Michael Lewis

Professor. Behavioral neuroscience and neuropharmacology: Alcohol dependence, substance abuse and eating disorders.

Diego Loayza

Assistant Professor. Telomere function in human cells.

Victoria Luine

Distinguished Professor. Behavioral Endocrinology.

Lou Massa

Professor. Quantum crystallography.

Hiroshi Matsui

Associate Professor. Bio-Nanotechnology material science, microelectronics, sensors, photonics, spectroscopy.

Carmen Melendez-Vasquez

Assistant Professor. Cytoskeletal Regulation of Myelin Formation.

Peter Moller

Professor. Animal Orientation and Communication.

David (Randy) Mootoo

Professor. Organic Synthetic Methodology.

Ben Ortiz

Associate Professor. Chromatin, Transcription and Immune System Development.

Jeffrey Parsons

Associate Professor. The intersection between sexual risk behaviors and substance use, and how this affects issues related to HIV/AIDS.

Sandeep Prasada

Associate Professor. Lexical and conceptual representation and development.

Weigang Qiu

Assistant Professor. Evolutionary Informatics and Microbial Diversity.

Gary Quigley

Professor Chair. Chemistry Dept. Biomolecular Structure and Function, particularly that of DNA and RNA.

Vanya Quinones

Professor. Neuroendocrinology and Behavior.

Vita Rabinowitz

Provost.

Shirley Raps

Professor. Molecular Organization of Phycobilisomes: Characterization of cyanobacterial plasmid for use as a cloning vector.

Patricia Rockwell

Associate Professor. Signal Transduction Pathways.

Rivka Rudner

Professor. Redundancy, Conservation and Differential Expression of Ribosomal and Transfer RNA Genes in the Genus Bacillus.

Thomas Schmidt-Glenewinkel

Associate Professor. Biochemistry and Molecular Biology of Neurotransmitter Receptors and Ion Channels in Drophila melanogaster.

Mike Steiper

Assistant Professor. Biological anthropology, molecular evolution and phylogenetics, population genetics, primates, malaria.

Maria Tomasz

Distinguished Professor Emerita. Interaction of Drugs with DNA. Molecular Basis of the Antitumor Action of the Mitomycins.

H. Phil Zeigler

Distinguished Professor. Neuroethology of movement. Sensory processing and motor control of active touch. Development of a mobile sensory system.

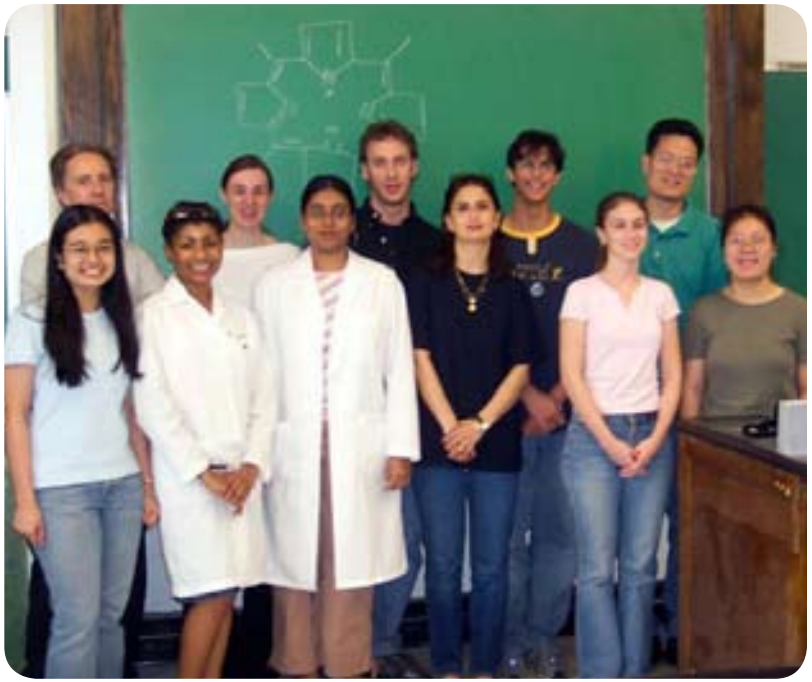
Yujia Xu

Assistant Professor. Interactions of macromolecules, including molecular recognition, protein folding and ligand binding, and their involvement in diseased state.

Hualin Zhong

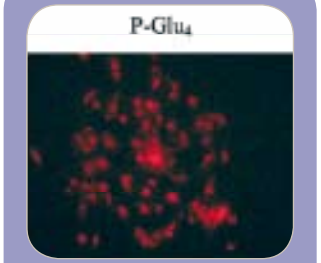
Assistant Professor. Regulation of gene expression and nuclear transport.

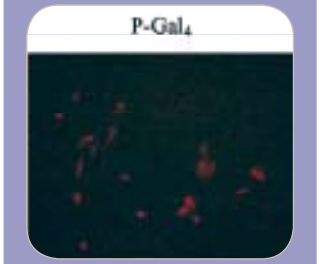
Photos by Zen Jarrette

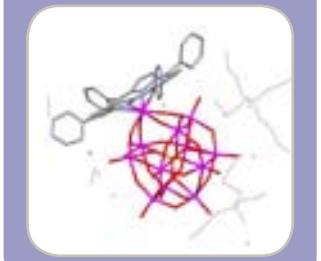


Charles Michael Drain
Without porphyrins, life itself would be impossible.

Organic Nanoparticles
Professor Drain pioneered the formation of all-organic nanoparticles by supramolecular chemistry whereby the organic components are merely mixed together rather than laboriously synthesized by classical organic methods. This groundbreaking work demonstrated a variety of applications of these nanoparticles as catalysts, therapeutics, sensors, photonics, and a vehicle for thermally activated drug delivery. These systems are formed by the self-organization of large dye molecules called porphyrinoids that have a rich variety of photochemical and physical that can be modulated. As one example 5-10 nm particles of a porphyrin decorated with sugar molecules designed to target cancer cells is actively taken up by every cancer cell line examined to date. Briefly shining light on the cancer cells disaggregates the nanoparticle and rapidly kills the cell, thus, this is a promising new class of photodynamic therapeutic. A second example uses nanoparticles of an iron porphyrin to catalyze the oxidation of organic substrates in water using oxygen – a transformation that is otherwise quite difficult – representing a new generation of environmentally friendly catalysts.







Self-Assembled and Self-Organized Materials
In 1989 Professor Drain published one of the earliest examples of a working molecular electronic device in the form of an organic phototransistor. This device used self-organized lipid bilayers and a self-assembled wire of porphyrins. Since this work, there are now well over 2000 papers on porphyrinoid self-assembly and self-organization. At the Hunter College lab, this work continues to be pushed toward the self-assembly of increasingly complex hierarchical materials containing many different kinds of molecular building blocks. The nanoarchitecture of these materials imparts useful properties and functions that are not available on the molecular or the bulk materials levels. Dr.Drain's work has been featured in several books and journals.

Solar Energy Harvesting.
The problem of collecting sunlight and efficiently turning it into useful electrical or chemical energy has been around for nearly a century. The efficiency of photosynthesis in plants is nearly 100%, but despite a huge amount of research man-made devices rarely exceed 20%. Also, the amount of energy and cost that it takes to make silicon based solar cells is prohibitive for most consumers without significant government subsidies. Solar cells base on less expensive, readily available materials such as polymers, dyes and titanium dioxide are a plausible alternative, yet there are significant hurdles. The Drain group has developed a series of compounds – mostly metalated porphryonoids – that may significantly address one of the major problems with the latter inorganic-organic hybrid solar cells, specifically, the efficiency of how the dyes transfer energy or electrons to the semiconducting materials.

Christopher Braun

The tremendous diversity of sensory systems found in fish offers countless natural evolutionary experiments to document the relationship between structure and function. Braun's research uses behavioral and physiological studies of sensory abilities to understand the relationship between neuronal structure and sensory function. He focuses on species with dramatically different sensor morphologies and asks how their sensory capabilities differ. Anatomical diversity is compared to behavioral diversity to document, for instance, how a mechanical linkage between gas-filled cavities and the ear affects relative hearing ability in fish. In combination with ecological data, Braun reconstructs the evolutionary history of hearing, including the environmental factors that promote enhanced hearing. The results of his recent studies of Malagasy cichlids support the hypothesis that enhanced hearing evolves in species living in quiet habitats. Further, most evolutionary modifications of the auditory system in noisy habitats act to reduce hearing sensitivity in the face of high noise and turbulence. Other current studies include species' differences in exploratory behavior in South American weakly-electric fishes. Electrosensory exploratory behavior is an experimentally tractable model of the neural basis of orienting responses and sensory attention. Braun has shown that specific electric behaviors reflect different motivational states. Species variation in exploratory behavior reflects differences in underlying neural circuitry and provides an excellent opportunity to study the evolution of neural circuits. These studies combine to reveal the complex relationship between evolutionary history, ecological constraint, and the function of morphological diversity in the nervous system.

David Mootoo

Professor David Mootoo, who joined the Hunter College Chemistry Department in 1989, is by training an organic chemist and was an early member of the "glycobiology" community – chemists and biologists who focus on carbohydrate-mediated diseases processes. The Mootoo lab has synthesized several classes of novel carbohydrate-like compounds to investigate biomechanical pathways implicated in disease. With over 65 publications and NIH support since the inception of this program, Professor Mootoo is internationally recognized for his contributions to the field. In addition to Hunter College faculty, he has collaborated with faculty from the Department of Biomolecular Engineering at the Johns Hopkins University, the National Cancer Institute of the National Institutes of Health (NIH), Centro de Investigaciones Biológicas, Madrid, and Laboratoire de Biochimie et Physicochimie des Membranes Biologiques, Marseille, among others. Professor Mootoo was appointed to the position of Full Professor in 2000, has served on grant review panels for the American Chemical Society, National Science Foundation and the NIH, and is currently a chartered member of the Synthetic and Biological Chemistry A Study Section of the NIH.

Two specific projects illustrate the breadth of applicability of the chemistry that has emanated from the Mootoo group. The tetrahydrofuran containing acetogenin family of natural products exhibits extremely potent antitumor properties, with activities up to 1010 times that of the known clinical agent adriamycin, a very common chemo-therapy drug. Although individual compounds show high selectivity for certain tumor cell lines, their generally high cytotoxicity presents a hurdle towards their progress as clinical agents. Synthetic methodologies for several acetogenins have been developed, and as part of a collaborative effort in the Chemistry and Biology departments, are being utilized to elucidate the medicinal chemistry of the acetogenins.

C-glycosides are unnatural analogues of O-glycosides in which the glycosidic oxygen is replaced with a carbon substituent. The differences in chemical and physical properties compared to their parent O-glycosides make C-glycosides unique biomechanistic tools. This project entails the design, synthesis and application of C-glycosides as bio-mechanistic probes, and explores innovative strategies in synthetic chemistry and drug discovery. Among the disease states that are being targeted are inflammation disorders and AIDS.

Marie Filbin

After injury to the central nervous system (CNS), the brain and spinal cord, there is no spontaneous regeneration of axons. Surprisingly, it is not because adult axons have lost the intrinsic ability to regenerate but because the environment is inhibitory for regeneration. A major contributor to this inhibitory environment is presence of inhibitors of regeneration in myelin and the glial cells that make myelin. The general focus of my lab is to take a multi-faceted approach to characterizing and overcoming inhibition of axonal growth by glial inhibitors, and encouraging axonal regeneration *in vivo*. We are interested in the receptor-ligand interactions of the axon with the glial cell and /or myelin, the signaling cascade from these interactions that brings about inhibition, and the identification and characterization of parallel pathways that can overcome inhibition.

My lab was launched in the direction of studying regeneration when, in 1994, we made the serendipitous discovery that a well-known myelin protein, myelin-associated glycoprotein (MAG), was a potent inhibitor of regeneration. This was important for a number of reasons. First, this was the first myelin-associated inhibitor to be defined. The antigen of the IN-1 antibody, Nogo, was not described until 1999. Second, the finding showed that there was likely to be many inhibitors of regeneration in myelin, rather than just the IN-1 antigen, as was widely believed. Third, MAG was the first molecule to be shown to have bifunctional capabilities. That is to say it could either promote or inhibit axonal growth, an outcome that we went on to show is developmentally regulated. Using MAG and myelin in general, we then embarked on identifying mechanisms to overcome inhibition. We showed that elevating cAMP either with analogues such as db cAMP or, surprisingly, by priming neurons with neurotrophins, inhibition was overcome. (This observation lead to me being the co-recipient of the Ameritec Prize to Cure Paralysis, together with Dr. Muming Poo). Importantly, we went on to show that elevation of cAMP in vivo was sufficient to promote spinal axon regeneration *in vivo*.

We next wanted to identify how elevation of cAMP was encouraging regeneration through an inhibitory environment. We showed that the effect is transcription dependent and requires activation of CREB. Two of the genes that are up-regulated in response to cAMP/CREB activation, are the enzyme Arginase I (Arg-1), which is a key enzyme in the synthesis of polyamines, and the cytokine IL-6. Both of these proteins can overcome inhibition – up-regulation of Arg-1 and increased synthesis of polyamines is necessary and sufficient to overcome inhibition, while IL-6 is sufficient but not necessary. Also, intrathecal delivery of IL-6 resulted in substantial regeneration through and beyond the lesion site.

We also identified the MAG receptor as the Nogo receptor (NgR). It is now known this receptor binds the three known inhibitors in myelin, suggesting redundancy. Indeed, we have mapped the inhibition site on MAG to the 5th Ig-like domain and shown that peptides corresponding to sequences in this domain block the inhibition not only by MAG but also by myelin in general.

All of the above lines of investigation are being pursued further. In addition, we are studying the rearrangements of the cytoskeleton that accompany/cause inhibition of axonal growth. Conversely, we are also manipulating the dynamics of the cytoskeleton and asking if inhibition is overcome. Recently, we have established an animal model of spinal cord injury in which we test the various putative therapies. To date, we have had considerable success with a number of compounds.

Finally, it is apparent that a lot of the treatments that we have shown can overcome inhibition by MAG and myelin also affect other aspects of neuron biology that influence axonal regeneration in the injured spinal cord, namely neuronal cell death/survival and formation of the glial scar. We are extending our interests to address the role of cAMP, CREB, Arg 1, polyamines, IL-6 in these aspects of neuron/glial behavior.

SUCCESSES 1985-2006

HIRED OUTSTANDING FACULTY RESEARCHERS

- 20 new outstanding tenure-track faculty members
- 10 are members of groups under-represented in science

DEVELOPED RESEARCH FACILITIES

- 15 research labs constructed/renovated
- 5 core research facilities constructed
- 3 core research facilities renovated/upgraded

GENE CENTER FELLOWS – Ph.D. students

- 12 US nationals supported using $1.2M from this grant
- (136 Ph.D students total)

SUCCESSES 1985-2006

GENE CENTER RANKING

NIH "Report Card"

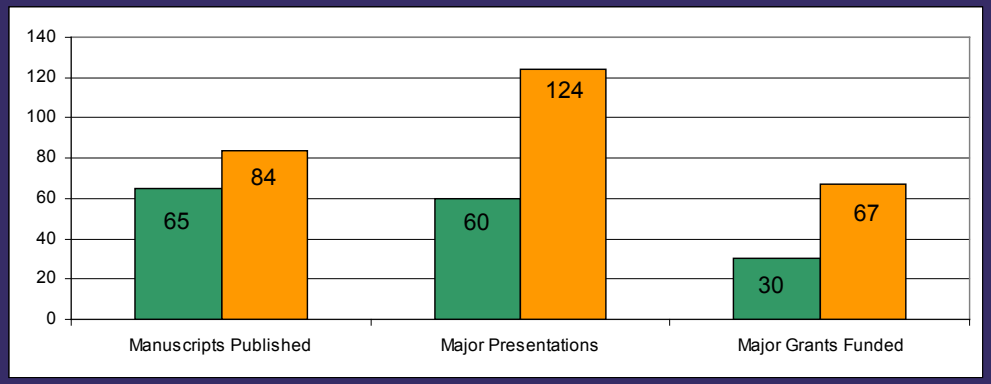
- **NIH funding rank among all RCMI Centers (18) – 7th**
- **NIH funding rank among RCMI Centers without a Medical School – 1st**

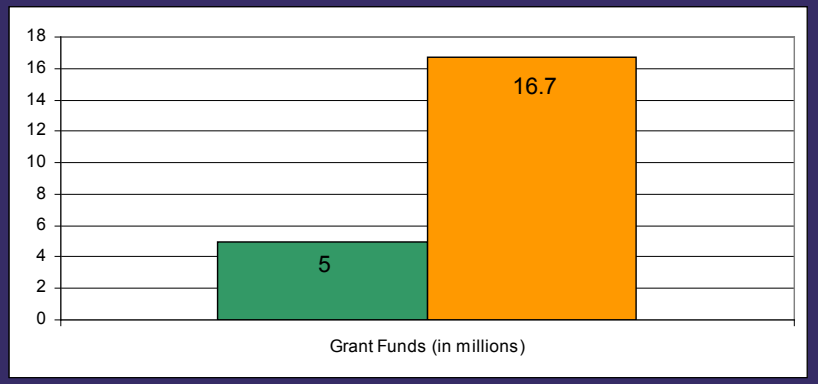
NIH FUNDING

- **Hunter NIH ranking – 217th**
- **Hunter NIH R01 awards**
  - **14 in 2003**
  - **20 in 2006**
- **$13.2M award from NCRR for 2005-2010**

INCREASED RESEARCH PRODUCTIVITY

	1985	2005
Manuscripts published	65	84
Major presentations	60	124
Major grants funded	<30	67
Grant funds	$5M	$16.7M





PRESIDENTIAL AWARDS TO GENE CENTER MEMBERS

Professor **Derrick Brazill** receives Presidential Early Career Award

In 2004, Brazill received a $625,000 NSF CAREER Award for five years of his research to uncover and study the genetic regulation of cell density sensing by using the social amoeba Dictyostelium discoideum as a model. A graduate of Stanford University, Brazill received his Ph.D. from the University of California at Berkeley. Professor Brazill has been a member of the Gene Center since 2000.

Professor **Jill Bargonetti-Chavarria** - Outstanding Cancer Biologist

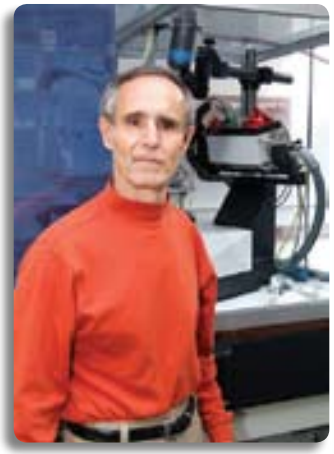
In 1997 President Bill Clinton presented Biologist Jill Bargonetti the Presidential Early Career Award for Scientists and Engineers, the highest governmental honor bestowed on scientists at the beginning of their research careers. Bargonetti was commended for her research on P53, a gene that helps suppress tumor cells, and her multicultural approach to teaching.

Professor **Steven Greenbaum** selected for 2002 Presidential Award for Excellence in Mathematics, Science, and Engineering

In a ceremony held at the White House on March 18, 2003, Hunter Physics Professor Steven Greenbaum was one of 10 individuals to receive the 2002 Presidential Awards for Excellence in Mathematics, Science and Engineering Mentoring text. For over twenty years, Greenbaum has inspired and mentored students who have become major figures in industry, academia and research institutions including MIT, NASA Goddard Institute for Space Studies, Duke University, and DuPont.

GENE CENTER FACILITY MANAGERS

Carlos Lijeron
Webmaster, internet2 Facility Manager



Louis J. Todaro, Ph.D.
X Ray Diffraction Facility Manager

Michael Blumenstein, Ph.D.
NMR Facility Manager

Lloyd Williams, Ph.D.
Bio Imaging Facility Manager

Barbara Wolin
Animal Facility

Joon Kim
Flow Cytometry Facility Manager

Raul Morales
Network Facility Manager

Patricia Glennon, Ph.D.
Veterinarian, Animal Facility Manager

INTERNET2 DISTANCE COLLABORATION AND VIDEO CONFERENCING FACILITY

1. Main control system: Rack and Servers
2. High resolution projector
3. Wireless Auto tracking camera for speaker
4. 42" Plasma TV for speaker's view of remote location
5. Manager's office
6. Sound panels
7. Internet2 and workstations node
8. Crestron central control unit
9. High quality sound system
10. Sound proof windows with air bubble between 2 windows
11. Audience camera

Internet2 Facility at Hunter College Advances Research and Teaching

By Farooq Ahmed

The Gene Center at New York City's Hunter College has recently finished construction on an Internet2 Distance Research & Learning Facility, designed by the renowned Walters-Storyk Design Group whose previous clients include Jazz at Lincoln Center. The facility will provide novel ways for scientists to collaborate on biomedical research and will also help to develop new modalities for teaching and learning.

With the explosion of computing power, computer-intensive research, and advancements in research techniques in the last quarter of the twentieth century, universities and other research institutions quickly outgrew the bandwidth provided by the traditional internet. To overcome this limitation, in the mid-1990s a consortium of universities and businesses formed Internet2, a suite of advanced network applications and technologies with high-throughput data transfer for use in research and education.

The state-of-the-art Internet2 complex at Hunter features two conference rooms, an office, and an equipment room that supports input from many media sources: high-speed fiber-optic lines provided by the City University of New York, digital television, DVD, and CD. It provides output through video cameras, one with robotic tracking, a separate document camera, 42" flat panel monitors, several projectors, a retractable projection screen, and a sound system. Even the furniture in the room is 'smart,' wired for full-function computer, phone, noise cancellation microphones, and video. The entire complex can be controlled by a single Crestron touch screen mounted on the lectern in the main conference room or by a computer in the

Mobile Cart for real-time remote collaboration among labs at disparate locations

adjacent office. An important feature of the facility is the sophisticated 'mobile cart' that provides full audio, video, and high-speed internet connections to individual labs within the Gene Center.

Hunter College President Jennifer Raab contributed a 1,100 square foot sector of the third floor of the campus at Park Avenue and 69th Street, and the National Institutes of Health's National Center for Research Resources provided primary funding for the installation.

Dr. Robert Dottin, the director of the Gene Center at Hunter, reports that the new facility presents formidable interactive communication advances, enabling scientists to exchange, observe, and discuss complex data with high visual and audio quality in real-time. "Internet2 speed, reliability, and clarity will enable us to virtually share the same laboratory with colleagues at over 200 research institutions and universities in this country, and with similarly equipped international institutions," he says.

The facility will be used to support ongoing research in AIDS, neurological diseases, cancer, and behavioral disorders. The ability to collaborate with investigators around the world will allow researchers to use unique and often expensive equipment such as scanning probe microscopes with nano-manipulators without physically being on site. Using the Gene Center's mobile cart, for example, Hunter's scientists can transmit from their labs, observations of mice responding to drugs that affect memory or access functional MRIs for psychophysiological studies, all interactively and in real-time.

"The future," says Dottin, "involves a kind of experimentation where you don't necessarily have to have the multi-million dollar equipment in front of you to do the most sophisticated experiments."

The Internet2 facility will also have a tremendous impact on education. Enhanced distance learning allows bicoastal classes to share materials and conduct live multimedia presentations that can be archived online with voice and synchronized slides. Dottin calls it "collaborative learning at a distance, which gives students ownership of their own creations. They can share them with peers, family, even potential employers." Teaching, he believes, has more impact this way.

An additional pedagogical benefit of the new technology is the ability to help underserved students in the United States and throughout the world. "This small classroom can host a world of budding scientists," Dottin explains. Students from Puerto Rico, Hawaii, or California with Internet2 facilities can pose questions to a professor at Hunter as if they were sitting in the same classroom, helping to bridge the education gap in all directions. These 'budding scientists' can look through microscopes and slides simultaneously and manipulate them as well. Dottin feels that "undergraduates at Hunter will have partners in other parts of the world who are learning the same material and contributing at the same time. This is not possible with the standard form of the internet, and this facility is unique, even in New York."

GENE CENTER PRE-DOCTORAL FELLOWS

Lisa Abrams
BioPsychology

Najat Al-Bashir
Biology

Jacob Edelstein
Biology

Avalon Garcia
Biochemistry

Janette Gomos-Klein
Biology

DongGon Lyo
Biology

Michael Scarpati
Biology

Samantha Sheppard
Biology

Ingrid Tulloch
BioPsychology

Sonjae Wallace
Chemistry

Stephanie Wolfe
Biochemistry

Paige Yellen
Biology

SONJAE WALLACE, GENE CENTER FELLOW MEETS WITH NOBEL LAUREATES IN LINDAU, GERMANY

Professor Jerome Karl, current collaborator, his wife Isabella and Sonjae Wallace

Dr. William Lipscomb, mentor of Sonjae Wallace's mentor, Dr. Massa and Sonjae Wallace

Every year since 1951, Nobel Prize Winners meet and invite students and young researchers from around the world to participate. I was selected to attend the 56th meeting with Laureates in chemistry and physics which was held in Lindau, Germany, June 22 - June 30, 2006. For the first two days, we explored the island, rented bicycles and ventured off to castles, vineyards, a vintage car show, or rented boats to visit the nearby coast.

The opening ceremony on the second day included informal discussions with the other students about their research and their working environments. I shared a table with three students from Germany, two from France, and two from Canada. I left the table realizing that although all of those countries had what we in America considered free education, only some of their institutions were properly funded.

The next morning the presentations by the Laureates began, followed by question-and-answer sessions in the afternoon. I attended a presentation by Professor Kurt Wutrich and later discussed with him some of the details not shown in his presentation "Methods Development by Physical Chemists for Biological and Biomedical Research."

That evening, we attended dinner with the Laureates. I sat with Professor Roald Hoffmann, now a poet and author who is "retired and happy." Dr. Hoffman and I talked about his relationship with my current mentor, Dr. Louis Massa. Later, during the forum, Dr. Hoffmann spoke about ethics and honesty—a refreshing topic for young scientists that emphasizes reporting things as they are, not as they should be.

As a Ph.D. candidate studying theoretical chemistry, my trip would not have been complete without paying homage to the man who gave us Density Functional Theory (DFT) — Professor Walter Kohn. Unfortunately, he did not discuss DFT, preferring to speak about his renewable energy and global warming movie, which had been shown earlier that day. Global warming dominated the discussion that evening at dinner in the company of Professor Sherwood Rowland. We talked at length about the 1988 testimony by Dr. James Hansen before the US Congress that helped raise broad awareness on this issue. Later, as we attended a panel discussion on energy and global warming, my thoughts drifted to Dr. Hansen, my former mentor at the Goddard Institute for Space Studies, and his work on global warming. But more specifically, I thought about the political pressure he had been under in his career to falsify reports, and the problems that followed when he testified about it to Congress.

Judging from the amount of time devoted to the topic of Global Warming at this year's meeting, it seems that most scientists agree that this is the most serious problem facing the scientific community today. Though provable, global warming is still wrought with political, economic, scientific, and social arguments. The scientific solutions have been published in many journals over the years. However, global warming requires political solutions as well as scientific ones, and although the former would seem easier to resolve, our political leaders have not been able to do so.

On the final day of talks, the American delegation had lunch in the casino, dubbed "The Statistics Laboratory." That afternoon I attended the discussion of Professor Jerome Karle, the 1985 Nobel Prize winner in Chemistry, and we had a very fruitful discussion on the Kernel Energy Method. During the two-hour boat trip to the farewell ceremony, everybody had their chance to say goodbye and exchange contacts. Everyone was accessible, and the conversations flowed easily.

Overall, I had a wonderful experience in Germany. The availability of fellow young researchers from all over the world allowed for meetings and discussions in an atmosphere that could only have been created in Lindau. One by one, as we stepped into the buses to leave, it seemed we all had the same epiphany: "We will probably never be back in this magical place, unless we win a Nobel Prize." The meeting was truly a motivational call for my research endeavors.

THE SUMMER PROGRAM FOR UNDERGRADUATE RESEARCH (SPUR)

The Summer Program for Undergraduate Research (SPUR) of the Center for Study of Gene Structure & Function at Hunter College, CUNY was established in 1994. The goal of the program is to prepare and encourage undergraduate students to pursue graduate study in Biomedical Research. College sophomores or Juniors who are US Citizens or permanent residents with a major in Biology, Chemistry, Biopsychology, or Biophysics are eligible to apply. Members of minority groups under-represented in Science (African American, Latino, Native American, Alaskan Natives and Pacific Islander) are especially encouraged to apply. The Annual Application Deadline is February 1st. For more information, and to apply online, visit the Gene Center website: http://genecenter.hunter.cuny.edu

The SPUR program is affiliated with The Leadership Alliance, a consortium of 33 institutions of higher education, including leading research and teaching colleges and universities, dedicated to improving the participation of underrepresented students in graduate education and Ph.D. programs. The Summer Research Program is predominantly for underserved and underrepresented students. It offers undergraduates the opportunity to work for eight to ten weeks under the guidance of a faculty or research mentor. Through this one-on-one collaboration, students gain theoretical knowledge and practical training in academic research and scientific experimentation. The program is designed to encourage students from groups traditionally underrepresented in the sciences, social sciences and humanities to consider research careers in the academic, public or private sectors. Students are required to present a written report and/or abstract at the end of their summer research activity and complete a program evaluation. All participants are expected to participate in the Leadership Alliance's annual, national symposium and to make oral or poster presentations of their research. Students receive a stipend, travel reimbursement, and housing.

Benjamin Ortiz

Dr. Ortiz received his B.A. in Biology at Hunter College and went on to earn a Ph.D. in Immunology from Stanford. After postdoctoral work at U.C. Berkeley, he returned to Hunter where he is now Associate Professor of Biology. He is a key faculty advisor to the SPUR program, which he envisions as a national program providing supportive first research experiences to promising early-year undergradaute students. He has also hosted numerous SPUR students in his own laboratory which studies gene regulation in the T cells of the immune system. His lab has identified novel DNA sequence elements that appear to regulate gene expression via the alteration of chromatin structure. The action of these elements might help explain cell type specific gene expression patterns and aid the design of gene therapy vectors.

JUSTGARCIAHILL.ORG - THE LARGEST VIRTUAL COMMUNITY FOR THE PROFESSIONAL DEVELOPMENT OF MINORITIES IN SCIENCE

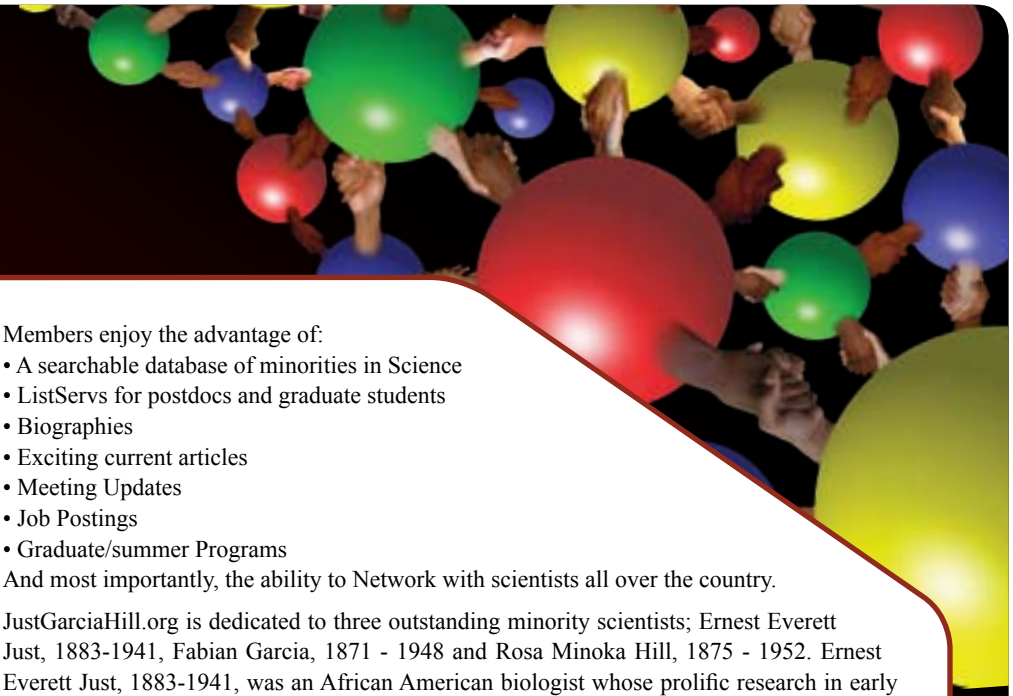
ROBERT DOTTIN Ph.D.
Director of JGH and
Principal Investigator

MEKBIB GEMEDA
Asst. Director of JGH
Director of Office
of Diversity Affairs
New York University
School of Medicine

CARLOS LIJERON
Webmaster

FAROOQ AHMED
Editor and Content
Manager

RICHARD BALDWIN
IT consultant, Episolve



Members enjoy the advantage of:
- A searchable database of minorities in Science
- ListServs for postdocs and graduate students
- Biographies
- Exciting current articles
- Meeting Updates
- Job Postings
- Graduate/summer Programs

And most importantly, the ability to Network with scientists all over the country.

JustGarciaHill.org is dedicated to three outstanding minority scientists; Ernest Everett Just, 1883-1941, Fabian Garcia, 1871 - 1948 and Rosa Minoka Hill, 1875 - 1952. Ernest Everett Just, 1883-1941, was an African American biologist whose prolific research in early development brought him international recognition. However, because of racism and segregation, the gates of the research establishment in the U.S. remained closed to him. Rosa Minoka Hill, 1875 - 1952, was the second Native American to receive a medical degree. She served the poor Indian and white community of Oneida, Wisconsin selflessly for forty years. Fabian Garcia, 1871 - 1948, was a Chicano biotechnologist, a pioneer who engineered chili plants that have launched the southwest as a major player in agrobusiness.

JustGarciaHill is committed to increasing the number of minorities entering science careers and to celebrating contributions to science by minority scientists. We pay tribute to these three pioneers who had to surmount significant obstacles to do what they loved, science. You will find more about Just, Garcia, and Minoka Hill, and other minority scientists in the Biography section of the site

With the JGH portal we hope to provide a supportive environment that would stimulate underrepresented minorities to pursue and strengthen scientific output in the United States and improve the health and well being of minority populations.

Initial funding for this project was provided by NIGMS in a grant to Robert P Dottin and Sigma Xi, The Scientific Research Society.

GENE CENTER PREDOCTORAL FELLOWSHIP PROGRAM

The Gene Center Predoctoral Fellowship program has been instrumental in attracting excellent graduate researchers into the Gene Center labs. The program has trained and launched the careers of outstanding, competitive minority students, most of whom have gone on to make important contributions and some of whom have earned national recognition for their research. In turn, these graduate researchers have made significant contributions to research at the Gene Center and have helped to raise the stature/profile and productivity of the Gene Center research enterprise.

The Gene Center Predoctoral Fellowship is designed to recruit the most outstanding American graduate researchers, including minorities who are underrepresented in science. Fellowships are offered in biology, biochemistry, biopsychology, biophysics, bioanthropology and chemistry to PhD students with excellent/outstanding credentials.

U.S.Citizens or Permanent Residents, members of minority groups under-represented in science are encouraged to apply; e.g., African Americans, Hispanics or Latinos, American Indians or Alaska Natives, and Native Hawaiian or Pacific Islanders. Fellows will receive a stipend of $30,000, full tuition, and health insurance each year for five years, pending availability of funds.

To be considered for the Gene Center Predoctoral Fellowship at Hunter College, please send a copy of your application and supporting documents to the Center for Study of Gene Structure and Function, 695 Park Avenue, Room 315HN, New York, NY 10065.

To apply for the PhD programs online, go to www.gc.cuny.edu/doctoral_programs and select your area of interest. Applications and other information are available online.

Spring semester – submit application by September 1st

Fall semester – submit application by February 1st

THE NYC MINORITY GRADUATE STUDENT NETWORK

AVALON GARCIA
Biochemistry
Gene Center Fellow

The New York City Minority Graduate Student Network provides academic/research support, mentoring opportunities with established scientists, career and personal development workshops, mixers to foster networking and collaborations, and community outreach projects to its members. Avalon Garcia, a biochemistry doctoral candidate at the City University of New York at Hunter College's Gene Center who co-chairs NYC-MGSN, has found the network to be "a great opportunity to meet people from various universities and tap into their resources and their information." The Director of the Gene Center, Robert Dottin, has known and has encouraged Garcia from her teens. He feels that "social networking among minority scientists helps to develop more minority scientists."

The group also sponsors a popular seminar series, Shades of Success. Though the talks are organized by minority graduate students, they are open to students from all backgrounds and disciplines. This inclusiveness contributes to high turnouts for events and support from minority as well as non-minority students for greater diversity among scientists.

The New York City Minority Graduate Student Network was fostered after a group of graduate students from various New York City academic and healthcare institutions (including CUNY, NYU, Columbia and Rockefeller) met informally at the 2005 ABRCMS conference in Atlanta, Georgia. They exchanged contact information with the aim of organizing the framework for gatherings of minority graduate students at the local level. With the support of Mekbib Gemeda, Assistant Dean for Diversity Affairs and Community Health at the NYU School of Medicine, and Robert Dottin, Director of the Center for Study of Gene Structure and Function, the idea became a reality. The aim of the NYC Minority Graduate Student Network is to create a community to help retain and increase the number of minority graduate students pursuing graduate degrees in biomedical research.

Contact avalongaracia@hotmail.com or visit the network website at http://www.nycmgsn.com

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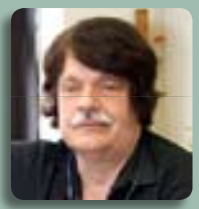

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Network Facility

Tammy Scozzafava
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Not shown:

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Program Administrator
for Communications
and Outreach

Jeanne Waxman
Program Manager

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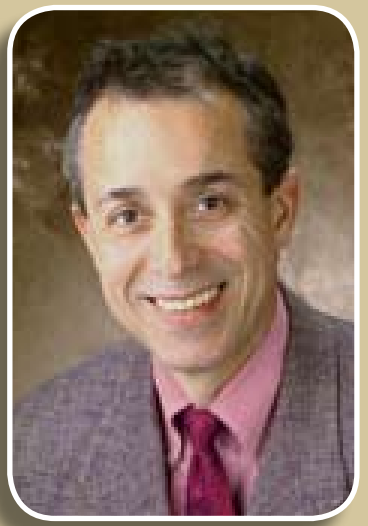
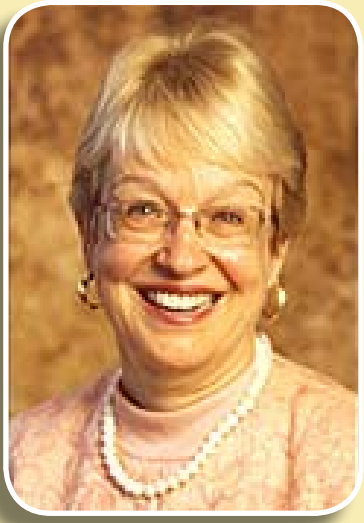
John F. Alderete, PhD



Chair, Gene Center EAC
Associate Vice Provost for Research and Professor, School of Molecular Biosciences
Washington State University
Pullman, WA 99164-1033

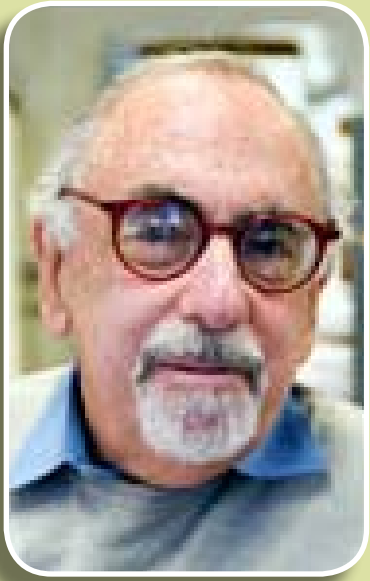
John F. Alderete, Ph.D. is Vice Provost for Research and Professor, School of Molecular Biosciences at Washington State University, Pullman WA. His research on the major non-viral sexually transmitted agent, *Trichomonas vaginalis*, has resultedin 6 patents and patents pending. Dr. Alderete has received many honors and awards, most notably the Premio Encuentro Award for Science and Technology in 1992, the single highest honor given to an Hispanic in America. He was recently accepted into the National Academy of Sciences of Mexico. He is the inventor of the first-ever diagnostic for trichomonosis disease and was co-founder of a biotechnology company, Xenotope Diagnostics, Inc.

Norma M. Allewell, PhD



Dean, College of Life Sciences
University of Maryland
College Park, Maryland

Dr. Allewell leads and oversees the academic, administrative and financial activity of the College of Life Sciences. Her research deals with the molecular mechanisms of biological function and regulation of multisubunit proteins. Her current research, in collaboration with Dr. Mendel Tuchman at the Children's National Medical Center, deals with the biochemical basis of diseases of nitrogen metabolism. She was the recipient of both a Research Career Development Award and a MERIT Award from the National Institutes of Health.



Max E. Gottesman, MD

Revson Professor of Biochemistry & Molecular Biophysics and Microbiology
Columbia University
College of Physicians and Surgeons
New York, NY

Dr. Gottesman's research focuses on three areas. In collaboration with Dr. W. Blaner, his group studies the roles of vitamin A in development and physiology, The Gottesman lab also studies how cAMP signals are transduced to different parts of the eukaryotic cell and the E. coli virus, lambda, and its relatives. Their focus has been the inhibition of lambda gene expression by phage HK022 Nun protein. In 1996, Dr. Gottesman received an honorary doctorate from the Peking Union Medical College in Beijing, China.

Ken Harewood, PhD

GlaxoSmithKline Distinguished Professor of Biomedical Sciences and Biotechnology
Director of the Julius L. Chambers Biomedical/Biotechnology Research Institute
North Carolina Central University
Durham, NC

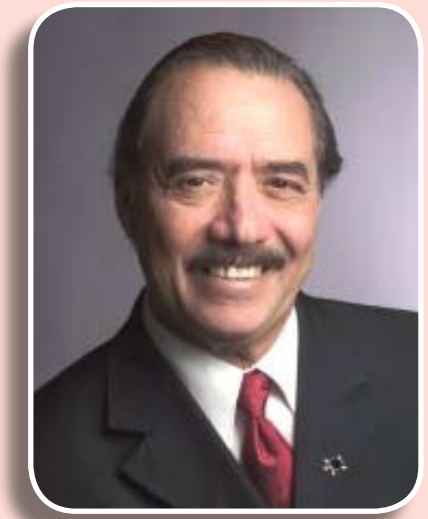
During his 23-year career with Pfizer, Harewood helped build the company's biotechnology program and participated in the discovery of viral agents that cause human leukemia and AIDS. His pioneering research also led to novel new anti-cancer drugs and to Federal Food and Drug Administration approval of the first recombinant DNA process for a food ingredient. In 1998, he was recruited to NCCU to serve as the first director of the new Julius L. Chambers Biomedical/Biotechnology Research Center (BBRI). In that role, he has shaped and defined the BBRI's research mission and focus, assembled research teams targeting diseases that disproportionately affect minority populations, and forged partnerships with other universities, federal agencies and industry. In 2004, he was appointed NCCU's GlaxoSmithKline Distinguished Professor of Biomedical Sciences and Biotechnology.

Jeffrey Laurence, MD

Professor of Medicine
Weill Medical College
Cornell University
New York, NY

Jeffrey Laurence is the senior scientific consultant for programs of the American Foundation for AIDS Research (amfAR) and director of the Laboratory for AIDS Virus Research at Weill Medical College of Cornell University. In 1984, Dr. Laurence authored a paper with Dr. Luc Montagnier, co-discoverer of HIV, documenting HIV as a cause of AIDS and including the first description of a silent, or carrier, state of HIV. Dr. Laurence is the recipient of several honors and awards, including the Clinician-Scientist Award of the American Heart Association and the William S. Paley Fellowship in Academic Medicine.

Eloy Rodriguez, PhD



James A. Perkins Professor of Environmental Studies
Cornell University
Ithaca, NY

Rodriguez has published over 150 research articles in the areas of Biological Chemistry, Tropical Biochemical Ecology and Zoopharmacocnosy (self-medication by wild primates). He is currently exploring biodiverse organisms of the Amazon and Bwindi Impenetrable Forest (Uganda) for novel medicines. His laboratory efforts include natural products, chemistry, medicinal chemistry, medicinal chemistry systematics and phytochemical evolution. Dr. Rodriguez is also the creator of numerous science programs for K-16 students, with a focus on minority students. His favorite program is the KIDS (Kids Investigating and Discovering Science) Program which is designed for K-6 elementary students and is still in operation in Southern California.

IN MEMORIAM, ERWIN FLEISSNER

For over a decade (1987-1998), Erwin Fleissner was the Director of the Gene Center. During that time, I had the privilege of working with him as Coordinator. After he retired in 1989, I became Director of the Gene Center, which, for me, was a hard act to follow.

Under Erwin's leadership, the Gene Center flourished as the number of participating faculty members more than doubled in size. Erwin recruited and nurtured outstanding researchers, who are still important members of the Gene Center in the fields of Immunology, Drug Addiction, Neurobiology, Drug Design and Synthesis, Nanotechnology, and Cancer Research. Also, his decade of behind the scenes work in recruiting and mentoring faculty has contributed to CUNY's Decade of Science which now appears in NYC subways and on buses throughout the five boroughs. This is part of the City University's latest advertising campaign to spotlight CUNY's extraordinary faculty. Erwin's skillful negotiations resulted in support programs for postdoctoral fellows, graduate students, and summer undergraduate researchers.

Erwin was very generous with his time and helped many with the challenges of establishing their research at Hunter College. His vision of excellence and collegiality has had a permanent impact on Hunter. Our best tribute to him will be to ensure that his vision, one that he lived by, will continue to grow.

Beyond Hunter College, Erwin made a lasting impression on the community of Directors of 18 RCMI programs from Hawaii to Puerto Rico. Dr. Sidney McNairy, Director of the Division of Research Infrastructure, NIH/RCMI, a friend of Erwin, emphasizes how much he enjoyed Erwin's vision and his gift of compassion. He made others feel that they too can match his accomplishments. Dr. McNairy asked that, as a tribute to Erwin, we commit ourselves to scientific excellence that will better the lives of everyone.

In conclusion, the Gene Center's Annual International Symposium is the highlight event of the year and one of metropolitan New York's top scientific events. Erwin promoted these symposia and participated in many on topics such as AIDS, Neurobiology, and Cancer. As recently as last year, he participated in the symposium on Minorities, Race, Genomics, and Health Inequities. We all enjoyed working with him again.

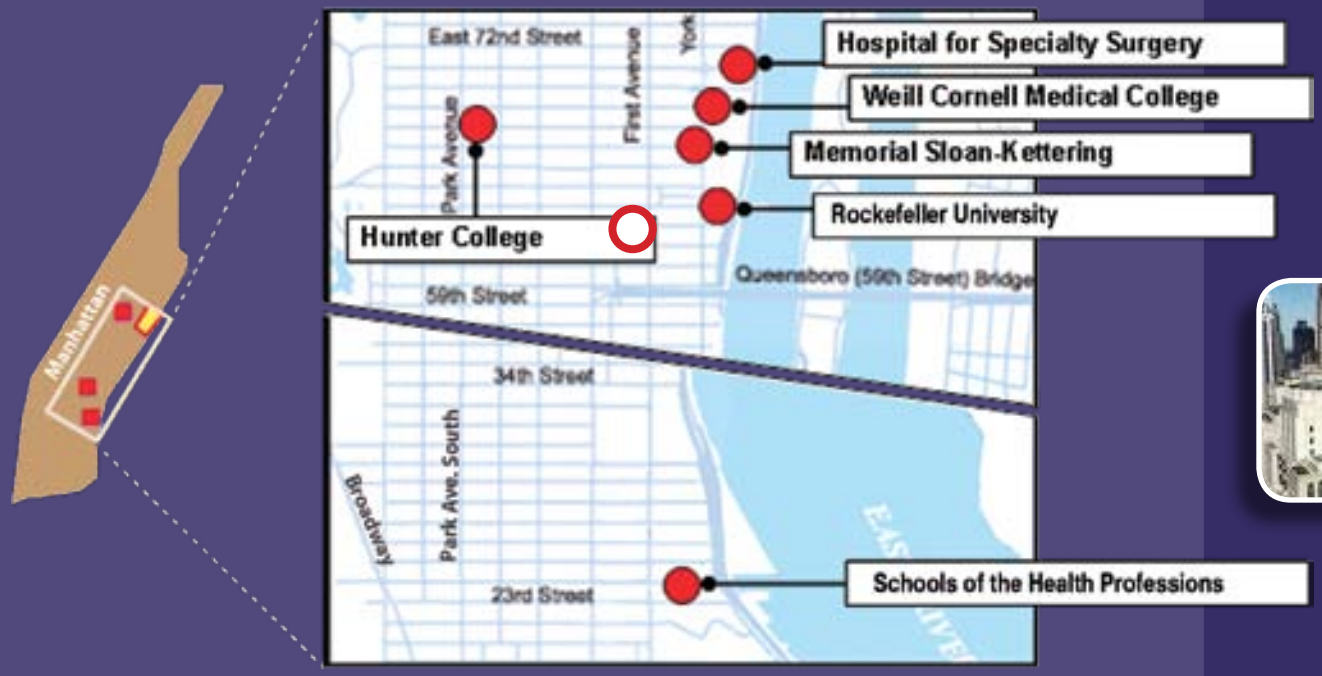
The Gene Center plans to dedicate its 2009 symposium to Erwin's honor. The topic will be Cancer, a vital field of research to which Erwin devoted much of his career. We will miss Erwin, but are grateful for the gifts he left us

Robert Dottin
Director, Gene Center
May 30, 2007

Photo Credit: Barbara Winters

Image taken from: Vital Harmonies: Molecular Biology and Our Shared Humanity, Columbia University Press. New York 2004

PROPOSED NEW HUNTER SCIENCE BUILDING



Hospital for Special Surgery

Weill Cornell Medical College

Hunter College

Memorial Sloan Kettering Cancer Center

Proposed New Hunter Science Building

BARBARA M. ALVING

Director of the National Center for Research Resources (NCRR) at the National Institutes of Health

SIDNEY A. MCNAIRY JR.

National Center for Research Resources (NCRR) of the National Institutes of Health (NIH) and the Director of the Division of Research Infrastructure

SHELIA A. MCCLURE

Division of Research Infrastructure (NCRR)

WILLIE D. MCCULLOUGH

Research and Animal Facilities Improvement

FUNDING AGENCIES

The 20th annual international symposium of the Gene Center is supported by the Research Centers in Minority Institutions Program (RCMI) of the Division of Research Infrastructure of the National Center for Research Resources (NCRR) of the National Institutes of Health (NIH) - Grant Number G12 RR-03037

National Center for Research Resources

The RCMI Program enhances the research capacity and infrastructure at minority colleges and universities that offer doctorates in health sciences.

NATIONAL INSTITUTES OF HEALTH

NCRR enables discoveries that begin at a molecular and cellular level, move to animal-based studies, and then are translated to patient-oriented clinical research, resulting in cures and treatments for both common and rare diseases. NCRR connects researchers with one another, as well as with patients and communities across the Nation, to harness the power of shared resources and research.

The NIH, a part of the U.S. Department of Health and Human Services, is the primary Federal agency for conducting and supporting medical research. Composed of 27 Institutes and Centers, the NIH provides leadership and financial support to researchers in every state and throughout the world. Its mission is science in pursuit of fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to extend healthy life and reduce the burdens of illness and disability.

SYMPOSIUM 2007, OVERVIEW

"Nothing in biology makes sense, except in the light of evolution," wrote Theodosius Dobzhansky in 1973. In human health and disease, evolution illuminates our changing relationships with pathogens as well as the persistence of chronic diseases. The new field of "Darwinian medicine," also called "evolutionary medicine," aims to apply this important perspective to medical science. At Hunter College on January 19, 2007, nine speakers met with members of the community to discuss "Evolution, Health, and Disease" at the 20th Annual International Symposium of the college's Center for the Study of Gene Structure and Function. Professors Michael Steiper, Christopher Braun, and Weigang Qiu, graduate student Jessica Brinkworth, and center director Robert Dottin organized the symposium.

Far from being an "alternative," Darwinian medicine complements mainstream medicine by seeking not just proximate causes of diseases - the "how" - but also the longer-term reasons they exist - the "why." **Randolph Nesse** of the University of Michigan listed six reasons why natural selection can leave us vulnerable to disease. In addition to traditional answers, such as evolution's slow pace and its blindness to diseases arising after reproduction, some unpleasant responses may protect us from more serious problems. In one example, **Paul Sherman** of Cornell University found that most studies suggest that allergy symptoms protect people from cancer. **Paul Ewald** of the University of Louisville focused on how genetic, parasitic, and environmental factors interact to cause chronic disease, and proposed that, in contrast to common wisdom, pathogens play a primary role in atherosclerosis.

These microorganisms evolve as well. **Stuart Levy** of Tufts University described how extensive antibiotic use has turned natural bacterial resistance into a huge problem, often starting outside of hospitals. **Holly Wichman** of the University of Idaho has tracked viruses in the lab over as many as 13,000 generations to explore the mathematical models for the evolution of microbes, including pathogens.

Past evolution has left its fingerprints on both people and pathogens. **Steve Mack** of the Children's Hospital Oakland Research described how highly variable immune-system genes, which must continually respond to novel threats, provide unique clues about past human migrations and current disease patterns. **Cristina Gutierrez** of the Pasteur Institute in Paris traced the evolution of the species that causes tuberculosis and showed that tuberculosis and people evolved together.

On a larger scale, **Arata Kochi**, head of the World Health Organization's Global Malaria Programme, summarized the technical and political issues that hampered past efforts to control malaria, as well as the promise presented by new tools and funding. Finally, in a talk that went beyond medicine into sociology and politics, **Stephen Bezruchka** of the University of Washington summarized the discouraging state of public health in this country, which he attributes less to absolute poverty, but to unequal distribution of wealth.

This wide-ranging symposium illuminated not only exciting advances at the intersection between medicine and evolution, but also how much remains to be learned.

eBriefings
eBriefings are web site-based reports that offer expert-written overviews of the symposia. Speakers' slides are synchronized with voice, and details about the speakers.
eBriefings on this and past Gene Center symposia can be accessed via the following URLs:
Gene Center website: http://genecenter.hunter.cuny.edu JGH: http://justgarciahill.org NYAS: http://www.nyas.org/ebrief/

SYMPOSIUM 2007, PROGRAM: EVOLUTION, HEALTH AND DISEASE

MORNING SESSION: EVOLUTION OF MOLECULES AND PATHOGENS

Science Poster Set-Up

Michael Steiper, PhD – Session Chair
Hunter College, CUNY
Introduction to: *Evolution of Molecules and Pathogens*

Paul Ewald, PhD – Keynote Speaker
University of Louisville
Gene/Environment Interaction and the Causes of Atherosclerosis

Holly Wichman, PhD,
University of Idaho
Experimental Evolution in a Virus Model System

Christina Gutierrez, MD, PhD
Pasteur Institute, France
Parallel Origin and Diversity of TB Agents and Humans

Steven Mack, PhD
Roche Institute
Using the Human Major Histocompatibility Complex to Study Disease, Natural Selection and Human Evolution

Questions to Panel of Morning Speakers

AFTERNOON SESSION: HEALTH EVOLVING – PEOPLE AND POLICY

Science Poster Session

Provost, Vita Rabinowitz – Greetings
Director, Robert Dottin – About the Gene Center

Christopher Braun – Session Chair
Hunter College, CUNY
Introduction to: Health Evolving – People and Policy

Randolph Nesse, PhD – Keynote Speaker
University of Michigan
Darwinian Medicine: Why has Natural Selection Left us so Vulnerable to Disease?

Arata Kochi, MD,
Director, World Health Organization's Global Malaria Program (WHO/GMP)
Malaria Control: Why It Has Failed and How to Fix It?
Public Health Approaches and Interntional Politics

Stuart Levy, MD
Tufts University
The Ecology of Antibiotic Resistance

Paul Sherman, PhD
Cornell University
Allergies and Cancers: Are The Complex Relationships Comprehensible?

Stephen Bezruchka, MD, MPH
University of Washington
Targeting Childhood Development to Make the Nation Healthy Again

Questions to Panel of Afternoon Speakers

Award Ceremony for 3 Best Posters
1st Prize – Michael Campbell, Columbia University, New York
2nd Prize - John Torday, University of California, Los Angeles
3rd Prize - Oliver Attie, Hunter College, City University of New York
Closing Remarks

Targeting Childhood Development to Make the Nation Healthy Again

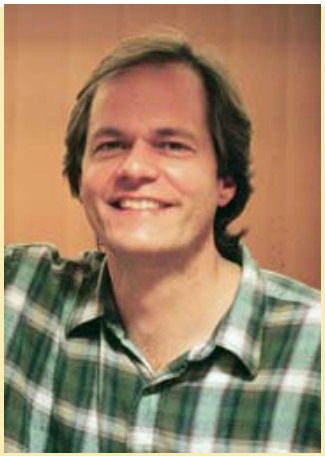
Stephen Bezruchka, University of Washington

Abstract: The US is less healthy by any measure than pretty well all the other rich countries and a few poorer ones, despite spending half of the world's health care bill. Our health continues to decine compared to other nations and this year, there are at least 28 healthier countries while, 55 yeras ago, the US could boast being in the top five or ten. Even if we eradicated heart disease, our leading cause of death, we would still not be the healthiest. Research on the determinants of health of populations over the last 25 years points to structural factors impacting economic justice as the root cause of our poor health as a population. More egalitarian societies have better average health, thus, implicating our increasing economic inequality as the primordial cause. This factor may have its greatest impact during early life. If this nation is to regain its health status compared to other countries, just political policies that promote advantaged early life for all will need to stay in place for decades . Enacting and maintaining these policies for a generation or two will have major health impacts, far beyond those of any other 'medicine.'

Bio: Stephen Bezruchka graduated from Stanford Medical School in 1973 after getting a Master's in Mathematics at Harvard. He also received a Master's in Public Health from Johns Hopkins University in 1993. He continues to practice medicine in the US as an emergency physician. He has also worked in Nepal for over ten years in community health projects, setting up remote district hospitals as teaching institutions for Nepali family practice doctors and supervising them in their rotations there. He currently works with Nepali doctors there to improve surgical services in remote hospitals. He is a Senior Lecturer in the International Health Program of the Department of Health Services at the School of Public Health and Community Medicine in the University of Washington. He set up and facilitated the introductory component of their Community Oriented Public Health Practice MPH curriculum that creates learning opportunities by group study of problems, rather than by faculty giving lectures. He received the 2002 Outstanding Teacher Award in the School of Public Health. He worked as the Assistant Health Officer for Kittitas County in Washington State in the mid 1990s. His main interest is in disseminating information about population health, and for this purpose he maintains a web site: (http://depts.washington.edu/eqhlth/) where the science is presented. He runs a Population Health Forum at the University of Washington where people try to advance understanding of these concepts. The most exciting developments at present revolve around developing curriculums on population health for middle and high schools. He speaks widely to groups from the homeless, to teachers' conferences, student groups, church organizations, unions, and political action networks.

Gene/Environment Interaction and the Causes of Atherosclerosis

Paul Ewald, University of Louisville



Abstract: Gene/environment interactions are broadly considered to be important for understanding biomedical phenomena. But the value of considering such interactions depends on the breadth of environmental variables that are considered and how the environmental variables are integrated into alternative causal hypotheses. In medical research on chronic diseases, environmental variables are often considered descriptively as risk factors, but the spectrum of known or suspected risk factors are rarely cast integratively into alternative hypotheses of causation. An evolutionary perspective is central to this process because evolutionary considerations aid in the generation of alternative hypotheses of causation, and help distinguish reasonable hypotheses from infeasible ones. My presentation will apply such an integrative approach to the causes of atherosclerosis as a model for investigating of the causes chronic disease in general.

Bio: Paul W. Ewald is a Professor of Biology and Director of the Program on Disease Evolution at University of Louisville. He holds appointment in the Department of Biology at the Academic campus and the Department of Microbiology and Immunology at the School of Medicine. Professor Ewald received his B.Sc. in Biological Sciences from the University of California, and his Ph.D. from the University of Washington with a specialization in evolutionary biology. He was the first recipient of the Smithsonian Institution's George E. Burch Fellowship in Theoretic Medicine and Affiliated Sciences, which was established in honor of the renowned cardiologist to foster pioneering advancements in the health sciences. Prior to joining University of Louisville, Professor Ewald was on the Faculty at Amherst College, where he held Assistant, Associate and Full Professorships and was the Dominic Paino Professor of Global Environmental Studies. During this time, he also held and adjunct appointment at the University of Massachusetts. Professor Ewald was a principal founder of the discipline, *Evolutionary Medicine*, by virtue of the papers and books he has published from 1980 onwards. He is the author of Evolution of Infectious Disease (Oxford), which is widely acknowledged as the watershed event for the emergence of this discipline (awarded Honorable Mention from the Association of American Publishers, 1994 Annual Award Program for Excellence in Professional and Scholarly Publishing). The book summarized the conceptual framework for understanding the evolution of acute infectious diseases, which he developed during the 1980's. It also laid down its application to the threat posed by influenza, which has been proven accurate by the two decades that have elapsed since its publication. His second book, Plague Time (Free Press & Anchor) integrated many of these ideas with our emerging understanding of the broad role of germs as causes of chronic diseases.
He has written many articles for scientific journals on topics ranging from territorial behavior to new strategies for designing vaccines. He also has written numerous articles for popular magazines such as Natural History, National Geographic, and Scientific American, and Op Ed pieces for the New York Times and the London Times. His work has been featured in publications such as Science, Newsweek, The New York Times, Omni, Scientific American, Forbes, Fortune, US News & World Report, The Atlantic Monthly, and Esquire's Best and Brightest issue for 2005, often as cover stories. He has lectured extensively at college campuses and symposia around the world and has made approximately 200 appearances on television (PBS, Learning Channel, Discovery Channel, NBC, Canadian Broadcast Company, Australian Broadcast Company, etc.) and radio (NPR's Science Friday, Soundprint and The Connection, CBC's Quirks & Quarks, Sunday Edition, Newsweek Radio Show, etc.).

Parallel Origin and Diversity of TB Agents and Humans

M. Cristina Gutierrez, Pasteur Institute

Abstract: The agent of tuberculosis is inextricably intertwined with humankind. Every second someone somewhere in the world gets infected, and each year TB kills about 2 million people. How long have these bacteria been co-living with our ancestors? Recent studies indicate that the ancestor of contemporary *Mycobacterium tuberculosis* originated from a three million year old species. Extant *Mycobacterium prototuberculosis* are found in patients from East Africa, not far from some of the richest lodes of hominid fossils in Ethiopia, and the genetic diversity of these bacteria reflects the genetic diversity of living Africans. One branch of this species expanded about 35,000 years ago and spread around the world, today infecting one-third of humankind. *Mycobacterium tuberculosis* had to spread with the waves of human migration, because these bacteria are not found in the environment and humankind is virtually its only reservoir. The worldwide contemporary tuberculosis bacilli show a high genetic diversity, with a global population structure and geographical distribution comparable to those of modern human population. Almost certainly, tuberculosis has impacted on humankind through pre-history. *M. tuberculosis* and its earlier relatives have probably been co-evolving with *Homo sapiens* and their earlier relatives for hundred of thousand of years.

Bio: Cristina Gutierrez was born in 1962 in Vigo (Spain). She obtained her medical degree in 1986, and her Ph.D. in Molecular Biology in 1990, both from the University of Santiago de Compostela, Spain. In 1996, she received her Specialty in Medical Microbiology from the Spanish Ministry of Education. She is currently a senior researcher at the Institut Pasteur, Paris. She has been working at the Institut Pasteur since 1997. First she focused her work on developing molecular methods for characterization of the agents of tuberculosis and other mycobacteria, and on their application on molecular epidemiological studies of tuberculosis. Then she focused on the molecular evolution of the tuberculosis agents and their diversity on different human populations around the world. From 2000 to 2005, she worked as well as Deputy Director at the French National Reference Center for Mycobacteria. She was a founder-member of the European Network for surveillance of multidrug resistant tuberculosis. Since 2000, she has taught at the Institut Pasteur School for Post-graduate Training where she heads a course on molecular tools and epidemiology of tuberculosis. She is active in national and international mycobacteriology societies, and she is a scientific advisor for the French High Council of Public Health. Recently, on the basis of her experience with mycobacteria, she and her collaborators have challenged the hypothesis of a recent origin for human tuberculosis. Working with bacteria from patients in eastern Africa, she has instead proposed the hypothesis that the agents of tuberculosis originated millions of years ago in eastern Africa, where they have been co-evolving with humans since the origin of the humankind. She has authored or coauthored over sixty scientific publications and book chapters, and has been a referee for various scientific journals. Articles about her work have appeared in newspapers and magazines around the world, including the BBC News, The New York Times, The Washington Post, The Spiegel, and Le Figaro.

Malaria Control: Why It Has Failed and How to Fix It? Public Health Approaches and International Politics

Arata Kochi, Director, World Health Organization's Global Malaria Program (WHO/GMP)

Abstract: Through comparative analysis of 'successful' global efforts to combat infectious diseases, including immunization, TB, and past malaria control efforts, the speaker will describe the history of global malaria control and why past efforts have 'failed' from both scientific and political perspectives. The analysis will include, inter alia, epidemiology, available tools, mindset/culture of the malaria community, as well as interactions between research and control efforts, and global partners. New strategic approaches - both technical and political, adopted and espoused by the World Health Organization's Global Malaria Programme beginning in 2006, will be presented.

Bio: In October 2005, Dr Arata Kochi, one of the most senior public health experts at WHO, was appointed by WHO's Director-General, Dr LEE Jong-Wook, to revitalize the organization's malaria control efforts. Prior to his appointment as Director of the Global Malaria Programme, Dr Kochi served in several key leadership posts at WHO. In 1989, Dr. Kochi was charged by WHO to revise and strengthen its programs to control the global tuberculosis (TB) epidemic. At that time, only 2% of the world's TB patients were receiving proper TB treatment recommended by WHO. Because of new control practices initiated by Dr Kochi, nearly 60% of TB patients now receive this quality treatment and care. In 2001, Dr Kochi became the Director of WHO's HIV Department and initiated AIDS treatment in poor countries which lead to the "3 by 5" initiative. As a medical doctor, Dr Kochi was trained at the Tohoku University Medical School in Japan where he also obtained a PhD in Social Medicine. He also holds a Master of Public Health and a Master of Science in Food Policy and Nutrition degrees from the Harvard School of Public Health. Dr. Kochi also has extensive field experience, having worked for UNICEF as a health and nutrition expert in Myanmar and Afghanistan.

The Ecology of Antibiotic Resistance

Stuart B. Levy, M.D., Tufts University

Abstract: Antibiotic resistance is a major public health problem in countries throughout the world. Bacteria know no boundaries: resistant, like susceptible strains can move from person to person, community to community, city to city, and country to country. Resistant forms are selected by antibiotic use in various locations, e.g. people, animals, agriculture, and become prominent in these environments. All bacteria are subject to resistance selection and these resistances are transferable among bacteria of different types. Thus, while it is important to be aware of resistance in bacteria which are of clinical importance, we must also maintain awareness of resistance among the commensal flora. Both clinical and commensal strains make up the pool of resistant bacteria that share resistance determinants among themselves in broad ecologic and environmental areas. Since bacteria and resistance determinants move, the selection of drug resistance anywhere in the world can eventually be a problem somewhere else. This phenomenon highlights the concept that antibiotics are unique therapeutics – they are societal drugs. The emergence of resistant bacteria in an individual taking an antibiotic becomes a problem for all members of society since these bacteria are easily shared. The frequency of resistance emergence can be seen as a result of "selection density." The greater the number of individuals being treated with antibiotics in one location, the greater rate and frequency of resistant bacteria there. To control the spread of resistance, we must improve our understanding of how to use these valuable therapeutics and increase our awareness of the broad ecologic presence of drug resistance in bacteria.

Bio: Stuart B. Levy, M.D., Professor of Medicine and of Molecular Biology and Microbiology, is the Director of the Center for Adaptation Genetics and Drug Resistance at Tufts University School of Medicine, and Staff Physician at the New England Medical Center. He also serves as President of the *Alliance for the Prudent Use of Antibiotics*, an international organization with members in over 100 countries of the world. He is a past President of the 42,000 member *American Society for Microbiology*. He is co-founder and Chief Scientific Officer of Paratek Pharmaceuticals, Inc.

A magna cum laude, Phi Beta Kappa graduate of Williams College, Dr. Levy received his medical degree from the University of Pennsylvania. He did his residency at Mt. Sinai Hospital in New York and postdoctoral research at the National Institutes of Health, Bethesda. Dr. Levy is a Fellow of the American College of Physicians, Infectious Disease Society of America, American Association for the Advancement of Science, and the American Academy of Microbiology.

Dr. Levy is well known for his contributions to the antibiotic resistance field. He has published over 250 papers on antibiotic use and resistance. He authored *The Antibiotic Paradox*, now in its second edition, and has edited four books and two special journal editions devoted to the subject and has organized numerous international symposia and meetings on antibiotic resistance. Dr. Levy has been featured and quoted for his work on antibiotic use and resistance in major national and international newspapers and magazines and on all major U.S. television network news shows, including the *CBS Evening News, ABC World News Tonight* and the *NBC Today* shows. He has appeared on many National Public Radio programs including *Fresh Air, The Connection, Science Friday*, and *All Things Considered*.

Using the Human Major Histocompatibility Complex to Study Disease, Natural Selection and Human Evolution

Steve Mack, Roche Institute

Abstract: The Human Leukocyte Antigen (HLA) genes are the most polymorphic loci in the human genome. The products of these genes present endogenous and exogenous peptides for inspection by T-cells, which recognize and respond to HLA-presented antigens by initiating specific immune responses, and, as such, are central to immune function. Susceptible and protective associations have been observed between alleles at specific HLA loci and a variety of autoimmune diseases (e.g., Type-1-Diabetes and Rheumatoid Arthritis) and cancers (e.g. Nasopharyngial Carcinoma), and for many diseases, the HLA region appears to be the major genetic determinant of disease. These associations of disease with HLA diversity are observed to be population-specific, and are likely the result of the genetic diversification of the human population in its spread across the globe. The central immune role played by the HLA loci results in strong selection for population-level diversity (balancing selection), a phenomenon that, when considered with the tremendous diversity at these loci, makes them suitable for studies of population history, and the testing of specific anthropological hypotheses. For example, phylogenetic analysis of HLA allele and haplotype frequencies in Oceanian and Pacific populations indicates that the Highland populations of Papua New Guinea (PNG) are more closely related to Aboriginal Australian populations than to coastal and Lowland PNG populations, a finding that supports the so-called "Sahul Hypothesis" of the colonization of Australia and New Guinea.

The strong balancing selection observed at the locus level for HLA loci can be dissected at the amino-acid level by exploring the selective forces shaping diversity within specific functional groups of peptides and at individual peptide residues. For example, the strong balancing selection seen worldwide at the HLA-C locus may result from the functional constraints placed on this molecule by interaction with both T-cells and Natural Killer cells. In this way, the fundamental biochemistry of these molecules, which is the same in all populations, serves as the basis for understanding the tremendous molecular diversification and diversity of disease-associations seen around the world.

Bio: Steven J. Mack earned his Ph.D. in Molecular and Cell Biology in Allan Wilson's laboratory at the University of California at Berkeley in 1996, studying the molecular evolution of mitochondrial DNA and MHC genes in Native American populations. He then post-docced with Henry Erlich at Roche Molecular Systems, studying the population genetics and molecular evolution of MHC in human populations. From 1999 to 2005, he co-chaired the Anthropology / Human Genetic Diversity components of the 13th and 14th international Histocompatibility workshops, and served on the Histocompatibility Committee of the National Marrow Donor Program. Dr. Mack is now an assistant staff scientist at the Children's Hospital Oakland Research Institute, but is a native of the Bronx, and still roots for the Yankees.

Darwinian Medicine: Why has Natural Selection Left Us So Vulnerable to Disease?

Randolph Nesse, University of Michigan

Abstract: Darwinian medicine is the enterprise of using the principles of evolutionary biology to address the problems of medicine. This lecture begins with data showing evolutionary biology nearly absent from medical curricula. Even the fundamental distinction between evolutionary and proximate questions remains poorly understood in medicine. Asking evolutionary questions is crucial to understanding why natural selection has left the body so vulnerable to so many diseases. The possible explanations fit nicely into six categories:

1. The mismatch between our bodies and novel aspects of the modern environment gives rise to much chronic disease.
2. Pathogens evolve so quickly that we cannot keep up.
3. Constraints such as path dependence limit the perfection of traits shaped by selection.
4. Tradeoffs leave every trait in the body imperfect and vulnerable to disease.
5. Selection shapes organisms for maximal reproductive success, even if that compromises individual health and longevity.
6. Defenses such as pain, cough, and fever are not diseases, but responses shaped by selection and regulated so they are expressed when they are useful.

The regulation of defensive responses like pain, fever, and anxiety is addressed in detail. Following the principles of signal detection theory, normal defense regulation systems are shaped by selection to express many painful defenses in situations where they are not actually necessary. This has major implications for everyday medical practice and research. The overall conclusion is that evolutionary biology is an invaluable basic science for medicine, one whose applications are just now being explored.

Bio: Randolph M Nesse is Professor of Psychiatry, Professor of Psychology and Research Professor at the Research Center for Group Dynamics at the Institute for Social Research at the University of Michigan where he directs the Evolution and Human Adaptation Program. He is a founder of the field of Darwinian Medicine. His early research was on the neuroendocrinology of anxiety and the treatment of anxiety disorders. Currently he is dedicated to advancing the field of Darwinian medicine, with special attention to implications for psychiatry. His specific research now focuses on the evolutionary origins of emotions, especially mood and moral emotions that make committed relationships possible.

Allergies and Cancers: Are the Complex Relationships Comprehensible?

Paul Sherman, Cornell University

Abstract: Are allergies and cancers related and, if so, why? To address these questions we comprehensively reviewed all published information. We located 118 papers (1955-2005), which reported results of 278 studies of individual types of allergies and 136 studies of multiple allergies combined, in relation to cancers of 18 specific tissues and organ systems or multiple cancers combined. We used these data to test three alternative hypotheses: (1) antigenic stimulation (allergy symptoms increase cancer risk because chronic inflammation and stimulation of cell growth provides frequent opportunities for mutations and malignant proliferation of actively-dividing stem cells), (2) prophylaxis (allergy symptoms reduce cancer risk by binding heterospecific cells, toxins, and foreign particles with mucous and expelling them before they, and any contained or adhering mutagens, can trigger carcinogenesis), and (3) immunosurveillance (allergy symptoms do not directly affect cancer risk, but allergies and cancers are inversely related because immune systems that are especially capable of detecting and attacking pre-malignant autogenic cells also are adept at recognizing and eliminating heterospecific cells, toxins, and foreign particles). Overall, 0.44 of studies of specific allergies and 0.44 studies of multiple allergies combined reported that people diagnosed with a cancer were less likely to have expressed allergy symptoms – coughing, itching, tearing, diarrhea, etc. - prior to their diagnosis than matched comparison groups of non-cancer patients. By contrast, only 0.18 of studies of specific allergies and 0.16 of studies of multiple allergies combined reported that cancer patients were more likely to have expressed allergy symptoms prior to diagnosis than non-cancer comparison groups. The remaining studies of specific allergies (0.37) and of multiple allergies combined (0.40) found no relationships with cancers. Contrary to antigenic stimulation, there was a significant excess of inverse allergy-cancer relationships over positive and null relationships. Allergy-cancer relationships also differed among types/sites of cancers: inverse relationships were significantly more frequent for cancers of seven tissues and organ systems of epithelial embryonic origins that can interface with the external environment than for cancers of five tissues and organ systems of endothelial origins that interface only with the body's internal milieu. These results suggest that normal (sub-lethal) allergy symptoms help protect certain tissues frfom cancer, especially tissues that are routinely exposed to environmental toxins, microorganisms, and particulate matter such as dust, pollen, smoke, and mold, to which mutagenic chemicals may be adhering.

Bio: Prof. Sherman was an undergraduate at Stanford, a graduate student at Michigan, and a Miller Postdoctoral Fellow at Berkeley. He joined the Cornell faculty in 1981, was awarded tenure in 1985, and was promoted to Full Professor in 1991.

Prof. Sherman's research has contributed to scientific understanding in six general areas: altruism, kin recognition, eusociality, sexual selection, conservation biology, and Darwinian Medicine. He has studied birds, insects, and mammals, including an insect-like mammal, the naked mole-rat. He has published almost 200 papers and books.

Prof. Sherman teaches courses and seminars in Behavioral Ecology, Animal Behavior, and Darwinian Medicine. In 2005, he was appointed an S. H. Weiss Presidential Fellow in recognition of "effective, inspiring, and distinguished teaching." He was a Sigma Xi National Lecturer in 2004-06, and was elected a Fellow of the Animal Behavior Society in 2004.

Experimental Evolution in a Virus Model System

Holly Wichman, University of Idaho

Abstract: Most pathogens evolve at a rate that is very rapid relative to human life span. Thus, pathogens can adapt to new hosts, evolve resistance to drugs and vaccines, and evade immune response. Population genetics has given us a large body of theory relevant to these issues, and now experimental evolution puts us in the position of testing some of these theories. We use experimental evolution of icosahedral phages as well as phenotypic and sequence analysis of wild phages to explore the rules of viral evolution. The strengths of the system include: the well-described biology and known structure of the prototype icosahedral phage, X174; the small genome size, which allows for extensive whole genome characterization over the course of evolution; and several methods of propagation, which allow many different problems to be addressed.

Bio: Dr Wichman is a Professor in the Department of Biological Sciences, University of Idaho. She obtained her Ph.D. in Biology from Wesleyan University, Connecticut in 1983. Her laboratory conducts research in two areas – the molecular basis of adaptive evolution and the genomic impacts of mammalian transposable elements. Her studies of adaptive evolution take an experimental approach, using bacteriophages as a model system to study patterns and processes of evolution in real time. Dr.Wichman has published extensively in both these fields, and is also interested in the applications of evolutionary biology to societal issues in health, agriculture, and industry. She is the Associate Editor of the journal "Genetica" and has served as an editorial board member of the journal "American Naturalist". In 2005, she co-organized an NIH workshop on Evolution of Infectious Disease.

SYMPOSIUM ORGANIZERS

Steiper, Michael
Institution: Hunter College, CUNY
Chair, Symposium Planning Committee

Michael Steiper is an anthropologist at Hunter College interested in primate molecular evolution. His specific research relates to the evolution of genes implicated in human adaptation to malaria and molecular clocks.

Brinkworth, Jessica
City University of New York
New York Consortium in Evolutionary Primatology
Symposium Planning Committee

Jessica F. Brinkworth is a doctoral student in the Department of Anthropology, City University of New York, New York Consortium in Evolutionary Primatology. Her research interests include evolutionary immunology, host-pathogen coevolution, primate retroviruses and protein modelling. Brinkworth's dissertation is an investigation into Chimpanzee/immunodeficiency virus coevolution and innate immune receptor mediated resistance to AIDS pathogenesis. Her project examines differences in genetic sequence, protein structure and cellular expression of receptors in chimpanzee subspecies and humans. Brinkworth is completing her research at Cornell University's Joan and Sanford I. Weill Medical College and is a graduate of the University of Toronto (Msc., 2000, Anthropology) and Wilfrid Laurier University (Honors B.A., 1998, Anthropology, Archaeology minor).

Dottin, Robert
Hunter College, CUNY
Director, Center for Study of Gene Structure & Function
Symposium Planning Committee

Robert Dottin's research focuses on the mechanisms by which extracellular ligands induce development. His research demonstrated receptor-mediated induction of gene expression in Dictyostelium development. He examines the role of reversible protein dephosphorylation in development by protein phosphatases.

Braun, Christopher
Hunter College, CUNY
Symposium Planning Committee

All of the research in my lab can be related to the simple question: What do animals know about their world, and how do they know it? Indeed, all animals experience the world through their perceptions, so the world is literally defined by the sensory information available. I am particularly interested in understanding the tremendous diversity of sensory systems across the animal kingdom. The breadth of sensory systems found in fishes (the most diverse group of animals with backbones) offers countless opportunities to examine the results of natural evolutionary experiments. What can some species perceive that others cannot, and what specific features of their sensory apparatus are responsible for that difference in performance? We use a variety of techniques to probe the relationship between nervous system structure and sensory function, ranging from studies of peripheral sensory structures and the organization of sensory processing in the brain, to behavioral and physiological studies of sensory abilities.

Qiu, Weigang
Institution: Hunter College, CUNY
Symposium Planning Committee

Dr Qiu got his B. Sc. degree in Biochemistry from Fudan University, Shanghai, China in 1986. He held a Master's Degree in Biotechnology from the Shanghai Jiao Tong University. He studied in Dr Daniel Dykhuizen's lab at State University of New York, Stony Brook and graduated in 1999 with a Ph.D. in Ecology and Evolution. He spent three years as a postdoctoral fellow in Dr Arlin Stolzfus's lab in CARB, University of Maryland Biotechnology Institute, specializing in evolutionary bioinformatics. He started in Hunter College as an Assistant Professor of Biology in Fall, 2002.

TECHNICAL STAFF: **Carlos Lijeron**, Internet2 Facility Manager; **Raul Morales**, Network Coordinator; **Lloyd Williams**, Network Manager; **Zen Jarrette**, Photographer; **Kevin Campbell**, Technical Support.

PLANNING STAFF: **Leah T Abraha**, Symposium Coordinator; **Jeanne Waxman**, Program Manager; **Marlin Guerrero,** Grant Accounts Specialist; **Christina Haynes**, Assistant**; Denise Charles,** Program Administrator for Communications and Outreach

- Stephen Bezruchka and Robert Dottin (top left)
- Christopher Braun and Stuart Levy (top middle)
- Steven Mack, Holly Wichman and Paul Sherman with symposium parrticipants (top right)
- Paul Sherman and Paul Ewald (bottom left)
- Derrick Brazill, Benjamin Ortiz and symposium participant (bottom right)

PICTURES AT AN EXHIBITION

PREVIOUS SYMPOSIA

2007
EVOLUTION, HEALTH, AND DISEASE

Morning Session:
Evolution of Molecules and Pathogens
Michael Steiper, Hunter College, CUNY – Session Chair
Paul Ewald, University of Louisville
Cristina Gutierrez, Pasteur Institute, France
Steve Mack, Roche Institute
Holly Wichman, University of Idaho

Afternoon Session:
Health Evolving – People and Policy
Session Chair: Christopher Braun, Hunter College, CUNY
Stephen Bezruchka, University of Washington
Arata Kochi, World Health Organization's Global Malaria Program (WHO/GMP)
Stuart Levy, Tufts University
Randolph Nesse, University of Michigan
Paul Sherman, Cornell University

eBriefing: http://www.nyas.org/darwinian

2005
MINORITIES, RACE, GENOMICS AND HEALTH INEQUITIES: WHAT ARE THE CONNECTIONS?

Morning Session: Genomics, Diversity, and Pharma
Moderator: Harvey L. Ozer, New Jersey Medical School-University Hospital
Cecil B. Pickett, Schering-Plough Research Institute and Schering-Plough Corporation
Brian S. Mustanski, University of Illinois at Chicago
Charles N. Rotimi, National Human Genome Center, Howard University
Carlos Bustamante, Cornell University

Afternoon Session: Health, Health Inequities, Race, and Genomics
Moderator: Erwin Fleissner, Hunter College, CUNY
David R. Williams, University of Michigan
Harold P. Freeman, Columbia University, College of Physicians and Surgeons
Lisa Bowleg, University of Rhode Island
Troy Duster, New York University
John Ruffin, National Center on Minority Health and Health Disparities, NIH
Jill Bargonetti, Hunter College, CUNY

eBriefing: http://www.nyas.org/ebriefreps/splash.asp?intEbriefID=501

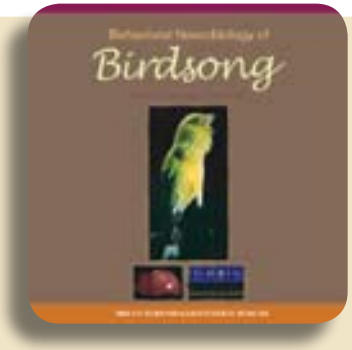
2005
CHEMICAL BIOLOGY:
INTERVENTION IN CELLS BASED ON CHEMICAL PRINCIPLES

Stuart L. Schreiber, Harvard University
Jose A. Salas, Universidad de Oviedo, Spain
Akira Kawamura, Hunter College, CUNY
Eloy Rodriguez, Cornell University
Carmichael C. Roberts, Surface Logix, Inc.
Benjamin C. Cravatt, The Scripps Research Institute
Judy Lieberman, Harvard Medical School

eBriefing: http://www.nyas.org/ebriefreps/splash.asp?intEBriefID=390&SourceCD=content&PartnerCD=Hunter&TrackCD=eB390

2004 SYMPOSIUM:
LIFE AND DEATH IN THE BRAIN

David Anderson, California Institute of Technology
Marie T. Filbin, Hunter College, CUNY
Barbara Hempstead, Weill Medical College of Cornell University
Christopher Henderson, Institut national de la santé et de la recherché médicale (INSERM), Marseille, France
Karen Hsiao-Ashe, University of Minnesota Medical School
Erich D. Jarvis, Duke University Medical Center
Eric Kandel, Columbia University, College of Physicians and Surgeons



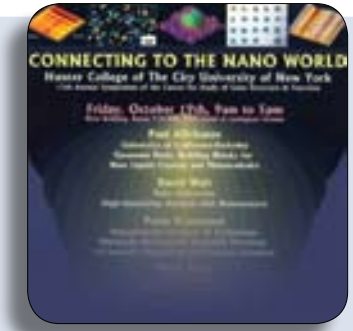
2002
SINGING IN THE BRAIN

Speakers:
Fernando Nottebohm, Rockefeller University
J. M. Wild, Medical and **Health Sciences**, University of Auckland, New Zealand
Daniel Margoliash, University of Chicago
Richard Mooney, Duke University Medical Center
Gregory Ball, Johns Hopkins University
Steve Nowicki, Duke University

Panel Discussion:
John Kirn, Wesleyan University
Constance Scharff, Max Planck Institute for Molecular Genetics, Berlin
Linda Wilbrecht, Rockefeller University
Arthur Arnold, University of California, Los Angeles
Ofer Tchernichovski, City College, CUNY
Sarah Bottjer, University of Southern California
Kathy Nordeen, University of Rochester
Michael Brainard, University of California, San Francisco
Cheryl Harding, Hunter College, CUNY
Fred Theunissen, University of California, Berkeley
Claudio Mello, Oregon Health & Science University
Sarah Woolley, University of California, Berkeley
Tim Gentner, University of Chicago
Franz Goller, University of Utah
Michael Fee, Bell Laboratories
Roderick Suthers, University of Indiana, Bloomington
David Vicario, Rutgers University, New Brunswick
Juli Wade, Michigan State University, East Lansing
Manfred Gahr, Vrije University of Amsterdam, Netherlands
Eliot Brenowitz, University of Washington, Seattle
Mei-Fang Cheng, Rutgers University, Newark
Kazuo Okanoya, Chiba University, Japan
David Perkel, University of Washington Medical School
Erich Jarvis, Duke University
Timothy DeVoogd, Cornell University

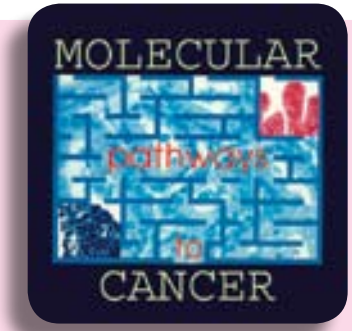
Roundtable:
Chair: Israel Lederhendler, National Institute of Mental Health
Peter Marler, University of California, Davis
Heather Williams, Williams College
Allison Doupe, University of California, San Francisco
Clive Catchpole, Royal Holloway, University of London

Workshops:
David Clayton, University of Illinois, Urbana
Daniel Margoliash, University of Chicago
Michael Fee, Bell Laboratories



2001
CONNECTING TO THE NANO WORLD

Paul Alivisatos, University of California, Berkeley
David Walt, Tufts University
Mark Reed, Yale University
Angela Belcher, University of Texas, Austin
Paula Hammond, Massachusetts Institute of Technology
Paul Weiss, Pennsylvania State University
Jeremy Sanders, Cambridge University



2000
MOLECULAR PATHWAYS TO CANCER

Robert Benezra, Memorial Sloan-Kettering Cancer Center
Sumayah Jamal, New York University Medical Center
Chris Marshall, Institute of Cancer Research, London
John Kuriyan, Rockefeller University
Christoph Lengauer, Johns Hopkins University School of Medicine
Judith Campisi, Lawrence Berkeley National Laboratory
David A. Foster, Hunter College, CUNY
Andrew J. Dannenberg, Weill Medical College of Cornell University

1999
VIRTUAL HIGHER EDUCATION?
CRITICAL PERSPECTIVES

Neil Postman, New York University
Starr Roxanne Hiltz, New Jersey Institute of Technology
Robert Dottin, Hunter College, CUNY
Tine Herreman, Hunter College, CUNY
David Hakken, State University of New York, Utica-Rome
Anthony Picciano, Hunter College, CUNY
David Noble, York University, Toronto
Robbie McClintock, Teachers College, Columbia University
Dean Savage, Queens College, CUNY
Anthea Tillyer, City College, CUNY
David Tillyer, City College, CUNY
Murray Turoff, New Jersey Institute of Technology
Watson Scott Swail, The College Board

1998
MATERIALS FOR THE 21ST CENTURY & BEYOND

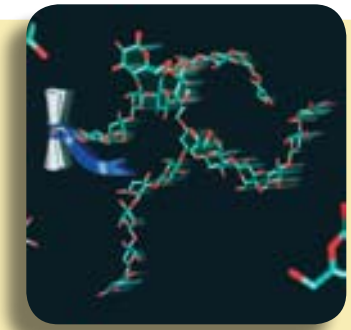
Charles M. Drain, Hunter College, CUNY
Michael D. Ward, University of Minnesota
Charles M. Lieber, Harvard University
Jean-Marie Lehn, College De France and Université Louis Pasteur
Andrew R. Barron, Rice University
Stuart Parkin, IBM - Almaden Research Center
Alex Zettl, University of California, Berkeley
Geoffrey Ozin, University of Toronto

1997
BIOTECHNOLOGY: HOW BASIC RESEARCH DRIVES MEDICAL APPLICATIONS

James R. Broach, Princeton University and Cadus Pharmaceuticals
Alan Colman, PPL Therapeutics, United Kingdom
Max Diem, Hunter College, CUNY
Lynn C. Francesconi, Hunter College, CUNY
Jeffrey M. Friedman, Howard Hughes Medical Institute and Rockefeller University
Barbara Hosein, United Biomedical, Inc.
Ronald M. Lindsay, Regeneron Pharmaceuticals
Frank McCormick, University of California, San Francisco

1996
GYCOCONJUGATES: CELLULAR MESSENGERS AND MEDIATORS

Samuel J. Danishefsky, Sloan-Kettering Institute and Columbia University
Ten Feizi, Northwick Park Hospital, United Kingdom
Peter N. Lipke, Hunter College, CUNY
James C. Paulson, Cytel Corporation
Timothy A. Springer, Center for Blood Research and Harvard Medical School
Pamela Stanley, Albert Einstein College of Medicine
Elaine Tuomanen, Rockefeller University

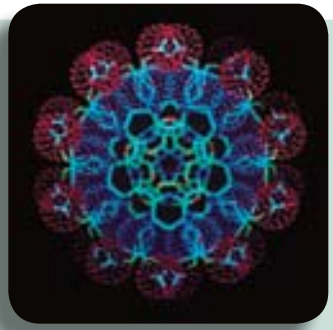


1995
APOPTOSIS (PROGRAMMED CELL DEATH)

Jill Bargonetti, Hunter College, CUNY
Alan Eastman, Dartmouth Medical School
Jerry C. Guyden, City College of New York
Michael Hengartner, Cold Spring Harbor Laboratory
Barbara Osborne, University of Massachusetts
Martin Raff, University College, London
Hermann Steller, Massachusetts Institute of Technology
Eileen White, Rutgers University

1994
NEW APPROACHES TO CANCER CHEMOTHERAPY

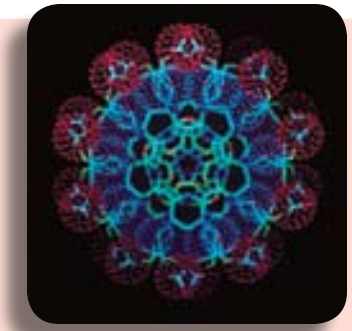
Sara A. Courtneidge, European Molecular Biology Laboratory
Gerard Evan, Imperial Cancer Research Fund
Jackson Gibbs, Merck & Co., Inc.
Raymond A. Firestone, Bristol-Myers Squibb Pharmaceutical Research Institute
George A. Ellestad, Lederle Laboratories
Maria Tomasz, Hunter College, CUNY
Peter E. Nielsen, The Panum Institute, University of Copenhagen
Dolatrai M. Vyas, Bristol-Myers Squibb Pharmaceutical Research Institute



1993
NEUROBIOLOGY

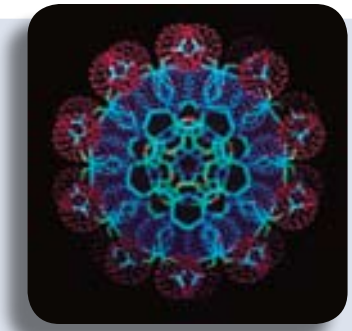
Eric R. Kandel, Columbia University
Joshua R. Sanes, Washington University School of Medicine
Marie T. Filbin, Hunter College, CUNY
Stanley B. Prusiner, University of California, San Francisco
Mary E. Hatten, Rockefeller University
Frank S. Walsh, United Medical and Dental Schools of Guy's and St. Thomas's Hospitals, London
Stephen F. Heinemann, Salk Institute

1992
THE WORLD OF RNA 1992



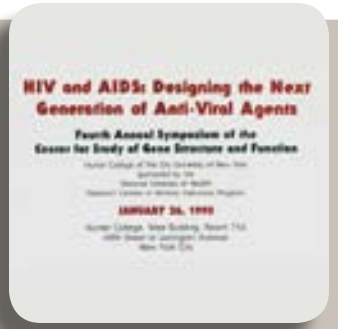
Sidney Altman, Yale University
Dixie J. Goss, Hunter College, CUNY
Michael R. Green, University of Massachusetts Memorial Medical Center
Arthur Pardi, University of Colorado, Boulder
Paul Schimmel, Massachusetts Institute of Technology
Barbara Sollner-Webb, Johns Hopkins School of Medicine
Elizabeth C. Theil, North Carolina State University

1991
SIGNAL TRANSDUCTION



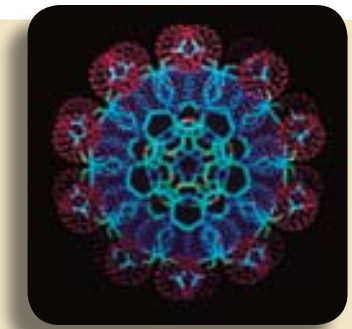
H. Robert Horvitz, Massachusetts Institute of Technology
David Baltimore, Rockefeller University
Stuart L. Schreiber, Harvard University
Melvin Simon, California Institute of Technology
Robert P. Dottin, Hunter College, CUNY
James H. Schwartz, Columbia University
David A. Foster, Hunter College, CUNY
Enrique Rozengurt, Imperial Cancer Research Fund, United Kingdom

1990
HIV AND AIDS: DESIGNING THE NEXT GENERATION OF ANTI-VIRAL AGENTS



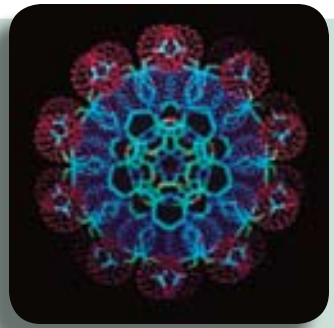
William A. Haseltine, Dana-Farber Cancer Institute, Harvard Medical School
David Ho, UCLA School of Medicine, Cedars-Sinai Medical Center
Dani Bolognesi, Duke University Medical Center
David Beveridge, Wesleyan University
Alexander Wlodawer, National Cancer Institute at Frederick
Martin Rosenberg, Smith Kline Beecham, Inc.
Steven Goff, Columbia University, College of Physicians and Surgeons
John Martin, Bristol-Myers Squibb

1989
MOLECULAR BASIS OF GENE REGULATION



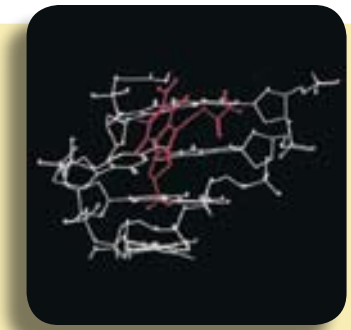
Timothy M. Lohman, Texas A & M University
Paul B. Sigler, Howard Hughes Medical Institute, Yale University
Joseph S. Krakow, Hunter College, CUNY
Steven L. McKnight, Carnegie Institution of Washington
Robert G. Roeder, Rockefeller University
Keith R. Yamamoto, University of California, San Francisco

1988
MOLECULAR BASIS OF DEVELOPMENT: FROM GENES TO ORGANISM



Richard Losick, Harvard University
Gerald Fink, Whitehead Institute for Biomedical Research, Massachusetts Institute of Technology
Robert P. Dottin, Hunter College, CUNY
Matthew Scott, University of Colorado, Boulder
Bernardo Nadal-Ginard, Children's Hospital Boston, Harvard Medical School
Frank Ruddle, Yale University

1987
RECOGNITION OF DNA BY PROTEINS AND DRUGS



Irving H. Goldberg, Harvard Medical School
Lawrence H. Hurley, University of Texas, Austin
Nicholas R. Cozzarelli, University of California, Berkeley
John M. Rosenberg, University of Pittsburgh
Alexander Rich, Massachusetts Institute of Technology

SYMPOSIUM 2008

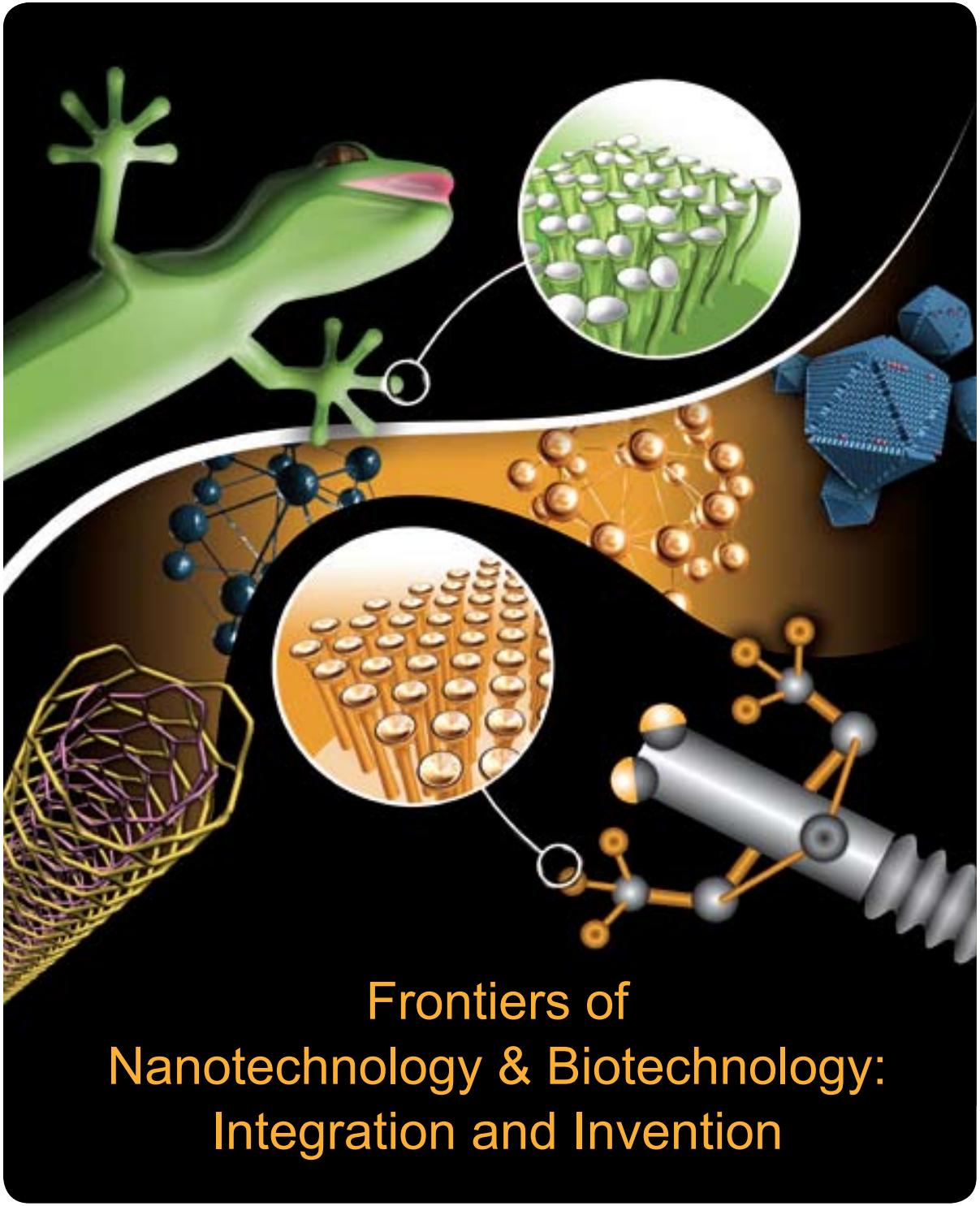
The 21st Annual International Symposium of the Center for Study of Gene Structure and Function will be held on Friday, January 18th, 2008 in Conference Room 714 West, Hunter College.

The keynote speakers are:

Chad Mirkin
Northwestern University
Tadashi Matsunaga
Tokyo University of Agriculture and Technology

Five other speakers are invited:

Derek Lovley
University of Massachusetts
Tejal Desai
University of California, San Francisco
Jeffrey Schloss
The National Human Genome Research Institute
Morley Stone
Air Force Research Lab /DARPA
Christine Ortiz
Massachusetts Institute of Technology.



NOBEL LAUREATE PARTICIPANTS IN SYMPOSIA

2002 — **H. Robert Horvitz, Massachusetts Institute of Technology**
Nobel Prize in Physiology or Medicine
1991 Symposium – Signal Transduction

2000 — **Eric Kandel, Columbia University of Physicians and Surgeons**
Nobel Prize in Physiology or Medicine
2004 Symposium - Life and Death in the Brain

1997 — **Stanley B. Prusiner, University of California, San Francisco**
Nobel Prize in Physiology or Medicine
1993 Symposium - Neurobiology

1992 — **Sidney Altman, Yale University**
Two Nobel Prizes in Chemistry
1989 — 1993 Symposium - The World of RNA

1987 — **Jean-Marie Lehn, College De France and Universite Louis Pasteur**
Nobel Prize in Chemistry
1998 Symposium - Materials for the 21st Century and Beyond

1975 — **David Baltimore, Rockefeller University**
Nobel Prize in Physiology or Medicine
1991 Symposium – Signal Transduction

HUNTER'S NOBEL PRIZE WINNERS

Of the 12 women who have received a Nobel prize in the science, Hunter College is the only institution in the world from which two of these women earned their undergraduate degrees.

Rosalyn Yalow
The Nobel Prize in Physiology or Medicine 1977

Gertrude B. Elion
The Nobel Prize in Physiology or Medicine 1988

Rosalyn Yalow was born in the Bronx borough of New York City in 1921. She graduated from Hunter College in 1941, where she developed an interest in physics. Believing that no good graduate school would admit and provide financial support to a Jewish woman, she took a part-time position as a secretary to Dr. Rudolf Schoenheimer, a leading biochemist at Columbia University's College of Physicians and Surgeons . Soon after graduating from Hunter, she received an offer for a teaching assistantship in physics from the University of Illinois; World War II took many of the men off to war. She graduated with a Ph.D in Nuclear Physics from the University of Illinois in 1945. She was the only woman in her graduating class and the second woman to receive a PhD degree.

In 1977, Yalow was awarded the Nobel Prize in Physiology or Medicine. She was the first American-born and the second woman to ever win the a science Nobel Prize. Yalow developed radioimmunoassay (RIA), an application of nuclear physics in clinical medicine that makes it possible for scientists to use radiotropic tracers to measure the concentration of pharmacologic and biologic substances in the blood and other fluids in animals and plants. She invented this technique in 1959 to measure the amount of insulin in the blood of adult diabetics.

Yalow was also the first woman to win the prestigious Albert Lasker Basic Medical Research Award. In addition, she received the National Medal of Science in 1988, which is the United States' highest science award, and she acquired more than 50 honorary degrees.

Gertrude Elion discovered some of the world's most effective medicines but could not get a laboratory job because they were not open to women in her time. As a result, she worked as a volunteer secretary until she landed a non-paying job in the chemical industry. She won the 1988 Nobel Prize in Physiology of Medicine and is the fifth woman ever to receive the award and one of the very few recipients to earn a science Nobel without a doctorate. Elion developed the first drugs that were effective against childhood leukemia, the first successful anti-viral medications, and a drug that made the first kidney transplant possible. Elion graduated from Hunter College in 1937.

In addition to the Nobel Prize, Elion received the Garvan Medal in 1968, the National Medal of Science in 1991, and 25 honorary doctorate degrees. Although she officially retired in 1983, Elion continued her work to advancement science through the World Health Organization, honorary university lectureships, and by assisting students in medical research. Her name appears on 45 patents.

Hunter College along with the Center for Study of Gene Structure and Function, continues to increase the number of underrepresented groups, including women, in the sciences. We aim to increase and diversify research faculty with an emphasis on the recruitment of individuals historically underrepresented in the sciences, train scientists in biomedical investigation by offering research fellowships to PhD students, and encourage undergraduate students to pursue graduate study in biomedical research.

OTHER RESEARCH PROGRAMS AT HUNTER

Minority Access to Research Careers

The MARC program at Hunter College is supported by the National Institutes of Health and is intended to encourage talented minority students to pursue careers in biomedical research leading to a PhD. The overall goal of the program is to increase participation of minorities underrepresented in the biomedical sciences in academia or industrial research sciences.

The MARC program is restricted to undergraduate students with a minimum of 60 college credits. Students are supported for up to a 2 year period during their junior and senior years. The program pays 100% tuition, health insurance and provides a monthly stipend for conducting research at a science laboratory of Hunter College. Applicants must be US citizens or permanent residents majoring in biological sciences, chemistry, physics, or psychology, must maintain 3.0 GPA, have solid science grades and a career interest in research. Students are expected to participate in at least one external summer internship.

The MARC Program includes intensive biomedical research under the guidance of faculty mentors. Students spend at least 15-20 hours during the academic year and full days during the summer in a research lab. They attend the Annual Biomedical Research Conference for Minority Students where they are expected to present the results of their lab research in poster and oral presentations. All travel arrangements and expenses are covered by the program. The MARC program is administered by the Dr. Derrick Brazill, Program Director, Department of Biological Sciences, email: brazill@genectr.hunter.cuny.edu.

BRIDGES-to-the-Doctorate

The Bridges to the Doctorate Program (BRIDGES) supports matriculated students in a master's degree science program at a participating CUNY college who are preparing for a career in biomedical research. BRIDGES is a two-year transitional program that prepares master's-level students for doctoral study. Students chosen for the BRIDGES program participate in scholarly research and are offered tuition assistance and payment for work related to their research assignment. The Bridges Program is funded by the National Institutes of Health.

Howard Hughes Medical Institute Undergraduate Science Education Program

Since 1993, funding from the Howard Hughes Medical Institute Undergraduate Science Education Program has enabled the Department of Biological Sciences to provide summer research opportunities for biology majors at the Marine Biological Laboratory, the American Museum of Natural History, and the Cold Spring Harbor Laboratory. The program has also funded the development of an outreach program with the goal of increasing the number of high school/middle school students interested in careers in science by creating a summer workshop program where new and established high school/middle school teachers work together to learn molecular biology techniques and theory, develop lesson plans based upon the workshop for use with equipment purchased for each teacher's school, and visits by the teachers and their students to Hunter College and to the American Museum of Natural History. Applicants for all programs are selected on the basis of their applications, an essay about why they want to participate in the program, letters of recommendation, and interviews. In addition, the Howard Hughes Program funds a close collaboration with the new Manhattan/Hunter Science High School. For more information, contact Dr. Shirley Raps, Chair, Department of Biological Sciences at 212-772-5281 or email: raps@genectr.hunter.cuny.edu.

Ronald E. McNair Post-Baccalaureate Achievement Program

The Ronald E. McNair Post-Baccalauareate Achievement program is one of eight federally-funded trio programs. The mission is to assist those individuals who have an interest in pursuing a doctoral degree in their respective fields obtain research opportunities, and gain admission to graduate programs. Individuals served by the program are U.S. citizens, or Permanent Residents from low-income, first-generation low-income, or members of groups underrepresented in graduate school (Black/ African American, Hispanic/ Latino, or Pacific Islander/ American Indians) backgrounds. Students with a minimum of 45 credits, and a minimum GPA of 3.0 with a strong interest in pursuing their doctoral degrees should apply.

The McNair program at Hunter College serves approximately 25 students a year, and provides advanced writing, library research, career development, critical thinking skills, and online research workshops. The program also provides students with mentored research and academic advisement, GRE preparation, assistance in obtaining admission to and financial support for enrollment in doctoral/graduate programs, and summer research opportunities. A $2,800 dollar stipend is provided, and is dispersed throughout the year, as students meet various academic goals mutually agreed upon by McNair scholars and administrators.

For more information, please visit www.hunter.cuny.edu/mcnair or contact the Program Director, Dr. Carol Oliver at (212)772- 4937 or carol.oliver@hunter.cuny.edu.

MIDARP

MIDARP is a federally funded program established with funding from the National Institute of Drug Abuse to develop quality research projects that address basic biological issues related to drugs of abuse. The program was established within the faculty in the department of psychology and the department of biology at Hunter College to revitalize drug abuse research at Hunter College and to provide the infrastructure support needed to maintain research and training. The purpose of this program is to increase the capacity of minorities in the area of behavioral sciences to conduct research in drug abuse and addiction. The program provides quality scientific training to talented undergraduate and graduate students, and in particular to students from underrepresented populations. The Program Director is Gordan A. Barr, Professor of Psychology

NIMH-COR (National Institute of Mental Health-Career Opportunities in Research Education and Training)

The COR program designed to encouraged talented and highly motivated minority students to pursue careers in research is funded by the National Institutes of Mental Health. COR provides undergraduates (usually juniors and seniors) with four semesters and two summers of intensive training. To ensure and prepare students for the rigors of doing research, COR students work under the close supervision of a faculty mentor. During the two years as scholars, students attend special courses, seminars and mini-workshops to learn theoretical and methodological approaches to their field of research. During the summer between the junior and senior year, COR trainees spend 8 to 10 weeks in a summer research program, preferably in universities outside of New York City. The backbone of the training program is the research placement. For two academic years, students are placed under the supervision of a Hunter College or neighbor institutions' faculty in a laboratory from one of the different disciplines related to this grant. Students learn basic research methods (ranging from bibliography searches, formulating a hypothesis, data accumulation and analysis) as well as good scientific practice. Most of the COR students have an independent project or sub-project within their mentors research. Trainees receive a one-to one training with faculty involving training in experimental design and data analysis. Overall, the training environment provides the COR trainee with opportunities to develop independence, and to gain experience, and confidence. The current Director is Vanya Quinones-Jenab, Department of Psychology.

MBRS/RISE

The Hunter College RISE (Research Initiative for Scientific Enhancement) Program has been funded by the National Institute of General Medical Sciences for approximately 25 years. Its goal is to increase the number of underrepresented minorities in biomedical research. Undergraduates and graduate students in Biology, Chemistry, Physics, and Psychology receive salary, placement in a laboratory engaged in state of the art research, and mentoring from their advisors and program activities. Support is also given for presenting research at national meetings. Students spend one summer at research centers around NYC and the country. Undergraduates have received numerous CUNY awards and Gates Millennium Scholarships, ABRC-MS poster and speaker awards, and American Chemical Society scholarships. Additional information can be found at www.marc/mbrs.hunter.cuny.edu. The current Director is Dist. Prof. Victoria Luine (Psychology) and the Program Assistant is Prof. Karen Phillips (Chemistry).

Biotechnology Workforce Training at Hunter College

The Biotechnology Program at Hunter College is designed to provide students with skills in molecular biology to meet the needs of the New York workforce in the biotechnology/pharmaceutical industry, academic research, and public health. The cornerstone of this program involves an intensive project-oriented four-week biotechnology workshop for seniors majoring in Biology. Successful completion of this workshop entitles students to a summer internship in a biotechnology company or a biomedical research laboratory. Seniors have the option of enrolling in an accelerated (Five-Year) BA/MA Degree in Biological Sciences with Specialization in Biotechnology. Thus provides students with a means to receive MA degrees one year after completing their bachelor degree requirements.

The results of agarose gel electrophoresis of PCR generated DNA are documented by photographing gels of stained DNA

Dr. Patricia Rockwell at Hunter College, in collaboration with Dr. Eva Cramer at SUNY Downstate Technology Center Inc. (DTCI), has received funding for a grant, entitled *Biotechnology Scholars Community* for Laboratory Technicians, A Career Pathway, from The New York City Sectors Initiative (NYCSI), to create a new model for workforce development for New York City. Hunter College will be the training center for the SUNY Downstate Advanced Biotechnology Park and Incubator and other building projects that are planned to house biotechnology companies in New York City. Students will also be trained to work in local research institutions that have partnered with this project.

SNRP (Specialized Neuroscience Research Program)

The Specialized Neuroscience Research Program (SNRP) at Hunter is funded and supported by the National Institute of Neurological Disorders and Stroke (NINDS). The program consists of three research projects in collaboration with other institutions. SNRP has a comprehensive programatic framework for scientific and administrative decision making. The goal of the program is to create a strong neuroscience research program at Hunter College.

As of September 1st, 2006, the program at Hunter College started its second cycle (SNRP 2). To strengthen the neuroscience environment at Hunter College, SNRP2 is promoting interactions among scientists by making use of expertise in the college which will foster communication between the Neurosciences within Hunter and outside researchers in the NY area. Neuroscience will also be introduced to undergraduates at an early stage in their career to help stimulate their interest in this crucial field and provide a wider choice for graduate students during their doctoral research.

The current Program Director is Dr. Filbin, who provides orientation and supervision of the program and is advised by the Program Advisory Committee (PAC). Dr. Filbin provides oversight of the Scientific Advisory Committee (SAC) regarding the direction of the research project. Additional information can be found at http://biology.hunter.cuny.edu/snrp/.

LSAMP (Louis Stokes Alliances for Minority Participation)

The Louis Stokes Alliance for Minority Participation is funded by the National Science Foundation. The NYC LSAMP program is an alliance of 16 CUNY colleges, including Hunter and the Graduate Center. LSAMP's overall goal is to ensure a long-term capacity to produce significantly greater numbers of minority students in STEM (Science, Technology, Engineering and Mathematics) careers through lasting changes achieved in the participating institutions. The LSAMP program is designed to develop the comprehensive strategies necessary to strengthen the preparation and increase the number of minority students who successfully complete baccalaureates in STEM fields; this in term facilitates the long-term goal of increasing the production of Ph.D.s in STEM fields with an emphasis on entry into faculty positions. LSAMP undergraduates and graduates must be full time minority students (Black, Hispanic, American Indian, Alaskan Native, or Native Pacific Islander) who are US citizens or permanent residents. Students are offered research opportunities designed to encourage graduate study; tutoring; summer internships in university, research or corporate settings; access to a community of scholars in which academic excellence is encouraged and expected and where students receive support from other students and access to an internet based community center. For m ore information, contact Hunter College Program Coordinator, Kim Ryce at 212 650-3707.

The Score Program

The Hunter College SCORE Program (Support of Continuous Research Excellence) is funded by the National Institute of General Medical Sciences. SCORE is a developmental program which is designed to increase the research capabilities of minority-serving institutions and the research competitiveness of the faculty. Since its awarding to the college in 1999, approximately thirty faculty members in Anthropology, Biology, Chemistry, Psychology, and Physics have received research grants. Many faculty have used the grants to build/expand their research programs and consequently obtained RO1 and other grants from NIH. Currently, twenty-one faculty have grants totaling approximately $2,500,000/year. Additional information can be found at http://score.hunter.cuny.edu. The Project Director is Dist. Prof. Victoria Luine and the Administrator is Valeria Bergou. CUNY colleges and other universities including Long Island University, Duke University and New Jersey Institute of Technology. Additional information can be found at www.marc/mbrs.hunter.cuny.edu. The current Director is Dist. Prof. Victoria Luine (Psychology) and the Program Ass't is Prof. Karen Phillips (Chemistry).

Nicholas Freudenberg's Program

Nicholas Freudenberg is Distinguished Professor of Public Health at Hunter College and Director of the City University of New York's new Doctoral Program in Public Health.

He is also a member of the Planning Committee for the CUNY School of Public Health at Hunter College, scheduled for opening in 2010-11. From 1988 to 2001, he served as founding director of the Hunter College Center on AIDS, Drugs, and Community Health.

Freudenberg's research focuses on the social determinants of the health of urban populations. For the past 15 years, he has implemented and evaluation interventions to reduce drug use, HIV risk, and recidivism among people leaving the Rikers Island Detention Center, one of the largest jail systems in the world. His work has been supported by the Robert Wood Johnson Foundation, the National Institute for Drug Abuse, the US Centers for Disease Control, the Open Society Institute, and others.

Freudenberg has also played a leading role in defining the field of urban health. He received an NIH Road Map Curriculum Development Award to develop an interdisciplinary doctoral curriculum in urban health at CUNY. He is lead editor of Cities and the Health of the Public (Vanderbilt Press, 2006), a synthesis of recent scholarship on how city living affects health.

More recently, Freudenberg has investigated how the alcohol, automobile, tobacco, firearms, food, and pharmaceutical industries contribute to socioeconomic and racial/ethnic disparities in health, and the role of public health advocacy in modifying health-damaging corporate practices.

NATIONAL INSTITUTES OF HEALTH - NATIONAL CENTER FOR RESEARCH RESOURCES (NIH-NCRR): RESEARCH CENTERS IN MINORITY INSTITUTIONS (RCMI)

RCMI Centers

CLARK ATLANTA UNIVERSITY
Dorcas D. Bowles, PI
Shafiq A. Khan, PD
Phone: (404) 880-6795
E-mail: skhan@cau.edu
http://www.ccrtd.cau.edu/programinfo.htm

CITY COLLEGE, CUNY
Gregory H. Williams, PI
Jerry Guyden, PD
Phone: (212) 650-8449
E-mail: jguyden@ccny.cuny.edu
http://www.ccny.cuny.edu/rcmi/

FLORIDA A&M UNIVERSITY
Henry Lewis, III, PI
Karam Soliman, PD
Phone: (850) 599-3306
E-mail: karam.soliman@famu.edu
http://pharmacy.famu.edu/rcmiprogram.asp

HUNTER COLLEGE, CUNY
Jennifer Raab, Esq., PI
Robert P. Dottin, PD
(212) 772-5171
dottin@genectr.hunter.cuny.edu
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William Southerland, PD
Phone: (202) 806-9711
E-mail: wsoutherland@howard.ed
http://www.howard.edu/medicine/rcmi/

JACKSON STATE UNIVERSITY
Ronald Mason, Jr., Esq., PI
Abdul K. Mohamed, PD
Phone: (601) 979-2153
E-mail: abdul.k.mohamed@jsums.edu
http://www.jsums.edu/~sst/rcmi.htm

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Joseph Whittaker, PD
Phone: (443) 885-4515
E-mail: jwhittak@jewell.morgan.edu
www.morgan.edu/academics/special/Biomed/default.asp

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James G. Townsel, PI
James Hildreth, PD
Phone: (615) 327-5754
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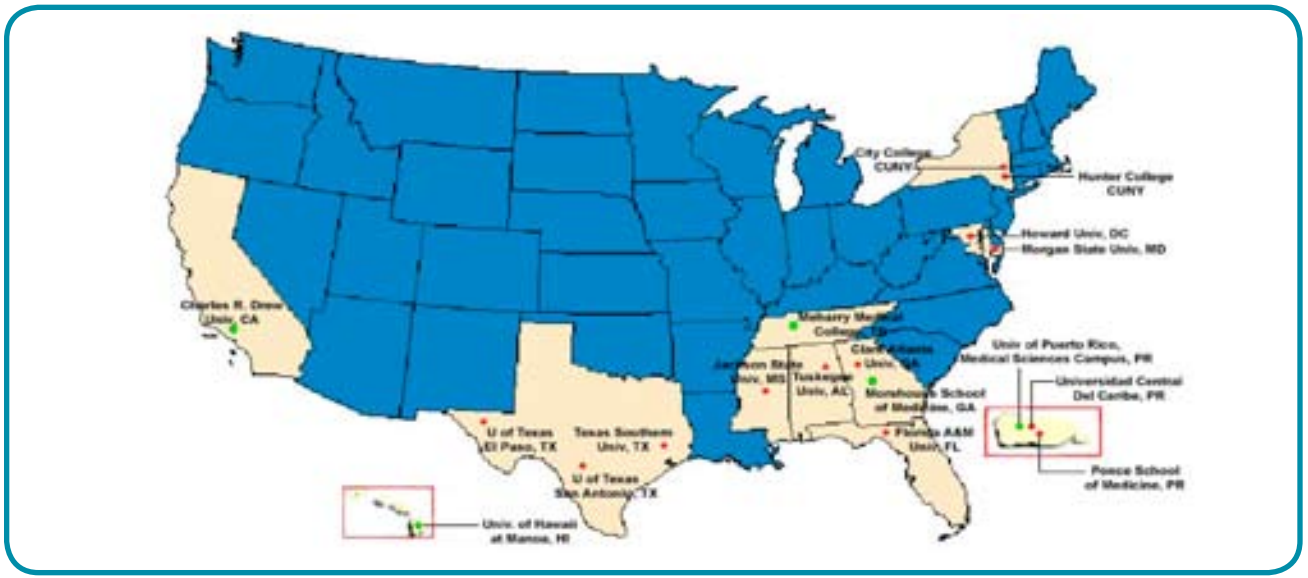
http://www.mmc.edu/research/programs/rcmi/rcmi_mission.html



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National Center for Research Resources

w w w . n c r r . n i h . g o v

The National Center for Research Resources ensures that essential tools and research resources are readily available to NIH-supported investigators nationwide. NCRR-supported resources - a comprehensive range of human, animal, technology, and more - enable biomedical research advances.

The Division of Research Infrastructure (DRI) of the National Center for Research Resources (NCRR) provides RCMI grants to expand our nation's research capacity in colleges and universities that (1) have a 50 percent or greater enrollment of students who are underrepresented in biomedical sciences, and (2) award doctoral degrees in the health professions or health-related sciences. Underrepresented students are African Americans, Hispanics, Native Americans, Alaskan Natives, Native Hawaiians, and Pacific Islanders.

The RCMI Program provides for: core administrative staff; pilot projects; faculty development, enrichment, and expansion; acquisition of state-of-the-art instrumentation; enhancement of grants management and research development activities; improvement of biostatistical and computer resources; development of new technologies; initiation and expansion of research disciplines; and renovation of laboratories and animal facilities.

RCMI grants are limited to institutions within the United States and its territories. All RCMIs share common concerns about minority health issues; however, they differ from one another in several aspects. For example, of the 18 institutions that currently host RCMIs, 8 are graduate schools, 7 are medical schools, 2 are schools of pharmacy, and 1 is a school of veterinary medicine. Moreover, several are state-supported institutions, while some are private; a few are relatively new, while others have long-standing research programs in the health sciences.

CLINICAL AND TRANSLATIONAL SCIENCE CENTER (CTSC)

The Center for Study of Gene Structure and Function (Gene Center) at Hunter College is partnering with a consortium of prestigious institutions in close proximity in Manhattan's Upper East Side to establish the Clinical and Translational Science Center (CTSC), whose goal is to "facilitate research aimed at advancing and expediting new patient treatments and preventive interventions". The CTSC was awarded $49 million from the National Institutes of Health for transforming advanced research on the bench into state of the art patient care at the bedside or clinic, and for improving health outcomes in the community. The CTSC will create synergistic programs among these neighboring institutions: the lead institution, Weill Cornell Medical College (WMC), Memorial Sloan-Kettering Cancer Center (MSKCC), the Hospital for Special Surgery (HSS) and Hunter College's School of Nursing as well as our Gene Center. The Principal Investigator is Julianne Imperato-McGinley.

Hunter's Gene Center provides many ongoing research projects that already address AIDS, cancer, neurodegenerative diseases and compliant behavior – all important aspects of clinical translational research. Modern electronic infrastructure and professional networks link minority scientists nationwide to enhance research in health disparities and to help recruit and nurture minority talent. An internet2 facility facilitates advanced research collaborations. The Principal Investigator of the Hunter grant is Robert Dottin.

In sum, the unique cluster of institutions in the CTSC supports the NIH roadmap initiative of breaking down institutional and disciplinary silos to accelerate the clinical application of basic science discoveries.

CLINICAL AND TRANSLATIONAL SCIENCE AWARDS (CTSA) PARTNERS

Emory University
Atlanta, GA

Atlanta Clinical and Translational Science Institute (Atlanta-CTSI)

Principal Investigator
David S. Stephens

Participating Institutions:
- Emory University, Atlanta, GA
- Morehouse School of Medicine, Atlanta, GA
- Georgia Institute of Technology, Atlanta, GA
- Children's Healthcare of Atlanta, Atlanta, GA
- Georgia Research Alliance, Atlanta, GA
- Kaiser Permanente, Atlanta, GA
- Georgia Bio (formerly Georgia Biomedical Partnership), Atlanta, GA
- Atlanta Veterans Affairs Medical Center, Decatur, GA
- Centers for Disease Control and Prevention, Atlanta, GA
- Grady Memorial Hospital and Health System, Atlanta, GA
- The Robert W. Woodruff Health Sciences Center, Atlanta, GA
  - Emory University School of Medicine
  - Rollins School of Public Health
  - Nell Hodgson Woodruff School of Nursing
  - Yerkes National Primate Research Center
  - Emory Healthcare
    - Emory University Hospital
    - Emory Crawford Long Hospital
    - Wesley Woods Geriatric Center
    - The Emory Clinic
    - Winship Cancer Institute

Vanderbilt University
Nashville, TN

Vanderbilt Institute for Clinical and Translational Research (VICTR)

Principal Investigator
Gordon R. Bernard

Participating Institutions:
- Vanderbilt University, Nashville, TN
- Meharry Medical College, Nashville, TN

Weill Cornell Medical College
New York, NY

CTSA at Weill Cornell Medical College

Principal Investigator
Julianne L. Imperato-McGinley

Participating Institutions:
- Weill Cornell Medical College (WCMC), New York, NY
- Weill Cornell Graduate School of Medical Sciences
- Cornell University, New York, NY
  - Cornell University Cooperative Extension in New York City (CUCE-NYC)
- Hospital for Special Surgery (HSS), New York, NY
- Hunter College, City University of New York
  - Hunter College Research Center for Minority Institutions (RCMI), Center for the Study of Gene Structure and Function
  - Hunter College School of Nursing
- Memorial Sloan-Kettering Cancer Center (MSKCC), New York, NY
- New York-Presbyterian Hospital, Weill Cornell Campus
- Weill Cornell-affiliated hospitals

RCMI RESEARCH TRANSLATIONAL NETWORK - INTEGRATING THE RESEARCH ENTERPRISE

The specific aims to accomplish this objective:

- Establish the Network
- Generate Translational Research within cyber workspaces
- Conduct Multi-site Research
- Implement the Data Technology and Coordinating Center (DTCC)

The NCRR-funded RCMI Translational Research Network, provides opportunities for multi-site clinical and translational research among minority and other collaborating institutions throughout the nation. The institutions participating in the network are part of the Research Centers in Minority Institutions (RCMI) program. Investigators at these institutions are focused on cancer, diabetes, renal disease, infant mortality, HIV/AIDS, and cardiovascular diseases—diseases that disproportionately affect minority populations.

Translational research conducted in the network will range from those studies focused on applying discoveries generated during research in the laboratory to clinical trials, and then to developing and implementing best practices in disease prevention and intervention in local community settings.

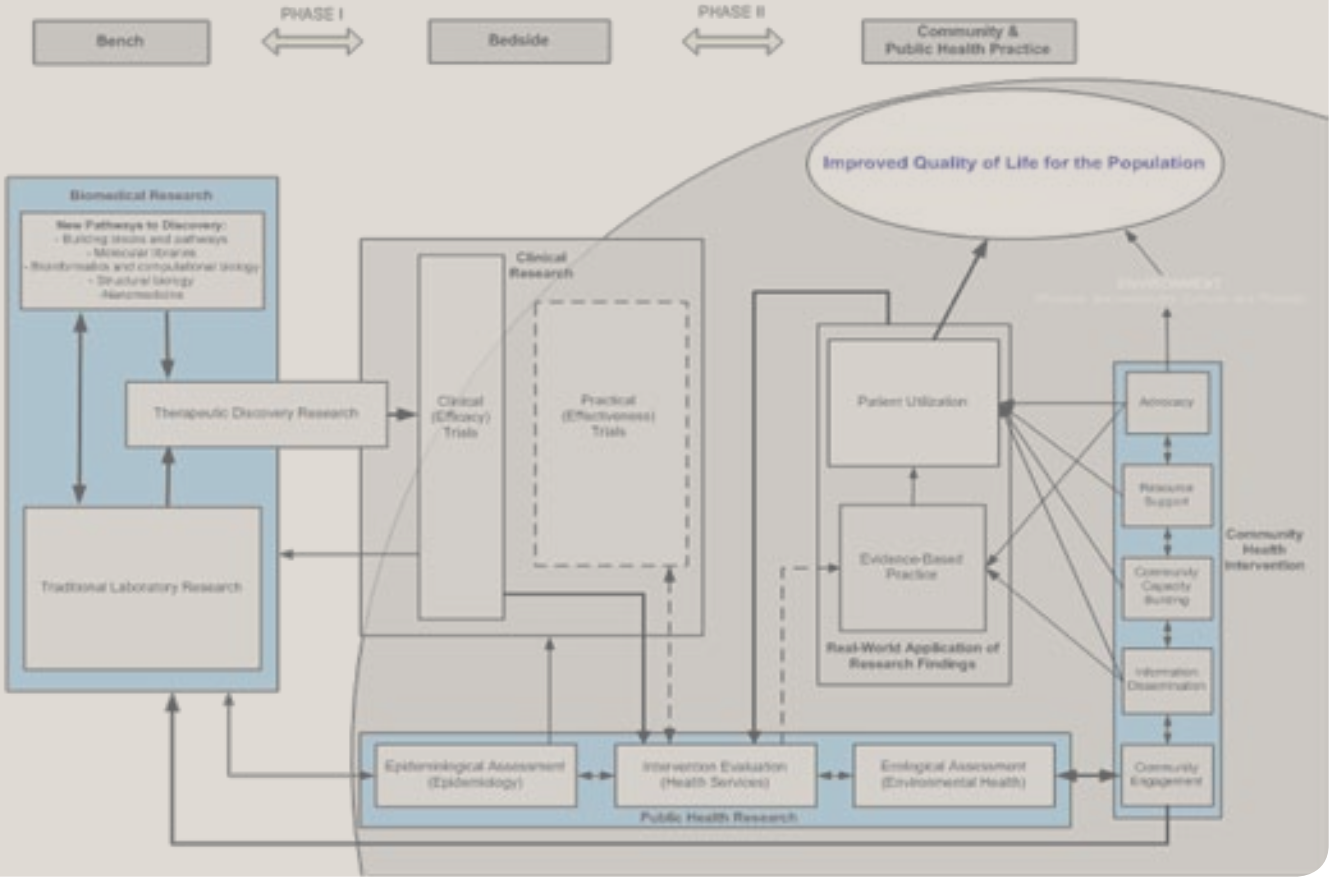
By providing computer-based tools for analyzing and managing clinical research data, recruiting for clinical trials, and sharing information with patients, the network will enable clinical and translational researchers to collaborate more efficiently with each other and their communities.

The Data Technology and Coordinating Center for the network will be located at Jackson State University in Jackson, Mississippi. The center will provide a secure Web site; data management and data sharing tools; staff; and hardware and software for collecting, analyzing, storing, and exchanging clinical data for the multi-site studies.

Keith C. Norris
Program Director for the RCMI Clinical Research Center

James L. Perkins
Director of the Office of Research, Industrial and Community Relations

David Easa
Associate Dean, JABSOM Director, RCMI Clinical Research



THE NEW YORK ACADEMY OF SCIENCES

New World Trade Center Building 7 - new home of New York Academy of Sciences

Since its founding in 1817, the New York Academy of Sciences, the third-oldest scientific society in the United States, has become not only a notable and enduring cultural institution in New York City, but also one of the most significant organizations in the international scientific community.

Throughout its history, Academy membership has featured leaders in the sciences, business, academia, and government, including U.S. Presidents Jefferson and Monroe, Thomas Edison, Louis Pasteur, Charles Darwin, Margaret Mead, and Albert Einstein. Today, members include an unprecedented number of Nobel Laureates (such as Harold Varmus, Paul Greengard, and James Watson) and other luminaries from all walks of life. The Academy currently numbers more than 25,000 members in 140 countries.

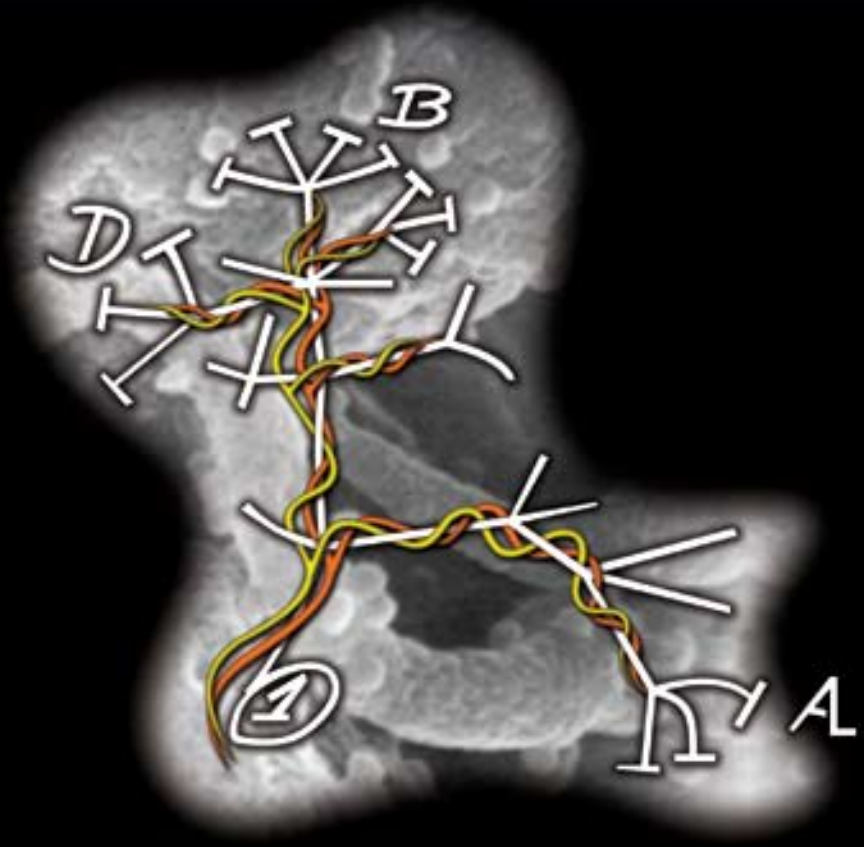
The Academy has a three-pronged mission: to advance scientific knowledge; to help resolve the major global challenges facing society with science-based solutions; and to increase the number of scientifically informed individuals. One way the Academy accomplishes this is by convening leading and emerging experts in meetings, seminars, and interdisciplinary conferences to facilitate the exchange of the insights that drive progress, and then disseminating the information shared at these events through both print and electronic media. The Academy's publishing and dissemination tools include the historic – the *Annals of the New York Academy of Sciences*, the oldest continuously published scientific serial in the U.S. – and the cutting-edge – Academy eBriefings.

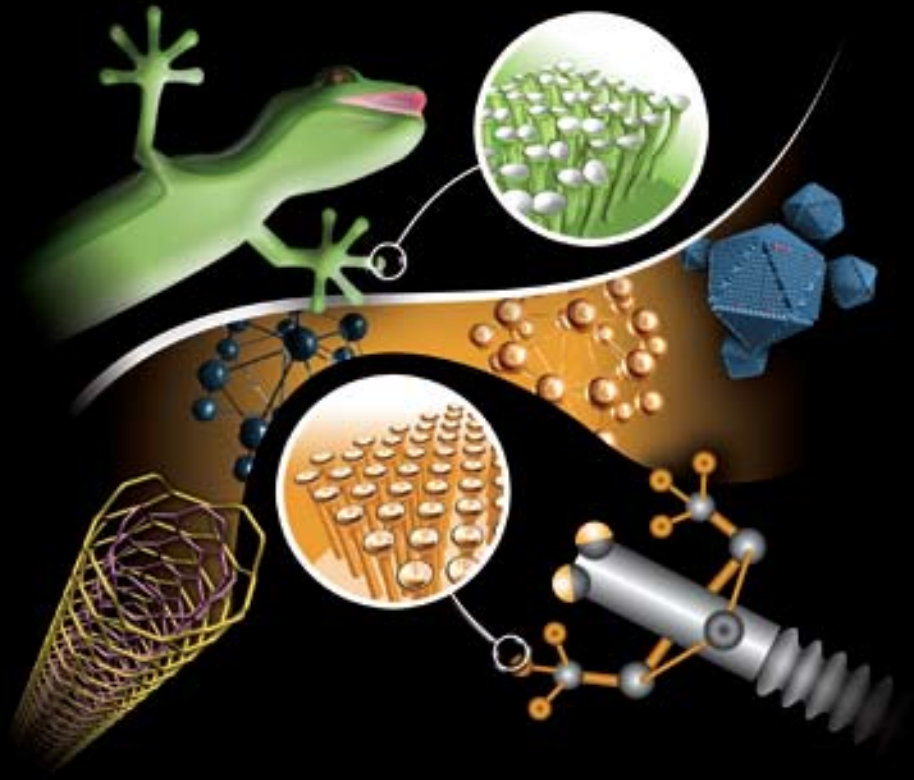
Academy eBriefings are multimedia presentations established in 2003 as a way to provide NYAS members, and others who couldn't attend NYAS events, a virtual version of the Academy's extensive, highly regarded programs. eBriefings offer NYAS's worldwide membership and other interested audiences a World Wide Web-based window into a wide range of cutting-edge conferences, symposia, and other meetings through compelling, carefully crafted overview and summary reports prepared by expert science writers; synchronized audio/slide (and, as appropriate, selected video) presentations; and a searchable, chapterized drilldown format that lets busy scientists quickly find comprehensive summaries while allowing educators, students, and others to explore deeper background resources at their own pace.

To date, the Academy has produced more than 400 eBriefings in disciplines ranging from agriculture to zoology. Nearly two dozen have been developed in partnership with leading research institutions, organizations, and agencies, including the National Academy of Sciences, the Chinese Academy of Sciences, the National Institute of Allergy and Infectious Diseases, Center for the Study of Gene Structure and Function at Hunter College, and Cornell, Harvard, and Princeton Universities. The resulting high-quality multimedia presentations, by capturing the essence of the live meeting and making it available through the NYAS Web site to interested audiences worldwide, have substantially enhanced the reach and impact of both NYAS and its partners.

SYMPOSIUM 2007
Evolution, Health and Disease

SYMPOSIUM 2008
Frontiers of Nanotechnology & Biotechnology: Integration and Invention





SYMPOSIUM 2009
Cancer

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