Grant News

Engineering Research at Hofstra University

And more good news from the humanities...

In each issue of Hofstra Horizons, *through our Grant News column, we seek to highlight some of the recent accomplishments of Hofstra University faculty in major national and international, peer-reviewed grant competitions, and important regional grant competitions.*

Thomas O. Murphy
Associate Provost for Research and Sponsored Programs

The undergraduate engineering program at Hofstra University is not among our nation's largest – and maybe that is part of its appeal for many of our students. Despite its size, students have ample opportunity to learn from and work with nationally recognized scholars among the Department's faculty.

Engineering is the science of putting knowledge obtained through basic research to practical uses, and for many years the federal government has placed its confidence in Hofstra University's engineering faculty, extending important research challenges to them and providing the University with sizable grant and contract awards to take on the tasks at hand.

David E. Weissman, a Professor in the University's Department of Engineering, is a longtime recipient of research support from the National Aeronautics and Space Administration (NASA). Dr. Weissman currently serves as principal investigator on two separate NASA awards. The thrust of this research is to investigate the ability of microwave radar and similar instruments on NASA orbiting satellites, to measure ocean surface winds and rainfall over oceans. This involves knowledge of electromagnetic wave theory, ocean dynamics and atmospheric rain structures. The research falls within the broad field known as "microwave remote sensing"; it is concerned with measuring and monitoring the Earth as a whole system. This endeavor has been growing rapidly for more than 35 years, and is currently organized as part of NASA's Earth Science Enterprise. Dr. Weissman's research career at Hofstra demonstrates that he is a pioneer in this field. One of his current projects involves converting the radar measurements, from an instrument known as a scatterometer, into sea surface wind stress estimates. The applications of this are being developed with colleagues at Florida State University, the Center for Ocean-Atmospheric Prediction Studies and the New York City office of the National Weather Service. Another project under Dr. Weissman's direction uses the same instrument, but utilizes specially developed algorithms to detect and quantify the rain over the oceans. These results will provide more accurate and longer range weather forecasts, and climate monitoring.

NASA's confidence in David Weissman remains strong, as evidenced by a new grant award commencing this spring.

Another accomplished engineering researcher with ongoing federal grant support is **Wing C. Kwong**, an Associate Professor in the Department. Dr. Kwong is the recent recipient of a four-year research award investigating Fiber-Optic Code-Division Multiple-Access Communication Systems and Networks.

The study of advanced multiple-access techniques in wireless and optical networks is an increasingly important research topic. Multiple-access techniques allow multiple users to access a communication channel with limited bandwidth. Code-division multiple-access (CDMA), in which every user is assigned a unique code word as its own address signature, has become the dominant multiple-access technology for wireless networks around the world because it offers a number of significant benefits. However, Optical CDMA (OCDMA) has recently emerged as an important technology for future ultrahigh-speed, high-capacity optical networks, particularly the next generation information superhighway and Internet II, as well as with broadband multimedia and high-definition television (HDTV) applications.

OCDMA will be an increasingly important technology in applications related to homeland security. Besides supporting multiple users to share the same fiber-optic channel simultaneously with no delay or scheduling, OCDMA offers important benefits such as physical layer security, low probability of detection, interception and jamming; capability of coexisting with present wavelength division multiplexing optical networks; and decentralized network control leading to increasing reliability and survivability. Consequently, the next generation OCDMA-based information superhighway should have greater resistance against terrorist attack on the Internet infrastructure. In addition, OCDMA can potentially improve our national security because OCDMA-based networks render eavesdropping much more difficult.

To provide accelerated progress toward an advanced optical network based on OCDMA, the U.S. Defense Advanced Research Projects Agency (DARPA) recently funded a program demonstrating technology in this area. The Hofstra team, under the supervision of Dr. Kwong, is collaborating with Princeton University and Telcordia Technologies (formerly Bell Labs) as one of the five funded teams in this overall $30-million DARPA project.

Dr. Kwong has a very strong track record on OCDMA research, dating some 12 years. His research involves both theoretical studies and experimental demonstrations on the latest OCDMA technologies. Dr. Kwong expresses his gratitude to the University's Faculty Development Research Grants (FDRG) program and the Presidential Research Awards Program (PRAP), along with past support from the National Science Foundation, in helping his research program reach its current status, with more than 50 archived journal and conference articles, and a technical reference book on OCDMA to Dr. Kwong's credit.

Sina Y. Rabbany is a full Professor and Chairman of the Department of Engineering at Hofstra. Dr. Rabbany recently completed work on a major multi-year research grant funded by the Office of Naval Research (ONR) titled "Innovative Methodologies in Immunoassay Design."

Dr. Rabbany's patent-winning research involves the application of both experimental and theoretical methods to the study of complex biological processes and is presently focused on areas of cardiovascular dynamics, biosensors and endothelial/stem cell biomechanics. Biological systems use a variety of membrane-bound receptors to differentiate a multitude of stimuli. The Rabbany research team is working to understand how sensing is done by cells in tissue as well as to exploit this concept to develop (bio)sensors.

A biosensor can be defined as a detection device that incorporates biological recognition elements such as antibodies. The biomolecules incorporated into the biosensors are chosen for the specificity with which they recognize a particular analyte and for the ability of the sensor to measure that recognition event rapidly. Biosensors have generated wide interest in both the scientific and industrial communities due to the practically inexhaustible number of uses for which this technology lends itself.

"In terms of the generation of external grant funding, Engineering is among the most successful departments on campus," notes a proud Dean Bernard J. Firestone. "Drs. Wing Kwong, Sina Rabbany, and David Weissman have extraordinarily prolific records of research and scholarly productivity, yet each is strongly committed to undergraduate teaching as well."

The confidence that NASA, DARPA and ONR place in our Engineering faculty speaks very highly of the University's engineering program. Congratulations to Wing Kwong, Sina Rabbany and David Weissman for their noteworthy accomplishments in externally funded engineering research.

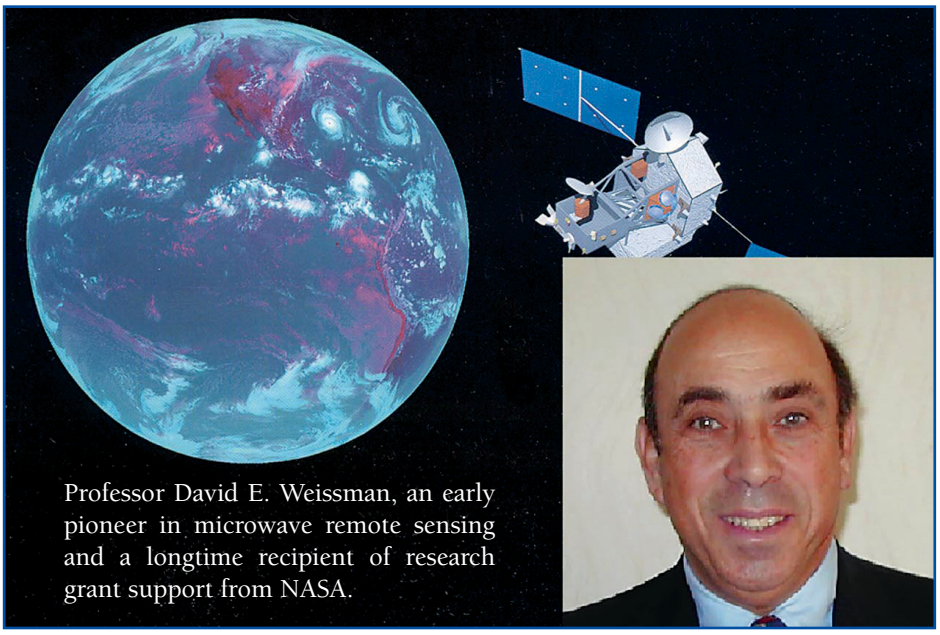
News from the Humanities

We are pleased to report that **John L. Bryant** (Professor, Department of English) is the recipient of a 2003 Research Fellowship from the National Endowment for the Humanities for a book project titled "Seeking Change: Fluid Texts and the Revision of Culture." *Seeking Change* is the third in a trilogy of critical books on the "fluid text," or any literary work that exists in multiple versions because of authorial, editorial or cultural revision. The book focuses on the "revision strategies" implicit in all three sources of revision and how they reveal the dynamics of change in a culture, with regard to the problems of racial mixing, domesticity and gender, sexuality, plagiarism and censorship. Writers treated include Melville, Mary Shelley, Stowe, William W. Brown, Dickinson, Whitman, Eliot, Spender, and David Leavitt.

Professor John L. Bryant, Hofstra's latest NEH Fellow.

"I am delighted that the outstanding work of the English Department continues to receive the external recognition that it so richly deserves," said Dean Firestone on receiving word of this latest NEH award to Professor Bryant. In total, faculty from Hofstra University have received six prestigious NEH Fellowships in the past three years. Among private universities, only Notre Dame (11), Boston (9) and Harvard (7) fared better. Among public and private universities combined, Hofstra ranks eighth nationally.

Congratulations to Professor Bryant and to recent NEH Fellowship recipients **Daniel M. Varisco** and **G. Thomas Couser** (2001), and **James Berger**, **Sharryn Kasmir** and **Lisa Merrill** (2002).



Professor David E. Weissman, an early pioneer in microwave remote sensing and a longtime recipient of research grant support from NASA.