AFIT Welcomes New Chancellor and Director

AFIT welcomed its first civilian Chancellor and Director at an Appointment of Leadership Ceremony on May 8, 2012.

Prior to joining AFIT, Dr. Todd I. Stewart served 34 years with the United States Air Force. His military career included numerous command and staff assignments in positions responsible for combat engineering and installation management, including infrastructure construction, operation and maintenance, energy management, environmental protection, and military family housing management at Air Force bases in the United States and around the world. While on active duty, he also served as an Associate Professor of Management at the Air Force Institute of Technology. In his final assignment, General Stewart was responsible for developing and implementing long-range plans and programs related to Air Force organizations responsible for systems acquisition, research and development, test and evaluation, depot-level maintenance, supply, and transportation. He retired from active duty in April 2002 at the rank of major general.

Following his retirement from active service, Dr. Stewart held appointments at The Ohio State University and Michigan Technological University. At both institutions, he led university-wide initiatives to encourage, support, and facilitate research and teaching related to all aspects of national security. This included activities related to defense, intelligence, homeland security, foreign relations, and international development.

While at Ohio State, he founded and served as Executive Director of the National Academic Consortium for Homeland Security, an alliance of more than 365 colleges and universities. Dr. Stewart was also appointed as an Adjunct Assistant Professor of National Security Affairs, at the John Glenn School of Public Affairs, The Ohio State University.

Treating Wastewater for Reuse on the Front Lines

Water sustainability at forward operating bases (FOBs) is a growing interest and priority to the U.S. Department of Defense (DOD) as a means to reduce logistics costs and potential casualties. Maj LeeAnn Racz, Assistant Professor in the Department of Systems Engineering and Management, is researching sustainable wastewater treatment methods suitable for rugged and austere environments, such as FOBs.

Military operations at FOBs often face two water-related challenges: (1) the proper treatment and disposal of wastewater generated at FOBs and (2) the availability of fresh water for potable and other routine uses. Wastewater reuse after its proper treatment is now considered one of the important aspects of water sustainability. This method will be capable of configuration as modular units that can be transported on standard military cargo aircraft and can be scalable to accommodate varying base population sizes. The (continued on page 3)
AFIT Class of March 2012 Graduates

AFIT’s Graduate School of Engineering and Management conferred 249 Master’s degrees and 8 Doctor of Philosophy degrees on March 22, 2012. The ceremony was held at the National Museum of the United States Air Force with Vice Admiral Daniel T. Oliver, USN, Retired, President of the Naval Postgraduate School, serving as the distinguished speaker.

“It is a great day to see our graduates heading off to deliver operational impact with the knowledge they have gained while at AFIT,” said Colonel Timothy J. Lawrence, AFIT Commandant. “With pride and enthusiasm, we deliver graduates that keep current and future American warfighter technological research and capability the best in the world, which AFIT has done, since 1919.”

Commandant’s Award Winning M.S. Thesis: Improved Radiation Detection
2dLt Jack G. FitzGerald, “A Programmable Liquid Collimator for Both Coded Aperture Adaptive Imaging and Multiplexed Compton Scatter Tomography”

Numerous scientific and engineering endeavors rely on the ability to image high-energy photons, including gamma-rays and X-rays. In 2010, AFIT began research to improve gamma-ray imaging using a liquid collimator. This device selectively blocks the radiation using masks with different patterns. Since gamma-rays cannot be focused by a lens, a coded aperture is a substitute for a lens as it allows gamma ray sources to be imaged.

A device, designed by 2dLt FitzGerald and built by the AFIT model shop, consisted of 100 small chambers. Each chamber could either be filled or evacuated of a dense liquid metal. When filled, gamma-rays are blocked. When evacuated, the gamma-rays easily pass through the chamber. By changing the pattern of filled and evacuated chambers, noise and artifacts cancel out in the final image, resulting in images of a higher quality than those of a traditional coded aperture system.

2dLt FitzGerald’s research offers a number of promising potential applications, including surveying large areas for radiation after a nuclear explosion or after a reactor accident using an unmanned aerial vehicle (UAV) or ground-based robot, and finding radioactive effluents for treaty monitoring. When used for Multiplexed Compton Scatter Tomography (MCST)—a method of nondestructively generating cross-sectional images of a sample’s electron density—the device could perform single-sided airfoil defect inspections, bone density studies, and historic artifact scanning. If mated with a single radiation detector, it could decrease government cost for a position-sensitive detector and serve to upgrade current radiation detectors used in the U.S., transforming them into imaging systems. Space-based astronomy could benefit from this device with improvements in solar flare or Gamma-Ray Burst (GRB) observations and improve medical imaging, including Computed Tomography (CT), Single Photon Emission Computed Tomography (SPECT), and Positron Emission Tomography (PET).

2dLt FitzGerald’s research was conducted in support of the U.S. Strategic Command (USSTRATCOM). His thesis advisor is Dr. Larry Burggraf, Professor in the Department of Engineering Physics.
“The Integrator”—a process of summing up—is borrowed from the title of AFIT’s 1950 student yearbook.

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high quality effluent from this treatment system could be reused for nonpotable purposes at a minimum (such as construction of roads and vehicle washing). In addition, the treatment method will generate biogas to be used for energy, making the treatment system self-sustaining for power requirements.

Maj Racz’s research incorporates source separation and treatment of grey water in order to easily produce nonpotable water for reuse. This system can be used in conjunction with or instead of the Shower Water Reuse System (SWRS). Black water will also be treated to produce high-quality water for nonpotable purposes at a minimum, using novel biological and physical methods suitable for rugged and austere environments such as FOBs. In addition, the bioreactor will run in such a fashion to generate minimum biomass. The treatment method will generate biogas to be used for energy, making the treatment system self-sustaining.

This treatment system will provide water for reuse at FOBs without the need for excessive external power, significantly reducing the need for transporting water and fuel and potentially saving precious resources and lives. In addition to meeting the needs for sustainable water operations at FOBs, it holds promise for advances in decentralized wastewater treatment for non-DOD communities.

This type of treatment holds promise for civilian use as well and could be provided to rural villages overseas as an act of good will in order to promote national security strategy objectives.

Maj Racz’s research was initially supported by an AFIT Faculty Research Council project. Since then, the project has received sponsorship from the U.S. Environmental Protection Agency, National Homeland Security Research Center and has supported four AFIT graduate students’ theses to date.

Faculty News

IIE Medallion Award
The Institute of Industrial Engineers (IIE) has recognized Dr. Adedeji Badiru, Professor and Head of the Department of Systems Engineering and Management, with its prestigious Medallion Award for 2012.

The Medallion Award recognizes individuals who have made a notable impact on the industrial engineering profession. Professor Badiru’s award specifically recognizes his professional leadership and “… specific accomplishments of distinction, through advising and mentoring students and entry-level industrial engineers, to include innovative means of stimulating programs, curricula, laboratory, and design projects that are worthy of special recognition.”

Outstanding Engineer
Dr. John Raquet, Associate Professor of Electrical Engineering and Director of the Advanced Navigation Technology Center, was recognized by the Affiliate Societies Council of Dayton as an outstanding engineer and scientist, as part of the activities of Engineers and Scientists Week. Dr. Raquet was among eleven other engineers and scientists in the Dayton area honored for important contributions to their professions.

Research Award
Dr. Michael J. Havrilla was selected as the AETC Nominee for the 2012 John L. McLucas Basic Research Award. This award, named for the former Secretary of the Air Force, recognizes individuals that make outstanding contributions through scientific efforts and achievements of United States Air Force in-house basic research activities.
AFIT Celebrates National Engineers Week

To encourage today’s youth to pursue careers in Science, Technology, Engineering, and Mathematics (STEM), AFIT hosted nearly 160 local high school students during National Engineers Week on February 19-25, 2012, with a series of engineering workshops. This allowed students to tour the AFIT campus and see, first-hand, technologies the Institute uses to provide a world-class graduate education and make a difference in today’s technology-driven world.

A major highlight of the week was the keynote presentation by Colonel Michael Fossum, USAF, retired, AFIT 1981 systems engineering alumni, Space Shuttle pilot and Commander of the recent Expedition 29 to the International Space Station. During the luncheon presentation, Col Fossum shared stories of what it is like to work and live in space for 6 months and stressed the importance of focusing on STEM education. “The world is more complicated. Even your washing machine is more complicated than it was 30 years ago. The more that people understand technology, the better they are able to cope with the world as it comes at them. Our country needs people in these career fields. It’s really critical for maintaining economic strength,” he said. Col Fossum’s AFIT education has played a key role in his successes, stating, “The education I received here and the contacts that I have made here, the friends that I made here, have been with me my entire career in the Air Force.”

AFIT hosts AFOSR Seminar Series speaker, Dr. Margaret Murnane, on May 31, 2012. She is a Fellow at JILA and a Distinguished Professor in the Department of Physics and Electrical and Computer Engineering at the University of Colorado.

Pictured above from left to right: Dr. Russell Thomas, AFOSR Director; Dr. Murnane; and Dr. Heidi Ries, AFIT Dean for Research.

A look back in AFIT history...

March 1979: Major General James H. Ahmann presenting the graduation address to 35 officers receiving degrees from AFIT. At the time, Maj Gen Ahmann was the Director of Plans in the Office of the Deputy Chief of Staff, Plans and Operations, at Headquarters U.S. Air Force. Maj Gen Ahmann is also an AFIT alum earning a master’s degree in Electrical Engineering in 1960.