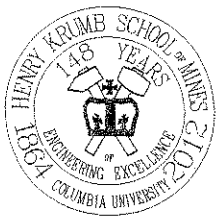
MIM Conference 2012
Proceedings



Columbia University,
School of Engineering & Applied Science,
Davis Auditorium, Shapiro Center,
530 W 120th Street, New York, NY 10027

October 20, 2012

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PREFACE

The Turkish-American Architects, Engineers and Scientists Society (MİM), in conjunction with the Columbia University Earth and Environmental Engineering Department (EAEE) organized MİM Conference – 2012 in New York City. This conference brought together a group of prominent Turkish-American scientists to share with the audience their most recent research findings and contributions to their respective fields. The attendance to MİM Conference – 2012 was open to the public and free of charge. The goals of this Conference are listed below:

1- To determine the significant contributions made by the Turkish-American Architects, Engineers and Scientist to America and to publish this as the proceedings of the congress.

2- Use the Proceedings of the Conference to create awareness on Turkish American community's contributions to the American society.

3- To stimulate cooperation and friendship between the Turkish and American Scientists, Engineers and Architects.

4- To honor the Engineers, Architects and Scientists who made significant contributions in their fields.

This document includes the author biographies as well as the abstracts of the papers presented at the conference.

CONTROL OF DNA REPAIR AND CANCER BY THE CIRCADIAN CLOCK

Aziz Sancar, MD, Ph.D,
Distinguished Professor of Biochemistry and Biophysics,
University of North Carolina School of Medicine

ABSTRACT

Circadian rhythm is the oscillation of the biochemical and physiological functions with a periodicity of about 24 hours. The rhythm is generated by a molecular clock. In mammalian organisms the molecular clock regulates a key protein in the DNA repair system that repairs DNA damage caused by carcinogenic UV radiation as well as chemotherapeutic drugs such as cisplatin. As a consequence, the time of the day of delivery of DNA damaging agents dictates the degree of their carcinogenicity and their therapeutic efficacy.

BIOGRAPHY

Aziz Sancar is Distinguished Professor of Biochemistry and Biophysics at the University of North Carolina School Of Medicine. He was born in Savur-Mardin, Turkey in 1946. He obtained his primary and secondary education in Savur and Mardin. He received an M.D. degree in 1969 from the Istanbul University School of Medicine and a Ph.D. degree in Molecular Biology in 1977 from the University of Texas at Dallas. He did postdoctoral research at Yale University in the period of 1977-1982 and joined the faculty of the University of North Carolina in 1982. He conducts research on DNA repair, DNA Damage Checkpoints, and the Circadian Clock.Aziz Sancar is the recipient of the Presidential Young Investigator Award (USA), American Society of Photobiology Award, TUBITAK Research Award, and the Vehbi Koc Prize in Medicine. He is a member of the Turkish Academy of Sciences,the American Academy of Arts and Sciences, and the National Academy of Sciences USA. Aziz and Gwen Sancar are co-founders of CAROLINA TURK EVI in Chapel Hill, North Carolina.

FUNCTIONAL OPTICAL BRAIN MONITORING SYSTEM: FNIR

Banu Onaral, Ph.D,
Professor and Director of Bioengineering,
Drexel University

ABSTRACT

Near-infrared spectroscopy (NIRS) based optical imaging systems have been widely used in functional brain studies as a noninvasive tool to study changes in the concentration of oxygenated hemoglobin (oxy-Hb) and deoxygenated hemoglobin (deoxy-Hb). Based on the NIRS technique, Drexel University's Optical Brain Imaging team has developed a functional brain monitoring system (fNIR) to assess cognitive activity of healthy subjects and patients. The fNIR is a portable, safe, affordable and negligibly intrusive monitoring system which enables the study of cortical activation-related hemodynamic changes under various field conditions. This presentation will provide an overview of applications of the fNIR including human performance assessment, learning and training, depth of anesthesia monitoring, neuro-rehabilitation, brain computer interface for locked-in patients, mental health applications as well as 'brain-in-the loop' applications in motor learning and robotic rehabilitation. The audience will be introduced to the *Cognitive Neuroengineering and Quantitative Experimental Research (CONQUER) CollabOrative* which hosts the Optical Brain Imaging team and welcomes all regional, national and international partners dedicated to the research, development, integration, translation, productization, field deployment and commercialization of functional imaging techniques to monitor human brain activation in natural environments.

BIOGRAPHY

Banu Onaral is H. H. Sun Professor of Biomedical Engineering and Electrical Engineering at Drexel University, Philadelphia, PA. She received her BS and MS in electrical engineering from Boğaziçi University, Istanbul, Turkey, in 1973 and 1974 respectively and earned her PhD in Biomedical Engineering from the University of Pennsylvania in 1978. Dr. Onaral joined the faculty of the Department of Electrical and Computer Engineering and the Biomedical Engineering and Science Institute at Drexel University in 1981. Starting in 1995, she led the strategic planning to transform the Biomedical Engineering and Science Institute into a university-level interdisciplinary school. Since 1997, she has served as the Founding Director of the School of Biomedical Engineering Science and Health Systems.

Academic Focus and Leadership

Her academic focus both in research and teaching is centered on information engineering with special emphasis on complex *systems, biomedical signal processing in ultrasound and optics and functional optical brain imaging*. She has led major research and development projects sponsored by the National Science Foundation (NSF), National Institutes of Health (NIH), Office of Naval Research (ONR), DARPA, Department of Homeland Security (DHS) and Federal Aviation Agency (FAA). She supervised a large number of graduate students to degree completion and has an extensive publication record in biomedical signals and systems.

She founded several laboratories throughout her career: the most recent is the CONQUER (Cognitive Neuroengineering and Quantitative Experimental Research) CollabOrative established in Fall 2008 as an interdisciplinary, multi-institutional and international resource

dedicated to the study of brain activation, development and deployment of optical brain imaging technologies in human performance, healthcare, mental health and learning with research and development partners in US and overseas, including China, Israel, Spain, Turkey and UK.

National Honors, Awards and Services

She is the recipient of a number of *faculty excellence awards* including the 1990 Lindback Distinguished Teaching Award of Drexel University, the EDUCOM Best educational Software award and the NSF Faculty Achievement Award. She is a *Fellow of the IEEE* Engineering in Medicine and Biology Society, the American Association for the Advancement of Science (AAAS) and *a Founding Fellow of American Institute for Medical and Biological Engineering (AIMBE)*. She served on the inaugural Board of the AIMBE as publications chair and as Chair of the Academic Council.

Dr. Onaral's professional services include chair and membership on advisory boards and strategic planning bodies of several universities and funding agencies, including service on the National Science Foundation's Engineering Advisory Board, and on the proposal review panels and study sections. Her professional responsibilities have included service on the Editorial Board of journals and the CRC Biomedical Engineering Handbook as Section Editor for Biomedical Signal Analysis.

She served as *President of the IEEE Engineering in Medicine and Biology Society (EMBS), the largest member-based biomedical engineering society in the world.* Earlier, she had served as Vice-President of Conferences of IEEE-EMBS. She has been active in conference leadership; notably, she organized and chaired the 1990 Annual International Conference of the EMBS and Co-Chaired the 2004 Annual Conference of the Biomedical Engineering.

Translational Research and Health Innovations Leadership – University

Dr. Onaral's translational research efforts for rapid commercialization of biomedical technologies developed at Drexel and its partner institutions have resulted in the creation of the Translational Research in Biomedical Technologies program. This initiative brings together academic technology developers with entrepreneurs, regional economic development agencies, local legal, business and investment communities. Under her leadership, the program has been awarded $10 million from the Wallace H. Coulter Foundation toward the creation of the $20 million *Coulter Translational Research Partnership Endowment.*

Regional Health Innovation Partnership

She is currently leading the creation of the regional Health Innovation Partnership - Philadelphia Region modeled on the 'Coulter Translational Research Partnership' approach to commercialize university innovations. The initiative aims to mobilize the academic grassroots and to pool regional resources and assets to bring novel solutions to healthcare.

International Academic and Health Innovation Partnerships

She has actively forged international academic partnerships with institutions in China, Israel, Italy, Spain and Turkey. She participated in the strategic planning team charged with the creation of Sabancı University established in 1998 in Istanbul, Turkey and served on its Board of Trustees. She served as the President of the Turkish American Scientists and Scholars Association. She is currently serving as the US lead of regional health innovation initiatives.

namely INOVIZ, INOVA and INOVITA (health focused initiative of INOVIST) in Izmir, Ankara and Istanbul, Turkey, respectively.

In 2000, she led the first Eisenhower Foundation sponsored delegation of biomedical engineers to China and helped organize the first Asia-Pacific Biomedical Engineering Conference in Hangzhou. She has been instrumental in the organization of international biomedical engineering conferences in China and Turkey, including the Annual International Conference of the IEEE Engineering in Medicine and Biology in Istanbul, Turkey in 2001 and Annual International Conference of the IEEE Engineering in Medicine and Biology in Shanghai, China, in 2005. She has facilitated the development of translational research partnership with the Institute for Drug Research of Hebrew University, Jerusalem, Israel, in Fall 2010. She is spearheading the creation of similar partnerships with the Med-X Research Institute / School of Biomedical Engineering of Shanghai Jiao Tong University, Shanghai, China; Life Sciences and Technology Center, Boğaziçi University, Istanbul, Turkey; Human Neuropsychology and the Faculty of Physiology, University of Seville and the National Hospital for Paraplegics in Toledo, Spain.

CROSS-LINKED POLYETHYLENE IN JOINT IMPLANTS: FROM LABORATORY TO THE CLINIC

Ebru Oral, Ph.D,
Harvard Medical School

ABSTRACT

In the US, joint disease affects 70 million people and ~1 million patients with end-stage joint disease receive joint replacements annually, mainly using hip and knee replacements. Although this operation is one of the most successful and life-giving surgical interventions to date, its longevity and use in younger patients remain limited due to surgical and material problems. Typically, the synthetic joint comprises a metal-on-polymer articulating pair, the polymer component of which is ultrahigh molecular weight polyethylene (UHMWPE); a highly specialized medical polymer.

In the 1990's, a first generation cross-linked UHMWPE was developed in the laboratory to increase the wear resistance of the bearing surface and to decrease wear- induced osteolysis. This material was translated into the clinic in 1998 and it has been used successfully in the clinic. In total hips, the incidence of osteolysis has been decreased 87% compared to historical sterilized UHMWPE, which had been used since the inception of this type of replacement in the 1960's. This decrease is deemed one of the most significant developments in improving the performance of joint implants.

The demands on joint replacements are increasing at a fast rate with an increase in the total number of patients in need and also an increase in younger and more active patients. In addition, some of the materials that are used clinically as an alternative to metal-on-polymer systems have not shown improvements and even increased failure risk in some cases. Therefore, our efforts in the last decade were focused in improving the mechanical strength of cross-linked polymers and protecting them against long-term oxidation. For this purpose, we developed a novel, antioxidant-stabilized cross-linked UHMWPE bearing surface, which has been used clinically since 2007.

Our current research focuses on introducing attributes into the polymer bearing surface to allow more anatomical and functional designs and to remove the material as bottleneck from the clinical performance of joint implants.

Our experience in bringing our basic understanding of polymer science into clinical use as medical devices is supported by the quality of our people and science, the translational nature of our environment, our ability to protect intellectual property and our partnerships with medical device manufacturers. Today, the laboratory-to-clinic process is also strongly influenced by regulatory procedures as well as the media.

BIOGRAPHY

Ebru Oral is a native of Istanbul, Turkey. She received her BS degree from Boğaziçi University in Chemical Engineering and traveled to the United States for her graduate education. She did her graduate work under the direction of Dr. Nicholas Peppas at Purdue

University with specialization in polymeric biomaterials for therapeutic systems and received her PhD in Chemical Engineering in 2003. She did her post-doctoral training in Orthopaedic Biomaterials at the Harris Orthopaedic Laboratory at Massachusetts General Hospital from 2003 to 2005 on antioxidant stabilization methods of cross-linked polyethylenes for joint implants. She received the HAP Paul Award of the International Society for Technology in Arthroplasty in 2006 for the antioxidant-stabilized joint implants she developed during her post-doctoral work and once again in 2011 for improved technologies. She has been junior faculty since 2005 and leads a group of researchers on improving current polymeric materials used in joint implants and medical devices and developing next generation materials. She was named American Academy of Orthopaedic Surgeons/National Institutes of Health Young Investigator on Wear and Osteolysis in 2007 and is a Claflin Distinguished Scholar of the Massachusetts General Hospital from 2011 to 2013. She has published over 30 peer-reviewed papers as well as numerous reviews and book chapters. She is also an inventor on 12 families of patent applications on material technologies for joint implants. In addition to her research, she is an educator to biomedical engineering technicians, post-doctoral fellows, medical students and colleagues. She is married and she has a three year-old daughter.

CONTROLLED ANESTHETIC RELEASING IMPLANT

Deger C.Tunç, Ph.D,
Researcher, Senior Manager (retired),
Johnson and Johnson, Pfizer and Stryker Corporations

ABSTRACT

In the year 2009, 676000 Total Knee arthroplasties and 327000 Total Hip arthroplasties were performed in the USA and all the patients complained about severe pain after their surgeries. The pain is especially severe during the first week post operatively. There are a number of approaches used now to control the post operative pain but they either require a greater amount of anesthetic to be used systemically or they do not relieve the pain and thus result in reduced activity by the patient during rehabilitation and thus longer recovery period.

A new approach is developed where a device containing the anesthetic agent is attached to the prosthesis and thus implanted with the prosthesis. This is accomplished by developing a totally bioabsorbable device containing the anesthetic drug which releases it at a clinically desired rate into the joint space where the prosthesis is implanted. This reduces the pain during the first 4-7 days post surgery when the pain is most severe and then the drug is depleted and the device is absorbed by the body. A patent application covering this invention has been filed with the US Patent Office.

BIOGRAPHY

Forty seven years of experience as Senior Manager of Research and Development and Research Scientist at Johnson and Johnson, Pfizer, and Stryker corporations. Internationally well known expertise in Bioabsorbable polymers, controlled drug release systems, implantable medical devices, for use in craniomaxillofacial, trauma, sports medicine, and spinal applications. Was granted twenty three US patents and over four hundred international patents and authored thirty six publications. Developed a number of medical implants which generate multimillion dollars of sales per year. Presently President of Poly Medical LLC. Consulted with companies on:

- Bioabsorbable Polymers and Devices, all stages of development of products from concept to commercialization
- Devices/Implants in Orthopaedics, Spinal Implants, Sport Medicine Implants, Craniomaxillofacial Implants, Trauma Devices, Bone Fillers, Controlled Drug Release Devices,
- Fields included, concept development, polymer synthesis, product design, manufacturing method development, Quality Control, 510K submission, Operations Department functions.
- Consulted for the companies which included Smith and Nephew, Osteotech Inc.(now Medtronic) and Irwin Fritchie Urquhart & Moore.

EDUCATION
Ph.D., Physical Chemistry, Rutgers University , New Brunswick , NJ
M.S., Chemistry, Fairleigh Dickinson University , Teaneck , NJ
B.S., Chemistry, Columbia University , New York , NY

HONORS

Proclaimed as The Inventor of the Year, 1989 and inducted into "The New Jersey Inventors Congress and Hall of Fame" for extraordinary contributions to "The Advancement of Knowledge and Human Welfare With His Invention of Body Absorbable Bone Fixation Devices".

INVITED LECTURES/ SEMINARS

American Chemical Society
The Society for Biomaterials
Orthopaedic Research Society
American Society for Testing & Materials
North Atlantic Treaty Organization Advanced Study
Oxford University
Cornell University
Yale University Medical School
MDNJ - Robert Wood Johnson Medical School
U.S. Patent Office
United Nations Assignments of Ege University Izmir, Turkey and Middle Eastern Technical University Ankara, Turkey and
National Scientific and Industrial Research Institute at Gebze , Turkey

THE USE OF NANOSCALE AND MICROFLUIDIC TECHNOLOGIES IN MEDICAL LAB-CHIP DEVICES

Utkan Demirci, Ph.D,
Asst. Professor
Medicine and Health Sciences & Technology
Harvard Medical School

ABSTRACT

Emerging nanoscale technologies and microfluidic technologies offer exciting new directions to create intelligent medical lab-chip devices that positively impact human health. In this talk, we will provide examples covering applications in point-of-care and primary care settings such as ovarian cancer detection from urine, rapid CD4 counts for global health and multiple pathogen detection with a focus on HIV viral load from unprocessed whole blood. Our goal is to provide technologies that may shape our future providing clinical solutions in medicine.

BIOGRAPHY

Utkan Demirci, PhD, is an Assistant Professor of Medicine and Health Sciences and Technology at Harvard University Medical School, Brigham and Women's Hospital (BWH), and MIT (Massachusetts Institute of Technology) since 2007. Dr. Demirci leads a group of 30 researchers focusing on nano and microscale technologies. Dr. Demirci received his B.S. degree in Electrical Engineering in 1999 as a James B. Angell Scholar (Summa Cum Laude) from University of Michigan, Ann Arbor. He received his M.S. degree in 2001 in Electrical Engineering, M.S. degree in Management Science and Engineering in 2005 and Ph.D. in Electrical Engineering in 2005 all from Stanford University.

Dr. Demirci applies nano and microscale technologies to manipulate cells in nanoliter volumes to enable solutions to real world problems in medicine including applications in infectious disease diagnostics and monitoring, cell encapsulation in nanoliter droplets for cryobiology, and bottom-up tissue engineering. His research interests involve applications of microelectromechanical systems (MEMS) and acoustics in medicine, especially: microfluidics for rapid multiple viral/fungal/bacterial pathogen detection, inexpensive CD4 counts for HIV in resource-limited-settings for global health problems; 3D tissue printing; high-throughput blood biopreservation through vitrification. Dr. Demirci has published more than 60 peer reviewed journal publications in journals including PNAS, Advanced Materials, and Lab-chip, more than 80 conference abstracts and proceedings, and 10 book chapters. He holds various patents in biotechnology. His work was highlighted in Wired Magazine, Nature Photonics, MIT Technology Review Magazine, AIP News, BioTechniques, and Biophotonics.

Dr. Demirci's scientific work has been recognized by numerous national and international awards. In 2012, Dr. Demirci was awarded the NSF Faculty Early Career Development (CAREER) Award as well as the IEEE-EMBS Early Career Achievement Award. Dr. Demirci received IEEE-EMBS Translational Research Award (2011) and the Chinese International Young Scientist Award by the National Science Foundation of China (2010). Dr. Demirci was recognized by Junior Chamber International (JCI) globally among the ten outstanding young persons of the world (TOYP) in "Medical Innovation" in 2009. In 2008,

Dr. Demirci was recognized by Junior Chamber International (JCI) globally among the ten outstanding young persons of the world (TOYP) in "Medical Innovation" in 2009. In 2008, Dr Demirci received the Department of Medicine, Harvard Medical School-Young Investigator Award. Dr. Demirci received the Coulter Foundation Early Career Award in Biotechnology (Phase I in 2007, and Phase II in 2009); Nano-Biotechnology Award by The

National Science Council of Turkey and The Turkish Industrialists' and Businessmen's Association; MIT Deshpande Center Award. In 2006, he was selected to TR-35 as one of the world's top 35 young innovators under the age of 35 by the MIT Technology Review. In 2004, he led a team that won the Stanford University Entrepreneur's Challenge Competition and Global Start-up Competition in Singapore based on his doctoral work. He is a member of Phi Kappa Phi National Honor Society.

BIOENGINEERING AND CLINICAL APPLICATIONS OF CIRCULATING TUMOR CELL (CTC) CHIP

Mehmet Toner, Ph.D,
Helen Andrus Benedict Professor of Bioengineering
Massachusetts General Hospital, Harvard Medical School
Harvard-MIT Division of Health Sciences & Technology

ABSTRACT

Viable tumor-derived circulating tumor cells (CTCs) have been identified in peripheral blood from cancer patients and are probably the origin of intractable metastatic disease. The reliable isolation of CTCs using the microfluidic chip in metastatic cancer offers the possibility to change we manage cancer patients by monitoring patient response and changes in tumor genotypes during the course of treatment. However, the ability to isolate CTCs as a potential alternative to invasive biopsies as a source of tumor tissue for detection, characterization and monitoring of cancer patients have proven to be difficult due to the exceedingly low frequency of CTCs in circulation. We previously demonstrated the effectiveness of a microfluidic device, the CTC-Chip, in capturing rare CTCs using antibody-coated micro-posts under laminar flow conditions. More recently, we developed a second-generation chip based on high throughput microfluidic mixing approach, the herringbone-chip, or 'HB -chip', which provides an enhanced platform for CTC isolation. The HB-chip design applies passive mixing of blood cells through the generation of micro-vortices to dramatically increase the number of interactions between target CTCs and the antibody-coated chip surface. We applied the microfluidic platforms to blood samples obtained from metastatic lung, prostate, breast, colon, and pancreatic cancer patients. These studies with patient blood showed very high sensitivity and specificity of the microchip. We also tested the microchip in a cohort of patients with metastatic cancer undergoing systemic treatment and showed the temporal changes in CTC numbers correlated well with the clinical course of disease as measured by standard radiographic methods. To further show the utility of the CTC-chip, we isolated CTCs from patients with metastatic non-small-cell-lung cancer and identified the expected EGFR activating mutation in CTCs. We also detected the T790M mutation, which confers drug resistance, in CTCs collected from patients with EGFR mutations who had received tyrosine kinase inhibitors. More recently, we applied microchip to isolate CTCs from blood specimens of patients with either metastatic or localized prostate cancer. Remarkably, the low shear design of the HB-chip revealed micro-clusters of CTCs in a subset of patient samples. Microscopic CTC aggregates may contribute to the hematogenous dissemination of cancer. Currently, the work is focused on dissemination of the technology to multiple clinical centers as well as the development of novel tools for high sensitivity detection of CTCs for early detection of cancer. This presentation will share our integrated strategy to simultaneously advance the engineering and microfluidics of CTC-Chip development, the biology of these rare cells, and the potential clinical applications of circulating tumor cells.

BIOGRAPHY

Dr. Toner received BS degree from Istanbul Technical University and MS degree from the Massachusetts Institute of Technology (MIT), both in Mechanical Engineering. Subsequently he completed his PhD degree in Medical Engineering at Harvard-MIT Division of Health

Sciences and Technology in 1989. Since that time he has been on the faculty at Harvard Medical School. He was appointed as an assistant professor in 1990, promoted to associate

professor in 1996, and to professor in 2002. Currently, he is the Helen Andrus Benedict Professor of Biomedical Engineering at the Massachusetts General Hospital, Harvard Medical School, and Harvard-MIT Division of Health Sciences and Technology. Dr. Toner established the Center for Engineering in Medicine, and BioMicroElectroMechanical Systems Resource Center (BMRC) at the MGH to explore the applications of bioengineering in basic biology, systems biology, diagnostics and clinical medicine.

He is internationally regarded for his work in biomedical engineering. Dr. Toner has published >250 original papers in archival journals, including wide spectrum of high impact journals such as Nature, Science, New England Journal of Medicine, Science Translational Medicine, Nature Biotechnology, and PNAS. He has also delivered about 400 invited, keynote and plenary presentations. Most recently, he was the Commencement Speaker at his alma mater Istanbul Technical University's 238th anniversary.

In 1994, he was recognized by the "YC Fung Faculty Award" in Bioengineering. In 1995, he received the "Whitaker Foundation Special Opportunity Award." In 1998, Dr Toner was selected to become a "Fellow of the American Institute of Medical and Biological Engineering." In 2007, he became a "Fellow of the American Society of Mechanical Engineers." In 2008, he was given "One-of-the hundred" award by the Massachusetts General Hospital cancer Center for his impact in cancer research. He was also recognized by the magazine "Popular Mechanics" as one of the top ten inventors in 2008. In 2010, he received the American Association of Cancer Research (AACR) Team Award.

Dr. Toner has served on many national and international panels and review boards. He is a member of the Board of Trustees of Özyeğin University, and a member of the President's Council of Olin College of Engineering. In 2010, he was selected to serve a three-year term on the NSF Directorate of Engineering, Board of Advisors. Dr. Toner serves on the scientific advisory board of Tissue Engineering Research Center at Tufts University/MIT/Columbia University; Resource for Synthesis and Bulk Characterization of Polymer Biomaterials at Rutgers University; Institute of Engineering and Medicine at University of Minnesota; Center for Biomedical Engineering at University of North Carolina at Charlotte; and Center for Biomedical Engineering at Brown University. Dr. Toner is also on the editorial board of various technical and scientific journals including Journal of Biomechanical Engineering, Cryo-Letters, Cryobiology (Associate Editor), Cell Preservation Technologies (Associate Editor), Nanomedicine, Integrated Biology, Nanolife, and Annual Review of Biomedical Engineering (Associate Editor and Co-Founder). Dr. Toner is also co-founder of multiple biotechnology and medical device start-ups.

Among the > 100 graduate and postgraduate students trained by Toner today, many occupy major academic positions. Multiple of his alumni have received the NSF Career Award, NSF Presidential Young Investigator Award, NIH First Award and NIH Director's Young Investigator Award.

VAPOR INTRUSION – IMPACT OF TETRACHLOROETHENE AND TRICHLOROETHENE ON HUMAN HEALTH

Haydar Erdogan, Ph.D,
NJ Department of Environmental Protection
Trenton, New Jersey

ABSTRACT

The phenomenon of vapor intrusion, which involves migration of volatile organic compounds (VOCs) from the sub-surface into overlying buildings, has received a great deal of attention end evolved rapidly over the last 10 years. In this presentation, the concept of vapor intrusion, including conceptual site model (CSM), sources of vapor intrusion, vapor diffusion mechanisms, and migration of vapors from sources in shallow groundwater to indoor air pathway will be discussed. The major factors affecting vapor migration are biodegradation, site stratigraphy, soil moisture, groundwater recharge, fluctuations in groundwater table, ventilation systems in commercial and industrial buildings, and preferred migration path ways. The main contaminants of concern in sub-slab soil gas and indoor air are VOC including benzene, toluene, ethylbenzene and xylenes (BTEX), which are the major components of gasoline and chlorinated volatile organic compounds including tetrachloroethene (PCE), trichloroethene (TCE) and their degradation products such as 1,2-dichloroethane, 1,1-dichlorothene, and vinyl chloride. VOCs present in shallow groundwater table volatilize and migrate through the preferred pathways to the indoor air. These contaminants have a major impact on the human health and most of these compounds are carcinogens. Based on the results of groundwater analytical data, sub-slabs soil gas and indoor air samples were collected in several residential and commercial buildings located above the VOC plume. All samples were analyzed using the USEPA Method TO-15. Elevated levels of TCE, PCE, and their daughter products have been detected in some of the sub-slab soil gas samples. The analytical data was evaluated using the NJDEP sub-slab soil gas and indoor air screening levels and an active depressurization system was recommended for mitigating the vapor intrusion in homes, commercial and industrial buildings. Studies have shown that these systems are very effective in remediation of the vapor intrusion.

BIOGRAPHY

Dr. Erdogan is a Research Scientist at the New Jersey Department of environmental Protection. He was born in Tunceli, Turkey. He received his Bachelor of Science degree in Chemical Engineering from University of Ankara in 1972, a Master of Science Degree from Michigan State University in 1976, and a PhD. degree from University of Pittsburgh in 1981. In 1982, he joined Rutgers University, Department of Civil and Environmental Engineering as an assistant professor. In 1983, he joined the NJDEP as a Research Scientist. He has been working at the NJDEP since then. From 1991 to 1992 Dr. Erdogan taught at Columbia University, from 1992 to 1999 at New Jersey Institute of Technology as an adjunct professor. Dr. Erdogan gave seminars and lectures on water, wastewater, solid, and hazardous waste management in Ankara, Istanbul, Izmir, and Kayseri, in Turkey. Dr. Erdogan has several publications and is a member of several professional organizations including American Institute of Chemical Engineering, American Society of Civil Engineers, and Turkish American Association of Architect, Engineer and scientist (MIM). He is listed in the "Who's

Who in the Frontier Science and Technology" in the 1984 Edition, "Who's Who in the World" in the 1985 Edition, and "Men of Achievement" in the 1984 Edition. He is one of the founders of Turkish American Society of Civil and Environmental Engineering (TASCEE).

NATURAL DISASTERS, VULNERABILITY AND SUSTAINABLE DEVELOPMENT: AN OVERVIEW OF THE RELATION

Ebru Gencer, Ph.D,
Columbia University

ABSTRACT

Disasters and development have an interlinked and multifaceted relationship. They can mutually have a negative effect on each other, while development can also reduce disaster risks. Today, research on this complex relation is more essential than at any other time in history; as worldwide statistics indicate an increasing number of disasters and disaster impacts (with the exception of mortalities) as recent patterns. This presentation will be an overview of the interplay between natural disasters, vulnerability and sustainable development, both in the global and in the urban scale.

The presentation will start with examining the relation between Disaster Vulnerability and Sustainable Development in the macro scale. It will specifically concentrate on the author's background report for the United Nation's 2013 Global Assessment Report on Disaster Risk Reduction. Here the focus will be poverty, income inequality and vulnerability from natural disasters.

The presentation will continue with the author's research on the relation between Disaster Vulnerability and Urban Development, and it will specifically focus on the case of Istanbul. The author will displace her work for her doctoral dissertation and for the Columbia University.

Academic Project for Risk Mitigation to Metropolitan Areas, which investigate how the urban development of Istanbul has caused its vulnerability from natural disasters and how the current socio-economic and institutional structure of the city affects its earthquake risk management activities. The presentation will conclude with proposals for an integrated strategy for vulnerability assessment and disaster risk reduction.

BIOGRAPHY

COLUMBIA UNIVERSITY, NEW YORK
Doctor of Philosophy
in Urban Planning May 2007
Dissertation: The Interplay between Natural Disasters, Vulnerability, and Sustainable Development: Global Trends and Local Practice in Istanbul.

COLUMBIA UNIVERSITY, NEW YORK
Master of Philosophy
in Urban Planning October 2001
Related Discipline: Architecture, Sector Specialization: History and Theories of Public Space

MIMAR SINAN UNIVERSITY, ISTANBUL
Master of Science

in Urban Preservation and Renewal October 1996
Master's Thesis: Kentsel Koruma Planlarının Uygulanabilirliliği: İstanbul Yarımada Örneği (Applicability of Urban Preservation Plans: The Case of Istanbul's Historical Peninsula).

SUMMER ACADEMY on SOCIAL VULNERABILITY, HOHENKAMMER July 2007
Fellow Participant:
Received fellowship to participate in the Summer Academy on Social Vulnerability organized by the United Nations University Institute for Environment and Human Security (UNU-EHS) and the Munich Re Foundation. Tasks included writing a paper for the academy and making a power point and poster presentation. Additional tasks included leading group work on creating a megacity vulnerability framework advised by Thomas Downing of the Stockholm Environment Institute and making a concluding presentation to the academy.

COLUMBIA UNIVERSITY, NEW YORK September 2003 – June 2005
Research Assistant:
Received full fellowship by the Department of Civil Engineering and Engineering Mechanics and participated in Columbia University's Academic Quality Fund Project, "Development of an Integrated Methodology for Risk Assessment and Risk Mitigation of Major Metropolitan Areas Subjected to Natural and Man-Made Hazards." Activities included formulating and executing an anthropological research about earthquake hazard mitigation projects in Istanbul. Presented research at A Turkish Triangle Conference at Harvard University (http://studentgroups.gsd.harvard.edu/medina/Turkey/).

WORLD BANK/PROVENTION CONSORTIUM July 2003 – January 2005
Grantee:
Received applied grant for disaster risk reduction with project "Sustainable Planning for Disaster Mitigation in Istanbul." Activities included formulating and executing research on planning and risk reduction activities in Istanbul. Working drafts of the project reports and lessons learned were compiled by Asian Disaster Preparedness Center, Cranfield Disaster Management Centre and the University of Wisconsin Disaster Management Center and were distributed in photocopy form.

GENERALIZED DISCRETE FOURIER TRANSFORM WITH NONLINEAR PHASE

Ali N. Akansu, Ph.D,
Professor of Electrical & Computer Engineering
New Jersey Institute of Technology

ABSTRACT

Constant modulus transforms with orthogonality have found their popular applications particularly in radio/wireless communications where RF power amplifiers perform best for transmitted signals with constant power. Therefore, discrete Fourier transform (DFT), Walsh transform, Walsh-like transforms and Gold codes have been widely utilized in wire-line and wireless communications technologies including code division multiple access (CDMA), discrete multi-tone (DMT), and orthogonal frequency division multiplexing (OFDM). Most of popular transforms are linear-phase and well-structured in the number of zero crossings of functions in a given basis set. We relax linear phase restrictions to generalize constant power transforms and reformulate in the generalized discrete Fourier transform (GDFT) where freedom of the phase space to improve performance is fully exploited. It is predicted that some of the DFT based technologies including OFDM/DMT communications may rather employ GDFT in their future generations.

BIOGRAPHY

Ali N. Akansu received the B.S. degree from the Technical University of Istanbul, Turkey, the M.S. and Ph.D. degrees from the Polytechnic University, Brooklyn, New York, all in Electrical Engineering. Since 1987, he has been with the New Jersey Institute of Technology, where he is a Professor of Electrical and Computer Engineering. Dr. Akansu has administered and managed research programs and product development projects in academia and private sector, funded by the State & Federal Government agencies, and industry. He was a Founding Director of the New Jersey Center for Multimedia Research (NJCMR), and NSF Industry-University Cooperative Research Center (IUCRC) for Digital Video. Dr. Akansu was the VP for R&D of IDT Corporation [NYSE: IDT]. He was the founding President & CEO of PixWave, Inc., SVP for Technology Development of TV.TV, IDT subsidiaries. He was an academic visitor at David Sarnoff Research Center, IBM T.J. Watson Research Center and at GEC-Marconi Electronic Systems Corp. He was also a Visiting Professor at the Courant Institute of Mathematical Sciences of NYU. He has sit on several boards, and regularly consults to the industry and legal sector.

Dr. Akansu is a well published author and mentor who guided doctoral theses on the theory of signals and transforms, and applications in image/video coding, digital communications, Internet multimedia and engineering, information security, mathematical finance and electronic trading. He is a co-author of the book Multiresolution Signal Decomposition: Transforms, Subbands and Wavelets, Academic Press, 1992 and 2001 (2nd Ed.), and a co-editor of a book entitled Subband and Wavelet Transforms: Design and Applications, Kluwer, 1996. He is a co-editor of the book Wavelet, Subband and Block Transforms in Communications and Multimedia, Kluwer, 1999. He is also a co-author of a research

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