



**OFFICE OF
TECHNOLOGY
COMMERCIALIZATION**

Division of Research

IDEAS • INNOVATION • IMPACT

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OFFICE OF TECHNOLOGY
COMMERCIALIZATION

25TH ANNUAL
INVENTION OF THE YEAR RECEPTION



HONORING INVENTIONS & INVENTORS OF 2011



APRIL 17, 2012
CLUB HOUSE BANQUET ROOM
UNIVERSITY OF MARYLAND GOLF COURSE

Celebrating 25 Years



**OFFICE OF
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MISSION STATEMENT

To facilitate the transfer of intellectual property to business and industry through the development and management of a high-quality portfolio of diverse technologies; ensure intellectual property rights; negotiate and execute licensing agreements; and, when feasible, assist in the formation of start-up businesses that utilize the university's technology in order to provide benefits to the university and the regional economy.

Technology Transfer

Faculty
Industry


For Faculty, Staff, and Students:

OTC is here to serve the University of Maryland's faculty, staff, and students and aid in technology commercialization. We can help you

- obtain intellectual property protection
- build partnerships with business and government
- market and license your technology to industry
- start a company to bring your research to market

For Industry:

OTC provides a hub for the management, promotion, and protection of University of Maryland inventions. In doing so, OTC offers industry sponsors and licensees a fast and easy route to negotiating agreements with the university. It is the goal of OTC to foster a constructive and beneficial relationship between industry and the university so that each organization may enjoy the results of cooperative efforts.



25 Years of Technology Transfer at the University

Located in a technology hotbed, the University of Maryland opened the Office of Technology Liaison in December 1986 to transfer to industry the high-quality technologies emerging from its campus. In July 2000, the office was renamed the Office of Technology Commercialization (OTC) and currently operates under the leadership of Executive Director Gayatri Varma.

Since 1986, OTC has:

- Recorded more than 2,300 information, life and physical science invention disclosures
- Secured more than 450 U.S. patents
- Licensed more than 565 technologies to industry
- Signed more than 660 license agreements
- Generated more than \$24.2 million in technology transfer income
- Assisted in the creation of more than 62 high-tech start-up companies founded on the basis of technologies developed at the University of Maryland. Eighteen of 21 start-up companies founded in the last five years (FY07-FY11) are located in Maryland.

After 25 years of service to the University of Maryland, OTC continues to serve as a source of innovation and education on intellectual property, technology transfer, and the commercialization process.

25TH ANNUAL INVENTION OF THE YEAR RECEPTION APRIL 17, 2012

4:30 RECEPTION

**CLUB HOUSE BANQUET ROOM
UNIVERSITY OF MARYLAND GOLF COURSE**

5:15 REMARKS

**GAYATRI VARMA
EXECUTIVE DIRECTOR
OFFICE OF TECHNOLOGY COMMERCIALIZATION**

**PATRICK O'SHEA
VICE PRESIDENT
DIVISION OF RESEARCH**

**WALLACE LOH
PRESIDENT
UNIVERSITY OF MARYLAND**

**WILLIAM "BRIT" KIRWAN
CHANCELLOR
UNIVERSITY SYSTEM OF MARYLAND**

**PRESENTATION OF AWARDS
OUTSTANDING INVENTIONS OF 2011**

**MUSIC PROVIDED BY:
JUSTIN GOPAL, VIOLIN**

The Office of Technology
Commercialization thanks the
following sponsors for their generous
contributions to the 25th Annual
Invention of the Year Reception:

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*The reception and monetary awards are funded
without the use of State funds*

Start-up Companies

Listed by Fiscal Year

2012

- Maryland Energy and Sensor Technologies, LLC
- PrasiDiux, LLC

2011

- OmniSpeech, LLC
- Trasense, LLC

2010

- MedSense Technologies, LLC
- Omic Biosystems, Inc.
- Precision Polyolefins, LLC
- VisiSonics Corporation

2009

- BioSpecimen Technologies
- FlexEI, LLC
- Remedium Technologies, Inc.
- Traffax, Inc.

2008

- BOZ Development, LLC
- Columbia BioSystems, Inc.
- Purrfect Gourmet, LLC

2007

- CertusNet, Inc.
- Fantalgo, LLC
- Leukosight, Inc.
- NewAgriculture, Inc.
- SD Nanosciences, Inc.
- SentiMetrix, Inc.
- ULTRANETX, LLC
- Zymetis, Inc.

2006

- ADF Solutions, Inc.
- Personics Holdings, LLC

2005

- Berrigen Biotechnology, LLC
- Chausie Systems, Inc.
- Horus Wireless Systems, Inc.
- Komoku, Inc.
- Nuzzer Technologies, Inc.
- RioRey, Inc.
- Tradewinds Product Consultants, Inc.

2004

- COSEMI, Inc.
- CST Agro, LLC
- Data and Information Solutions Corporation (DISC)
- Optimized Thermal Systems
- Pervasive Technology Engineering LLC
- Thermal Analysis Partners, LLC

2003

- AlphaSight Networks, Inc.
- Five Aces Breeding, LLC
- G. Alec Steele
- Odexia, LLC
- Phytoextraction Associates, LLC
- Windsor Interfaces, Inc.
- XMTT, Inc.

2002

- Advanced Communication Technology, Inc.
- Envirion, Inc.
- Impactrix, LLC
- Ondov Enterprises, Inc.

2001

- AlphaTrek, Inc.
- Better Growth, LLC
- Blue Wave Semiconductors, Inc.
- Calibrant Biosystems
- LumenLink Corporation
- Optical Fiber Research Resources, Inc.

2000

- Little Optics Inc.

1999

- FLY OFF, Inc.
- SabaTech Corporation
- SkiMaps.com, Inc.

1998

- Quantum Photonics, Inc.
- Viridian Environmental, LLC

1997

- Advanced Thermal and Environmental Concepts, Ltd.

1994

Information Science

University of Maryland Widget Library™

Marko Teittinen, Harsha Kumar, Ninad Jog, David Carr, Richard Chimera, Ben Shneiderman

Life Science

Foliar Spray of Methanol and Nitrogen for Increased Soybean Productivity

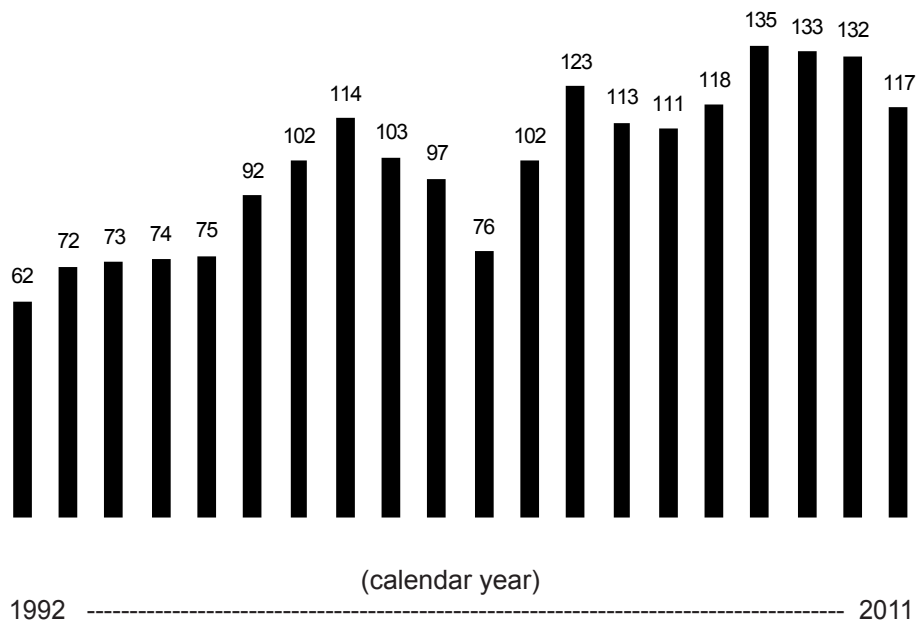
Jagmohan Joshi

Physical Science

A System Design for a Hybrid Network Data Communications Terminal Using Asymmetric TCP/IP to Support Internet Applications

John S. Baras, Aaron Falk, Timothy Kirkwood, Narin Suphasindhu, Daniel Friedman, Anthony Ephremides, Brian Johnson, Douglas Dillon

Invention Disclosures



Inventions of 2011

Information Science

IS-2011-003 *In-Pixel Biasing Technique for Focal Plane Arrays*
David Sander, Pamela Ann Abshire

IS-2011-006 *Conservation Dependencies*
Lukasz Golab, Howard Karloff, Philip Korn, Divesh Srivastava, Barna Saha

IS-2011-009 *Pandora Operation and Analysis Software*
Alexander Cede, Nader Abuhassan, Jay Herman

IS-2011-033 *Spatio-Cultural Abductive Reasoning Engine (SCARE) Software*
Paulo Shakarian, Venkatramanan Siva Subrahmanian, Daniel Buckley LaRocque, John Paul Dickerson

IS-2011-034 *Spatio-Cultural Abductive Reasoning Engine -System 2 (SCARE- S2) Software*
Paulo Shakarian, Venkatramanan Siva Subrahmanian, Daniel Buckley LaRocque, John Paul Dickerson, Damon Nicholas Earp, Margo Kathryn Nagel, Brittany Elizabeth Schuetzle

IS-2011-035 *Region-Based Geospatial Abduction*
Paulo Shakarian, Venkatramanan Siva Subrahmanian

IS-2011-036 *Biomedical PHM: Prognostics of Asthma Exacerbation*
Ravi Doraiswami, Arvind Sai Sarathi Vasani, Rafei Keyvan, Michael G. Pecht

IS-2011-037 *Falling Elderly*
Ravi Doraiswami, James Koo, Bryan Terry, Michael G. Pecht

IS-2011-043 *Method and Apparatus for Authenticating Biometric Scanners*
Vladimir Iankov Ivanov, John S. Baras

IS-2011-044 *PMatch*
Matthias Broecheler, Venkatramanan Siva Subrahmanian, Andrea Pugliese

IS-2011-045 *BudgetMatch*
Matthias Broecheler, Venkatramanan Siva Subrahmanian, Andrea Pugliese

IS-2011-057 *TILE Software Code*
David Lester, Douglas Reside, James Grant Dickie

-
- IS-2011-067 *N-Print Calculator*
Richard Allen Kohn
- IS-2011-068 *Method of Error Correction for Non-volatile Memories*
Alexander Barg, Arya Mazumdar, Gilles Zemor
- IS-2011-075 *EAGER: True Government Transparency: Comprehensive National Data Finding & Navigation Tools*
Yan Qu, Paul Jaeger
- IS-2011-079 *Functional Dataflow Interchange Format (Functional DIF)*
Shuvra S. Bhattacharyya, Chung-Ching Shen, William Plishker
- IS-2011-080 *Targeted Dataflow Interchange Format*
Shuvra S. Bhattacharyya, Chung-Ching Shen, William Plishker
- IS-2011-081 *Data Communication Through Pipes and Structures By Dispersive Elastic Waves*
Deshuang Zhao, Yuanwei Jin, Yujie Ying
- IS-2011-086 *Robust Adaptive Event Detector for Non-Intrusive Load Monitoring*
Yuanwei Jin, Eniye Tebekaemi, Mario Berges, Lucio Soibelman
- IS-2011-090 *Environmental Signatures for Forensic Analysis and Alignment of Media Recordings*
Ravi Garg, Avinash L. Varna, Min Wu
- IS-2011-092 *CASL Grammar Series: Bambara Grammar*
Christopher Green, Amalia Gnanadesikan
- IS-2011-093 *CASL Grammar Series: Bangla Grammar*
Anne David, Thomas Connors
- IS-2011-094 *CASL Grammar Series: Burmese Grammar*
Brook Hefright, Thomas Connors
- IS-2011-095 *CASL Grammar Series: Dhivehi Grammar*
Amalia Gnanadesikan, Anne David
- IS-2011-096 *CASL Grammar Series: Javanese Grammar*
Anne David, Thomas Connors
- IS-2011-097 *CASL Grammar Series: Pashto Grammar*
Claudia Brugman, Anne David
- IS-2011-098 *CASL Grammar Series: Punjabi Grammar*
Thomas Connors, Brook Hefright, Amalia Gnanadesikan

1998

Information Science

- Method and Apparatus for Compressing and Decompressing Images
Nariman Farvardin, Eiji Atsumi

Life Science

- Phosphorus Removal from Animal Waste
Kristen Hughes

Physical Science

- Scanning Single Electron Transistor Microscope for Imaging Room Temperature Objects
Frederick Wellstood, Matthew Kenyon, Christopher Lobb

1997

Information Science

- Parka-DB™
James Hendler, Kilian Stoffel, Merwyn Taylor

Life Science

- Genetic Method for Identifying Individuals Who Most Benefit from Exercise Training
James Hagberg, Robert Ferrell

Physical Science

- Two Dimensional Optical Fiber Spectrometer
Shiping Chen, Yiqun Hu

1996

Information Science

- Software-Based Expert System for Assessing and Monitoring of Nuclear Power Plants
Seyed Mohammad Hadavi, Mohammad Modarres

Life Science

- Plant Carotenoid Genes
Francis X. Cunningham, Zairen Sun

Physical Science

- Filter Realizations Using New Transmission Media
Kawthar A. Zaki

1995

Information Science

- Tracking and Recognizing Facial Expressions
Yaser Yacoob, Michael Black

Life Science

- Phytomining of Ni from Soil
Jay Angle, Alan Baker, Rufus Chaney, Yin-Ming Li

Physical Science

- Fiber Optic Three Strain Sensor
James Sirkis, Harmeet Singh

2002

Information Science

Mitigation of Obsolescence Cost Analysis (MOCA)
Peter A. Sandborn, Pameet Singh

Life Science

Use of Lantibiotics in Environmental Decontamination, as Inhibitors of Food-Borne Pathogens, and to Fight New Strains of Bacteria
J. Norman Hansen

Physical Science

Fiber Tip-Based Fiber Optic Sensor Systems
Balakumar Balachandran, Miao Yu, Moustafa Al-Bassyouni

2001

Information Science

3D/4D Visualization of Network Traffic Data
Ravindra Kulkarni

Life Science

Novel Copper Complexes as Anti-Cancer Agents
Steven Rokita, Kenneth Karlin, Kristi Humphreys, Lei Li, Narasimha Murthy

Physical Science

Controlled Room Temperature Synthesis of Polymer-Templated Magnetic Nanoparticles
Peter Kofinas, Steven Bullock, Sufi Ahmed

2000

Information Science

PinPoint Technology: Locating and Synchronizing Mobile Wireless Nodes
Ashok Agrawala, A. Shankar, Ronald Larsen, Douglas Szajda

Life Science

A Novel Method for Production of Rare Carotenoids from Commercially Available Lutein
Frederick Khachik

Physical Science

Fiber Optic Breadboard
Steven Baker

1999

Information Science

Polarization and Wavelength Diversity for Fade Resistance in Optical Wireless Communication Systems
Christopher Davis

Life Science

Interferon Tau Mutants
Carol Pontzer, Lynnette Shorts, Christina Dancz

Physical Science

PLZT Spatial Phase Modulator
Maria Linnik, Aristos Christou

IS-2011-099 CASL Grammar Series: Swahili Grammar

Michelle Morrison, Christopher Green, Tristan Purvis, Claudia Brugman

IS-2011-110 Phylogeny Teaching Models

Hans Lemke, Brian Coyle, Jeffrey Jensen

IS-2011-112 Marketing, Programs, and Assessment Database

William A. Jones, Jr.

IS-2011-113 Nursery IPM App for Smartphones

Karen Rane, Stanton A. Gill, Amy Fulcher, Bill Klingeman, Alan Wondham, Frank Hale, Craig Adkins, Steven Frank, Kelly Ivors, Joe Neal, Anthony LeBude, Kris Braman, Matthew Chappell, Jean Williams-Woodward, Juang-Horng Chong, Sarah White, Steven Jeffers, Jeff Derr, Winston Dunwell

Life Science

LS-2011-001 Novel Method of Testing Drug or Antibiotic Permeation

Sergei I. Sukharev, Kishore Kamaraju

LS-2011-004 Human CD4 Mutants with High Affinity for MHC Class II

Roy A. Mariuzza, Xin Xiang Wang

LS-2011-010 A Functional High Throughput Screen for Compounds that Modulate Heme Transporters

Iqbal Hamza, Richard Bruick

LS-2011-011 Novel Silver Composite as a Promising Antiseptic

Qin Wang, Boce Zhang

LS-2011-015 Stimulus Indicating Device Employing Polymer Gels

Srinivasa R. Raghavan, Bani H. Cipriano, Rel S. Ambrozy, Jade Litcher, Raymond C. Jones

LS-2011-016 Stimulus Indicating Device Employing Polymer Gels 2

Chao Zhu, Srinivasa R. Raghavan, Bani H. Cipriano, Rel S. Ambrozy, Jade Litcher, Raymond C. Jones

LS-2011-017 Stimulus Indicating Device Employing Polymer Gels 3

Srinivasa R. Raghavan, Chao Zhu, Bani H. Cipriano, Jae-Ho Lee, Rel S. Ambrozy, Jade Litcher, Raymond C. Jones

LS-2011-019 A Method for Stimulating Growth and Oil Production in Microalgae with Potential Applications in the Alternative Fuel Industry

Mark A. Holland, Charles F. Davis

-
- LS-2011-021 *Diagnostic Assay to Study Protein-Nucleic Acid Interactions*
Vincent T. Lee, Kevin G. Roelofs, Gregory Donaldson
- LS-2011-022 *Methods for Producing Soy-Based Shelf-Stable Meal Replacer*
Yangming Martin Lo, Kenneth W. Boulden
- LS-2011-023 *Composition and Method to Enable Sterilization of Photopolymer Separators by Irradiation*
Mohamad I. Al-Sheikhly, Jane Emerson
- LS-2011-024 *Carbohydrase Systems of Saccharophagus Degradans*
Steven W. Hutcheson
- LS-2011-026 *Novel Anti-Malaria Strategy using Transgenic Fungi*
Raymond J. St. Leger, Weiguo Fang, Marcelo Jacobs Lorena, Angray Singh Kang
- LS-2011-028 *Everything We Say It Is: Essential Water*
Yangming Martin Lo, Trevor Eccleston
- LS-2011-039 *Embedded Biosensors*
Ravi Doraiswami, Louisa Wu, Junlin Wu, Dinesh Mahadeo, Michael G. Pecht
- LS-2011-041 *Highly Concentrated Water Soluble Carbon Nanotube Ink*
Jarrett Leeds, YuHuang Wang, John T. Fourkas
- LS-2011-042 *Novel Recombinant BCG Vaccine Candidates Using ESX-5a Secretion System Components and Substrates*
Volker Briken
- LS-2011-046 *Egg-Based Dietary Supplement for the Prevention and Treatment of Infectious Diseases*
Daniel R. Perez, Jianqiang Ye, Hongxia Shao
- LS-2011-047 *Partial or Complete Plasmid-Free Recovery of Influenza Viruses*
Daniel R. Perez, Hongjun Chen
- LS-2011-048 *Novel Technique for Enhanced Viral Protein Expression: Implications for Vaccine Preparation*
Daniel R. Perez, Yibin Cai
- LS-2011-049 *Novel Psyllium Derivatives with Improved Functionality for Use to Reduce the Risk of Chronic Human Disease*
Liangli Yu, Yuge Niu, Zhuohong Xie

2006

Information Science

- Markerless Motion Capture
Aravind Sundaresan, Ramalingam Chellappa

Life Science

- Enzyme Systems for Saccharification of Plant Cell Wall Polysaccharides by a Marine Bacterium to Release Fermentable Sugars
Steven W. Hutcheson, Ronald M. Weiner

Physical Science

- Method for Fabrication of Complex 3-D Microfluidic Networks
John Fourkas, Christopher N. LaFratta

2005

Information Science

- Data Normalization Strategy for Metabolomic Profiling Analysis
Harin Kanani, Maria I. Klapa

Life Science

- Novel Degradable Biomaterials
John Fisher, Sachiko Kaihara, Jennifer Moreau, Parth Modi

Physical Science

- Heteroaggregate Nanoparticles for Heterogeneous Catalysis
Bryan W. Eichhorn, Shenghu Zhou, Gregory S. Jackson

2004

Information Science

- Coding Techniques for Maximum Achievable Diversity in Space, Time and Frequency for Broadband Wireless Communications
Weifeng Su, Zoltan Safar, K.J. Ray Liu

Life Science

- Eukaryotic Heme Transport as a Drug Target for Helminthic Infections
Iqbal Hamza

Physical Science

- Cell Sensor Based Pathogen Detection
Benjamin Shapiro, Elisabeth Smela, Pamela Abshire, Denis Wirtz

2003

Information Science

- Horus: An RF-Based Location Determination System
Ashok K. Agrawala, Moustafa A. Youssef

Life Science

- A Novel Target for Antiviral Therapeutics
Jonathan D. Dinman

Physical Science

- Navigation Using X-Ray Sources
Suneel Sheikh, Darryll J. Pines

Previous Winners

2010

Information Science

Active Sensing for Dynamic Spectrum Access
Nathan Goergen, Wan-Yi Lin, K.J. Ray Liu

Life Science

Molecular Container to Enhance Solubility of Drugs
Lyle Isaacs, Da Ma, Volker Briken, Gaya Hettiarachchi, Duc Nguyen

Targeted Carriers for Drug Delivery across the Gastrointestinal Epithelium
Silvia Muro-Galindo, Rasa Ghaffarian

Physical Science

Thermoelastic Cooling
Ichiro Takeuchi, Jun Cui, Manfred Wuttig, et al.

2009

Information Science

Multi-Pitch Tracking in Adverse Environments
Srikanth Vishnubhotla, Carol Espy-Wilson

Life Science

Genetic Markers for Improved Lyme Disease Diagnostics
Adam Coleman, Utpal Pal

Physical Science

Nano Arrays for Energy Storage
Gary Rubloff, Sang Bok Lee, Israel Perez, Laurent Lecordier, Parag Banerjee

2008

Information Science

Efficient Key Exchange for Symmetric Cryptosystems
John S. Baras, Paul Yu, Brian Sadler

Life Science

"Nano-Velcro": A New Biomaterial for Improved Hemorrhage Control
Matthew Dowling, John Hess, Grant Bochicchio, Srinivasa Raghavan

Physical Science

World's Highest Energy Density Thin Film Battery
Martin Peckerar, Neil Goldsman, Yves Ngu, Zeynep Dilli, George Metzger

2007

Information Science

Audio Camera for Efficient Sound Localization
Ramani Duraiswami, Adam O'Donovan, Nail A. Gumerov

Life Science

Molecularly Imprinted Polymers for the Specific Binding and Separation of Viruses
Peter Kofinas, Daniel Janiak

Physical Science

Minimally Invasive Neurosurgical Intracranial Robot
Jaydev P. Desai, J. Marc Simard, Satyandra K. Gupta, Rao Gullapalli, Nicholas Pappafotis, Wojciech Bejgerowski

LS-2011-051 *Total Synthesis of an Oxidation Product of Gamma-Carotene - a Provitamin A Food Carotenoid*
Frederick Khachik, Kristine Crawford

LS-2011-052 *Process for Conversion of (3R,6'R)-alphacryptoxanthin to (6'R)-alpha-carotene*
Frederick Khachik

LS-2011-054 *Potential Vaccine Candidate Against Porcine Reproductive and Respiratory Syndrome Virus (PPRSV)*
Yanjin Zhang, Yuchen Nan

LS-2011-058 *Novel Transgene-Free Method of Silencing Plant Genes*
Zhongchi Liu

LS-2011-059 *Novel Cytotoxic T Cell Based immunization*
Zhengguo Xiao

LS-2011-063 *Human Exhaled Aerosol Droplet Biomarker System (HEAD Biomarker System)*
Donald K. Milton, Ian M. White

LS-2011-069 *Rapid Detection of Newcastle Disease Virus*
Siba K. Samal, Anandan Paldurai

LS-2011-071 *Templated Synthesis of Glycoluril Hexamer and Cucurbit[6]uril Derivatives*
Lyle David Isaacs, Derick Lucas

LS-2011-077 *Method for Extracting Surface Antigens from Pathogens*
Philip R. DeShong, Lenea Stocker, Abigail Horn, Daniel C. Stein

LS-2011-078 *Noninvasive Characterization of Mechanical Properties of Materials and Tissues Using Magnetic Resonance Techniques*
Yihua Bruce Yu, Yue Feng, Marc Taraban

LS-2011-087 *Vitamin D3 Nutritional Supplement Technology with Improved Solubility, Stability and Enhanced Bioavailability*
Qin Wang, Yangchou Luo

LS-2011-088 *DNA and RNA Model Set for Teaching and Learning of Molecular Biology*
Vincent T. Lee

LS-2011-100 *Patterning of Nanofiber with the Aligned SELP (Silk-Elastin-Like Protein Polymer) Using Nanomechanical Stimulus of AFM Tip*
Joonil Seog, Young Koan Ko, Jonathan Chang, Santiago De Jesus Solares, Hamid Ghandehari

LS-2011-101 *Intracellular Neutralization Strategy Against the Influenza Virus and a Broad Spectrum of Pathogens*
Xiaoping Zhu

LS-2011-105 *Genetic Containment Strategy for Biological Pest Control Agents in Soil*
Raymond J. St. Leger, Sibao Wang

LS-2011-107 *Improvement of Newcastle Disease Virus Replication and Immunogenicity*
Siba K. Samal, Peter L. Collins

LS-2011-108 *Containment Strategy for Biological Pest Control Agents*
Raymond J. St. Leger, Weiguo Fang

LS-2011-111 *A Method for Early Diagnosis of Amyotrophic Lateral Sclerosis (ALS)*
Eva Chin

Physical Science

PS-2011-002 *Use of Continuous DLPS-Based Polymerization to Render Tissue Engineering Scaffolds*
Howard David Dean, Ali Siblani, Jonathan E. Wallace, John Patrick Fisher, Antonios G. Mikos, Martha Wang, Kyobum Kim

PS-2011-005 *Novel Method for CO₂ Regeneration in CO₂ Removal Plant*
Abdullah A. Alabdulkarem, Yunho Hwang, Reinhard K. Radermacher

PS-2011-007 *Solid Polymer Electrolyte for Safer Lithium Batteries*
Aaron Fisher, Peter Kofinas

PS-2011-008 *Tunable Nanoparticle Array*
Woonjoo Lee, Seung Yong Lee, Oded Rabin, Robert M. Briber

PS-2011-012 *Highly Stable Colloid From Aqueous Solutions of Small Organic Molecules*
Deepa Subramanian, Mikhail A. Anisimov

PS-2011-013 *Novel Silica Particles as a Support for High Activity Olefin Polymerization Catalysts*
Kyu Yong Choi, Carla Luciani, Sang Yool Lee

PS-2011-014 *Evaporative Heat Transfer*
Serguei V. Dessiatoun, Michael M. Ohadi, Raphael Mandel

to be viable options. Techniques such as mass spectrometry and Raman/infrared-absorption based techniques are sensitive but require large technology footprints, trained operators, and lengthy processing times. Solid-state sensors such as chemiresistors and chemFETs can compete on cost but lack the sensitivity and selectivity of the laboratory techniques while consuming a fair amount of power, thereby limiting their use for most applications.

University of Maryland, in collaboration with the National Institute for Standards and Technology and George Mason University, have developed a novel chemical sensor architecture by combining the sensitive transduction capability of semiconducting nanostructures together with the enhanced catalytic efficiency of metal and metal-oxide nanoclusters. This new technology can produce sensors whose selectivity can be precisely tuned to any small set of chemicals through the design of the nanocluster, something currently not possible with any other technology.

These new sensors offer the best of both worlds: the sensitivity and selectivity of the desktop laboratory systems (FTIR, MS/GC) while consuming significantly less power than current solid state devices. Furthermore, this new technology promises to achieve parts-per-trillion sensitivity, satisfying the need for low cost, on-demand trace explosives detection. These combined attributes promise to make a sensor technology that is unmatched in terms of sensitivity, selectivity, size, power, and cost.

High-Density Thermal Storage Based Heating, Ventilation & Air Conditioning (HVAC) System

Reinhard K. Radermacher, Omar Abdelaziz

There are many alternative technologies in the fields of hot/cold storage and heat pump systems. One approach employed in hot/cold storage includes the use of phase change materials, while one type of heat pump system utilizes single or multi-stage vapor compressors. The following innovation description provides a revolutionary, cost effective high-density thermal storage based HVAC system.

Researchers at the University of Maryland have developed this hybrid thermal storage system by integrating a proprietary hot/cold storage system and vapor compressor heat pump system. One synergistic by-product of this innovative integration of the customized systems results in many more operating modes that provide optimal hybrid electric/thermal storage capability. The increased performance of the hybrid electric/thermal battery leads to a significantly improved performance level in high density storage at a lower cost. In addition, the combined systems have reduced weight and volume requirements.

Phonitons as a Sound-based Analogue of Cavity Quantum Electrodynamics

Charles George Tahan, Rousko Hristov, Oney O. Soykal

Quantum electrodynamics (QED) is the theory of how electrically charged particles interact through the exchange of photons (light) at the atomic scale. Specifically, cavity QED describes a system of a photon resonating with a charged particle in between two hypothetical mirrors, in reality, a small void. Cavity QED (cQED), initially described in the mid 90s, has advanced to commercial application in the past few years opening up new avenues for physical investigation as well as technology including single-photon sources, novel lasers, long-range entanglement, and quantum simulation.

University of Maryland and the National Security Agency (NSA) have developed the analog of cQED using phonons, the quantum particle of sound. Despite the added complexities of trapping a phonon in a host material, the research has shown that it is possible to couple a phonon and an electrically charged particle into what is now called a phoniton. Although the system for a phoniton may be analogous to that of a polariton, solving the problem of describing the system is non-trivial and until now, was not known to exist.

The phoniton plans to revolutionize various systems, both academic and commercial. Traditional MEMS sensors could be replaced by highly sensitive and extremely low power phoniton based sensors, phonitons could mediate interactions between distant qubits in quantum computers, and proposed sound lasers could become a reality with this technology. In any utilization of the system, the phoniton, just like its cavity polariton analogue, will create new avenues for scientific advancement and technological development.

Nanoengineered Chemical Sensors That Offer Superior Detection of Environmental Pollutants, Hydrogen, and Other Industrial Chemicals

Abhishek Motayed, Geetha Aluri, Albert V. Davydov, Mulpuri V. Rao, Vladimir P. Oleshko

Detection of chemicals in air such as industrial pollutants, poisonous gases, chemical fumes, volatile organic compounds (VOCs), and trace explosives is vital for the health and safety of communities around the world. However, current methods of detection lack the sensitivity, selectivity, and cost benefits

PS-2011-018 *Phonitons as a Sound-Based Analogue of Cavity Quantum Electrodynamics*

Charles George Tahan, Rousko Todorov Hristov, Oney O. Soykal

PS-2011-020 *Novel Design of a Flash Tank*

Xing Xu, Yunho Hwang, Reinhard K. Radermacher

PS-2011-025 *Photochromic Thin Films for Reconfigurable Photonics*

Edo Waks, John T. Fourkas

PS-2011-027 *Method for Controlling Dexterous Upper Limb Neuromotor Protheses/Orthoses with Multiple Degrees of Freedom from Neural Activity in Humans*

Jose Luis Contreras-Vidal, Harshavardhan Agashe

PS-2011-029 *Novel Nanoemulsion Fluids With Superior Thermal Properties*

Bao Yang, Jiajun Xu

PS-2011-030 *Articulating Neural Interface*

Eugene D. Daneshvar, Elisabeth Smela, Daryl R. Kipke, Mohammad Reza Abidian

PS-2011-031 *Low Noise Serrated Leading-Edge Blade for Helicopters*

Fredric H. Schmitz, Sudarshana Koushik

PS-2011-032 *Microchannel Heat Exchanger with Built In Header Subcooler*

Yunho Hwang, Reinhard K. Radermacher

PS-2011-038 *Immunoassay Using RF MEMS Shunt Capacitors*

Ravi Doraiswami, Arvind Sai Sarathi Vasani, Michael G. Pecht

PS-2011-040 *Heating Performance Improvement of Heatpump System*

Toru Okuma, Reinhard K. Radermacher, Yunho Hwang

PS-2011-050 *High-Speed, Low Latency, Analog System for Correlation Detection Analysis*

Donald C. Schmadel, Julius Goldhar, Khushboo Kalyani, Yongzhang Leng

PS-2011-053 *Robotic MRI*

Alan B. McMillan, Rao Gullapalli, Howard M. Richard III, Steven Roys, Jaydev P. Desai

PS-2011-055 *A Non-Intrusive Method to Resolve the Thermal-Dome-Effect of Pyranometers*

Qiang Ji, Si-Chee Tsay

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- PS-2011-056 *Separate Sensible and Latent Cooling System with Chilled Panels*
Jiazhen Ling, Yunho Hwang, Reinhard K. Radermacher
- PS-2011-060 *MINIR: Minimally Invasive Neurological Intracranial Robot*
Jaydev P. Desai, J. Marc Simard, Rao Gullapalli, Mingyen Ho
- PS-2011-061 *Nanoengineered Chemical Sensors Offer Superior Detection of Environmental Pollutants, Hydrogen, and Other Industrial Chemicals*
Abhishek Motayed, Geetha Aluri, Albert V. Davydov, Mulpuri V. Rao, Vladimir P. Oleshko
- PS-2011-062 *Continuous Wound Composite Truss Structures*
Benjamin K. S. Woods, Benjamin Otto Berry, Vladimir Bohdan Stavnychyi
- PS-2011-064 *Perforated Piezoelectric Film Sensor*
Yunfeng Zhang
- PS-2011-065 *Integrated Hot/Cold Thermal Battery for Direct Air Heating/Cooling*
Reinhard K. Radermacher, Omar Abdelaziz Ahmed Abdelaziz
- PS-2011-066 *Flowless Microfluidic Chips for Studying Drug Interaction with Suspended Cells*
I-Jane Chen, Ian M. White
- PS-2011-070 *Inter-Dispersed Amorphous MnOx-Carbon Nanocomposites with Superior Electrochemical Performance as Lithium Storage Materials*
Chunsheng Wang, Michael R. Zachariah, Juchen Guo, Qing Liu
- PS-2011-072 *An Enhanced Superpositioned Bioelectric Effect for Biofilm Treatment*
Reza Ghodssi, Young Wook Kim, William E. Bentley, Hadar Ben-Yoav, Hsuan-Chen Wu
- PS-2011-073 *Opto-Mechanical Induced Non-Reciprocity*
Mohammad Hafezi, Peter Rabl
- PS-2011-074 *A Simple Filter Based Approach to Surface Enhanced Raman Spectroscopy for Trace Chemical Detection*
Wei Wen Yu, Ian M. White
- PS-2011-076 *Production of Silicone Microparticles*
Kunqiang Jiang, Peter Thomas, Srinivasa R. Raghavan, Donald Lad DeVoe
- PS-2011-082 *Complex Fluids for Control and Immobilization of Nanoparticles on a Surface*
Chad Ropp, Edo Waks, John T. Fourkas, Benjamin Shapiro, Linjie Li

Researchers studied the role of genetically modified or transgenic fungi (*Metarhizium anisopliae*) as a biological control agent in controlling the malaria parasite in mosquitoes. They also developed unique techniques to control and manage the persistence of these transgenic fungi in the environment. These novel approaches not only resolve the issue of insect resistance to pesticide, when collectively utilized, but also provide an environmentally safe approach that can be contained and managed.

Intracellular Neutralization Strategy Against the Influenza Virus and a Broad Spectrum of Pathogens

Xiaoping Zhu

The immune system is designed to generate a response and neutralize pathogens like bacteria and their toxins, viruses and other microorganisms that invade the body's tissues. It can be imagined as a system that is distributed throughout the body in the form of immune cells and protein molecules like antibodies to defend the body against a variety of pathogens. The antibodies identify and neutralize foreign objects such as bacteria and viruses by recognizing a unique specific part of the foreign target, termed an antigen, and bind to it in a lock-and-key type of mechanism. Antibodies and immune cells typically recognize antigens and act outside cells. However, many pathogens grow and replicate inside the host or human cells. Once the pathogens invade the cell, it is difficult for the immune system to target and eliminate them.

Researchers at the University of Maryland have developed a novel antibody-mediated neutralization mechanism that can neutralize the influenza virus and other pathogens by targeting them inside the infected cells. This molecular mechanism is similar to the antibody-antigen method utilized by the body's natural defense system to target pathogens that have already invaded and overcome the body's first line of defense. This revolutionary technique will potentially broaden antibody treatment in a wide-range of diseases and provide more prophylactic and therapeutic applications like vaccine development, against infectious diseases.

A Functional High Throughput Screen for Compounds that Modulate Heme Transporters

Iqbal Hamza, Richard Bruick

Helminthic (parasitic worm) infections are an enormous burden to public health and global agriculture. To sustain their growth and reproduction, helminthic parasites have adapted to acquire nutrients, particularly heme, uni-directionally from their host cells. Resistance to drugs by these parasites is highly prevalent, and there is an urgent need to find new effective drugs.

Previously, researchers at the University of Maryland identified the first gene for heme transport in helminths. Because helminths cannot live without heme, the next step was to devise a high throughput screening technology that interrogates tens of thousands of small molecules and identifies lead compounds that can be effective anthelmintic drugs.

Researchers at the University of Maryland, in collaboration with the University of Texas Southwestern Medical Center, have successfully developed and performed a high throughput screen which has led to the identification of a short list of potential candidate drugs. These can be potentially effective anti-parasitic drugs without affecting the human or host cells.

Environmentally Safe Anti-Malarial and Bio-Containment Strategies for Biological Pest Control Agents

Raymond J. St. Leger, Weiguo Fang, Marcelo Lorena, Angray Kang, Sibao Wang

Malaria is a life-threatening infectious disease caused by parasites that are transmitted to people through the bites of infected mosquitoes. In 2008, an estimated 190-311 million cases of malaria occurred worldwide and approximately one million people died as a result of it (CDC). Current anti-malarial techniques like chemical pesticides and genetically modified mosquitoes have their disadvantages (resistance to pesticides, environmentally unsafe) and have not been successful in eradicating malaria. Genetically engineering the mosquito population has so far not been a practical or feasible solution. Additionally, concerns have arisen lately about the effects of Genetically Modified Organisms (GMOs) and other biological pest control agents on human health (toxicity, allergic reactions and unintended side effects) and the environment.

Researchers at the University of Maryland have developed unique technologies in the fields of malaria eradication and Pest Control and Management.

PS-2011-083 *Microscale and Nanoscale Patterning of Thermoplastic Materials by Selective Solvent Exposure*

Donald Lad DeVoe, Chien-Fu Chen, Omid Rahmanian

PS-2011-084 *Active Jet Acoustic Control System for In-Plane Helicopter Rotor Noise Reduction*

Fredric H. Schmitz, D. Caleb Sargent, Gaurav Gopalan

PS-2011-085 *On-Chip Ultra-Wideband Chaotic Oscillator Circuit*

Myunghwan Park, John C. Rodgers, Daniel P. Lathrop

PS-2011-089 *Method for Determining the Absolute Number Concentration of Nanoparticles from Electrospray Sources*

Michael R. Zachariah, Mingdong Li

PS-2011-091 *Methanol, Ethanol, and Hydrogen Sensing Using Metal-Oxide and Metal (TiO₂-Pt) Composite Nanoclusters on GaN Nanowires: A New Route towards Tailoring the Selectivity of Nanowire-Nanocluster Based Chemical Sensors*

Abhishek Motayed, Geetha Aluri, Albert V. Davydov

PS-2011-102 *Three-Dimensional, Biotemplated Hierarchical Electrodes for Microbattery Applications*

Konstantinos Gerasopoulos, Ekaterina Pomerantseva, Reza Ghodssi, James Noel Culver, Adam Brown, Matthew McCarthy

PS-2011-103 *Diffusion-Based Biosensing Approach in Miniaturized Lab-on-a-Chip Devices*

Hadar Ben-Yoav, Reza Ghodssi, Peter H. Dykstra

PS-2011-104 *Two-Component Structures Providing Fast Low-Temperature Charging of Mg with Hydrogen*

Leonid Bendersky, Zhuopeng Tan, Edwin Heilweil

PS-2011-106 *Imaging Lipid Microdomains in a Microfluidic Bilayer Lipid Membrane Chip*

Donald Lad DeVoe, Chenren Shao

PS-2011-109 *Compact Biomechanical Energy Harvester as a Battery Replacement*

Alireza Khaligh, Yichao Tang

PS-2011-114 *Highly Energy-Dissipative Ductile (HED) Diagrid Framing System*

Nasim Sadat Moghaddasi Bonab, Yunfeng Zhang

PS-2011-115 *Ultra Low Capacitive Antenna Coupled Metal-Insulator-Metal Tunnel Diode Fabrication Process Method*

Filiz Yesilkoy, Martin C. Peckerar

PS-2011-116 *Communications by Means of Nonlinear Time-Reversal*
Matthew Frazier, Biniyam Tesfaye Taddese, Steven Mark Anlage

PS-2011-117 *Organic Multiferroic*
Manfred R. Wuttig, Shenqiang Ren

2011 Finalists

Information Science

Next Generation Image Sensors

David Sander, Pamela Abshire

Focal plane arrays (FPA) are collectively part of the next generation of image sensors. The FPAs are present in infrared photon detectors, radiation detectors, positron emission tomography detectors, etc. The FPAs are attached to complementary metal oxide semiconductor (CMOS) substrates, thereby leading to reduced costs of the sensors. However, the recent trend of integrating specialized detectors with the ability to set predetermined voltage and/or current points has led to difficulty in the fabrication of these customized next-generation detectors.

Researchers at the University of Maryland have developed an approach that allows arbitrary programming characteristics of the biasing configuration on a pixel-by-pixel basis via an innovative proprietary optimization technique within the sensors. As a result, performance metrics such as signal-to-noise ratio, bit-energy, minimized thermally generated dark current, etc. are vastly improved and optimized.

Functional Dataflow Interchange Format (Functional DIF)

Shuvra S. Bhattacharyya, William Plishker, Chung-Ching Shen

Designers of digital signal processing (DSP) systems have utilized dataflow formalisms to assist in the design and simulation of statically structured data processing behaviors. However, as DSP systems become increasingly complex, significant amounts of dynamic structure must be incorporated into the data processing - for example, to handle changes in data characteristics or operational constraints. While DSP-oriented dataflow models have expanded to cover quasi-static and dynamic applications, efficient functional simulation for such generalized dataflow modeling has not occurred.

Researchers at the University of Maryland have developed software that enables enhanced dynamic dataflow modeling and simulation capabilities by introducing a new dataflow model of computation called enable-invoke dataflow (EIDF). An outcome of this improved software architecture is much more efficient data processing for embedded software systems. This increased efficiency can be applied to reduce power consumption (e.g., to increase battery life) or increase the data rates at which signals are processed (e.g., to increase sound or video quality).

Environmental Signatures for Forensic Analysis and Alignment of Media Recordings

Ravi Garg, Avinash L. Varna, Min Wu

In the modern era, a huge amount of digital information is available in the form of audio, image, video, and other sensor recordings. Stored on disks and other storage devices, this information has metadata describing the time and place of recording. However, digital tools can be used to modify the stored information. For example, digital editing softwares can be used to cut a clip from an original audio or insert a clip from one audio into another audio, or manipulate the metadata field to alter the recording date. Similar changes can also occur with video surveillance and other recordings. In the absence of any cryptographic protection and watermarking techniques during initial data acquisition, such modifications can be difficult to detect. Developing forensic tools to authenticate data using natural timestamp in the stored digital data presents an attractive direction to complement the existing technologies.

University of Maryland researchers have devised a novel natural timestamp for audio and visual recordings. By detecting the natural interference caused by the 50/60 Hz electrical network frequency (ENF), an audio/visual recording can be authenticated in time and even location. This system will also allow users to determine if a recording has been tampered with or edited in any fashion. Furthermore, this technology will enable new alignment and stitching methods in professional A/V editing software, creating an easy way to synchronize various recordings.