



Maryland Technology Transfer Offices Partnership Newsletter

University of Maryland College Park • The Johns Hopkins University • University of Maryland Baltimore County
University of Maryland Baltimore • Morgan State University • University of Maryland Biotechnology Institute
The Johns Hopkins University/Applied Physics Lab

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INTRODUCTION

Broadly, technology transfer is the dissemination of know-how or creations from an inventing entity to another that wants to use it. Technology transfer can happen in a number of ways and takes many forms. Some transfers are more successful than others, just as some inventions have more potential. This sixth issue focuses on those inventions that have been internally recognized as technologies having great potential for not only generating income but more importantly improving quality of life to those who use them.

FEATURES

University of Maryland Announces Inventions of the Year 2004

A technique to code broadband wireless networks for more strength and reliability; a powerful discovery in the fights against parasitic infection and iron deficiency; and a more accurate method of pathogen detection are the University of Maryland Inventions of the Year for 2004.

The winners were announced Tuesday, April 19, at a reception to honor the inventions and inventors of 2004. Each year a panel of judges made up of University of Maryland personnel and industry experts selects one winner from groups of finalists in each of three categories: information science, life science and physical science. The winners are chosen based on the creativity, novelty and potential benefit to society of each of the inventions.

Information Science Invention of the Year

Coding Techniques for Maximum Achievable Diversity in Space, Time and Frequency for Broadband Wireless Communications

Weifeng Su, Zoltan Safar, K.J. Ray Liu

Researchers at the University of Maryland have developed three space-frequency (SF) code design methods that can guarantee reliable data transmissions at high data rates in broadband wireless communications. This is the first coding scheme to guarantee full rate and full diversity in such communications. No other technology demonstrates the same functionality. This technology has potential applications in the design of the next generation of broadband wireless communication systems.

Novel features include:

- The inaugural design of full diversity SF codes from space-time (ST) codes;
- The first systematic SF code design method that can guarantee both full rate and full diversity in multiple-input-multiple-output orthogonal frequency division multiplexing (MIMO-OFDM) wireless communication systems;
- A space-time frequency (STF) transmission scheme, capable of coding across multiple OFDM blocks, to further exploit all the available diversity in MIMO-OFDM systems; and
- The proposed SF/STF code designs are applicable

to the most general channel model that has been used in practice.

A U.S. patent application is pending.

Life Science Invention of the Year

Eukaryotic Heme Transport as a Drug Target for Helminthic Infections

Iqbal Hamza

Helminthic infestations by parasitic worms afflict more than two billion people worldwide and cause more than \$80 billion of annual crop loss globally. Novel treatments for these parasitic infections, for which there is no universal cure, can be developed based on studies by a University of Maryland researcher on heme transport using the free-living microscopic roundworm *Caenorhabditis elegans*.

An equally important public health issue, often compounded by helminthic infections, is iron deficiency. It is the most common nutritional disorder in the world. Novel treatments for iron deficiency can be obtained by using *C. elegans* as a model for heme transport because heme is a more absorbable source of iron for human consumption.

Heme is a critical factor for sustaining life in a eukaryotic cell. Within these cells, heme is synthesized via a multi-step pathway that is highly conserved through evolution. In contrast, worms, including *C. elegans*, do not synthesize heme although they require heme-containing proteins for normal metabolism. This finding is novel because heme synthesis was thought to occur in all free-living eukaryotes. Like *C. elegans*, human and livestock parasitic worms also lack the ability to make heme.

Studies for this technology show that *C. elegans* is unique because it utilizes dietary heme to fulfill its heme requirement and uses heme as an iron source when iron is not easily available.

Identification of the heme transporter, using the *C. elegans* model, will allow the design of more bioavailable forms of iron-based nutraceuticals to deliver iron more effectively to iron-deficient populations. Illumination of the worm heme transport pathways also has potential applications for controlling helminthic infections by developing selective drugs that can target the worm but not its human or plant host. A U.S. patent application is pending.

Physical Science Invention of the Year

Cell Sensor Based Pathogen Detection

Benjamin Shapiro, Elisabeth Smela, Pamela Ann Abshire, Denis Wirtz

A tremendous amount of research and development efforts are being dedicated to biochemical pathogen detection. Current commercially available pathogen detection systems have an unacceptably high rate of false positive results. This new technology will enable selective pathogen detection by exploiting the signaling machinery of living cells.

Cell level pathogen detection will function by monitoring the response of cells when exposed to a specific external pathogen. Developed by University of Maryland and Johns Hopkins University researchers, this technology combines bioengineering with micro-engineered hardware, creating an improved system for pathogen detection. This technology has applications in homeland security, pathogen detection and pharmaceutical screening. A U.S. patent application is pending.

Johns Hopkins Applied Physics Laboratory Names Inventions of the Year

A system that helps the body absorb drugs more effectively, technology that immerses viewers in 3-D displays and laser beams that enhance the security of optical communications were announced April 21 as the Johns Hopkins University Applied Physics Laboratory's Inventions of the Year. The annual awards event showcased technologies submitted in 2004 developed by APL staff members.

Top inventions in the Physical Sciences and Information Science categories were selected by an independent panel of 20 representatives from industry and patent law, based on their benefit to society, improvement over existing technology, and commercial potential.

Winner: Physical Sciences

Microwave/Radio Frequency Energy-Assisted Drug Delivery Device

Henry A. Kues and Eric J. Van Gieson have developed a way to increase the effectiveness of medications while

reducing negative side effects using a handheld microwave transmitter to enhance drug absorption.

The transmitter emits microwave (or radio frequency) energy that can temporarily make blood vessels more permeable, possibly by opening gaps in the capillary walls, resulting in quicker drug absorption. Enhanced absorption could allow doctors to use less medication, especially when treating areas of the body that are resistant to drug therapy, and to better target drug delivery.

This research is especially important when dealing with brain-related disorders because the brain is protected by a blood barrier that allows few molecules to cross it. Only small, fat-soluble molecules can breach the barrier, but some of the most promising medications for neurological disorders and brain cancer are large-molecule drugs. By relaxing the brain's protective barrier, drug therapy could possibly be used in place of more invasive procedures.

Sometimes standard methods of drug delivery, such as pills taken orally, do not work. For example, peptide, protein and DNA therapies require a delivery system that puts medication in the blood stream rather than the stomach where it would probably be digested before it could produce the desired result. Microwave-assisted drug therapies open options for a wider range of medications in this and similar situations.

Winner: Information Science

3-D Display with Walkthrough and "Virtual Visitation" Features for Command and Control Centers, Teleconferencing and Personal Communication

Jerry A. Krill has created a concept for making the viewer an interactive part of 3-D technology using liquid crystal display (LCD) goggles that could have military, medical and gaming applications. The technology marries cutting edge wireless and bandwidth capabilities with next-generation optics and displays, pulling the viewer "inside" the scene of whatever environment or program the system is running.

The LCD goggles include a fiber optic camera to pick up directed images, a wireless antenna for transmitting and receiving high data rates, partially mirrored lenses and driver for a distant focused display imager, and an earplug millimeter wavelength transceiver and command computer with eye-pointing menu and audio capability.

Originally designed for use on military battlefields, the technology could improve awareness of the surrounding environment and provide better communications between dispersed units. The technology could also be used to enhance current two-dimensional video-conferencing, making the experience more realistic.

Recent Technologies at University of Maryland Biotechnology Institute

The University of Maryland Biotechnology Institute recognizes some recent technologies.

Negative Regulation of Plant Disease Resistance by a Protein Phosphatase

Plants have evolved a sophisticated defense system to protect themselves from the attack of potential pathogens. This invention deals with plant disease resistance genes that recognize invading pathogens and trigger a series of signaling events including protein phosphorylation and dephosphorylation that ultimately lead to expression of resistance. Dr. Shunyuan Xiao and Dr. Wenming Wang, of the Center for BioSystems research, have established that an Arabidopsis gene (At1g22280) encoding a protein phosphatase type C (PP2C) is a negative regulator of the defense-signaling pathway. This research could be used for engineering crops for enhanced Broad Spectrum disease resistance studying the signaling mechanisms of disease resistance.

Winner: Innovative Contributions to the Military
Apparatus and Method for Providing Secure Multi-Channel Optical Laser Communications

Matthew G. Bevan, Bradley G. Boone, Ann G. Darrin, Donald D. Duncan and Raymond M. Sova have created a more effective and robust way to secure optical data links using narrow multiple laser beams to send and receive data and Microelectro-Mechanical systems (MEMS) technology for accurately verifying the source of the transmission.

The very high bandwidths used by existing optical communications networks make it hard to guarantee security. But this new system transmits and receives data in a very precise method less vulnerable to jamming or interception. Narrow, multichannel bandwidths also allow for independent control of each optical channel while significantly reducing the chance that neighboring laser communications channels or unintended sources (jammers) could cause interference.

Innovations in the system enable the use of narrow beams thanks to components that are cheaper and weigh less than the bulkier ones used in current systems. The APL system is also easily scaled to large numbers of independent communications channels.

This new optical architecture makes secure multisatellite, multisite terminals possible, provides more accurate pointing of data streams from moving satellite platforms and reduces the mass, power and volume required to support multichannel optical communications.

Ubiquilin Regulation of the Gamma-Secretase Complex

Ubiquilin 1 and Ubiquilin 2 proteins can be used to control levels of presenilin fragments, which are thought to comprise the catalytic component of gamma-secretase activity. This activity is responsible for cleaving the amyloid precursor protein to yield the A β fragment that is a pathological fragment that accumulates in the brains of those with Alzheimer's disease. Dr. Mervyn Monteiro of the Medical Biotechnology Center has shown that ubiquilin 1 and 2 proteins can regulate accumulation of other known components of gamma-secretase, namely Pen-2 and Nicastrin.

*Use of *Silicibacter* SP. TM 1040 For Genetic Transformation of Marine Algae *Silicibacter* SP*

TM 1040 is a culturable, genetically tractable member of the marine Rosebacter clade that forms an intimate and obligate interaction with algae. Analysis of the TM 1040 genome reveals the presence of a complete complement of genes homologous to *Agrobacterium tumefaciens*.

faciens vir genes whose function is involved in the transfer of DNA from the bacterium to the plant cells. This discovery may lead to the use of *Silicibacter* SP. TM 1040 as a tool to deliver genes to marine algal species. The inventor is Dr. Robert Belas of the Center of Marine Biotechnology.

Nanostructures for Polarized cancer imaging and receptor quantization: breaking the diffraction limit for imaging

This development is a new way to undertake cellular imaging based on the utilization of silver and gold nanostructures. This invention describes the use of polarized scattering for cellular imaging and possible cancer detection. Polarized imaging is far superior to simple scattering-based imaging because one gets very high image contrast, the scattered light from the cells or even tissue being unpolarized. Inventor Dr. Chris Geddes is with the Medical Biotechnology Center.

Venture Plan Featuring UMCP Technology Wins Award in Austin, Texas

A University of Maryland College Park technology, created in collaboration with USDA, the University of Sheffield and Massey University, “*Thlaspi caerulescens* Subspecies for Cd/Zn Recovery,” was part of the winning entry at the 2005 Austin Technology Incubator Venture Competition. The University of Texas’ IC2 Institute chose the winning venture plan of Plant Sciences LLC. The plan is based on the UMCP technology that corrects cadmium-contaminated soil at a cost of \$25,000 or less per acre. Traditional remediation can cost more than \$1 million per acre.

The winning team of seven students in the Science and Technology Commercialization master’s program at UT beat six other teams. Plant Sciences received a one-year residency at the Austin Technology Incubator, an award worth about \$25,000.

Inventors of the technology are Dr. J. Scott Angle, Dr. Rufus Lee Chaney, Dr. Yin-Ming Li, Dr. Roger D. Reeves and Dr. Alan J.M. Baker.

UMCP Invention Makes Wind Farms Safer for Birds

A fan whirring is a familiar sight as the heat of another summer settles in. But if you look closely, it seems like you can see through the fan blades as they spin. This phenomenon is known as motion smear. This optical illusion isn’t a problem with most fans because the blades are encased.

The blades of wind turbines are similar to giant fans without that protective case. However, rather than spinning to provide circulation, the turbines’ movement generates electricity. The turbines also prove hazardous for flying birds. Much like the human eye sees through a fan, many birds are unable to see the turbine blades.

Thousands of birds, some endangered species, have been killed flying into the blades. This is a recognized problem in the Altamont Pass wind farm east of San Francisco.

University of Maryland professor of psychology Dr. William Hodos has come up with a solution to make turbine blades easier for birds to see. The blades are painted in a pattern that allows birds’ retinas to rest and prevents or delays the onset of motion smear. A U.S. patent (6,623,243) issued for the technology in 2003, and the Office of Technology Commercialization recently exclusively licensed it for field trials at Altamont Pass.

NEWS & NOTES

JHU Names New Executive Director of the Office of Licensing & Technology Development

Jill Tarzian Sorensen was appointed as associate provost and executive director of the Office of Licensing & Technology Development at The Johns Hopkins University. She started work at JHU on March 1.

Sorensen is an intellectual property lawyer with nearly 20 years of law and business experience. She spent 18 of those years at the University of Illinois at Chicago, where she was assistant and then associate university counsel beginning in 1987. In 1998, she became director of technology management and assistant vice chancellor for research, reorganizing the office along a decentralized model responsive to the needs of the university's schools and faculty.

In five years, her Illinois office nearly doubled the university's invention disclosures and the number of licenses it executed. The office also promoted new models of technology transfer, including leveraging intellectual property, particularly in global health, for sustainable economic development in developing countries.

Morgan State University Names New Technology Management Specialist

James E. Lewis Sr., J.D., began work at Morgan State University as a technology management specialist in March 2005. In this role he is responsible for managing the University's intellectual property portfolios, identifying commercial partners and negotiating licenses, among other duties.

"We're pleased to have James on board," said Dr. Mildred Huff Oforu, assistant vice president for Academic Affairs/Sponsored Programs and Research. "His background and commitment to intellectual property issues make him a perfect fit for this position. In the few months he has been here, he's already making a huge impact on our office."

Before coming to Morgan State, Lewis worked in Washington D.C. for Reed Smith, LLP with their intellectual property group. He has experience in prosecuting biotechnological and pharmaceutical patent applications and licensing. Lewis also has experience in research. Prior to entering law school, he attended Tuskegee University receiving a NASA fellowship in which he conducted research focusing on genetically engineering plants for long-term space missions.

Lewis said he is looking forward to being more involved in the Maryland Technology Transfer Offices partnership.

Morgan State University Hosts Technology Commercialization Conference

Morgan State University held The Technology Commercialization Conference on May 9, 2005. The conference was sponsored by the Clarence M. Mitchell, Jr. School of Engineering and Entrepreneurial Development & Assistance Center (EDAC). EDAC is a business development organization providing resources to aspiring entrepreneurs while assisting existing business owners in their growth and development. EDAC is housed in the Earl G. Graves School of Business and Management on Morgan State's campus.

The conference succeeded in its efforts to provide an educational forum in the areas of intellectual property, licensing, small business development and funding resources. The presenters were excellent and provided a wealth of information to those in attendance. Alethea Pounds, Omar S. Muhammad, director of EDAC, and others worked tirelessly to put this conference together, and their efforts paid off.

UMCP, UMBI Formalize Partnership in Nano-Biotechnology and Molecular Bioprocessing

UMBI and UMCP finalized a memorandum of understanding on June 8 for cooperative education and research programs in nano-biotechnology and molecular bioprocessing. Faculty from UMBI's Center for Biosystems Research and Center for Advanced Research in Biotechnology will partner with faculty from UMCP's A. James Clark School of Engineering on academic and research components. The MOU also seeks to accelerate the commercial development of inventions and other intellectual property resulting from the partnership.

UMBI Spins Off Biotechnology Company

The Institute of Human Virology, a center within UMBI, announced the new spin-off biotechnology company, Profectus BioSciences, Inc. in February. The new company develops and commercializes technologies to reduce morbidity and mortality caused by human viral diseases and cancers, particularly the human immunodeficiency virus (HIV), the causative agent of AIDS. Profectus exclusively licensed UMBI intellectual property for HIV vaccines and therapies.

Profectus was co-founded by Dr. Robert Gallo, director of the virology institute and co-discoverer of HIV; Dr. William Blattner, director of the institute's epidemiology and prevention division; and Dr. Robert R. Redfield, director of the institute's clinical division who first documented the heterosexual transmission of HIV and developed the first clinical staging system. More information can be found at www.profectusbiosciences.com.

JOB OPPORTUNITY

A vacancy announcement for USDA Patent Adviser positions in the Pacific West Area opened in June. The announcement is posted online at: <http://www.afm.ars.usda.gov/divisions/hrd/vacancy/x5e-0264.pdf>

CALENDAR

- July 11 - July 13** AUTM Eastern Regional Meeting
Globalization of Technology Transfer
Loews Annapolis Hotel
Annapolis, MD
<http://www.autm.net/events/dsp.eventDetail.cfm?eid=5&mode=current>
- July 12** Greater Baltimore Technology Council Bioscience Speaker Series
Dr. Bruce C. Robertson, managing director of Toucan Capital
“How to Prepare for the Venture Capitalists”
GBC Board Room
<http://www.gbtechcouncil.org/calendar/viewcalendar.asp?month=7&year=2005&Date=7/1/2005&tic=1>
- July 14** Creating Superior BioMedical Technologies
Federal Marketplace Series: Frederick, MD
Tech Council of Maryland
<http://www.mdhitech.org/Calendar/html/462.html>
- July 21** Entrepreneur Day – Biotechnology Discoveries and Commercial Opportunities
UMBI at Shady Grove facility in Rockville, MD
One of UMBI’s 20th Anniversary events
<http://www.umbi.umd.edu/nande/EntrepreneurDay.html>
- Sept. 13** Research Day: Biotechnology on the Edge Day
UMBI Auditorium at CARB
One of UMBI’s 20th Anniversary events
<http://www.umbi.umd.edu/nande/events.html>
- Sept. 13-14** Bio-Life-Tech 2005: Venture Capitalist Conference
Hyatt Regency, Inner Harbor, Baltimore, MD
http://www.earlystageeast.org/blt_conf/conference_home.asp
- Sept. 30** Biotechnology and Maryland Stakeholders
UMBI Auditorium at CARB
One of UMBI’s 20th Anniversary events
<http://www.umbi.umd.edu/nande/events.html>

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