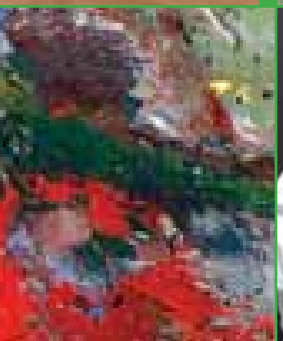



THE BETTER WORLD REPORT *PART TWO*




Technology Transfer Works: 100 Innovations from Academic Research to Real-World Application

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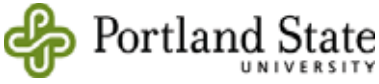

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AUTM extends its thanks to Nikki Borman for spearheading the 2008 Edition of the Better World Project; all members of the AUTM Board of Trustees for their ideas, feedback and participation, the Better World Project Committee, Kirsten Leute and all of the institutions and companies who told their stories.

The *Better World Report* is a testament to the efforts of institutions' technology transfer offices, their directors and staffs, who gathered and submitted these stories and more. These contributions tell the story of how institutions are doing their part to improve the world we live in not only through education but through innovation, and it is the return on innovation that we bring to light in this report.

Editors and Staff:

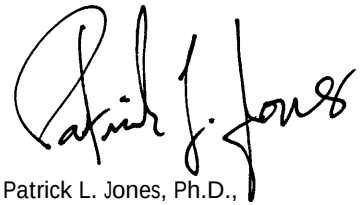
The stories in the *Better World Report* were researched and written by Sharyn Alden, Frank Bures, Brian Clark, Mark Crawford, Jill Ladwig, Nicole Resnik, Bill Shepard and Chris Thiede of The Blue Waters Group, a communications consultancy serving the knowledge industry. The *Better World Report* was produced by The Sherwood Group, Inc., an association management firm serving science, technology and health care specialty fields. AUTM's management staff and the communications department at The Sherwood Group, Inc. provide strategic, editorial and design support for The Better World Project.

The 2008 AUTM *Better World Report* you hold is the third in our series of reports making up the Better World Project. This report tells the stories of varied collaborations with partners and others who contribute to the success of academic technology transfer, bringing the results of research into use for the benefit of the general public, our institutions and the communities we serve.

The stories in this year's report illustrate that academic technology transfer takes place in a complex ecosystem. Moving academic research into use requires continuous interaction and partnering at a number of levels in the public and private sectors. While patterns emerge, how these patterns may be used, merged or modified reflect a truth about technology transfer and relationships in general; each is different. Rather than explain, we feel the richness of these interactions speaks for itself.

The overall message of the stories comprising the 2008 *Better World Report* is that of the human face of the technology transfer practiced by our members on behalf of their academic institutions. Success in the short term may be measured in the initial relationships constructed through licensing as reported in AUTM's Licensing Activity Surveys. Success in the long term is measured by the success of ongoing relationships, the collaborations that ensue and ultimately the lives that are changed worldwide through products and services made available through those efforts.

The members of AUTM facilitate the movement of research into broad use through the relationships they help establish. The 2008 *Better World Report* highlights a few of these collaborative successes.



Patrick L. Jones, Ph.D.,
AUTM President

Bioengineered Crops Improve Yields in South Asia and Southeast Asia

Cornell University and Sathguru

Eggplant is an essential crop in many tropical countries around the world, including India and the Philippines. However, eggplant fields are often attacked by the eggplant fruit and shoot borer (EFSB), an insect that can causes widespread crop damage. These losses hurt the food supply chain, as well as the regional economies where eggplant is a staple food source. They also force farmers to spread expensive chemical pesticides, to which the EFSB is gradually becoming resistant.

In an effort to strengthen crop yields, Cornell University, Ithaca, N.Y., and Sathguru Management Consultants in India have partnered with a private enterprise Mahyco seed company and a consortium of public research institutions to introduce a bioengineered, EFSB-resistant variety of eggplant to Asia. They coordinated the pro bono use of Monsanto – Mahyco technology, which was licensed to a public/private research and development consortium to develop this new variety of eggplant. The work was funded by the U.S. Agency for

International Development's Agriculture Biotechnology Support Project and the governments of India, Bangladesh and the Philippines.

Monsanto's insect-resistance technology is based on the cry1Ac protein from *Bacillus thuringiensis* (Bt), a soil bacterium. This unique organism produces crystal proteins that are toxic to a variety of insects, including EFSB. The technology bioengineers the cry1Ac gene into the eggplant, creating a hybrid variety with plant leaves that are toxic to EFSB but safe for human consumption.

Bioengineered eggplant allows farmers to reduce their dependence on pesticides, which is also safe for the environment. It also maximizes farm yields and creates more stable income for farming families. Transgenic Bt-hybrid eggplant will be available commercially in India, Bangladesh and the Philippines in 2008.

Technology Converts Agricultural "Leftovers" into Useful Products

University of Western Ontario

A new technology developed at the University of Western Ontario in London, Canada, enables farmers to convert biomass "leftovers" into valuable commodities such as heating oil, pharmaceuticals and food additives.

Department of biochemical engineering professors Franco Berruti, Ph.D., Cedric Briens, Ph.D., and Ron Golden, Ph.D., developed the apparatus and process for the pyrolysis of agricultural biomass in 2005. Initial funding of $100,000 was provided through the Ontario Centers of Excellence. Agri-Therm, a University of Western Ontario spin-off company, was created to commercialize and market the technology.

The portable device converts agricultural biomass, such as leftover crop material, into bio-oil, carbon char and non-condensable gases through fast pyrolysis, a process that rapidly heats the biomass to high temperatures typically around, 932 degrees fahrenheit (500 degrees Celsius) in the absence of oxygen. The chemical bonds of biomass compounds are broken, releasing the constituent components. The resulting hot, smoky gas is filtered and rapidly cooled to condense liquid bio-oil from the gas stream. Combustible gases such as methane, hydrogen, and ethane are recovered and burned as a partial replacement for natural gas used to heat the pyrolysis process, or to dry out biomass feedstocks. The solid "char" can also be burned as fuel, applied as fertilizer, or used to filter contaminated air streams.

While the process can convert any carbon-based material, or biomass, each feedstock produces a unique combination of solids, bio-oil, and gases depending on its chemical makeup. Fuel, fertilizer, pesticide, pharmaceutical, food and specialty chemical uses are all possible when appropriate feedstocks are matched with the desired end-use product.

The truck-mounted mobility of the device allows farmers to economically process the biomass residue on-site in their fields.

Fast-Growing Shrub Willow Is a Sustainable Bioenergy Crop

State University of New York

With power plant emissions and global warming causing concern around the world, there is increasing demand for cleaner, alternative fuel sources. After 20 years of research, scientists at the State University of New York College of Environmental Science and Forestry (SUNY-ESF) in Syracuse have developed fast-growing varieties of shrub willow that can be harvested and burned as a substitute for coal or natural gas.

Associate professor Lawrence Smart, Ph.D., senior research associate Lawrence Abrahamson, Ph.D., research associate Timothy Volk, Ph.D., and research scientist Richard Kopp, Ph.D., at SUNY-ESF created several new shrub willow varieties that display improved disease and pest resistance, higher yield of biomass, and are suitable for large-scale commercialization. About $350,000 in funding was provided by the U.S. Department of Energy, the U.S. Department of Agriculture and New York State Energy Research Development Authority.

Shrub willow grows quickly, reaching heights of about 24 feet after four years of growth. At this point the stems are harvested, chipped, and delivered to a facility where this biomass can be co-fired with coal to provide heat for the boilers that drive the steam turbines. The willow plants will vigorously re-grow the following spring, returning to full height in only three years. One planting of shrub willow can be harvested about seven times.

Shrub willow is economically competitive compared to other biomass crops grown in northern climates. Its green energy return is about 10 times higher than corn. That is, for every fossil fuel gallon expended to plant, grow, harvest and deliver the shrub willow, the return after conversion is about 10 times higher than corn in equivalent green fuel gallons. Burning shrub willow is also very clean compared to coal, emitting only minute amounts of mercury, nitrogen and sulfur oxides.

The Research Foundation of State University of New York is leading the commercialization process. Hundreds of acres of shrub willow have been planted in nurseries and bioenergy plantations in the United States and Canada. The nursery plantings will provide planting stock for the next generation of commercial plantations that will cover tens of thousands of acres of currently underutilized agricultural land.

QGE Technology Revolutionizes Gene Analysis

Boston University

With the success of the Human Genome Project, bioscientists have made great strides in identifying genes that may predispose the body to developing specific diseases. However, analyzing small strands of DNA is a time-consuming and laborious process. Now researchers at Boston University have developed a new DNA-scanning technique that enhances the diagnosis of genetic diseases and disorders.

Quantitative Gene Expression (QGE) was developed at Boston University's Center for Advanced Biotechnology by professor Charles Cantor, Ph.D., of the department of biomedical engineering, and Chunming Ding, Ph.D. Research was funded through a sponsored agreement with Sequenom, a biomedical company headquartered in San Diego, Calif.

Disclosed in 2002, QGE technology significantly improves an existing process called haplotyping, which scans chromosomes for clusters of mutated genes that may result in the onset of certain diseases. This process is, however, labor-intensive and can only analyze short strands of DNA. Results can be inconsistent and difficult to interpret without knowing the individual's genetic profile.

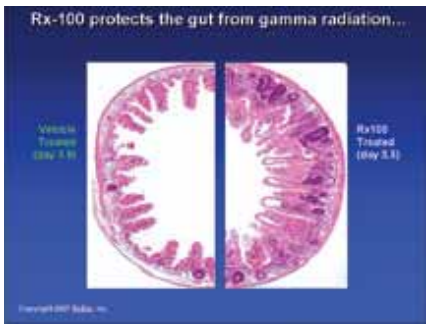
QGE technology combines several existing diagnostic processes (reverse transcription, competitive polymerase chain reaction (PCR), base extension and mass spectrometry) to create a high-throughput, automated gene expression analysis platform. Several hundred genes from up to 500 different samples can be accurately quantified in a single day — a much faster throughput compared to existing methods. QGE also requires a much smaller sample size and can test longer strands of DNA, eliminating the need for a genetic profile of the individual. These improvements allow medical researchers to more quickly and accurately identify gene patterns that result in disease, as well as permit earlier intervention with more effective treatments.

Breakthrough Technology Minimizes the Effects of Radiation Exposure

University of Tennessee

Exposure to high levels of ionizing radiation can result in widespread cell damage, failing organ systems or even death. Now a new product developed at the University of Tennessee in Memphis — RX100 — can help people survive potentially lethal doses of whole-body radiation, up to 24 hours after exposure.

RX100 was developed in 2004 at University of Tennessee's Health Science Center by Gabor Tigyi, M.D., Duane Miller, Ph.D., and Rusty Johnson, Ph.D. Initial research was supported by the National Institutes of Health.



Prior to the development of RX100, there was no protective treatment (radioprotectant) that could prevent damage if administered after the exposure occurred. RX100 is the first radioprotectant that boosts the immune system and promotes and sustains cell survival, avoiding massive cell death and organ failure. It is also highly effective at protecting rapidly growing cells, such as those in the blood or the small intestine. RX100 also protects the mucosal lining of the intestines, preventing diarrhea and combating bacterial infections.

Studies have shown that RX100 can prevent death if given before or during lethal radiation exposure — and rescue life if administered up to 24 hours after lethal, whole-body radiation exposure. This remarkable compound can be formulated for a wide range of patient types, from infants to the elderly.

RxBio, Inc., a biotechnology startup founded by the research team, continues to study and develop RX100. Applications abound in fields where exposure to ionizing radiation is possible, including health care and military or defense applications. The company's discoveries have generated major interest from several U.S. government agencies and departments.

New Enzyme Therapy Fights the Rare and Often-Deadly Pompe Disease

Erasmus University Medical Center

Myozyme™ is the first medicine produced for Pompe disease and the first ever treatment for an inherited muscle disorder. Pompe disease is a rare genetic disorder, which can affect infants, children, and adults; only about 5,000 to 10,000 people in the world suffer from this condition. Progressive muscle weakness is the most common symptom of both the infantile-onset and the late-onset forms of this disease. It limits mobility and respiratory function.

No therapy was available for this devastating condition until 2006. Fundamental and applied clinical research at Erasmus University Medical Center in Rotterdam, The Netherlands, finally resulted in the first pharmaceutical product that is effective in treating Pompe disease. A defective gene in the body causes this disease because the gene cannot produce acid alpha-glucosidase, an enzyme that breaks down glycogen, a form of sugar. This inability leads to accumulation of glycogen in the muscle, which is followed by loss of muscle function.

A.J.J. Reuser, Ph.D. and A.T. van der Ploeg, M.D., at Erasmus University Medical Center, initiated the development and manufacturing of recombinant human alpha-glucosidase in cultured cells and milk of transgenic animals. Genzyme, a Boston-based biotechnology company introduced the product Myozyme™ to the health care market in 2006 after receiving FDA and EMEA approval. The Erasmus University Medical Center, the Prinses Beatrix Fonds, patient associations and industrial partners provided funding for this work.

Clinical trials have shown that Myozyme™ improves the ventilator-free survival rate in patients with infantile-onset Pompe disease and the condition of affected children and adults.

Talactoferrin Boosts Cancer Survival Rates

Baylor College of Medicine

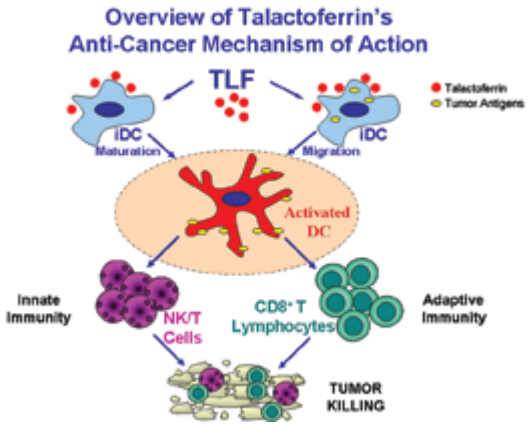
Developed at Baylor College of Medicine in Houston, by Orla M. Conneelly, Ph.D., Bert W. O'Malley, M.D., Denis R. Headon, Ph.D., and Gregory S. May, Ph.D., talactoferrin is a targeted dendritic cell activator with promising anti-cancer activity. Early research funding was provided by the Baylor College of Medicine's department of genetics, and by Agennix, Inc. The technologies related to the discovery of talactoferrin were disclosed in 1988 and 1992.

Talactoferrin, a novel dendritic cell (or immune cell) activator, is a unique recombinant form of human lactoferrin. After isolating the human lactoferrin gene sequence, the research team then developed a method for producing human lactoferrin (an important protein with immunomodulatory activity) through recombinant gene technology. In 1993 the technology was licensed to Agennix Inc., a biotechnology company that is developing an oral formula of talactoferrin for treating cancer and a topical gel formulation for the treatment of diabetic foot ulcers.

Talactoferrin is an orally active protein that mediates its activity through the gut and the GALT — the largest lymphoid organ in the body — through dendritic cell recruitment and activation. This results in a strong systemic innate and adaptive immune response, cellular infiltration of distant tumors and tumor-cell death.

Agennix has completed two randomized, double-blind, placebo-controlled Phase II studies evaluating talactoferrin for the treatment of non-small cell lung cancer (NSCLC), which is one of the most common types of cancer worldwide. In the first-line, patients receiving talactoferrin, combined with standard chemotherapy, showed an apparent improvement in response rates, time to disease progression, duration of response and overall survival when compared to standard chemotherapy alone. In a more recent trial in patients with refractory disease who received supportive care plus either talactoferrin or placebo, the median overall survival was 65% higher in the talactoferrin group than in the placebo group.

Oral talactoferrin has also demonstrated apparent anti-cancer activity in clinical trials with other tumor types including kidney, breast, ovarian, and prostate cancer and in melanoma. Topical talactoferrin was evaluated in a placebo-controlled trial in patients with diabetic foot ulcers and met its primary endpoint of enhanced wound healing. The company has 95 issued patents and 47 pending patents covering talactoferrin and its multiple uses and is preparing to initiate global Phase III trials in both NSCLC indications.



Revolutionary Technology Uses Shellfish Extract to Repair Damaged Cartilage

École Polytechnique de Montréal

Using a new tissue-engineering technology developed by researchers at the École Polytechnique de Montréal, physicians may soon be able to stimulate the human body to repair damaged articular cartilage.

The discovery, called BST-Gel®, was invented in the mid-1990s by a group of professors and graduate students at the engineering school affiliated to Université de Montréal, École Polytechnique de Montréal. The research was funded through several sources, including Natural Sciences and Engineering Research Council of Canada, Formation de Chercheurs et l'Aide à la Recherche, Canadian Institutes of Health Research, Canadian Arthritis Network, the Canada Research Chair Program, and École Polytechnique.

The technology was disclosed in 1996 and licensed the following year to Bio Syntech Canada Inc., a spin-off technology company created by Polyvalor, Limited Partnership (now known as Gestion Univalor, Limited Partnership) the commercial arm of École Polytechnique de Montréal.

One application of BST-Gel®, called BST-CarGel®, brings the potential to repair damaged articular cartilage. It is a gel based on the biopolymer chitosan, which naturally occurs in the shells of crustaceans, such as shrimp. During use, BST-CarGel® is mixed with a small volume of the patient's own whole blood and applied surgically to the damaged cartilage area over holes that have been made into the bone marrow. Animal studies have shown that the BST-CarGel® acts as scaffold within the blood, and guides regeneration of the cartilage.

In addition, this same technology can be used to treat other orthopedics indications and is being tested as a therapy for chronic wounds.

Extraction Technology Allows Researchers to Identify Genetic Information from Preserved Tissue

University of Southern California

Until an innovative extraction technology was invented at the University of Southern California, it was impossible to extract meaningful genetic information from diagnostic specimens fixed and stored in paraffin. Ribonucleic acid (RNA), a molecule that carries genetic information in a manner similar to that of deoxyribonucleic acid (DNA), could only be obtained from fresh frozen tissue samples.

The method of extracting RNA from formalin-fixed paraffin-embedded tissues was developed in 2000 by University of Southern California researchers Kathleen Danenberg, Ph.D., Peter Danenberg, Ph.D. and Stephen Swenson, Ph.D.

This discovery enables the extraction and analysis of genetic information from genes derived from tumor samples stored as formalin-fixed and paraffin-embedded specimens. It allows pharmaceutical companies to create new, cost-effective platforms for the analysis of clinical trial samples, leading to the development of more "personalized" patient therapies.

Response Genetics, a biotechnology company in Los Angeles, holds the exclusive license and has invested approximately $13 million to further develop the process. Strategic partners include global pharmaceutical and diagnostics companies, including Hitachi, GlaxoSmithKline, Roche and Eli Lilly. Response Genetics' laboratories, which process clinical trial samples for its pharmaceutical partners, are located in Los Angeles and Edinburgh, Scotland, with expectations to expand into Japan and China within the next year.

New Molecular Biomarkers to Improve Treatment of Colorectal Cancers

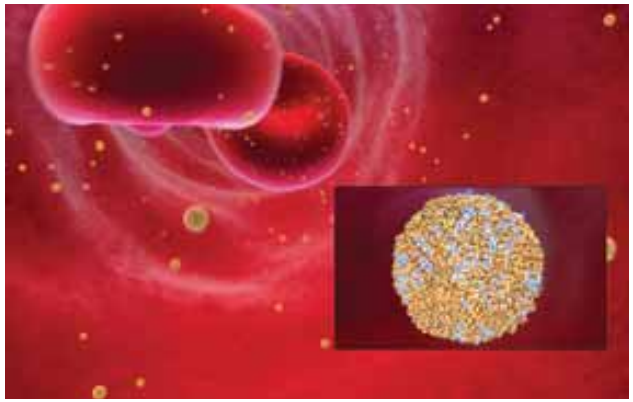
University of Southern California

Surgery has always been the most accepted treatment for early-stage colorectal cancers, but a groundbreaking discovery from the Keck School of Medicine at the University of Southern California will likely provide physicians with more treatment options.

In 1998 associate professor of medicine Heinz-Joseph Lenz, M.D., and colleagues David Park, Ph.D., Jan Stoehlmacher, Ph.D., Sheeja Thankappan-Pullarkat, M.D. and Yi Ping Xiong, M.D. discovered a group of biomarkers that are associated with colorectal cancer.

Detecting biomarkers specific to a disease can aid in the identification, diagnosis, and treatment of affected individuals, as well as people who may be at risk but do not yet exhibit symptoms. Officially called "Medical Diagnostic Predictors of Therapy Response Rate," this technology will help scientists predict therapy response rates and overall outcomes and survival for patients with colorectal cancer, helping caregivers immediately determine the best methods for treatment.

In 2007 the technology was licensed to Abraxis Bioscience, a biotechnology company located in Los Angeles. The goal of continued research is to combine prognostic markers with specific therapeutic agents, which will allow clinicians to tailor therapy to the molecular profile of the patient while minimizing life-threatening toxicities. The end result has the potential to improve the overall outcome and survival rate for patients with colorectal cancer.



Each nab™ particle is composed of a layer of albumin surrounding an inner core of water-insoluble cytotoxic drug.

Wet/Dry Adhesive Mimics the Complex Structure of a Gecko's Foot

Northwestern University

Inspired by the striking ability of geckos to attach themselves to vertical surfaces, and the cement-like sticking power of mussels, engineers at Northwestern University Evanston, Ill., have invented a reusable adhesive that performs well in both wet and dry conditions.

"Biomimetic Modular Adhesive Complex" was developed in 2006 at Northwestern's Biomedical Engineering Department by professor Phillip D. Messersmith, Ph.D., graduate student Haeshin Lee, and Bruce P. Lee of Nerites Corp., a biotechnology company in Madison, Wis. The research was funded by National Institutes of Health and NASA.

Called geckel, the tape-like material mimics the adhesive strategies of geckos and mussels. The bottom-most layer is an adhesive backing or strip. The

structure of the gecko's foot is imitated by nano-arrays of silicone pillars that are attached to the strip and are flexible enough to adapt to rough surfaces. The pillars are then coated by a thin layer of a synthetic polymer that is chemically very similar to the compound mussels excrete to adhere to underwater surfaces.

Although other gecko-mimetic adhesives have been created, this one is the first that works well on wet surfaces or underwater. Possible applications include using geckel as a water-resistant adhesive for bandages, closing wounds, denture adhesives, sports grips, and an all-purpose adhesive for use in marine environments.

Cinnamon Extract Provides a Powerful Defense Against Some Viruses

Tel Aviv University

With antibiotic-resistant "superbugs" on the rise, new strategies and materials are desperately needed to combat these and other potentially deadly microorganisms, including human and avian influenza. Tel Aviv University, Isarel, has taken a big step in this direction by developing a novel extract from cinnamon that kills viruses in less than one minute of incubation.

Michael Ovadia, Ph.D., a professor in the university's zoology department, identified and tested "Viral Neutralizing Fraction" (VNF) in 2001-2002. Both in vitro and animal studies showed the substance neutralized a number of viruses, including human influenza H1N1, avian influenza H5 and H9, Sendai virus, Newcastle disease virus HIV and the human herpes virus. VNF was also successfully used in mice and chicken embryos as a vaccination against Sendai virus and Newcastle disease virus.

VNF shows promise as a possible treatment for human and avian viral infections, as well as a vaccination agent. It may also be incorporated into consumer-care products such as intimate lubricants (reducing the chances of transmission of HIV, the herpes simplex virus and other viruses), air filtering systems, hand sanitizers and cleaners, and personal masks for reducing the spread of viruses in closed spaces.

An exclusive license for VNF was issued to Frutarom Industries, Ltd., one of the world's largest flavors companies. The cooperation with Tel Aviv University is part of Frutarom's broad strategic plan to expand Frutarom's offering of unique natural products and to strengthen Frutarom's position and standing as a leading global supplier of natural products and functional food ingredients for tasty and healthy solutions.

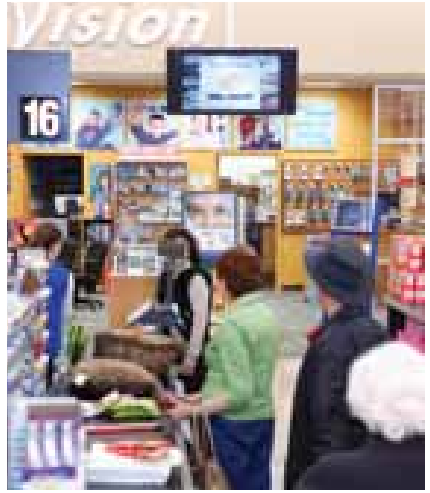
Narrowcasting is the Next Wave of Global Advertising

University of Western Ontario

Narrowcasting is just the opposite of broadcasting: instead of sending a single message to every possible listener or viewer (whether it is of value to them or not), narrowcasting targets a selected audience, such as customers, and presents them with customized, relevant messages that boost sales and increases cross-selling across multiple areas.

Two researchers at the University of Western Ontario in London, Ontario — Ed Elliot and Ken Stuart — developed the intelligent narrowcast network in 1998 with initial funding from the university's office of technology transfer and industry liaison. This software program, which incorporates a user-friendly web interface, can control thousands of digital screens and enables universal access, multi-level user privileges, precise control of digital media messages, and performance monitoring.

Using special algorithms and high-quality streaming video, the network system incorporates the business's own unique data such as systems,



sales goals, inventory levels, weather conditions, and schedules to inform and influence buyers when they are most likely to spend, at or before the point-of-purchase. Thus a variety of local, national or global marketing messages can be delivered, in real time, to specific departments, aisles, or stores.

EK3 Technologies, a University of Western Ontario spin-off company in London, Ontario, was established to further develop this state-of-the-art narrowcasting and digital signage technology. The company's core technology, EK3 imPulse™, is used by some of the largest companies in the world across a wide range of industries, including retail, grocery, financial, automotive and advertising.

Cell Sample Testing 30 Times Faster with New Flow Cytometer System

University of New Mexico

Flow cytometers can examine cells by using a laser to measure molecular biomarkers in each cell. Standard flow cytometers rely on a manual sample feed, where technicians place individual samples into the flow cytometers one at a time. This process is too slow for drug discovery and other large-scale biological research, which require rapid analysis of tens of thousands to millions of samples.

Researchers at the University of New Mexico (UNM) in Albuquerque have increased sample handling rates by creating the "HyperCyt™ High-Throughput Flow Cytometry System." Developed from 2001 to 2006 by Larry Sklar, Ph.D., and Bruce Edwards, Ph.D., of UNM's Cancer Research and Treatment Center, this computer-driven sampling system is 30 times faster than standard flow cytometers. To develop this technology, initial funding of $12.5 million was provided by the National Institutes of Health and the first patent was issued in 2005.

HyperCyt™ technology consists of an autosampler and data analysis software platform that are connected to a flow cytometer. A straw-like metal probe sucks samples from a microplate and rapidly delivers them into the flow cytometer. The software platform analyzes and stores the data.

This technology is ideal for drug discovery research because it analyzes many samples rapidly. The automated feed system replaces single test tubes and allows hundreds of samples to be analyzed in seconds. HyperCyt™ also lowers the overall cost of testing because it requires smaller samples, which means fewer cells and associated reagents are needed for each sample. Also, most standard flow cytometers can be easily retrofitted with HyperCyt™ technology.

IntelliCyt, a startup company, licensed this technology in 2006. It is currently manufacturing the HyperCyt™ platform and selling it to pharmaceutical and biotechnology companies for drug discovery screening and life science research. There are currently 20,000 flow cytometers in use worldwide that could benefit from the HyperCyt™ technology.

IRENE Restores Sound from Old or Damaged Recordings

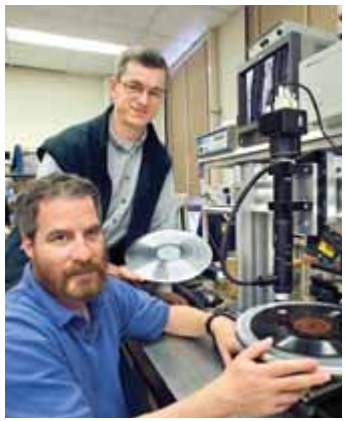
Lawrence Berkeley National Laboratory

Recorded media is constantly evolving; what was once state-of-the-art is now ancient technology. Media such as wax and plastic cylinders, vinyl discs, and acetate sheets that are more than 100 years old, are usually damaged by scratches or mold, or have pieces missing. Thanks to new restoration technology developed at Lawrence Berkeley National Laboratory in Berkeley, Calif., these recordings can be fully recovered.

The "Berkeley Lab Optical Sound Restoration (OSR) System" or "Image, Reconstruct, Erase, Noise, Etc. (IRENE)" system was developed from 2000-2003 at Berkeley Lab by physicists Carl Haber and Vitaliy Fadeyev. More than $600,000 in combined funding was provided by the Library of Congress and the National Endowment for the Humanities.

Current restoration techniques would damage or destroy this historic media, but Berkeley's technology recovers audio data without any physical contact with the fragile discs and cylinders. The OSR System is the first technology to provide non-contact restoration of recording on all types of mechanical sound carriers. The system produces either two-dimensional or three-dimensional optical digital images, creating a map of the entire groove profile of a disc or cylinder. Computer algorithms emulate the stylus motion, select undamaged portions of the groove, and reconstruct the audio waveform. Because it is "touchless," the lack of physical contact prevents any further damage to the older materials.

The inventors are developing a customized machine for the Library of Congress and are working with the University of California's Phoebe Hearst Museum of Anthropology to reconstruct sound from wax cylinders that capture the spoken word and songs of endangered Native American cultures. The hope is that the digitally restored recordings will help language institutes revitalize these cultures.



Physicists Carl Haber (foreground) and Vitaliy Fadeyev (background) invented the touch-less Berkeley Lab sound restoration system.

Green Steel Gets the Lead Out

University of Pittsburgh

Two professors at the University of Pittsburgh discovered a better alternative to the millions of tons of lead-containing steel produced worldwide every year. They found that tin can perform the same function as lead. Just as lead has been removed from gasoline and paint for environmental reasons, the tin steel offers another attractive way to keep lead products out of the environment. For this reason, the tin steel has been named "Green Steel."

Anthony DeArdo and C. Isaac Garcia, professors of materials science and engineering, examined the new tin steel on an atomic level to determine how it affected machinability. Machinable steel has a smoother surface finish and causes less wear on the tools used to shape it. They found that their tin steel can be machined at speeds about 30% faster than leaded steel which can result in a significant increase in profitability by companies that make machined parts. In addition, the expenses that go toward protecting factory workers from lead fumes can be eliminated.

The work leading up to the invention started in 1995 under funding from a consortium of companies that manufacture and machine steel. The University of Pittsburgh Office of Technology Management worked with these companies to form the Non-Leaded Free Machining Steel Consortium LLC. The Web site of Curtis Screw Co. LLC, one of the consortium members, says 2,000 of its 12,000 tons of cut cold drawn steel will be green steel this year. The consortium was dissolved in 2002 to pursue licensing as a better way to advance the technology.

The university has granted an exclusive license to a major steel company that serves all of North America, a non-exclusive license to a major steel manufacturer in Europe, and is fielding inquiries for possible licenses from companies in the Far East and South America.

Boards Made from Plant Fibers and Soy Protein Are Stronger than Steel

Cornell University

Composite materials, such as particleboard, fiberglass and carbon-fiber products, are held together with a moldable glue or resin. Unfortunately, most glues are not safe for the environment, are not biodegradable, and are often toxic. Many of the polymers used in composites are petroleum-based — a nonrenewable, high-cost resource. Engineered wood products also contain formaldehyde, a known carcinogen that degasses slowly over time, creating indoor air quality problems. Huge amounts of engineered wood products are thrown into landfills every year, both from tear-downs and new construction projects.

Scientists at Cornell University in Ithaca, N.Y., have invented an alternative to standard composite materials — biodegradable composites made entirely from plant materials. Stronger, cheaper and safer for the environment, this biodegradable composite technology, involving fibers and resins based on soy proteins, was disclosed in 2003.

Developed by Anil Netravali, a professor of fiber science and apparel design at Cornell University, the process binds together renewable fibers from fast-growing plants with a proprietary soy protein-based resin. This material is then processed into sheets. Many of these fibers, such as bamboo, kenaf, and flax, can be grown on marginal or unused farmlands. Other advantages include a high strength-to-weight ratio, no petrochemical content, and lower overall cost compared to traditional composite materials.

e2e Materials LLC, an Ithaca company founded on this new technology, is developing biodegradable composites with a wide range of strength properties, reaching as high as mid-range steels, for different industries and applications. Biodegradable composites manufactured by e2e Materials are currently being used in skateboard decks and office furniture. The company is also developing advanced composites that are stronger than steel but almost six times lighter, which will be suitable for a variety of structural applications, such as I-beams.

Structural Connections Made Three Times More Resistant to Earthquake Destruction

National Taiwan University of Science and Technology

Brittle fracture often occurs in steel beam-column connections during earthquakes, resulting in damage to the building, or sometimes complete structural failure. Sheng-Jin Chen, Ph.D., a professor at the National Taiwan University of Science and Technology, invented the "Steel Beam-to-Column Connection" in 1993. This new design, which relies on flange plates and web plates, helps disperse energy by providing ductile steel beam-column connections.

The research was funded by the National Taiwan University of Science and Technology Taiwan's National Science Council.

The invention disperses outward energy more efficiently, which makes this type of building up to three times more resistant to earthquakes than conventional H-type steel bar construction. Because less steel is actually used with this type of design, the cost of raw materials is also reduced. Taipei 101, the tallest building in Asia at 1,651 feet, was built with this technology because it is located on a seismic zone.

"The Steel Beam-to-Column Connection" method has been rapidly accepted around the world. Since its disclosure in 1994, 66 technology transfer cases have been derived from the technology. Sixty skyscrapers have also been built using this design method.

The Taipei 101

(source: Project for Multi-Discipline Management of Technology, sponsored by DoIT, MOEA(ROC))

Anti-Sway Control System Improves Crane Safety, Saves Time

National University of Singapore

Industrial crane operators typically manipulate the independent motions of trolley, hoisting and traverse when they are moving payloads. This, however, can result in an uncontrolled swaying motion, which slows down the construction process because extra time is required to let the swaying motion come to a stop. Uncontrolled swaying is also a safety issue that can result in serious injury.

Led by associate professor Ong Chong Jin, researchers at the National University of Singapore's Mechanical Engineering Department have developed a highly effective solution to the control of payload sway in industrial crane and crane-like structures. The "Anti-Sway Control of a Crane under Operator's Command" technology was developed in 2000.

In response to the operator's command for trolley, hoist and traverse motions, this software program utilizes a family of differential equations to calculate the precise counter-adjustments necessary for canceling out sway. The differential equations are solved in real time, using sensory measurement of the cable length and its time derivative.

The program also responds immediately to the operator's commands under simultaneous trolley/hoisting and traverse/hoisting motions. The software takes into account the acceleration, velocity, and span limits of the drive system of the crane to ensure the anti-sway control is not compromised when these limits are reached. The use of this technology on construction sites improves safety; labor costs are also reduced because operators spend less time waiting for swaying motions to cease.

Online Learning System Provides Interactive Electronic Textbooks

University of Massachusetts

Researchers at the University of Massachusetts-Amherst have developed an Internet-based software program that provides electronic homework, online examinations, interactive electronic textbooks, and online training and compliance materials.

"OWL" (Online Web-Based Learning) was originally developed in the late 1990s by the Chemistry and Physics Departments and the Center for Educational Software Development (formerly the Center for Computer-Based Instructional Technology). Initial funding was provided by the National Science Foundation, the U.S. Department of Energy, Five Colleges, Inc., Davis Educational Foundation, the Dreyfus Foundation, Cengage Learning (formerly Thomson Learning) and the university.

OWL provides students with study questions that are graded automatically online. Algorithmically generated practice questions help students practice for tests or exams, which are also taken online (including high-stakes tests). Interactive electronic textbooks incorporate embedded graded questions that students can try to answer as they read, providing instant feedback. OWL can also be customized for any age group of students, including middle school and high school.

The original version of OWL, a chemistry curriculum developed for the University of Massachusetts's chemistry department, was licensed to Thomson Learning in 2001 to support the company's line of chemistry textbooks. The success of this endeavor has led Thomson Learning to license other OWL programs, including organic chemistry and nursing chemistry. The university is seeking to expand OWL's reach to include a broader offering at the college and university level as well as to continuing education, high school and refresher courses.

Screenshot of the course interface for a module called "Components of Compaction", which is targeted at the operator audience (individuals in the field), explaining a concept that is important in road building.

Software Program Identifies At-Risk Children in the Classroom

University of Virginia

High literacy rates are among the chief hallmarks of a strong educational system. And in order to stay ahead of the curve, teachers must regularly assess students' reading skills, monitor their progress, and determine how well they are achieving their literacy goals. To help teachers meet this formidable task, researchers at the University of Virginia in Charlottesville invented the "Phonological Awareness Literacy Screening (PALS) Online Score Entry and Reporting System," a diagnostic reading software tool for kindergarten through third grade students.

Marcia Invernizzi, director of the McGuffey Reading Center in the Curry School of Education at the University of Virginia, developed PALS from 1997 to 2002. The Virginia Department of Education initially funded the project at $350,000, which it increased to an annual amount of $950,000 in 2000.

PALS is a software program that quickly assesses how well children understand literacy fundamentals. Children who need intervention are identified quickly so they can receive the tools and special instruction they need before they fall too far behind. Students are tested two to three times a year to monitor their progress and adjust their method of instruction, if necessary.

PALS is an important diagnostic tool that identifies at-risk elementary students at a young age, allowing for early intervention. It is easy to use and generates quantitative data that accurately determines reading level, comprehension and other literacy metrics. The PALS Internet database has resulted in 100 percent universal literacy screening in K–3 in Virginia and has become a model for other states.

Online Program Delivers Training Tools for the Paving Industry

University of Washington

Researchers at the University of Washington's (UW) Department of Civil and Environmental Engineering have created an engaging, interactive web-based solution for training workers in the pavement construction industry.

The idea for such a tool originated with early work by professor Joe Mahoney in the late 1980s well before the rise in popularity of the World Wide Web. While they waited for technology to catch up, Mahoney and professor Steve Muench continued to develop training content based on their research. In 2002, Mahoney, Muench and senior research engineer George White began developing web-based, interactive delivery systems for this growing body of training material.

Several products were developed along the way for research sponsors including the National Asphalt Pavement Association and the Washington State Department of Transportation; the latter of which, in 2003, won a national award from the National Engineering Education Delivery System (NEEDS), for computer-based training. In addition, the University of Washington also entered into license agreements with a number of paving industry organizations and state departments of transportation.

Currently, these high-quality interactive training materials are the largest collection of digital media and information resources available on hot mix asphalt pavement construction materials, methods and practices. In 2006, Pavia Systems, the first startup company to come out of the UW Civil and Environmental Engineering Department, exclusively licensed the materials for commercial delivery and released a subscription based product series in the form of structured online training courses.

Pavia Systems is marketing the modular, customizable online training service to paving companies, equipment manufacturers and transportation agencies around the world and expects to have an international impact on the paving industry. Whereas, traditional training requires one to spend hours of time in a classroom, Pavia's online solution available at www.paviasystems.com provides one the convenience of personalized training 24 hours a day.

Black Silicon Revolutionizes How Light Is Captured and Stored

Harvard University

In 1999 Harvard University physics professor Eric Mazur accidentally created a remarkable new material in his laboratory by subjecting gray silicon to ultra-short bursts of energy from a high-intensity laser. He discovered the surface of the now-blackened silicon was covered by billions of tiny, needle-like spikes of silica only one-hundredth the diameter of a human hair.

Mazur and his research team quickly realized this new material, which he named black silicon, had excellent light-absorbing properties. Funding for additional research was provided by the U.S. Army Research Office, National Science Foundation, and the U.S. Department of Energy.

Black silicon can absorb visible light and infrared radiation (heat) at unprecedented levels. For example, normal gray silicon absorbs only about 60 percent of sunlight that strikes its surface. Black silicon can absorb 96 to 98 percent of the light that hits it, thereby giving it highly sensitive and unique optical and electronic properties.

This technology is currently being developed by Massachusetts-based Sionyx, Inc. Possible applications include manufacturing very sensitive and inexpensive photodetectors for high-resolution cameras, day/night cameras for security and surveillance, and high-sensitivity detectors and imagers for biotechnology applications. Because it also absorbs heat, black silicon is an excellent detector of clouds, pollution, water vapor and other atmospheric effects that influence climates. Other possible products include disposable chemical/biological sensors and improved thin-screen displays.

Unique Polymer Coatings Enhance High-Performance Display Panels

University of Akron

Polymer films are used in flat-panel liquid crystal displays to improve off-angle viewability. Optical devices also rely on polymer films to maintain the integrity of transmitted light signals. An advanced polymer film invented at the University of Akron in Ohio now makes images on high-performance screens sharper and brighter than ever before.

After 10 years of research, University of Akron professors Frank Harris and Stephen Cheng developed "Negative Birefringent Polymer Films for Liquid Crystal Displays." Initial funding consisted of a National Science Foundation Advanced Liquid Crystalline Optical Materials (ALCOM) grant for $500,000.

The technology consists of unique polymers that are applied as ultra-thin coatings to high-performance displays, such as high-definition television screens and cockpit instrument panels. The polymer films prevent the distortion of light, which results in greater sharpness and clarity, as well as a greater range of distortion-free viewing angles.

With assistance from the University of Akron Research Foundation (UARF), Akron Polymer Systems was established in 2002 to further develop and commercialize high-performance polymers for aerospace, optical and photonic applications. UARF transferred the technology to the startup company, which also uses UARF's polymerization pilot plant to formulate and test different polyimide resins. Akron Polymer System's economic impact to the area recently led to a $1.5 million award from the state of Ohio for promoting job growth.

Researcher using rotary apparatus to isolate polymer sample.

Cellulosic Ethanol: A Cleaner, Lower-Cost Alternative to Petroleum

University of Florida

Because of increasing costs and dwindling reserves of petroleum, the world is focusing more on ethanol as an alternative fuel. Ethanol can be created from a variety of plants, the most well known being corn. In the late 1980s, professor Lonnie Ingram, Ph.D., of the University of Florida in Gainesville, developed technology that enables the production of cellulosic ethanol from biomass derived from specific energy crops, such as sugarcane bagasse and specially bred energy cane.

Funding for this research was provided by the U.S. Department of Energy and the U.S. Department of Agriculture. Dr. Ingram's process, which was disclosed in 1989 and patented in 1991, breaks down biomass cells and reduces the cellulosic matter to five sugars. The sugars are then fermented to produce cellulosic ethanol.

Prior to this discovery it was not feasible to use cell matter to produce ethanol. Yields of cellulosic ethanol are about five times higher per acre than ethanol produced from corn. Another big advantage over corn is that cellulosic ethanol does not compete with the food supply (the demand for corn to produce ethanol has a tremendous impact on the price and availability of corn for consumption).

In 1991 the University of Florida launched Verenium Corp., a startup company, to commercialize this unique production process. They have worked together to continuously improve their core cellulosic ethanol technology. Today Verenium is known around the world for its expertise in pre-treatment, enzyme development, fermentation, engineering and project development. The company has upgraded and expanded its production facility in Louisiana and is testing yields from diverse regional feedstocks. By 2010 the facility is expected to produce about 30 million gallons of cellulosic ethanol annually.

Maximizing DC Power Conversion from Solar Panels

British Columbia Institute of Technology

A new device developed at the British Columbia Institute of Technology in Burnaby, Canada, allows energy users to draw the maximum amount of power from a solar array, at any given time.

Called the Maximum Power Point Tracking (MPPT) technology, it was developed by BCIT engineers and students over a four-year period. Photovoltaic cells have a single operating point where the current and cell voltage result in a maximum power output. This point fluctuates according to several factors, including time of day, season, temperature and weather conditions. MPPT technology uses a patented logic algorithm that continuously searches for the point of maximum power buildup in the solar array, and allows the converter circuit to extract it from the cell. Benefits are most apparent when the weather is hazy, overcast, or rainy, or when the battery has a low charge. The controller also acts as a battery charger for various battery types.

Analytic Systems of Surrey, British Columbia, licensed the technology from BCIT and designed and produced the final design. Called SolarMax, the solar charge controller is primarily being marketed for industrial applications. At 100 amps it provides the highest power output of any solar charge controller currently on the market, and is one of the most compact. Analytic Systems is developing a line of products for the solar and wind-generation industries and expects to increase revenues by 100 percent over the next five years. The United States government is also interested in potential military applications of the technology. Based on this initial technology Analytic Systems has been given a prestigious IRAP grant, one of the largest in Western Canada, from the National Research Council of Canada to continue to develop products in this solar category.

Environmentally Friendly Landfill Cover Absorbs Toxic Gases

University of Maine-Orono

Decomposing waste materials in landfills release sulfur-bearing gases, which often create foul-smelling air around the landfill and possible health issues for landfill personnel and nearby residents. Landfill operators are required to cover the working face of the landfill on a daily basis, with soil or plastic tarps being the preferred method. Tarps are labor-intensive because they need to be rolled out at the end of the day and removed in the morning. They also do a poor job of containing the troublesome gasses.

To streamline this procedure, as well as reduce gas emissions, Susan MacKay, Ph.D., Karl Bishop, Ph.D., Doug Ruthven, Ph.D., and Michael Bilodeau at the University of Maine-Orono invented a paper-based cover that contains an engineered zeolite (Zeo-BLOC™. This mineral reacts with sulfur-bearing gas to precipitate a non-toxic solid that is trapped in the fibrous web of the cover.

This low-cost, biodegradable alternative to plastic tarps not only effectively covers the working face, but also captures and neutralizes a significant portion of the noxious gases, as well as reducing the unwanted sulfur concentrations in the biogas that is recovered from the landfill. The paper cover also does not have to removed — it can remain in the landfill, saving labor and removal costs.

The University of Maine, in partnership with Maine-based Zeomatrix, LLC, has developed a commercial version of this product, which is currently being tested in the field. Commercial production is expected in 2008.

Zeomatrix prototype tarps deployed for testing at the Rockland Municipal Landfill.

Superprimer Compounds Make Paints Safer for the Environment

University of Cincinnati

Chromates have excellent anticorrosion properties — which is why more than 600,000 metric tons of chromate are incorporated into paints every year. Despite its effectiveness in protecting metal from corrosion, chromate in its hexavalent oxidation state is toxic and carcinogenic. Overexposure to chromate results in a host of health problems, such as ulcers, respiratory ailments, allergic reactions and cancer. Paints also release volatile organic compounds (VOCs) into the air, which are dangerous to breathe.

A new anticorrosion primer system developed at the University of Cincinnati in Ohio, totally eliminates the need for chromates in paints. "Superprimers" were developed from 2001 to 2006 by professor of materials science William J. van Ooij, Ph.D. More than $2 million in funding was received from the Environmental Protection Agency, Department of Defense, and the Strategic Environmental Research and Development Program.

Superprimers are one-step, very-low-VOC primers that can replace the chromate-based anti-corrosion primers typically used in the metal-finishing metal-pretreatment industries. Mixtures of silanes (silicon analogues) and waterborne resins can be applied directly to metals as self-priming primers. A plasma-treated pigment package in the primer slowly releases a corrosion inhibitor that mimics the anticorrosion properties of chromates.

Because superprimers have very low VOC content and no chromate, they are much safer for human health and the environment. Ecosil Technologies was launched in 2003 to commercialize superprimer technology. Ecosil works with many companies around the world and currently has joint development agreements with several billion-dollar companies in the silane and paint industries.

William J. van Ooij, Ph.D., professor of material science at the University of Cincinnati in Ohio, developed Superprimers, which eliminate the need for chromates in paints.

From Cheese Byproducts to Natural Wood Finish

University of Vermont

Standard wood finishes can create unhealthy indoor environments by releasing toxic volatile organic compounds (VOCs) into the air. VOCs have been linked to a variety of health problems, including headaches, allergies, and respiratory diseases. Some VOCs are even carcinogenic. A key ingredient in many oil-based wood finishes and paints is petroleum — a high-cost, non-renewable resource. To conserve petroleum and improve indoor air quality, a researcher at the University of Vermont has invented a natural wood finish that contains 25 percent fewer VOCs.

Ming Ruo Guo, a professor in the nutrition and food sciences department, has created a unique coating for wood from very pure whey protein, a byproduct from cheese manufacturing. Whey contains a high BOD (biochemical oxygen demand) that can increase the burden on waste treatment facilities and pollute water resources. The new coating, called PolyWhey, incorporates reformulated whey polymer proteins as the bonding agent.

PolyWhey has a cured hardness twice that of other water-based finishes. It also provides increased density and viscosity, better water resistance, greater coverage, shorter drying time, and lower production costs. By reformulating whey into a durable, natural wood finish, a potential waste product is not only taken out of the waste stream, but also put to a useful purpose.

Disclosed in 2002, PolyWhey was licensed two years later to Vermont Natural Coatings, a University of Vermont startup based in Hardwick, Vt. PolyWhey is being marketed to furniture and toy makers, wood manufacturers, architects, and contractors who are interested in using nontoxic, environmentally friendly products. Vermont Natural Coatings is continuing to research more green alternatives to petroleum-based products.

Composting Toilet Is Environmentally Friendly

University of Washington

Managing human and animal waste can be a big problem in remote, rural, or environmentally-sensitive areas. But University of Washington-Bothell professor Chuck Henry, Ph.D., has taken a big step toward managing this challenge by inventing an inexpensive, continuously-composting toilet that produces a nontoxic end product that can be used as compost.

The "Earth Auger" was developed and tested from 2001 to 2006 by Henry and several of his graduate students. The device can be assembled from standard, inexpensive piping and processes both human and animal waste. It is ideal for locations lacking wastewater treatment facilities, especially undeveloped natural areas or places designed for animal use, such as dog parks.

The Earth Auger is better than pit toilets because it produces usable compost and works continuously

with minimal maintenance. Although other continuously composting toilets exist on the market, Earth Auger is significantly less expensive and is easy to construct, which makes it ideal for use in developing countries.

Brown and Henry LLC owns the technology, which has been licensed to Zaste, a for-profit company, and Creative Sustainable Practices, a not-for-profit organization. Zaste is marketing the composting toilets to city governments for use in dog parks and other suitable areas. Creative Sustainable Practices is using the product to raise international awareness of how lower-cost, alternative sanitation technologies can benefit underdeveloped regions of the world.

Sustainable Polymer Blend Sends Plastics Packing

École Polytechnique de Montréal

A major issue with commodity plastics is that they are derived from nonrenewable petroleum resources. Researchers at the École Polytechnique de Montréal in Québec, Canada, have invented a material that allows shippers and packagers to replace a large percentage of its plastic packaging material with a more environmentally friendly polymer/thermoplastic starch blend that has a similar cost and performs just as well as pure polyethylene.

The technology was developed by Basil Favis, Ph.D., Bruce Ramsay, Ph.D., and Francisco Rodriguez, Ph.D., at École Polytechnique de Montréal's Chemical Engineering Department. About $800,000 Canadian in funding was provided by the Natural Sciences and Engineering Research Council of Canada, Gestion Univalor, Limited Partnership (the commercial arm of the Université de Montréal and of its affiliated schools) and Valorisation Recherche Québec.

The patent was submitted in 1999 and U.S. product and process patents were issued in 2003 and 2005 respectively. Cerestech, a spin-off company of the École Polytechnique de Montréal, secured the license for the worldwide commercial exploitation of this technology in 2002.

Starch is both a renewable resource and inexpensive, compared to even a low-cost polymer such as polyethylene. The polyethylene/thermoplastic starch blend has similar properties to pure polyethylene, is of low cost and does not depend on nonrenewable resources. It is a much more sustainable technology than pure polyethylene. It requires less energy and water resources to produce and has a significantly lower carbon (greenhouse gas) footprint. Prior to this discovery, there was no commercially available bio-based product that used a large proportion of starch in conventional polyethylene products. Cerestech's proprietary new blend process allows producers to adopt a more sustainable technology at a similar cost and performance to pure polyethylene. This offers new options for innovative processors worldwide.

Products such as this pail can be fabricated with the polymer/thermoplastic-starch blends developed by the Université de Montréal. The use of starch makes it a sustainable product.

Biorefinery Technologies Maximize the Value of Renewable Resources

The Research Foundation of State University of New York

Forest biorefinery is defined as the full conversion of wood biomass into fibers, chemicals and energy. For decades pulp mills have burned or discarded wood sugars and hemicellulose, which can be used in the manufacturing of plastics, ethanol and acetic acid. Now new processes developed at the State University of New York's College of Environmental Science and Forestry (SUNY ESF) in Syracuse make it much easier to exploit these co-products.

A suite of "Forest Biorefinery" technologies were developed by Thomas E. Amidon, Ph.D., Gary M. Scott, Ph.D., Bandaru V. Ramarao, Ph.D., Raymond Francis, Ph.D., Christopher D. Wood and Jeremy Bartholomew. The technologies are designed to extract value from trees in new and unique ways. The Empire State Paper Research Institute was the primary funding source.

Wood chips are pretreated with selected enzymes, which make the lignin, sugars, and hemicellulose easier to extract. Once extracted and concentrated, the sugars and hemicellulose are converted to acetic acid and ethanol, two valuable commodities. This enables pulp mills, chipboard plants and other businesses that utilize trees (or forest biomass) to better extract economic value from their current production processes. It is estimated that the extracted lignin, sugar and hemicellulose will yield as much revenue from downstream chemical products as the fiber or fuel that is traditionally extracted yields in the production of paper products or energy.

Acting on behalf of SUNY ESF, The Research Foundation of State University of New York is in the early stages of licensing and commercialization. Licensees and potential licensees are testing these technologies in small-scale pilot operations throughout the country. In 2007 New York State Department of Agriculture and Markets dedicated $10.8 million to the construction of pilot and demonstration plants in New York, first at SUNY ESF and then transferring the pilot plant to Lyonsdale Biomass, LLC, a wood-burning power plant on the Moose River, Lewis County. The first full-size biorefinery is scheduled for completion in early 2009 in the state of New York.

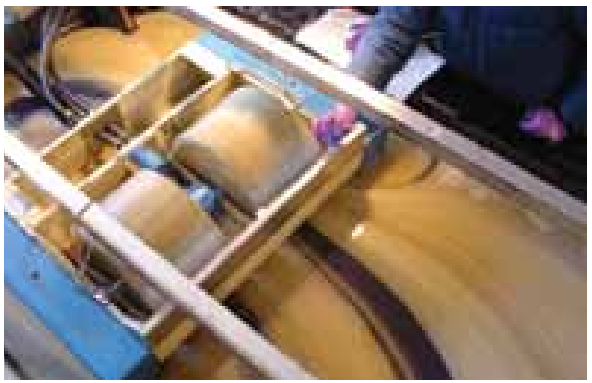
"Groovy Drum Skimmer" Improves Oil-Spill Recovery Rates

University of California, Santa Barbara

Oil-recovery methods from oil spills have essentially stayed the same for decades. A rotating drum with an oil-adhering surface called a "drum skimmer" turns in the contaminated water, removing oil that is then scraped into a collector. However, a new skimmer developed at the University of California, Santa Barbara is poised to revolutionize the oil-recovery industry.

Victoria Broje, a doctoral student at the university, redesigned the standard drum skimmer by adding new surface coatings and V-shaped grooves running in the direction of rotation. The grooves add four times the surface area compared to the standard drum skimmer. These grooves help the drum pull up a thicker layer of oil with each rotation, and slow oil drainage back to the slick. Tests showed that it increased oil-recovery rates by more than 200 percent. The "Groovy Drum Skimmer" was disclosed in 2004.

With a $170,000 grant from the Coastal Response Research Center at the University of New Hampshire, Broje successfully tested the design in ice-infested water. In 2006 the product was licensed to Illinois-based Elastec/American Marine, the largest manufacturer of oil-spill recovery equipment in the United States. The company has commercialized the Groovy Drum Skimmer and is selling it to recovery companies around the world.



Groovy drum skimmer tank test.

Pin Bone Wizard™ Removes Fine Bones from Salmon and Trout Fillets

University of Alaska Fairbanks

It's been a long-standing problem in the food industry: how to remove smaller bones from fish fillets, especially salmon and trout. These fine bones, called pin bones, are difficult to remove and often detract from the pleasure of eating fine fish. In fact, many view the presence of pin bones to be a significant deterrent to fish consumption.

In an effort to support Alaska's commercial fishing industry, researchers Lawrence V. Kozycki and Gregory Shipman at the University of Alaska Fairbanks invented a pneumatic device that pulls these bones from fish. Their research, which received funding from the Alaska Science and Technology Foundation, the United States Department of Agriculture, the University of Alaska Fairbanks' Geophysical Institute, and University of Alaska president Mark Hamilton, began in 1997, and is ongoing.

The compact, tabletop machine was developed for fish markets, grocery stores, fish smokers, individual fishermen, off- and on-shore processors, and restaurants. These small businesses cannot afford the large, expensive processing equipment used by the big processors. Marketed as Pin Bone Wizard™, it is more affordable than existing pin bone pullers and far more effective at removing bones from muscular, wild-caught fish. It can also pull neck bones (which lie on a different plane than pin bones) and does not break bones that are difficult to pull. The flesh of the fillet remains undamaged, providing an attractive product.

The Geophysical Institute markets and sells the Pin Bone Wizard™. Interest has come from around the world, including Ecuador, Peru, Mexico, Iceland, Australia, Canada and the countries of Scandinavia. The patented pulling mechanism is also being distributed to major manufacturers of fish-processing equipment for use in larger, automated, pin-bone removal machines used in processing plants.

Heart-Healthy Buttery Spread Improves Cholesterol Levels

Brandeis University

Diets high in the wrong kinds of fats, especially trans fats, can lead to serious health problems such as high LDL ("bad") cholesterol levels, cardiovascular disease, and diabetes. Now researchers at Brandeis University in Waltham, Mass., have created a butter substitute that increases HDL ("good") cholesterol and lowers bad cholesterol.

Increasing the HDL level and the HDL/LDL ratio in human serum with fat blends was the goal reached in 1995 by department of biology professor K.C. Hayes, Ph.D., professor Daniel Perlman, Ph.D., and Kalyana Sundram, Ph.D., director of nutrition for palm oil research at the Malaysian Palm Oil Board in Kuala Lampur. Research was funded by the Palm Oil Research Institute of Malaysia and Brandeis University.

The special blend is composed of cholesterol-free fats, with balanced proportions of saturated fats and polyunsaturated fats. The mixture provides natural hardness or plasticity that makes it as spreadable and flexible as shortening, which is difficult to achieve with most natural fats. These blends have been incorporated into a number of heart-healthy foods, such as Smart Balance® spreads and popcorn.

Clinical trials have shown the Smart Balance® formulas are effective in improving cholesterol ratios. Because of its excellent flavor (three consecutive Best Taste Awards from the American Culinary Institute), natural stability when heated, and melting characteristics, Smart Balance products have gained widespread acceptance by consumers as a butter substitute. Sales have increased 20 to 40 percent annually since it was introduced to the marketplace a decade ago.

"Sparkling" Yogurt Is a Hit with the Younger Crowd

Brigham Young University

Behind every great discovery is a healthy dose of curiosity. When professor Lynn Ogden of Brigham Young University in Provo, Utah, put a block of dried ice in yogurt to see what would happen, the result was somewhat surprising — a light-textured yogurt with a pleasant tingling taste. After further development in Ogden's laboratory at Brigham Young University's Nutrition, Dietetics and Food Sciences Department, "Sparkling Yogurt" was patented in 1997.

Ogden's discovery simply gives yogurt and other spoonable desserts like custard, pudding, and soft ice cream a more interesting taste sensation. These foods are carbonated using the standard process of bubbling compressed CO2 through the products, and then packaging to retain the carbonation.

The "sparkling yogurt" was sold on the Brigham Young University campus from 1995-1996. It was more popular than traditional yogurt and outperformed other yogurts in taste tests. Encouraged by these results, in 2006 the university granted exclusive rights to General Mills for selling the product as Fizzix™ in the United States. To date "sparkling yogurt" has been patented in 29 countries. General Mills and other distributors are hoping more children eight to 12 years old will improve their diets by eating more yogurt and fewer sugary snacks.

Lynn Ogden, professor of food science, first tasted the sensation of carbonated yogurt after he threw a block of dry ice into a bucket of yogurt more than 20 years ago.

Treating Phobias, Addictions and Stress with Virtual Reality

Emory University and The University of North Carolina at Charlotte

Exposure therapy is often used to help patients face irrational fears. Both patients and therapists experience the fear-provoking situation in a controlled environment. Traditional exposure therapy is often expensive, inconvenient, time-consuming and sometimes dangerous. Now researchers at Emory University in Atlanta, Georgia, and the University of North Carolina at Charlotte have invented a "virtual" way to conduct exposure therapy — in the privacy of the therapist's office.

Virtual Reality Therapy was developed from 1993 to 1995 by Barbara O. Rothbaum, Ph.D., professor of psychiatry at Emory University, and Larry Hodges, Ph.D., now a professor of computer science at The University of North Carolina at Charlotte, who began his work while at the Georgia Institute of Technology. Initial funding was provided by Emory University, Georgia Tech, and the Georgia Research Alliance.

The subject wears a headset that positions two small television screens in front of each eye. Using a computer, the therapist sends images or video to the television screens that recreate the fear-provoking situation. The subject is repeatedly exposed to this computer-generated "virtual reality" until the fear response is managed or eliminated.

Because Virtual Reality Therapy is conducted in the office, it reduces cost, saves time, and makes it easier for the therapist to observe the subject's reactions. Atlanta-based Virtually Better, Inc. was founded in 1996 to commercialize the Virtually Better™ product lines, which include hardware and software. Scenes address fear of heights, fear of flying, fear of storms, and Vietnam (for treating post-traumatic stress disorder.) Therapies are also available for alcohol, nicotine and drug abuse. Virtually Better™ technology is used around the world and the company is partnering with seven universities to develop new treatment modules.

Libby Tannenbaum, Ph.D., Licensed Clinical Psychologist (right) uses Virtually Better™ technology to treat patients.

Photo courtesy of Atticus Graybill, Virtually Better, Inc.

Programmable Infusion Pumps Reduce Tragic Medication Errors

Massachusetts General Hospital

Adverse drug events (ADEs) are the leading cause of medical injury to patients in the health care industry. Research has shown the medical procedure with the highest risk for ADEs is intravenous (IV) infusion. For example, the *Journal of the American Medical Association* has reported that, in a study of pediatric inpatients, 54 percent of potential ADEs were associated with intravenous medication.

To reduce ADEs in the hospital setting, researchers at Massachusetts General Hospital in Boston spent 15 years perfecting a smart drug infusion pump. Led by Nathaniel Sims, M.D., an anesthesiologist in the department of anesthesia and critical care at Massachusetts General Hospital, and assistant professor of anesthesia at Harvard Medical School, the team created an electronic pump that stores a continually updated, hospital-specific database of intravenous drugs and infusion procedures. The pumps prevent errors by comparing the dose rate the clinician enters with the hospital-specific predefined limits for that drug. If the programmed dose is outside the limits, the system alerts the clinician and, in some cases, prevents administration of the medication.

The smart drug infusion pump was immediately put to use in all departments at Massachusetts General Hospital, including operating rooms and intensive care units. Affiliates of the hospital are also using the pump, which has been effective in streamlining medication procedures and reducing ADEs.

Massachusetts General Hospital's Corporate Sponsored Research and Licensing Office licensed the technology nonexclusively to several global drug infusion pump manufacturers, including Alaris Medical Systems, Hospira (formerly Abbott Laboratories), Braun Medical, and Sigma International. Widespread use of the pump will reduce drug-dosing calculation errors and misprogrammed drug infusion pumps, increasing patient safety and reducing overall health care costs.

Innovative Bandage Saves Lives

University of North Carolina at Chapel Hill
East Carolina University

Severe blood loss is one of the leading causes of death in traumatic injury cases. Despite the abundant research that exists on ways to stop surface bleeding (hemostasis), little work has been done to develop special materials that can be applied to wounds to staunch bleeding. This is especially critical in combat casualty care, where control of non-compressible bleeding is one of the biggest unmet needs in military emergency medicine. Blood loss through gauze dressings is a major factor in the death of wounded soldiers on the battlefield.

To reduce death and injury from substantial blood loss, a joint research team from the University of North Carolina at Chapel Hill and East Carolina University in Greenville, N.C., invented a unique fabric in 2005 that activates the body's own hemostatic systems when applied to a wound.

The technology consists of a fabric of woven specialty fibers, including glass, silk, bamboo, cotton, flax, hemp and zeolite. Additional co-factors such as thrombin, RL platelets, RL blood cells, fibrin, fibrinogen, and other hemostatic agents can be incorporated into the textile. The fabric is soft, strong, and absorbent, can be cut to any needed size or shape, is temperature-stable, and may be used to support other hemorrhage-control methods.

This technology was licensed to Entegrion, a University of North Carolina startup company. In 2007 Entegrion received Food and Drug Administration approval for its hemostatic textile technology called Stasilon™. AlphaBandage™, the company's emergency bandage that promotes blood coagulation and reduces bleeding, was distributed to battlefield medics and performed well during pilot testing. The product has demonstrated the ability to reduce blood loss as compared with gauze by improving rates of clot formation. Entegrion is developing other wound-dressing products for military and commercial markets in the United States.

Activated-Carbon Fabric Garments Absorb Viruses, Toxins and Other Deadly Contaminants

Feng Chia University

What can help people resist the SARS virus, or protect them from contaminated water and air, or electromagnetic waves? The answer is a highly absorbent material called "PAN-Based Activated Carbon Fabrics" that was invented at Feng Chia University in Taiwan.

The development of this material, discovered by professor Tse-Hao Ko in 1995, was funded in part by the Taiwan National Science Council. It was licensed in 1996 to Taiwan Carbon Technology Co., CCTeks Co. and CeTech Co.

Polyacrylonitrile (PAN)-based activated carbon fibers are superior to pitch-based, cellulose-based, and phenol resin-based activated carbon fibers for mechanical strength and absorbency. The proprietary process that transforms activated carbon powder to carbon fiber results in a high density of air holes in the carbon fiber, creating higher absorbency. The PAN-based fiber bundles are oxidized first and then activated in a carbon dioxide atmosphere at a temperature of 1,652 degrees Fahrenheit (900 degrees C.)

PAN-based activated fibers can be woven into yarn, thread or cloth. This highly absorbent fabric can be used in a variety of ways, including in disposable respirators, medical protective garments that guard against virus transmission, protective gear for nuclear and biochemical attacks, as well as filters for air and drinking water. It's also lightweight — garments containing activated carbon fabrics are 40 percent lighter than other protective clothing worn by U.S. soldiers in Iraq.

Pan-Based Activated Carbon Fabrics and its applications

Source: Project for Multi-Discipline Management of Technology, sponsored by DoIT, MOEA(ROC)

Sturdy Solar Oven May Help Fight Diabetes in Poor Areas

University of New Mexico

Eating baked foods instead of fried foods is a good way to manage diabetes or reduce the risk of developing this life-threatening disease. However, for poor families living in rural areas without power, frying may be the only option. To help combat the growing problem of diabetes among Native Americans in northwestern New Mexico, Jeannie Martinez-Welles, a professor at the department of health careers at the University of New Mexico-Gallup (UNM-Gallup), invented a unique solar oven that doesn't require electricity to operate.

In 2004 Martinez-Welles and John Welles redesigned an earlier prototype to include a smaller door opening, sturdy bent-metal base, metal flashing and tempered glass for security and temperature. The plans were disclosed and copyrighted in 2006. About $32,000 in funding was provided by a strategic planning grant from UNM-Gallup and the Centers for Disease Control.

Energy from the sun creates a greenhouse effect inside the closed solar box, which can heat food and water at temperatures of 200-250 degrees Fahrenheit (93-121C). A variety of foods can be baked, such as roasts, turkey breasts, breads, quiche and rice. The solar oven performs better than traditional solar ovens because its triangular shape captures sunlight in all seasons, all day long, without having to rotate the oven. The beehive door prevents heat loss and allows the oven to accommodate large items, such as turkey roasters and pizza pans. Its sturdy construction with a large base makes it stable in windy conditions and "dog proof."

The oven can be constructed with a few basic tools and $30 of materials; plans can be downloaded from stc.unm, the university technology transfer office Web site. Workshops have been presented to Native American audiences and ovens have been distributed to Navajo families who are living without electric power. The solar oven will be a cost-effective way to improve the quality of life in poor areas around the world.

Solar cooking and outdoor temperatures.

Photo courtesy of University of New Mexico. Copyright UNM 2007.

Device Kills Head Lice in One 30-Minute Application

University of Utah

There are more than 10 million cases of head lice in the United States annually and more than 200 million globally, with 80 percent of the cases afflicting children. During the last five years the problem has increased dramatically because lice have developed widespread resistance to the pesticides used in both prescription and over-the-counter medications. In fact, head lice now cause almost twice the level of school absenteeism over asthma, the previous leading cause.

To fight this problem, in 2002-2003 University of Utah researchers developed the "Ectoparasite Eradication Method and Device." Professor Dale Clayton and students Joseph S. Atkin and Kevin G. Wilding showed that the chemical-free, hairdryer-like device eliminated head lice infestations by exterminating the eggs and killing enough lice to keep them from reproducing. More than $500,000 in funding from the State of Utah Centers of Excellence Program, the University of Utah and the National Science Foundation was used to develop and test the technology prior to licensing.

Marketed as LouseBuster™, the device blows warm, temperature-controlled air through a flexible hose attached to a special applicator that kills lice and eggs by drying them out, not by heating them. The big advantages over existing treatment methods are that the process is pesticide- and chemical-free, requires only one treatment, has no side effects, and results in extremely high kill rates for both lice and eggs.

Experienced entrepreneurs licensed the technology from the University of Utah and created a spin-off company, Larada Sciences, to commercialize and market the device. Initial products will include the LouseBuster™ as well as single-use disposable kits for institutional sale to health care professionals. Key markets include schools, public and private health care providers, homeless shelters, the military, day-care facilities and smaller niches such as summer camps.

University of Utah biologist Dale Clayton demonstrates the the latest prototype of the LouseBuster.

Photo courtesy of Sarah E. Bush

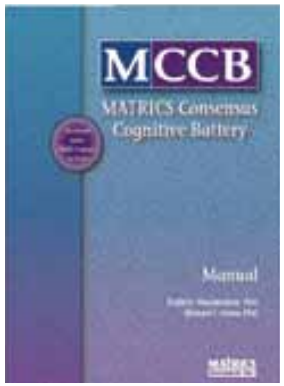
Treating Schizophrenia Starts with Cognitive Battery Tests

University of California, Los Angeles

Cognitive deficiencies, such as having an impaired memory or the inability to focus attention, are key predictors of long-term disability for schizophrenia patients. Further, the current antipsychotic medications do not help these cognitive impairments. To speed the development of new drugs that can possibly help these patients, researchers at the University of California in Los Angeles have designed a battery of tests to evaluate cognition in schizophrenia.

The "MATRICS Consensus Cognitive Battery" (MCCB) was published in 2006 by Keith H. Nuechterlein, Ph.D., and Michael F. Green, Ph.D. Funding was provided by the National Institute of Mental Health's (NIMH) Division of Mental Disorders and Behavioral Research.

The MCCB was developed to help accomplish the goals of the National Institute of Mental Health's initiative, Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS). The absence of any standard measure of cognitive function that was accepted by the U.S. Food and Drug Administration (FDA) for clinical trials of schizophrenia had been a critical obstacle in evaluating potential new medications for the core cognitive deficits. Thus, one of the key goals of MATRICS was to create a consensus cognitive performance test battery for future clinical trials.



The battery was designed with input from national experts in neuropsychology, clinical psychology, neuroscience, psychometrics and clinical trial design. It evaluates speed of processing, attention/vigilance, working memory, verbal learning, visual learning, reasoning and problem solving, and social cognition.

Recent scientific discoveries provide opportunities for developing medications that can improve cognitive function in schizophrenia. The MCCB has been endorsed by the NIMH and accepted by the FDA as the recommended battery for future clinical trials for potential cognition-enhancing drugs for schizophrenia.

Electronic Pill Crusher Saves Time, Prevents Injury

British Columbia Institute of Technology

The health care environment is often a hectic, fast-paced, and sometimes hazardous workplace for nurses and other providers. One of those hazards is the risk of developing painful and often debilitating carpel tunnel syndrome from repeatedly grinding pills into powder form by hand. Nurses do this for patients who cannot swallow pills and need their medications mixed with water or juice.

Dennis Kruger, owner of AB Innovations in Vancouver, British Columbia, with the help of the British Columbia Institute of Technology (BCIT), invented the Electronic Pill Crusher to help nurses with pill preparation. The crusher is lightweight, portable, easy to use, and powered by rechargeable batteries. This device relieves nurses of the task of crushing pills by hand and performing the same repetitive motion hundreds of times a day. It also increases nursing staff efficiency by saving time.

With $23,000 in funding from AB Innovations, BCIT designers Gordon Thiessen, Matt Greig, and Nancy Knaggs developed the device from 2005 to 2006. A plastic bag of pills is inserted into the crusher. When a button is pressed, the motor and rotating crusher head are activated. Different crushing modes are available for uncoated pills, coated pills or multiple pills.

The Electronic Pill Crusher can be used 1,000 times or more before it needs recharging. AB Innovations is currently licensing the technology to a medical device manufacturer.

A. pills in plastic pouch prior to crushing
B. pills inside Electronic Pill Crusher
C. pills in powder form after being crushed by Electronic Pill Crusher

Rapid Screening Fits Patients for New HIV-fighting Drugs

New York State Department of Health

A new diagnostic assay developed by the New York State Department of Health and Health Research allows physicians to quickly screen potential candidates for a new class of HIV drugs.

The technology was developed at the Wadsworth Center of the New York State Department of Health in Albany from the late 1990s to the present by Sean Philpott, Ph.D., Barbara Weiser, M.D., Harold Burger, M.D., and Christina M. Kitchen, Ph.D., who is based in Los Angeles. Initial funding was provided by the New York State Department of Health, the National Institute for Allergy and Infectious Diseases, and a National Research Service Award from the National Institute of Child Health and Human Development.

Licensed and commercialized by Pathway Diagnostics as SensiTrop™, the lab test measures a patient's HIV-1 co-receptor usage, to determine if the patient is an appropriate candidate for a new type of HIV drug called CCR5-blocking or CXCR4-blocking entry inhibitors. A co-receptor is a specific part of the cellular structure that HIV needs in order to attack the cell.

These drugs are part of the first new class of drugs for HIV treatment in 10 years and offer hope to patients whose treatment with other HIV drugs has failed. They may also be effective in treating newly infected patients, while causing fewer side effects. However, only patients with a specific co-receptor type of HIV will benefit. A test for co-receptor usage, also known as "tropism," ensures that patients are matched with the right drug. Studies also indicate that tracking tropism may be an important new tool for clinicians monitoring HIV progression and making treatment decisions.

SensiTrop provides a significantly faster solution for screening HIV patients for compatibility with these new drugs. Mayo Laboratories has become the first major lab to offer the test. Because of the need to repeatedly perform tests to monitor patients, cost and turnaround time are important factors. SensiTrop is extremely sensitive, very rapid, and about half the cost as compared to the biological HIV tropism assay that's currently available.

New Test Kit Improves *In Vitro* Fertilization Success Rates

McGill University

In vitro fertilization (IVF) can be an emotional roller coaster for many couples, one that often ends in disappointment; using current methods, about 85 percent of healthy-looking embryos transferred through IVF fail to result in pregnancy. Aside from the emotional toll this takes, IVFs are expensive and not always covered by health insurance.

Researchers at McGill University in Montréal, Canada, have developed a rapid, noninvasive test for determining compatibility between an embryo and a potential mother. Professors David Burns, Ph.D., and James Posillico, Ph.D., at McGill's department of chemistry developed Via-Test™-E in 2006-2007. Funding was provided by The Natural Sciences and Engineering Research Council of Canada, Canadian Institutes of Health Research, and Molecular Biometrics, a medical technology company.

ViaTest™-E targets *in vitro* biomarkers of oxidative metabolism (OM) that are indicative of embryo viability. The degree of OM is basically a measure of the level of oxidative stress in the cells. Embryos and gametes that are highly stressed are less likely to result in pregnancy. ViaTest™-E enables the rapid, simultaneous identification and analysis of multiple OM biomarkers in a single sample. This methodology leads to the accurate detection of viable embryos of high reproductive potential.

Current practices grade and select embryos for implantation based on their morphology, or how they look. This is a subjective and inaccurate practice that leads to high failure rates. To counter this, a common practice is transferring multiple embryos. This, in turn, results in higher incidences of multiple births and increased health care risks to mothers and infants. When combined with morphology, ViaTest™-E provides the most accurate method for identifying the healthiest and most compatible embryos.

Molecular Biometrics has licensed the technology from McGill University and is marketing the test kit. This product is the first of its kind and has generated interest around the world. Long-term use of ViaTest™-E is expected to increase pregnancy rates, lower multiple births, and reduce health risks to mothers and babies.

Color-Coded Beads Help Women Avoid Unwanted Pregnancies

Georgetown University

Women who are poorly informed about pregnancy prevention — especially in poor or developing nations — are at much higher risk for unplanned births. Large numbers of children can create additional economic and emotional hardships for struggling families.

To help women prevent unplanned pregnancies, researchers at the Institute for Reproductive Health at Georgetown University in Washington, D.C., invented CycleBeads®, a string of color-coded beads that represent different days of the menstrual cycle, according to the "standard days™" method of family planning.

Victoria Jennings, Ph.D., and Marcos Arevalo, M.D., developed the system in 2000-2002, which was successfully field-tested in Bolivia, Peru and the Philippines. About $200,000 in funding was provided by the U.S. Agency for International Development and Georgetown University to develop and test the beads.

With CycleBeads®, a woman can track the days of her menstrual cycle, identify which days are her most fertile and determine whether her cycle is the appropriate length for using the standard days method. Field testing showed that, when CycleBeads® were combined with this method, women were 95 percent effective in preventing unplanned pregnancies.

CycleBeads® are easy to use and understand, inexpensive, and offer a contraceptive/family planning option for women who prefer not to use hormonal or invasive birth control methods. Because they are a visual tool, CycleBeads® also facilitate communication between women and their partners regarding fertility and sexual matters.

More than half a million women around the world use CycleBeads®, many of them in some of the world's poorest countries such as Burkina Faso, Mali, Rwanda, Madagascar, Benin, India, the Philippines, Peru, Ecuador, Bolivia, Guatemala and Honduras. In addition, many women in developed countries, including the U.S., use CycleBeads® as part of their birth control planning.

Photo courtesy of the Institute for Reproductive Health

Diagnostic Kits Speed Detection of Infectious Diseases

National University of Singapore

Malaria and dengue fever are mosquito-borne diseases that affect millions of people in the tropics, with malaria killing about three million people worldwide every year. Rapid, accurate diagnosis is paramount for timely treatment or emergency response/containment procedures. The standard test for the malarial *Plasmodium* parasite is time-consuming, laborious, and can produce false negatives. Testing for dengue fever takes up to eight days and may also deliver inaccurate results. However, a Singapore medical diagnostics company, using breakthrough molecular technology from the National University of Singapore, has developed rapid-assay test kits that detect killer parasites in a matter of hours.

National University of Singapore researchers Ursula Kara, Robert Ting, Jill Tham, James Nelson and Theresa Tan discovered and patented the unique nucleic acid diagnostic primers for these organisms over a 10 year period. The technology was announced in 1998.

A primer is a short strand of DNA/RNA that is required for the formation of longer chains of DNA/RNA. Using a single drop of blood, the highly sensitive polymerase chain reaction (PCR) technology can distinguish between different Plasmodium species within three hours. The dengue fever kit can detect the virus within three to five days after it first appears in the bloodstream, compared to the usual eight days using standard immunodiagnostic methods. Early detection enables earlier medical attention, which can be critical for preventing serious complications, such as dengue hemorrhagic fever and dengue shock syndrome.

The National University of Singapore has licensed its technology to Veredus Laboratories, which is manufacturing and selling several diagnostic kits. Singapore's National University Hospital has used the Veredus dengue fever kit for more than three years as a routine diagnostic tool. In addition, Veredus has produced the world's first validated commercial avian flu diagnostic kit, which has cut the time required to accurately detect the H5N1 virus from seven days to as short as two days. The company is also developing kits for encephalitis, SARS, yellow fever, Japanese encephalitis, and chicken pox.

DNA Analysis IDs Infectious Agents in the Field

Brandeis University

Quick response is critically important when dealing with an outbreak of disease or a biological weapons attack. Rapid identification of deadly microbes is essential for rapid deployment of emergency response plans and minimizing loss of life. Now an invention by a professor at Brandeis University in Waltham, Mass., provides accurate results from samples in less than two hours.

Professor Larry Wangh, Ph.D., and his laboratory colleagues have invented a unique DNA amplification and analysis technique called "Linear After The Exponential (LATE) PCR (Polymerase Chain Reaction)." LATE-PCR is an advanced form of asymmetric PCR which begins by generating double-stranded DNA molecules but then switches to efficient amplification of single-stranded molecules. LATE-PCR provides significant advantages over traditional PCR techniques that only generate double-stranded DNA molecules, especially its ability to identify multiple types of bacteria or viruses in a single test. The technology was first disclosed in 2002 and was licensed to Smiths Detection, Inc. in 2004. Since that time Smiths Detection has provided major funding for further research and development of LATE-PCR.

Smiths Detection has engineered a point-of-use instrument, known as the BioSeeq®, to enable the use of LATE-PCR outside of the traditional laboratory. The BioSeeq® is a sophisticated and ruggedized portable device that incorporates automated sample preparation, assay processing and result reporting. Bioseeq® can also be decontaminated by immersion into bleach, making it the ideal platform for use in field locations where spread of disease must be controlled. Initially, Bioseeq® and LATE-PCR will be used to monitor and control animal disease outbreaks. A sample from an animal can be prepared and analyzed on the BioSeeq® in under two hours. The veterinarian thereby has the opportunity to take effective action without the risks associated with removing a potentially infected sample from the location. Up to five independent tests can be run simultaneously on the BioSeeq®, and the LATE-PCR technology has the ability to identify several different infectious agents with a single test. The list of diseases/infectious organisms for which tests are currently being developed is long, but includes anthrax, tularemia, plague, and orthopox. Multiplex assays for Foot and Mouth Disease and Avian Influenza are also in an advanced stage of development. LATE-PCR technology will play an increasingly important role in counter-bioterrorism efforts, as well as in detecting and monitoring high contagious animal disease outbreaks.

Advanced Urine-Testing System Delivers Results in Hours, Not Days

George Mason University

A process can go no faster than the slowest step in that process. In urine culture testing, one of the slowest steps takes up to two days to deliver results.

However, scientists at George Mason University in Fairfax, Va., have invented an innovative new technology that can reduce this step to hours instead of days, while providing highly accurate results.

Disclosed in 1997, the "QuikiCult Rapid UTI Detection System" detects urinary tract infections much faster by identifying high concentrations of infectious bacteria using light spectrophotometry and automated computer-driven analysis. The research was funded by the university and the private sector.

Doctors and patients benefit from faster reporting times — as little as three hours for most negative samples, compared to 24-48 hours using current testing methods. Other advantages of the QuikiCult System include the ability to test larger samples, increased protection from contamination, fewer false positives and reduced labor costs for operators.

Because the system is portable and easy to operate, QuikiCult System is ideal for non-laboratory health care settings, including hospitals, doctors' offices, rural or remote clinics and nursing homes. By operating the system at the point of collection, fresh samples can be tested quickly and provide more accurate results.

The technology was licensed in 2004 to Maryland-based Macrobionetics, which supplies customized testing equipment for industrial companies and government agencies. The company is selling the QuikiCult System under the name "CultureStat" to health care facilities and reference laboratories across the United States and Canada.

Shoulder Prosthesis Provides Full Range of Motion for Arthritis Sufferers

Columbia University

About 25 million Americans suffer from rheumatoid arthritis or osteoarthritis. One of the worst symptoms of this disease is restricted, painful movement, which can become debilitating as the condition progresses. Joint replacement is an increasingly popular way to restore function and motion to severely arthritic joints.

Louis Bigliani, M.D., chief of the Center for Shoulder, Elbow, and Sports Medicine at Columbia University in New York, N.Y., Evan Flatow, M.D., former Columbia University professor, and Zimmer, Inc. invented the "Bigliani/Flatow Complete Shoulder Solution" in 2000. This shoulder prosthesis technology provides the restoration of shoulder joint function for people who suffer from pain or disability from osteoarthritis (deterioration of the shoulder joint), rheumatoid arthritis (cartilage inflammation in the lining of the shoulder joint), traumatic arthritis

(physical injury to the shoulder joint resulting in arthritis), and certain breaks in the shoulder bones. The first-of-its-kind surface and the head design of the device help patients achieve full joint mobility and stability throughout the shoulder's range of motion. Natural stresses on the shoulder area are also distributed more broadly, which reduces uneven pressure and associated wear on the artificial joint.

The Bigliani/Flatow Complete Shoulder Solution is manufactured exclusively by Zimmer, an international leader in orthopedic implants. The prosthesis is distributed through Zimmer's extremities division and holds a strong position in the global shoulder implant market.

New Surgical Tool Reduces the Effects of Glaucoma

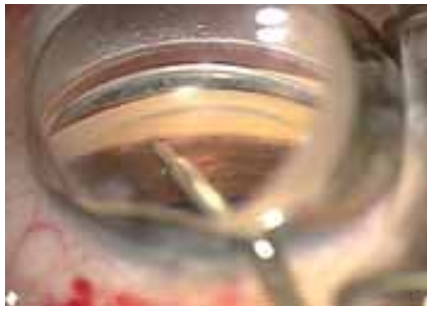
University of California-Irvine

Glaucoma is the second leading cause of blindness in the world, according to the World Health Organization. The disease occurs when the clear fluid in the eye does not drain properly through the trabecular meshwork, an area of spongy tissue near the base of the cornea. The poor drainage increases the internal pressure in the eye, which damages the optic nerve and causes progressive, irreversible vision loss over time.

In 2002 George Baerveldt, M.D., a professor at the University of California-Irvine's department of ophthalmology, invented a new surgical tool and method for treating glaucoma. This procedure allows surgeons to remove the clogged tissue, restoring access to the natural drainage pathways in the eye. Funding was provided by NeoMedix through a Small Business Innovation Research Grant from the National Eye Institute of the National Institutes of Health.

This technique is minimally invasive (only one clear corneal incision is required), relatively easy to perform, and can be combined with other surgical procedures, such as cataract removal. Studies have shown an 91 percent success rate in reducing pressure on the optic nerve.

Because of its excellent safety profile in both intra-operative and post-operative settings the Food and Drug Administration approved the procedure for open-angle glaucoma, a common form of the disease. The technology was patented in 2005 and licensed to California-based NeoMedix, which manufactures and markets the product as Trabectome®. The tool and procedure is currently being used in eyecare centers around the United States.



Ab interno trabeculotomy: Removal of diseased tissue using electrosurgical pulse. Continuous irrigation and aspiration removes debris and regulates temperature.

Software Program Enhances Campus Safety by Analyzing Incident Data

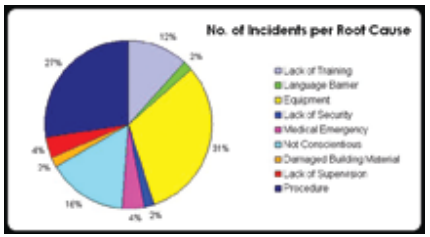
Boston University

Campus safety is a top priority among college and university administrators. When director Peter Schneider and associate director Ron Slade of Boston University's Office of Environmental Health and Safety (OEHS) realized there was no software package designed to track and analyze "incidents" on campus, they decided to create one.

Schneider and Slade developed the "Campus Incident Tracking System (CITS)" from 2000-2005 with $60,000 in funding from Boston University. CITS is a user friendly, Internet-based system that logs, tracks, analyzes, reports, and follows up incidents that occur on university, college and medical campuses.

The software captures critical information about each incident, and allows for trend and root-cause analysis. It is also a highly effective tool for recording information from multiple sources, such as police and fire officials, public safety personnel and eyewitnesses. Major risks can be identified and mitigated to improve campus safety, and speed up response time. The recorded data and reports can also be used to support lawsuits and internal audits.

Since it began using CITS, OEHS has tracked about 800 incidents. By analyzing trends and root causes, and implementing corrective actions, OEHS personnel have significantly improved campus safety. The university has licensed the software to Boston-based Axim Systems, which markets and sells CITS worldwide.



CATCH Reports on Community Health

University of South Florida

Three University of South Florida professors from the colleges of Public Health, Computer Information Sciences and Business Administration joined forces more than 10 years ago to use their combined expertise to develop a tool for assessing coummunity health.

Capitalizing on a unique combination of practical experience and research expertise in information technology, James Studnicki, Alan Hevner and Donald Berndt developed the Comprehensive Assessment for Tracking Community Health, or CATCH, which uses a data warehouse to assess the health status of community populations. CATCH Reports use more than 250 health care indicators in conjunction with an innovative comparative framework and weighted evaluation process to produce a ranked list of community health care challenges. For health care providers, community organizations and public agencies, the assessments can be used as a tool to determine resource allocation and health care policy formation. Individuals and whole communities benefit from the improved efficiency and effectiveness in how health care services, including medical and surgical procedures are provided. Moreover, health issues among defined populations can be better assessed and evaluated to determine smarter health care strategies for those groups.

The product precipitated and is licensed to a startup company called Medegy which is run by the inventors. Customers include hospitals, health departments and managed care organizations, with a large number of CATCH Reports being delivered to government-run and private health care agencies.

Web Site Provides Instant Access to Available Emergency Housing

Florida State University

Finding temporary shelter quickly after losing a home in a natural disaster such as a hurricane, earthquake, or forest fire is one of the most stressful challenges anyone can face. A new online resource created by faculty at Florida State University in Tallahassee provides government officials, real estate agents, and natural disaster victims with immediate access to information about available emergency housing in the area.

A research team led by Janet Dilling, director of Florida State University's Center for Disaster Risk Policy, created Disaster Housing Resources Online (DHROnline), a unique Web site that provides listings and descriptions of available rental properties in the region, as well as nearby states. The system operates on both a Web server and a database server at Florida State University.

Federal Emergency and Management Agency (FEMA) and the State Emergency Response Team launched DHROnline in 2004 in the aftermath of four major storms that hit Florida during the hurricane season. At its height, DHROnline listed more than 30,000 housing resources. In total, 120,000 housing opportunities were listed during the recovery from those storms.

The Web site was originally created for real estate agents and property owners in Alabama, Arkansas, Georgia, Florida, Louisiana, Mississippi and Texas. However, because of the widespread destruction from hurricanes Rita and Katrina in 2005, Florida State University expanded the DHROnline license to all 50 states.

3-D Prototyping Technology Streamlines Ceramic Manufacturing

Bowling Green State University

Ceramics are typically manufactured using prototype negative molds. Creating the mold is a time-consuming step that adds extra cost to the manufacturing process. Faculty at Bowling Green State University (BGSU) in Bowling Green, Ohio, have developed a rapid prototyping technology that uses a digital file to directly create durable ceramic products that can be glazed and fired in a kiln, without the need for a negative mold.

The construction of ceramic objects from digital models technology was developed in 2005-2006 by John Balistreri, Sebastien Dion and Amber Reed. Funding of $50,000 was provided by the BGSU Office of Sponsored Programs and Research. The research team invented specific ceramic recipes and binders that, when used in a rapid prototyping machine, produce fully functional and durable ceramic objects.

This technology eliminates the need for negative molds in the manufacturing process. It can produce an unlimited variety of precision, inert and heat-resistant ceramic parts, including insulators, gaskets, filters and engine parts. Architects and designers can create ceramic components directly from digital drawings of portions of walls, floors, and details of custom patterns in 3-D relief without going through an elaborate production process. Archaeologists, paleontologists, and restorers can also use this technology to quickly complete, reconstruct, or repair ancient fossils or artifacts through 3-D scanning and modeling techniques.

"Low Swirl Injector" Cuts Gas Turbine Nitrous Oxide Emissions

Lawrence Berkeley National Laboratory

Combustion has been one of the most studied chemical processes throughout history. The process does, however, release large amounts of pollution into the atmosphere that harms the environment and contributes to global warming. Now researchers at Lawrence Berkeley National Laboratory (LBNL) in Berkeley, Calif., have invented an ultra-low emissions combustion technology that significantly reduces greenhouse emissions and pollution from industrial burners and gas-turbines for electricity generation.

The Low Swirl Injector (LSI) technology was developed in LBNL's Environmental Energy Technologies Division by a research team led by Robert Cheng. Funding for the work was provided by the U.S. Department of Energy.

Cheng took a non-conventional approach to turbulent fluid mechanics, thermodynamics, and flame chemistry to create the Low Swirl Injector, which releases less than two parts per million of nitrous oxides (NOx) during combustion — almost five times less than its nearest competitor. The LSI is designed to be a drop-in component for gas-burning turbine power plants that requires no significant mechanical refitting. It also burns a variety of fuels, including natural gas, liquefied natural gas, petroleum production, refinery gases, waste gases and biogases.

LSI technology has the potential to eliminate millions of tons of greenhouse gases from the atmosphere every year. It is currently being sold by Indiana-based Maxon Corp. Several collaborative research projects are in progress that are testing combustion with different fuel types, including pure hydrogen. LBNL and Solar Turbines Inc. of San Diego are working together to develop an LSI unit for burning carbon-neutral renewable fuels from landfills, petroleum refining operations and other industrial processes.

Inventor Robert Cheng and the Berkeley Lab Low Swirl Injector.

Killing the Two-Stroke Engine That Pollutes Asia, Africa and South America

Colorado State University

Carbureted two-stroke engines are one of the world's largest sources of air pollution, especially in Southeast Asia. Nearly 35 percent of the fuel in these engines escapes directly into the exhaust and never burns, resulting in high hydrocarbon emissions. Pollution from taxis, scooters and other vehicles powered by two-stroke engines kills thousands of people annually in Asia, Africa and South America. In the Philippines alone, particulate emissions from 1.8 million two-stroke vehicles are estimated to result in 2,000 premature deaths every year.

Envirofit die cast cylinder head

To counter this problem, researchers at Colorado State University's Engines and Energy Conversion Laboratory in Fort Collins, Colo., invented the "Direct Injection Retrofit for Two-Stroke Cycle Engines Kit." Core technology developed by Orbital Engine Corp. was used in the design.

The retrofit technology was disclosed in 2003 and Envirofit International, a nonprofit corporation, was formed to commercialize the product. About $1.5 million in seed funding was provided by the Bohemian Foundation in Fort Collins from 2004-2007. During that time Envirofit perfected a production-ready direct-injection product, performed extensive field testing and began installing the technology on vehicles in the Philippines.

The retrofit kit significantly reduces emissions and improves fuel efficiency. The direct-injection method results in more complete combustion of fuel, reducing carbon monoxide emissions by 76 percent, carbon dioxide emissions by 35 percent and hydrocarbon emissions by 89 percent. At the same time, fuel use is reduced by 35 percent and oil by 50 percent.

An Envirofit retrofit kit costs about $350, but the annual fuel and oil savings are more than $500. For a typical Filipino taxi driver, the $500 in annual savings represents about a 40 percent increase in income. To date more than 500,000 kits have been installed worldwide.

Lead-Free Solder Makes Electronics Production Safer

Iowa State University-Ames

Because of its harmful impact on human health and the environment, lead has been removed from many commonly used products. However, lead-based solder is still used in the manufacturing process, especially for electronics. Discarded computers, cell phones, and other electronic devices are a major source of lead contamination in landfills.

In partnership with Sandia National Laboratory in New Mexico, Iowa State University-Ames researchers patented a new type of lead-free solder technology in 1996. Funding was provided by the Department of Energy and the Iowa State University Research Foundation.

The tin-silver-copper solder has superior performance characteristics compared to other lead-free alternatives on the market, such as a lower melting temperature and greater strength. These properties are especially important in prolonged high-heat conditions, such as those found in computers and cell phones.

Besides protecting the environment, eliminating lead from the solder used in manufacturing makes companies more competitive in the global marketplace. For example, Europe strictly limits the amount of lead and other hazardous materials contained in electronic appliances, and a similar initiative is being considered in Japan. Accordingly, Iowa State University's technology is gaining international interest. To date there are 61 licenses in 16 different countries.

Iver Anderson, senior metallurgist at the U.S. Department of Energy's Ames Laboratory, uses tongs to remove a soldered sample from the hot plate to place it on a chill block for cooling and solidification of the solder joint sample.

Photo courtesy of the U.S. Department of Energy's Ames Laboratory.

Storage Medium Protects Sensitive Biological Materials

University of Wisconsin-Madison

Preserving the structural and functional viability of biological materials is essential for biochemical and biomedical research. However, protective agents that are commonly used today, such as fish proteins, are only effective with certain sample types. Now researchers at the University of Wisconsin-Madison have invented a preservation medium that works well with a variety of biological materials.

A new preservation and storage medium for biological materials was developed in 1999 by Juan DePablo, Ph.D., professor of chemical engineering at the University of Wisconsin. Funding was provided by the National Science Foundation and Rhodia (now part of Danisco Co.).

Disclosed in 2000, the preservation medium is a mixture of monosaccarides, polysaccarides and phosphate ions. It works as a cryopreservative that stabilizes biological materials during freezing and/or drying processes, while maintaining the structure and function of these samples. Compared to other storage mediums on the market, this material provides longer-term stable preservation over wide ranges in temperature and humidity, works well for both freeze-drying and ambient-temperature drying and is less expensive.

Many biological materials can be preserved using this new medium, including enzymes, proteins, viruses, vaccines, tissues, blood, foodstuffs, semen and nucleic acids. This technology can also be used for increasing the shelf life of temperature-sensitive health-care supplements, such as probiotic capsules and powders, as well as freeze-dried bacterial cultures used in the dairy industry.

Setting the International Standard for Handling Human Biomaterials

Wayne State University

Using human biological samples for research has always been somewhat difficult because there has been no centralized and standardized method for acquisition, processing and data. Because of this, researchers have largely depended on animal testing for early stage drug development — which does not always yield the same results as human testing. To make the use of human biomaterials more viable, researchers at Wayne State University in Detroit, Mich. have developed standardized technologies and procedures for the collection, preservation and processing of human tissue samples and associated data for use in biomedical research.

These technologies and procedures were developed from 2000 to 2006 through a partnership between Wayne State University and Asterand, a high-tech startup company founded by Oxford Biosciences Partners and Randal Charlton. Initial funding was approximately $500,000; subsequent rounds of funding totaled $14 million.

Asterand and Wayne State University developed procedures, technologies, and tools for all aspects of human sample collection. This includes forms for paperwork, the logistics of bringing collection protocols to review boards for approval, and patient screening. Research groups worked together to define standard methods for characterizing tissue histopathology, molecular integrity and clinical data components.

Wayne State University's Office of Technology Commercialization has entered into a number of collaborative agreements with Asterand that involve hospitals and collection facilities. Through this consistent, standardized handling of human biomaterials, scientists around the world can now conduct their research in a more efficient way, which will enhance the discovery and commercialization process.

Automation Technology Speeds DNA Analysis

Lawrence Livermore National Laboratory

In the event of a disease outbreak or biochemical terrorist attack, identifying the pathological agents as quickly as possible is critical for mitigating losses. Technology developed at Lawrence Livermore National Laboratory in Livermore, Calif., now automates the molecular analytical process, reducing the time spent obtaining DNA identification from several hours to several minutes.

Lawrence Livermore National Laboratory (LLNL) is a U.S. Department of Energy research laboratory managed by the University of California. The new automation technology, involving a micro-machined chemical reaction chamber with rapid and precise thermal control, was developed from 1994-1995 by LLNL researchers Allen Northrup, Raymond Mariella, Anthony Carrano and Joseph Balch. Initial funding was provided by the Defense Advanced Research Projects Agency, an arm of the U.S. Department of Defense.

What makes this technology unique is the improvement in the thermal control over the reaction occurring in the reaction chamber. Before this technology was developed, a single heating/cooling cycle for copying a DNA strand could take up to four to five minutes, and 30-40 cycles would require several hours for full amplification and identification. Not only do long cycle times delay the DNA identification, but they also permit extraneous reactions to occur in the sample and interfere with the analysis. LLNL technology is a more efficient way to reproduce exact copies of DNA sequences, decreasing the cycle time to as little as several seconds to copy a single strand of DNA, and the full amplification process to a matter of minutes.

The technology was licensed by LLNL to Cepheid, a California-based startup company founded in 1997 to develop and commercialize genetic analysis systems for the clinical assessment, biothreat and life sciences markets. Core products being marketed today by Cepheid that are licensed under this technology are Smart Cycler® and GeneXpert® real-time thermocyclers, which can quickly perform a variety of genetic tests. Cepheid is to continue developing a broader array of tests for the scientific and medical communities.

Smart Cycler® and GeneXpert® are trademakrs of Cepheid.

Measuring pH of Exhaled Breath Helps Identify Airway Diseases

University of Virginia

When it comes to identifying airway diseases and a course of treatment, standard methods of monitoring airway inflammation in patients have proven invasive, difficult and expensive — until now. Physicians at the University of Virginia in Charlottesville have developed a quick, non-invasive, inexpensive breath-analysis test that accurately determines the severity of lung diseases, as well as the presence of acid reflux, which often leads to lung disease.

This new methodology, involving exhaled breath condensate pH measurement, was developed primarily by John Hunt, M.D., and Ben Gaston, M.D., both faculty members at the University of Virginia. Engineer Rafi Baddour of Respiratory Research, a University of Virginia startup company, designed the "RTube™ Exhaled Breath Condensate Collector."

The RTube™ is used with the pH measurement system to test samples of condensed breath, which provides previously unavailable information about how much acid there is in the lungs in diseases such as asthma, chronic cough, acid reflux and respiratory failure in the intensive care unit. Test results, obtained in as few as 20 minutes, are useful for identifying gastric acid reflux as the cause of chronic cough, as well as determining which patients need airway pH neutralization therapy.

This system is readily usable by patients in a home, clinic, hospital or emergency room setting. RTube™ provides highly reproducible results that may have relevance to airway pathology beyond asthma, including cystic fibrosis, smoking-induced diseases and occupational lung diseases. Scientists are using this equipment to better understand airway biochemistry and to develop more effective therapies for respiratory diseases.

RTube™ used for collection of exhaled breath condensate at home or in clinic, for measurement of airway acidity.

Implanted Medical Device Relieves the Pain of Spinal Stenosis

Yale University

Over 500,000 older Americans suffer from lumbar spinal stenosis. Progressive degeneration of the skeletal structure in the lumbar area (lower back) with aging can create a narrowing of the spinal canal, or spinal stenosis. This condition compresses nerve roots in the spine, resulting in chronic lower back pain and leg pain. Standard surgical treatment involves fusing the troublesome vertebrae together; although this does provide pain relief, it also greatly restricts motion.

After 20 years of research, Manohar Panjabi, Ph.D., a professor at Yale University Medical School in New Haven, Conn., perfected a surgically implanted device that stabilizes the weakened area of the spine, relieving pressure on the nerves and also preserving motion and flexibility. This safer and lower-cost alternative to spinal fusion decreases the specific movement in the spine that causes pain, while still allowing bending and twisting motions.

Called Stabilimax NZ®, this spine stabilization technology uses an innovative dual-spring mechanism that provides maximum stabilization to the spine, which decreases the motion that causes nerve compression and pain. Components of the device are made from non-ferromagnetic cobalt chromium, Elgiloy, and titanium alloy. Implanting Stabilimax NZ® is a minimally invasive surgical procedure that requires a shorter hospital stay than spinal fusion.

Panjabi founded Applied Spine Technologies to further develop and commercialize the Stabilimax NZ® system for treating chronic low back pain. Controlled clinical trials are underway in Europe and the United States. Once approved, Stabilimax NZ® is expected to become the treatment of choice for lumbar spinal stenosis.

Stabilimax NZ® with two levels

Surgically Implanted Plate Ideal for Challenging Fractures

University of North Carolina at Chapel Hill

Metaphyseal fractures are breaks that occur at the end of a bone, near the junction between the tubular shaft and the blocky end of the bone. Standard methods of repair, including casts, external fixators, pins and plates, may result in less-than-perfect outcomes, such as shortened bones, infection or chronic pain, irritation and stiffness.

Conventional plates can be effective, but a large incision is required that usually results in a significant scar. The plates are large and have irregular surfaces that can irritate tendons, muscle tissue and skin, causing discomfort and restricted motion.

To remedy these problems, Laurence E. Dahners, M.D., professor of orthopaedic surgery at University of North Carolina at Chapel Hill, invented the percutaneous intrafocal plate system in 2000. The device is a simple, safe and effective method for treating metaphyseal fractures that is more comfortable and does not result in major scarring.

The plate system is inserted through a very small incision above the fracture. The body element of the plate is actually inserted into the tubular hollow of the bone, so the plate is seated securely in the fracture site. Because the plate is slender and has a smooth surface, it does not irritate soft tissue. The system also enables screw placement at pre-determined anatomic angles so bone fragments can be attached to the plate for maximum stability.

The University of North Carolina has licensed this technology to Minnesota-based Tornier U.S., a leading designer of medical devices. Tornier U.S. is actively marketing the device as the CoverLoc Volar Plate™.

New Bio-Material Improves Heart Surgery Outcomes

Purdue University Research Foundation

More than 650,000 open heart surgeries are performed every year. During open heart surgery, the thin sac or casing surrounding the heart is cut open and sometimes even damaged. It's usually left unrepaired because a compatible repair material is not readily available. This increases the risk of developing scar tissue or adhesions, which may result in difficult follow-up surgery.

In the late 1980s and early 1990s researchers at Purdue University, West Lafayette, Ind., in partnership with Cook Biotech Inc. in Purdue Research Park, developed the CorMatrix® ECM Patch for closing the pericardial sac during surgery. Further cardiovascular applications were developed by Rob Matheny, M.D. of CorMatrix Cardiovascular Inc. in Sunnyvale, Calif.

The CorMatrix® ECM Patch is made from a pig's small intestine submucosa, which has been used for years in general soft tissue reconstruction and repairing wounds. This same material is now being used by heart surgeons.

The CorMatrix ECM® Patch provides surgeons with a way to repair or reconstruct the sac surrounding the heart. This also helps restore the natural barrier between the back of breastbone and the heart and can also protect underlying grafts.

In 2006 the first CorMatrix® ECM Patch was implanted to close the pericardial sac. To date more than 2,000 pericardial closure implants have been successfully performed in the United States. CorMatrix® Cardiovascular Inc. continues to research and develop new cardiovascular applications for this innovative technology.

The CorMatrix® ECM Patch for pericardial closure is used to repair the sac surrounding the heart after surgery.

Photo Courtesy of CorMatrix® Cardiovascular Inc.

Transgenic Mosquito May Help Fight the Spread of Malaria

Johns Hopkins University

According to the World Health Organization, malaria infects up to 500 million people every year and causes more than 1 million deaths. Despite efforts by the research community, malaria continues to plague much of the world because of the genetic complexity and multiple distinct life-cycle stages of the *Plasmodium falciparum* parasite, which carries the disease.

For decades, scientists in laboratories around the world have worked steadily toward creating genetically modified (transgenic) species. In the late 1990s the first transgenic mosquito was developed. Researchers at the Johns Hopkins Malaria Research Institute, with financial support from the National Institutes of Health, have now proven that mosquitoes can be genetically modified so they cannot support the deadly parasite.

Unlike other diseases, humans cannot spread malaria through direct contact. The parasite must first complete its cycle within a mosquito and be transmitted through a mosquito sting. Led by Marcelo Jacobs-Lorena, Ph.D., a professor at Johns Hopkins School of Public Health, researchers have identified a glyco in the mosquito's genetic makeup that the parasite must have in order to fully develop. If access to that protein is blocked, the parasite dies. This important discovery may result in a future vaccine that uses antibodies that block the production of this key sugar in the mosquito. Thus if a mosquito feeds on a vaccinated human, it would ingest the antibody, which would ultimately kill the parasite.

Studies by Jacobs-Lorena and his team have also demonstrated transgenic mosquitoes are just as fit and durable as normal mosquitoes. This improves the chances of possibly interbreeding transgenic mosquitoes with normal mosquitoes in the wild.

Temperature-Stabilizing System Ideal for Transporting Perishable Materials

University Technologies International/ University of Calgary

Maintaining exact temperature control for specialty products, such as medicines, organs, tissue samples and blood products, is a big challenge for shipping companies – one that can actually be a matter of life and death. Now a new heat-stabilizing technology developed by a Canadian engineering firm makes it easier to guarantee the safe arrival of critical shipments.

In 1999 Ted Malach of Calgary-based Intermed Engineering invented a unique packaging "phase change" material that can maintain a restricted temperature range for up to 72 hours. It's also reusable, nontoxic and meets all transportation regulations.

Intermed Engineering approached University Technologies International — the technology transfer and commercialization arm of the University of Calgary — to help commercialize the product.

As a result of their efforts, the technology was licensed in 2001 to Saf-T-Pak and trademarked as Saf-T-Temp™. Saf-T-Pak, an international company based in Edmonton, Canada, develops and markets packaging materials that meet the regulatory requirements for transporting infectious substances by global organizations such as the United Nations and the International Air Transport Association. Saf-T-Pak is also exploring the possible use of this unique material for shipping sensitive electronic equipment. It may also be beneficial in the production of clothing and building materials.

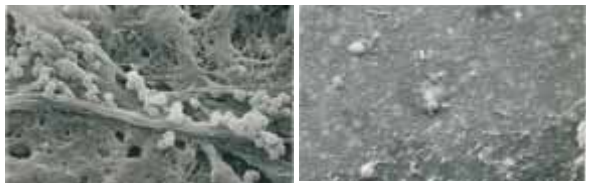
Antimicrobial Coating Prevents Serious Infections

Columbia University

Infections are a growing problem in health care settings. According to the Centers for Disease Control, there are 4.5 hospital infections for every 100 patient admissions, and nearly 100,000 deaths annually from hospital infections. To fight this problem, department of surgery researchers at Columbia University in New York, N.Y. have developed an antimicrobial coating for implanted medical devices that reduces the risk of post-operative infection.

From 1984 to 1987 Shanta Modak, M.D., Charles Fox, M.D., and Lester Sampath, M.D. developed the method and technology for applying an antimicrobial coating to medical devices and surfaces, making them infection-resistant. The coating consists of a polymeric matrix containing antimicrobial silver sulfadiazine and chlorhexidine. Initially funded with $500,000 from Daltex Medical Sciences, early experiments involved coating urinary catheters, gauze dressings, soft tissue patches, arterial grafts, catheters, wound covers, gloves, masks, contraceptive devices and implantable pumps.

Columbia University licensed this technology to Daltex Medical Sciences in 1987, which later sublicensed it to Arrow International. Studies have shown a 50-80 percent reduction in catheter-related infection and a 60 percent reduction in bloodstream infection when this antimicrobial coating is used. Arrow International has sold more than five million central venous catheters that utilize this technology. W.L. Gore also incorporates this coating in manufacturing the only hernia repair material that inhibits bacterial colonization in the hernia repair patch for up to two weeks after its implantation. Current research also indicates a lower risk of microorganisms developing resistance to antimicrobial-coated surfaces compared to non-coated implanted medical devices, making them a better long-term solution for patients.



Scanning electron microscopy of the intravascular portion of catheters covered in antimicrobial coating technology retrieved seven days post implantation in swine show decreased bacterial adherence and biofilm formation.

Photo courtesy of Shanta Moda, M.D.

Cloned Enzymes Identify Bacterial Toxins at Extremely Low Levels

National University of Singapore

Because horseshoe crab blood immediately clots when it comes into contact with bacteria, the blood of this unique animal has been used for decades by pharmaceutical companies for testing the purity of sterilized medical equipment and human injectable products. Although this quality assurance method is effective, it is costly, time-consuming, and suffers batch-to-batch variations in sensitivity, and could possibly kill the horseshoe crab, which is now considered an endangered species in various parts of the world. Now, however, a genetic engineering breakthrough at the National University of Singapore has cloned the enzyme that clots the blood of the horseshoe crab.

A novel generation of cloned horseshoe crab recombinant Factor C for detection and removal of endotoxin was discovered in 1998 by professor Ding Jeak Ling of the department of biological sciences, and associate professor Ho Bow of the department of microbiology. The cloned "Factor C" enzyme reacts to bacteria and endotoxins at extremely low levels, and is more stable and chemically consistent than the naturally occurring form. This technology also enables Factor C to be produced without having to bleed horseshoe crabs, which will help conserve this dwindling species.

The Factor C recombinant technology has been licensed by the National University of Singapore to several companies, including BioDtech and Lonza, a global life sciences company based in Switzerland. Lonza is using the cloned enzyme in both their Pyrogene™ and PyroSense™ systems with Pyrogene being an endotoxin detection kit whilst PyroSense is an online endotoxin monitoring system.

Medical Software Provides Blood Analysis at the Point of Need

University of Virginia

The "Remote Automated Laboratory System" (RALS) was developed by a group of engineers and faculty in the Medical Automation Research Center at the University of Virginia (UVA) in Charlottesville, Va. RALS is an interactive, multi-station, medical specimen analysis system that analyzes specimens taken at remote locations, processes the data at a central laboratory, and transmits results back to those locations.

Engineers Robin A. Felder, Keith Margrey, Bill Holman, Jim Boyd, John Savory, and Antonio Martinez designed RALS to solve the challenges of delivering quality laboratory care at the point of need (typically a patient's bedside). The UVA invested more than $100,000 in developing and testing the system from 1985 to 1989.

Not only is RALS a software tool, but it also serves as a robotic system that automatically performs blood gas analysis. It connects patient blood testing in various locations around the hospital with the central laboratory, which allows laboratory professionals to assure the quality of the testing being performed by nurses and other patient caregivers.

The UVA licensed RALS to Medical Automation Systems in 1999. Point-of-care analytical instruments, which are often not equipped to communicate with a computer, can be connected to RALS through customized interfaces developed by Medical Automation Systems or the instrument manufacturer. Since its inception, RALS has saved the UVA health system more than $5 million by eliminating the need for a fully staffed laboratory near the patient's bedside.

A medical technologist reviews a blood gas result from the critical care unit three floors above.

Photo courtesy of the UVA Medical Automation Research Center

Biomarkers Identify Best Treatment Options for Leukemia Patients

University of California, Los Angeles

In 2001 the Federal Drug Administration (FDA) approved the drug Gleevec™ as a first-line therapy for treating chronic myeloid leukemia (CML). To date results have been impressive — over 90 percent of the patients who received Gleevec responded well to treatment, with many experiencing complete remission. Yet the remaining 10 percent failed to respond at all to Gleevec, or experienced slight improvement before developing a resistance to the drug and relapsing.

Researchers at the University of California, Los Angeles, have discovered key mutations that are predictive of Gleevec activity and resistance. Disclosed in 2001, the Gleevec pharmacogenomic test was developed by Mercedes Gorre, Neil Shah, John Nicoll, and Charles Sawyers. Initial research was funded by the National Institutes of Health.

The Gleevec Pharmacogenomic Test can be used to accurately determine whether CML patients will respond favorably to Gleevec. In 2005 the university licensed this biomarker technology to Genzyme, which manufactures a diagnostic test that can quickly identify patients who are likely to respond to Gleevec, as well as those who are likely to develop resistance to the drug. Physicians and clinicians using this test will be able to make earlier and more effective treatment decisions for their patients regarding Gleevec therapy.

Drug Combination Relieves Heartburn Discomfort

Brigham and Women's Hospital

Heartburn is a prevailing condition for many Americans that can lead to gastro reflux disease, scarring of the esophagus, painful or difficult swallowing, and precancerous lesions. More than 60 million Americans have heartburn at least once a month, and about 15 million have it daily. Antacids have long been known to temporarily relieve the symptoms of heartburn. Researchers at Brigham and Women's Hospital, a teaching hospital at Harvard Medical School, in Boston have incorporated antacids into a more effective, longer-lasting medication for heartburn relief.

Michael J. Wolfe, M.D. (now section chief of gastroenterology at Boston University Medical Center), combined standard antacids with H2 antagonist pharmaceuticals to create the new medication. H2 antagonists are drugs that block the activity of histamine along the stomach wall, thereby decreasing the amount of acid these cells produce. The "double punch" of antacid and H2-anatgonists (such as Pepcid™) provides immediate and longer-lasting relief from heartburn discomfort.

Prior to this discovery, medical researchers believed that using both these medications together would decrease the effectiveness of the H2 antagonist. Brigham and Women's Hospital licensed the technology to Johnson & Johnson/Merck Consumer Pharmaceuticals Co., which subsequently developed a new version of Pepcid™ called Pepcid Complete™. Pepcid Complete is highly regarded as an over-the-counter medication that provides heartburn relief for millions of people.

Rotavirus Vaccine Will Save Hundreds of Thousands of Lives

Cincinnati Children's Hospital Medical Center

Rotavirus infection is the primary cause of gastroenteritis in children. More than 600,000 children around the world die every year from this virus, mostly in developing countries. Gastroenteritis results in painful inflammation and infection of the gastrointestinal tract — symptoms include diarrhea, internal bleeding, vomiting and dehydration.

Scientists at the Cincinnati (Ohio) Children's Hospital Medical Center Division of Infectious Diseases have developed an oral vaccine against the virus. Richard Ward, Ph.D., and David Bernstein, M.D. developed the rotavirus vaccine from 1989 to 1995. Initial funding was provided by the National Institutes of Health.

The Rotarix™ vaccine immunizes children against rotavirus infection and is quickly gaining acceptance around the world. The government of El Salvador has recently undertaken a national immunization program using Rotarix. Prior to the program, there were 15-20 deaths and hundreds of hospitalizations of children per year due to rotavirus infection. Since the Rotarix vaccine program was introduced in early 2006, there have been no reported deaths or hospitalizations of children caused by rotavirus infection.

Dick Ward, Ph.D. at work in his lab at Cincinnati Children's Hospital Medical Center.

Photo courtesy of Cincinnati Children's Hospital Medical Center

T-Cell Vaccination Lessens the Effects of Multiple Sclerosis

Baylor College of Medicine

Multiple sclerosis (MS) is an unpredictable neurodegenerative disease that exhibits highly variable symptoms, depending on how advanced the disease is and what areas of the central nervous system are being afflicted. Because MS is so variable, it is difficult to prescribe treatment protocols that are effective over the long term. However, researchers at Baylor College of Medicine in Houston have developed an effective therapy that is custom-designed for each patient's unique MS condition.

Jingwu Zang Zhang, M.D., a professor formerly with Baylor's department of neurology, developed a T-cell vaccination approach to fight multiple sclerosis in the late 1990s. T-cells are white blood cells that boost the body's immune response to infection and disease. The research was supported by funding from the Richardson Foundation. A disclosure for "T Cell Vaccination in Multiple Sclerosis" was submitted to the Baylor Licensing Group in 2001. The technology was licensed shortly thereafter to Opexa Therapeutics, Inc., and is now in phase II clincial trials under the name Tovaxin™.

Tovaxin™ is custom-made for each patient. It consists of irradiated T-cells that are reactive against myelin-basic protein, a key component of the protective sheath that covers nerve fibers. In MS, autoreactive T-cells attack the myelin sheath, resulting in neurological impairment that can range from mild to severely debilitating. Tovaxin stimulates an immune response from the body that specifically fights these autoreactive T-cells.

Tovaxin™ is beneficial to MS patients because it specifically treats the root cause of the disease — T-cells that are attacking myelin sheaths in the brain. Unlike more generalized treatments for MS, such as interferon, Tovaxin™ has fewer side effects, produces more consistent results, and is a highly personalized, patient-specific treatment therapy.

A Real-Life Wonder Drug

University of Illinois at Chicago

Since its discovery in the 1950s, millions of people worldwide have benefited from the tuberculosis vaccine Tice™ BCG (a bacterial preparation of a strain called Bacillus Calmette-Guerin). Today BCG is also used as a highly-effective treatment for bladder cancer and a preventative therapy for bladder tumors.

Tice™ BCG was developed at the University of Illinois at Chicago's Institute for Tuberculosis Research by its late director, Sol Roy Rosenthal. While Tice™ BCG is still used today against TB, the decline of TB cases in the U.S. allowed researchers at the UIC Institute to focus on other possibilities for the medicine. They were encouraged by research showing BCG to be an effective immune system stimulant and anti-cancer agent and began testing BCG's cancer fighting components. When injected, it is now an established treatment for bladder cancer and tumors and is a promising therapy for colon and lung cancer. Taken orally, tests show BCG could offer a non-surgical treatment for breast and other hormone-dependent cancers.

In 1986, UIC licensed Tice™ BCG to Organon USA; the University receives royalties of more than $1 million per year. The UIC Institute continues to pursue the discovery of anti-tuberculosis agents and their applications for other infections.

Prezista™ Leads the Next Generation of HIV Drugs

University of Illinois at Chicago

HIV mutates quickly, rapidly rendering drugs ineffectual. The FDA granted accelerated approval for the anti-HIV medicine Prezista™ in June 2006 and has indicated its use in salvage therapy, a form of treatment given after an ailment does not respond to standard treatment. For the thousands of patients with multi-resistant strains of HIV, Prezista™ is proving a potent option in their fight against the disease.

Possessed of a novel molecular structure, Prezista™ is always co-administered with ribonavir, a protease inhibitor which slows the breakdown of the drug in the body, and other antiretroviral agents. They work together to minimize the risk of a patient developing resistance to the drugs. Prezista™ is one of two second-generation protease inhibitors providing a major advance in drug resistance.

Prezista™ was developed at the University of Illinois at Chicago by Arun Ghosh, Ph.D. of the department of chemistry (now at Purdue University) with support and collaboration from the National Institutes of Health. In 1999, Prezista™ was licensed to Tibotec Therapeutics, a division of Ortho Biotech Products, L.P. It is expected that Prezista's sales potential will be $781 million by 2010. The University of Illinois at Chicago stands to receive millions of dollars in royalties.

Synthetic Vitamin D Protects Bone Strength in Kidney Failure Patients

University of Wisconsin-Madison

A serious side effect from kidney failure is the depletion of vitamin D hormone, which is manufactured by the kidneys and regulates calcium absorption from the intestines. Without adequate levels of vitamin D hormone in the bloodstream, the body cannot process enough calcium from digested food and instead must draw calcium into the blood from the skeleton. Over time this leads to weakened, brittle bones that break easily. To fight this condition, in the early 1990s, scientists at the University of Wisconsin-Madison invented paricalcitol, a synthetic form of vitamin D hormone that regulates calcium in the bloodstream.

Biochemistry professor Hector DeLuca, Ph.D., led the research team that discovered paricalcitol (now sold commercially as Zemplar™). Initial funding for the research was provided by the National Institutes of Health.

When calcium levels in the blood are low, the parathyroid gland produces parathyroid hormones that trigger calcium release from the bones. During kidney failure the parathyroid gland is in a state of over-production known as secondary hyperparathyroidism. Paricalcitol suppresses the activity of the parathyroid gland and the over-production of parathyroid hormone by increasing calcium levels in the blood. Paricalcitol is also safer than other vitamin D hormone therapies because it has lower risk for elevating blood calcium to dangerous levels.

The use of vitamin D hormone therapy in chronic kidney disease patients has increased since paricalcitol was commercialized as Zemplar. Nearly 80 percent of patients on kidney dialysis now receive vitamin D hormone compared to approximately 60 percent in 1999. Paricalcitol generates more than $30 million each year in royalties for the University of Wisconsin, where research continues for clinical applications of vitamin D in psoriasis, osteoporosis, cancer and a variety of autoimmune/inflammatory diseases.

ReoPro™ Cuts the Risk of Heart Attacks After Coronary Artery Angioplasty and Stent Replacement

Stony Brook University–Long Island

Sticky platelets in the blood often group together to form blood clots that can result in heart attacks — a definite concern during or soon after cardiovascular procedures such as angioplasty and stent placement. However, these risks are greatly reduced today because of a groundbreaking discovery in the early 1980s at the Stony Brook University School of Medicine in Long Island, N.Y.

While conducting research on platelet behavior, Barry Coller, M.D. (now physician-in-chief at Rockefeller University in New York), produced an antibody that inhibits platelets from sticking together. Further research showed the antibody was more effective than aspirin in preventing abnormal platelet aggregation in animal models. Much of the funding for this early research was provided by the National Institutes of Health. In 1994, after 13 years of research and testing, the FDA approved the drug abciximab (Centocor/Lilly), which is based on this antibody.

Abciximab is the first therapeutic drug derived from research in The State University of New York system and is licensed to Centocor Inc., an international biotechnology company specializing in antibody production and technology. Today Centocor/Lilly sells abciximab under the name ReoPro™. More than two million people have been treated with ReoPro™ as a preventative measure during cardiovascular procedures, such as angioplasty and stent placement.

New HPV Vaccine Fights Cervical Cancer

National Cancer Institute, National Institutes of Health

In 2006 the U.S. Food and Drug Administration approved Gardasil™, a vaccine developed by Merck and Co. for preventing human papillomavirus (HPV) infection in women. HPV is the major cause of cervical cancer and the most common sexually transmitted disease in the United States. The vaccine represents a new era in women's health and cancer prevention.

Cervical cancer is the second-leading cause of cancer death in women, killing more than 250,000 women every year around the world. In fact, research shows that nearly all cases of cervical cancer are related to HPV.

Douglas Lowy, M.D., and John Schiller, Ph.D., at the National Institutes of Health's National Cancer Institute, started their research on the structure and behavior of HPV nearly 20 years ago. They discovered that a certain protein in the virus could be used to create non-infectious, virus-like particles (VLPs) that closely resemble the actual virus. Injection of VLPs stimulates the body's immune system to create its own HPV antibodies. They also developed an innovative technology for producing large amounts of VLPs using insect cells.

The technology was licensed to Merck and Co., which did more research and ultimately developed Gardasil. Clinical studies in 13 countries have shown Gardasil to be 100 percent effective in preventing HPV16- and HPV18-related cervical cancers (these two strains of HPV represent 70 percent of all cervical cancer occurrences). In addition, the vaccine is highly effective in preventing genital warts. The National Institutes of Health also licensed the VLP technology to GlaxoSmithKline, which is conducting trials of its own HPV vaccine and expects to apply for FDA approval soon.

Drug Technology Targets Alzheimer's Disease in Its Earliest Stages

Tel Aviv University

Alzheimer's disease is a devastating neurodegenerative disorder that is increasing at alarming rates around the world. The Alzheimer's Association estimates that by 2050 nearly 12 million Americans and 45 million people worldwide will be afflicted with this chronic, debilitating condition.

A new weapon against Alzheimer's disease has been invented at the George S. Wise Faculty of Life Sciences at Tel Aviv University in Israel. The novel pharmaceutical technology consists of drug candidates with a unique mechanism of action that targets the very early stages of Alzheimer's disease.

This technology was developed from 2003 to 2007 by a research team led by professor Ehud Gazit, Ph.D. The project was part of a portfolio of technologies funded by an $8.5 million investment raised by Ramot at Tel Aviv University Ltd., the university's technology transfer company. A group of U.S. investors provided the investment capital.

Tel Aviv University licensed the discovery to Merz Pharmaceuticals GmbH in 2007. Merz is one of the world's leading pharmaceutical companies in Alzheimer's disease research and development.

Kepivance™ Improves Quality of Life for Cancer Patients

National Cancer Institute, National Institutes of Health

Chemotherapy and radiation are widely accepted treatments for many forms of cancers. Although they can be highly effective in eliminating or shrinking tumors, they often have serious side effects that destroy normal tissues. One of the most painful, debilitating, and depressing side effects of these treatments is mucositis, which results in painful ulcerations that attack the lining of the mouth. Mucositis can make a patient's everyday activities, such as eating, drinking, swallowing, and talking, difficult or impossible.

A research team led by Jeffrey Rubin, M.D., at the National Cancer Institute, within the National Institutes of Health (NIH) in Bethesda, Md., made an important finding in the late 1980s. They discovered a compound that has proven effective in fighting oral mucositis. This substance, called keratinocyte growth factor (KGF), occurs naturally in the human body and stimulates cells on the surface layer of the mouth to grow, which speeds healing of ulcers. Palifermin, a man-made version of KGF, is equally effective in treating mucositis.

The NIH then partnered with Amgen, a company specializing in chemotherapy-related products, to develop a therapeutic based on KGF. Amgen received an exclusive license from the NIH for its KGF technology in 1992. After years of research and testing Amgen has released its anti-mucositis drug, Kepivance™.

Kepivance™ was approved by the Food and Drug Administration in 2004 for reducing the incidence and duration of oral mucositis in leukemia patients undergoing bone marrow/ blood cell transplantation. Prior to Kepivance™, no effective treatment existed for this condition. Currently this drug benefits about 11,000 adult Americans who undergo bone marrow transplants each year. This reduces medical costs because patients recover more quickly and hospital stays are shorter. Kepivance™ may also enable patients to undergo fuller doses of treatment and acquire fewer infections during their hospital stay.

Zolinza™ Can Stop the Growth of Aggressive Cancers

Columbia University

Cancer is a complicated disease that in many cases spreads rapidly. Researchers at Columbia University in New York have developed a drug that can stop, or at least slow down, the growth of cancer cells by inhibiting the activity of certain enzymes that are abnormally active.

This research was initiated in the 1980s by Columbia University professor Ronald Breslow, Ph.D., and Paul A. Marks, M.D., of Memorial Sloan-Kettering Cancer Center. In 2001 they co-founded Aton Pharma, a privately held biopharmaceutical company, to develop and commercialize their discovery.

Called Zolinza™*, the drug targets cancer cells in which excess amounts of the enzyme histone deacetylase (HDAC) prevents the normal function of genes that control standard cell activity. Zolinza™ decreases the activity of HDAC, allowing for the reactivation of genes that may assist in slowing or stopping the growth of cancer cells.

In 2004 Merck and Co. acquired Aton Pharma. In 2006 the U.S. Food and Drug Administration approved Zolinza™ for treating cutaneous T-cell lymphoma, an aggressive form of non-Hodgkin's lymphoma, becoming the first oral drug in its class to reach the market. The effectiveness of Zolinza™ as a treatment for other types of cancer, including leukemia, multiple myeloma, advanced Hodgkin's lymphoma, and solid tumors, is also being studied.

*Zolinza is a registered trademark of Merck & Co., Inc., Whitehouse Station, N.J., USA

Water Filtration Membrane Repels Dangerous Contaminants

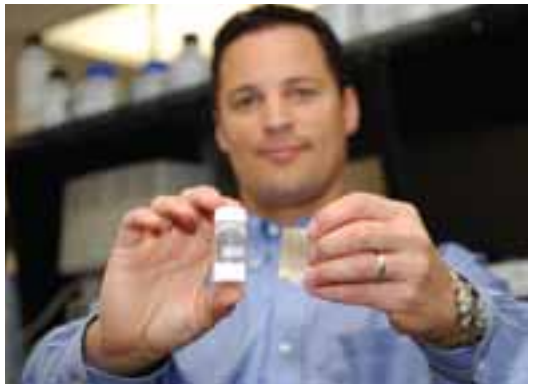
University of California, Los Angeles

With failing infrastructure and increasing contamination of surface waters, aquifers and wells, the purity of water resources is a growing concern in the industrialized world. In poorer countries, where communities lack critical infrastructure and water treatment facilities, millions of people are sickened every year by tainted drinking water.

To improve the safety of drinking water, researchers at The University of California, Los Angeles (UCLA), have invented a new membrane that promises to improve the efficiency and effectiveness of water filtration and desalination processes. Eric M.V. Hoek, Ph.D., assistant professor of civil and environmental engineering at the Henry Samueli School of Engineering and Applied Science, and UCLA's California NanoSystems Institute, began developing his nano-composite membranes in 2003.

The technology consists of specially designed nanoparticles embedded within the membrane. The nanoparticles soak up water like a sponge but repel contaminants such as dissolved salts, industrial chemicals and bacteria. This results in high purity water with lower energy consumption, in addition to longer-lasting, cleaner membranes that do not become clogged with impurities — a problem with conventional membranes.

UCLA has licensed this discovery to California-based NanoH_2O. The advanced membrane technology can be retrofitted to existing commercial facilities, fits current desalination pressure vessels, and can be customized for specific water chemistries.



Professor Hoek, Ph.D., UCLA, holds a vial of nanoparticles and a piece of his new membrane.

Photo courtesy of Reed Hutchinson

The MBPS System Protects Soldiers While They Sleep

University of Maine-Orono

American soldiers in Iraq and Afghanistan are frequently deployed on short missions to remote regions, where it is logistically difficult to provide sandbags and concrete barriers for protection against explosives and missile strikes. To protect these soldiers in their bivouacs, the University of Maine-Orono and the U.S. Army have teamed up to create lightweight, inexpensive ballistic protection that meets the requirements for Forward Operating Base construction.

University of Maine faculty members research staff and students, H. J. Dagher, E. Cassidy, K. Goslin, and L. Parent of the Advanced Engineered Wood Composites Center at the University of Maine-Orono, with the support from the U.S. Army Natick Soldier Research, Development & Engineering Center in Natick, Mass., invented the Modular Ballistic Protection System (MBPS). Over $1.5 million in funding was provided by the U.S. Department of Defense. The technology was developed in 2006-2007, progressing from concept to field demonstration in the Middle East and Southwest Asia in less than 18 months.

The MBPS consists of panels of wood composite (plywood or chipboard) covered in a thermoballistic composite skin, which are mounted inside the soldiers' tents with an energy-absorbing connection system. These reinforced wooden shields provide immediate protection for troops at the beginning of deployment before sandbags and concrete barriers arrive. A 20-by-32-foot tent can be up-armored with MBPS in less than one hour. The reinforced plywood can also protect units on the move.

The risk of injury from explosive devices and small-arms fire is greatly reduced in tents that are up-armored with MBPS. Domestic applications include protecting federal and institutional buildings, barracks, and responding to disasters. The University of Maine is currently negotiating several production agreements to further commercialize this protective technology in the private sector.

Biodegradable Inks Make Tattoo Removal Easy and Affordable

Massachusetts General Hospital

People get tattoos for lots of reasons that seem great at the time — but as life and love change, tattoos, especially if they are highly visible, may cause problems. Removing a tattoo can be painful and expensive and may lead to permanent skin damage and scarring. But that doesn't have to be the case. Massachusetts General Hospital in Boston has developed a safe, removable ink that is both biodegradable and bioabsorbable.

Rox Anderson, M.D., of Massachusetts General Hospital's Wellman Center of Photomedicine, became interested in the chemistry of tattoo ink when one of his patients developed a severe reaction to a permanent tattoo. After several years of research, Anderson invented microencapsulated biodegradable and bioabsorbable dyes within safe, colorless polymer beads. The dyes are made from natural pigments and enclosed in tiny beads several microns in diameter, which are injected under the skin. To remove the tattoo, a laser is passed over the tattoo, which ruptures the beads and releases the inks, which are then safely absorbed by the body.

This technology is licensed to Freedom-2 Inc., a startup company founded in 1999 by Anderson to commercialize biodegradable Freedom-2™ tattoo inks. The company is continuing to research and develop new engineered ink products using well-established, safe, biocompatible materials that provide both high-quality art and easy removability.

NQR Scanner Detects Explosives in Shoes at Airport Security Checkpoints

U.S. Naval Research Laboratory

Taking your shoes off at airport security checkpoints slows down the entire departure process and can be aggravating. Technology originally developed at the U.S. Naval Research Laboratory in Washington, D.C. is being refined to allow for the detection of explosives hidden in shoes as people walk through a scanner, without having to remove them.

The detection of explosives by nuclear quadrupole resonance (NQR) technology was invented in late 1980s by U.S. Navy researchers Michael Buess, Allan Garroway, and Joel Miller. About $100,000 in funding was provided by the Federal Aviation Administration Technology Center in 1989 to explore explosive detection technology for baggage. The technology was disclosed in 1991.

Explosives generally contain nitrogen, whose common isotope ^{14}N has specific electronic properties that can be detected with highly sensitive equipment. Components include a radio frequency power source, a coil to generate a magnetic excitation field, and a detector circuit that is programmed to recognize the specific nitrogen response. The NQR technology can also discern between different kinds of nitrogen-rich compounds commonly used in explosives.

In 1995 the NQR technology was licensed to Quantum Magnetics, which was acquired in 2005 by GE Security. The company is continuing to develop and refine the technology for shoe-scanning and other airport applications. The military is interested in using the device for detecting hidden explosives such as landmines. There are also nondestructive applications as well, such as analysis of stress and strain in mechanical parts.

Body Scanner Technology Ideal for Security — and Fashion

Pacific Northwest National Laboratory

With airline security in mind, Pacific Northwest National Laboratory (PNNL), a federal research facility in Richland, Wash., developed its Millimeter Wave Holographic Body Scanner technology in the late 1980s. Researchers Doug McMakin, Tom Hall, James Prince, Ron Severtsen, and Dave Sheen invented the device, which creates holographic images of the body ideal for detecting hidden weapons or explosives.

The body scanner relies on millimeter wave array/transceiver technology to create the image. A person stands within the portal-like scanner and is illuminated with low-level millimeter waves, a type of harmless radiation. The radiation penetrates clothing and is reflected off the body. The signals are captured, transmitted to a high-speed image processing computer, and converted into high-resolution, three-dimensional images.

PNNL recently licensed this technology for use in the private sector. SafeView, a California-based technology company, utilized the technology in its Scout™ Personnel Screening System. In 2006, SafeView was purchased by L-3 Communications, an international company specializing in security and military intelligence.

In the contrasting world of fashion, PNNL's body-scanning techniques are being used by Intellifit, a Pennsylvania-based company that adapted the technology for the fashion industry. In 2003 the company worked with PNNL to design a portable scanner for calculating body measurements. Distributed in malls and retail stores around the country, Intellifit scanners provide fully clothed clients with their exact body measurements in about 10 seconds.

An installation of Safeview's Safe Scout, a system created using PNNL's millimeter wave technology, resides in London's Paddington Station to ensure the security of rail passengers.

Crash-Test Software Saves Lives and Money

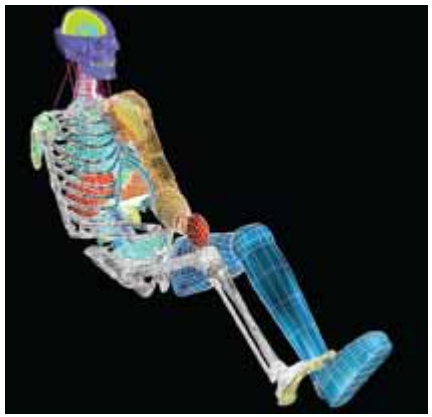
Wayne State University

Using crash-test dummies is a good way to make cars safer for dummies — but not necessarily people. Because dummies are not human, the crash-test data that automobile manufacturers rely on to make design decisions is not as relevant to human safety as it could be. Professor King H. Yang, Ph.D., director of the Bioengineering Center at the College of Engineering at Wayne State University in Detroit, decided to come up with a more "human" way to test car safety.

In the early 1990s Yang, along with professor Albert I. King, Ph.D., and a team of graduate students developed a software program called Anthropomorphic Numerical Surrogate for Injury Reduction (ANSIR). The Centers for Disease Control and the automotive industry supported the research, which exceeded $10 million. The technology was disclosed in 1995 and licensed in 1998 to Toyota Motor Co.

ANSIR is a software program that uses computerized models to demonstrate the detailed effects of car crashes on the human body. The models are based on tests using cadavers and reveal how various crash angles, velocities and car sizes affect the human body, especially internal organs. ANSIR presents far more detailed and accurate information compared to data derived from crash tests with dummies.

Toyota is currently developing its own variation of ANSIR and requires first-tier suppliers to use human models to check the safety performance of the parts they supply. ANSIR technology has been licensed around the world and is expected to save millions of dollars in crash-testing vehicles, improve vehicle safety, and reduce injuries. The software also has applications for designing sports and military helmets, body armor, and for pre-neurosurgical planning.



UV Radiation Kills Dangerous Pathogens in Drinking Water

University of California, Berkeley
Lawrence Berkeley National Laboratory

More than two billion people, or about one-quarter of the world's population, risk their health by drinking dirty water. Preventable waterborne diseases kill about two million people (mostly children below age five) annually, and stunt the growth and development of tens of millions more.

Ashok Gadgil, who is a senior physicist at Lawrence Berkeley National Laboratory in Berkeley, Calif., and a University of California, Berkeley professor, developed a technology to mitigate this situation. Gadgil's process quickly and efficiently purifies water at extremely low cost. Professor Gadgil developed the technology from 1993 to 1999 with about $300,000 in funding from the U.S. Agency for International Development, the U.S. Department of Energy and private donors. The work included field trials in India and South Africa.

UV Waterworks™ technology uses ultraviolet light to kill microbial pathogens in drinking water supplies, including the organisms that cause polio, diarrhea and cholera. Unlike other water purifiers on the market, UV Waterworks does not rely on potentially carcinogenic chemicals to disinfect the water, making it safer for human consumption, as well as the environment. The device is energy efficient, works well under gravity feed (no high pressure necessary), has rapid throughput, and is easy to maintain even in remote, underdeveloped regions. It's also a better alternative to boiling water, which is labor-intensive, increases smoke inhalation, uses 6,000 times more energy, and requires cutting trees for firewood.

The technology was licensed by the University of California to WaterHealth International (WHI) and is installed on a turn-key basis in poor communities in developing countries. It has been validated at 11 independent laboratories in five countries, including India, Mexico, the Philippines and South Africa. By the end of 2007 WHI had installed more than 450 water purification systems in developing countries around the world, and more than 600,000 people were obtaining their daily safe drinking water from WaterHeatlh Centers.

The exterior of the new, modular design of a WaterHealth Centre in Andhra Pradesh, India.

Predicting the Spread of the Next Big Pandemic

Los Alamos National Laboratory

From 1918 to 1919, the "Spanish Flu" pandemic killed more than 40 million people worldwide and is now thought to have been originally an avian flu. The last pandemic to strike (the "Hong Kong Flu") caused more than one million deaths in 1968-1969. Considering that pandemics historically occur every 30-40 years, much concern has been raised recently about how the next pandemic might affect world populations.

In 2006, scientists Timothy C. Germann, Ph.D., Kai Kadau, Ph.D., and Catherine Macken, Ph.D., of Los Alamos National Laboratory in New Mexico disclosed an innovative new software program called EpiCast (Epidemiological Forecasting), which can accurately simulate the effects of a pandemic in any part of the world. Funding was provided by the U.S. Department of Energy and other government sources.

Unlike other models, EpiCast utilizes a stochastic person-to-person model to account for the natural variability in any population, which makes the results more accurate and beneficial. Variables that are factored into the calculations include different age groups, household-sized demographics, population density, immunity status and worker mobility. This data allows scientists and government officials to determine the most effective procedures for limiting the spread of the pandemic, maintaining order and minimizing casualties.

Los Alamos National Laboratory has licensed EpiCast to The Company for Information Visualization and Analysis (CIVA). CIVA will create in-depth flu-impact models for governments, private-sector companies and other organizations so they can have effective countermeasures in place in the event of a pandemic outbreak.

Software Converts 2-D Digital Photographs into Stunning 3-D Mosaics

University of Washington

Suppose you've taken a series of photographs of the Notre Dame cathedral — now what? Using a software program developed by the University of Washington, you can meld those photographs into a three-dimensional mosaic, zooming effortlessly from an aerial view to a close-up ground level view and back again.

The software, called Photo Tourism, was invented by computer science and engineering department doctoral student Noah Snavely, associate professor Steven Seitz, and affiliate professor and Microsoft researcher Rick Szeliski, Ph.D. Research was funded in part by the National Science Foundation, the Achievement Rewards for College Scientists Foundation, Microsoft Research, and the UW Advanced Technology Initiative. Photo Tourism was disclosed in 2005 and licensed to Microsoft the following year.

The program creates a three-dimensional mosaic using random viewpoints from a collection of digital photographs. The underlying three-dimensional computer model is generated automatically, and the photos are placed as a mosaic over this model. The collection of photos can then be navigated by interacting with the model, creating an immersive, 3-D experience. This technology offers an innovative way to arrange, navigate, and search through collections of digital images. It can also be used to create high-fidelity computer models of sculptures, buildings and other structures.

Photo Tourism is an important part of Microsoft Live Lab's Photosynth technology, which has been used by NASA to show 3-D Web views of the space shuttle Endeavour and parts of the space program rarely seen. Microsoft is further testing the technology in more rigorous, complex environments before releasing the software more broadly.

The photo explorer interface enables the viewer to interactively move about the 3-D space by seamlessly transitioning between photographs, based on user control

Innovative Cognitive Tools Improve Memory and Reasoning Skills

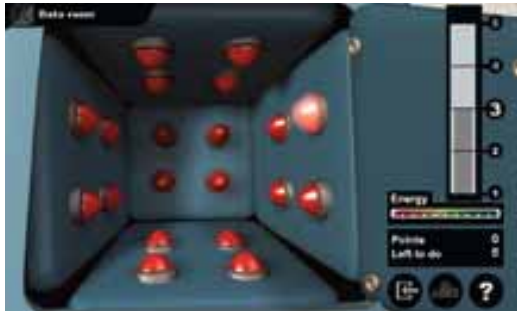
Karolinska Institute, Stockholm

Much has been discovered about working memory and how problems with it can affect how we function and how we learn. Working memory problems occur in a range of populations including those afflicted with attention deficit and/or hyperactivity disorders, people with learning disabilities, and victims of stroke and traumatic brain injury.

Torkel Klingberg, M.D., Ph.D., professor of neuroscience at the Karolinska Institute in Stockholm, Sweden, conducted groundbreaking research in 2001 that showed working memory can be trained through focused exercises. Based on this research, Klingberg designed Cogmed Working Memory Training, an educational software program. Funding for the initial research came from the Swedish Research Council.

Cogmed Working Memory Training is an engaging and challenging software program that increases the user's working memory capacity. Participants engage in specific memory exercises for about 30 minutes every day for five weeks. The exercises are designed to train both visuo-spatial and verbal working memory. With each click of the mouse, the level of difficulty adjusts based on the real-time performance of the participant.

The software is the first and only program that exclusively targets working memory. By improving attention and problem-solving and critical-thinking skills, Cogmed Working Memory Training helps people with problems with working memory manage their daily lives.



More than 80 percent of those who have completed Cogmed's rigorous and rewarding computer training program have demonstrated dramatic and lasting improvements to attention.

Unique Photovoltaic Cells are Flexible, Lightweight, and Made from Plastic

University of Massachusetts-Lowell

Conventional photovoltaic solar cells are rigid, glass-based, and generally expensive to manufacture — until now. Scientists at the University of Massachusett's Center for Advanced Materials in Lowell have invented a low-temperature manufacturing process for dye-sensitized, titanium-dioxide photovoltaic cells on a flexible polymeric film.

This unique photovoltaic cell technology was developed from 1999 to 2001 by Sukant Tripathy, K.G. Chittibabu, Jayant Kumar, Lynne Samuelson, Lian Li, and Srini Balasubramanian. Funding for the initial research was provided by the U.S. Army.

A flexible plastic film containing dyes and paint pigments is used to produce electricity. Utilizing this technology, it is now possible, for the first time, to use a variety of low-cost polymers as the top and bottom surfaces of photovoltaic cells. These cells can generate electricity from more light sources than just sunlight, including indoor lighting. The light energy is transmitted via the electrically active materials and a series of electrodes to create electricity. The film is produced in a continuous roll-to-roll process that is less expensive and less capital-intensive than the more complex, time-consuming assembly of traditional solar cells. A few of the abundant industrial applications are handheld electronics, sensor networks, textiles, military equipment and roofing materials.

The University of Massachusetts and private sources provided the funding necessary to launch a spin-off company to commercialize the technology. Established in Lowell in 2001, Konarka is conducting additional research and development on this innovative photovoltaic cell design. Investments in Konarka exceed $100 million to date.

High-Performance Radio Frequency ID Tags Work Near Water

University of Kansas

The performance of ultra-high frequency (UHF) radio-frequency identification (RFID) tags usually degrades significantly when they are placed near water or metal, where read distances typically fall from a normal range of 15-20 feet to 5 feet or less. To solve this problem, a researcher at the University of Kansas-Lawrence has invented a new antenna that corrects this interference.

Professor Dan Deavours, Ph.D., director of research at the RFID Alliance Laboratory at the University of Kansas, developed the microstrip antenna device for RFID tags over a two-year period from 2005 to 2007. About $100,000 in funding was provided by the Kansas Technology Enterprise Corp. through internal commercialization grants.

The technology involved developing an ultra-thin microstrip antenna to replace the dipole antenna that is typically used in RFIDs. Traditional microstrip antennas require an electrical connection between the top and bottom layer of the antenna. This new microstrip antenna eliminates the need for that connection and can also be more easily manufactured, without the need for drilling holes, wrapping or other methods of connection.

The microstrip antenna for RFID device is an innovative solution that overcomes the "metal/water problem" associated with UHF RFID by creating a thin, higher-performance tag that is lower cost and more easily manufactured than standard tags.

Microstrip Antenna

Photo courtesy of The University of Kansas.

Underwater Crime Scene Investigation Techniques are Best in the World

Florida State University

Although underwater recovery certainly isn't new, it wasn't until the early 1990s that police dive teams started to switch from the "snatch-and-grab" mentality of collecting evidence to more measured methods of recovery. It is, of course, much more challenging to apply standard investigation techniques to underwater crime scenes to preserve important data, which could prove invaluable in court.

The federal government recognized during the USS Cole investigation in 2002 that the process of securing an underwater crime scene, and gathering evidence that would be presentable in an international court, was a formidable task since there were no standardized protocols. In 2002 the U.S. Navy approached Florida State University to develop state-of-the-art protocols for underwater investigations. The U.S. Department of Defense contributed $500,000 toward this research.

In 2007 Tom Kelley, Ph.D., director of Florida State University's Panama City Underwater Crime Scene Investigation (UCSI) program, and team members Dale Nute, Ph.D., Mike Zinszer, Mark Feulner, Gregg Stanton, William Charlton, Joerg Hess, Terry Roy Johnson, and Kenneth McDonald, released "Underwater Crime Scene Investigation: A Guide for Law Enforcement."

This manual is the first resource that describes the principles, policies and procedures of an underwater investigation. It adapts surface investigative techniques to the underwater environment, including the use of integrated sensors, robotics, and computer modeling. Employing these methods underwater decreases typical investigative times from a few days to a few hours, and preserves more critical information.

UCSI team entering an underwater cave in Aruba during a search for Natalie Holloway.

The program consists of a 20-hour academic minor in UCSI and three 100-hour underwater investigative training courses. It is ideal for all local, state, and federal law enforcement agencies, as well as NOAA and NASA. This specialized curriculum has also generated interest from insurance companies that investigate underwater claims, such as the sinking of watercraft.

Mass Spectrometry Technique Improves Accuracy of Measurement

Pacific Northwest National Laboratory

Mass spectrometry is by far the most accepted method for measuring chemical composition. The process involves vaporizing the sample, separating the ions according to mass in a "carrier" gas, and measuring their relative abundances. However, sometimes ions released from the sample bond with carrier gas ions, creating "false" compounds of the similar mass that are also measured, throwing off the accuracy of the results.

In the mid-1990s researchers Dave Koppenaal, Charles Barinaga, and Greg Eiden at the Pacific Northwest National Laboratory in Richland, Wash., invented a process that improves the accuracy of mass spectrometry measurements by reducing the interference from carrier gas ions. The technique consists of injecting another gas into the chamber that reacts with the carrier gas ions, removing them from the sample stream. The result is improved spectral clarity of the stream and a higher level of accuracy in the measurements.
The research was funded by a variety of government and private sector sources, including the U.S. Department of Energy.

The technology was quickly introduced into the private sector, with the first license being issued in 1997. Today the commercial mass spectrometer instruments produced by international manufacturers Thermo Electron, Agilent and PE Sciex utilize this technology. The improved accuracy helps scientists, engineers, and technicians in a variety of fields make more informed decisions about their projects, many of which have major impacts to human health (such as environmental monitoring and remediation).

The technology may also have applications in the semiconductor industry, where trace contamination from certain compounds can greatly affect quality and performance. It also has excellent potential for use in the metalomics field, where trace-level metal measurements are used in the diagnosis and treatment of human diseases.

The addition of the dynamic reaction cell eliminates isobaric mass interferences and allows for the measurement of elements in the presence of high concentration interferences.

Adaptive Lens Technologies Ideal for Small, Adjustable Camera Lenses

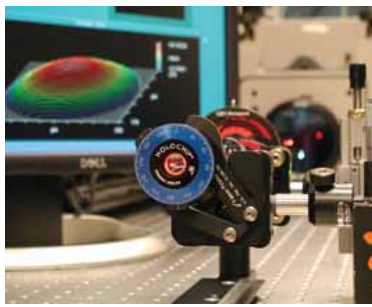
University of Central Florida

A scientist at the University of Central Florida's Center for Research and Education in Optics and Lasers (CREOL) in Orlando has invented adaptive lenses that change their light focusing properties in response to stimulus such as electrical current and mechanical pressure. Adjusting the pressure in the lens changes the level of magnification without having to rely on moving, mechanical parts the way standard cameras do.

The first patent application for professor Shin-Tson Wu's "Adaptive Liquid Crystal Lens" was submitted in 2002. Funding for the research, which has been ongoing for five years, is provided by the U.S. Air Force, the University of Central Florida, and the private sector. Wu's portfolio of adaptive lens technologies have been licensed by Holochip Corp., in Albuquerque.

Unlike conventional cameras that use mechanical controls to adjust focus, the Adaptive Liquid Crystal Lens uses liquid crystal technology to provide the focus and zoom capability, without the need for moving mechanical parts. The excitation of the liquid crystal through electrical current works like a LCD monitor in that the electrical current decides the shape of the lens, thus producing the effect of zooming or focusing. As a second approach, Wu's fluidic lens uses a transparent fluid encapsulated by a transparent elastic membrane. Mechanical compression of the fluid causes the membrane surface to bulge, thereby changing its curvature and the focal length of the lens.

These technologies make it possible to produce very small lenses, something that is prohibitively expensive for conventional mechanical lenses. Thus the liquid crystal and fluidic lenses are ideal for cell phone cameras and other image-capturing systems, including surveillance equipment for the military. Medical applications are also of interest, such as implantable lenses for eyes, or replacement lenses, that are made from biocompatible materials.



Holochip Corp. has licensed University of Central Florida's adaptive lens technologies for use in lenses similar to the one pictured.

Global Swine Disease Vaccine Will Save Millions of Animals

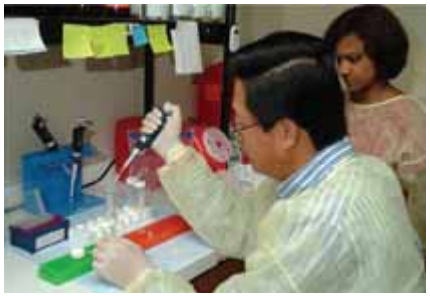
Virginia Polytechnic Institute and State University (Virginia Tech)

Post-weaning multi-systemic wasting syndrome (PMWS), has been a major threat to the global swine industry for more than a decade, especially in Europe and Asia. Porcine Circovirus Type 2 (PCV2) disrupts the immune system in pigs and severely constrains their weight gain and development. Recent outbreaks in the U.S. and Canada recorded mortality rates as high as 30 percent.

Breakthrough research by scientists at the Virginia-Maryland Regional College of Veterinary Medicine's (VMRCVM) Center for Molecular Medicine and Infectious Diseases at Virginia Tech in Blacksburg, Va., has resulted in a vaccine that protects pigs against PMWS.

The vaccine, Suvaxyn® PCV2 One Dose, was developed over a seven-year period by X. J. Meng, M.D., Ph.D., a virologist and professor in the VMRCVM's Department of Biomedical Sciences and Pathobiology, and his former graduate student Martijn Fenaux, Ph.D., and Pat Halbur, D.V.M., Ph.D., from Iowa State University. Funding was provided by Fort Dodge Animal Health Inc., the U.S. Department of Agriculture, and several other funding agencies. The technology uses a non-infectious strain of a related virus known as PCV-1 to produce a genetically altered virus that expresses the immune response of the infectious PCV2, but does not result in the disease.

Because there are many unknowns about the transmission, pathogenesis, epidemiology, and control of risk factors related to PMWS, effective prevention is critical to the health and financial performance of the swine industry. Virginia Tech Intellectual Properties Inc. has licensed the vaccine to Fort Dodge Animal Health Inc. for commercialization. Since only one dose is required for protection, Suvaxyn PCV2 One Dose lessens the risk of reactions and reduces farm labor costs. It is expected the vaccine will save the global swine industry millions of dollars in production losses caused by PMWS.



Drs. X.J. Meng and Martijn Fenaux's nearly seven years of work in the Virginia-Maryland Regional College of Veterinary Medicine's Center for Molecular Medicine and Infectious Disease led to the invention of Suvaxyn ® PCV2 One Dose.

New Oral Vaccine Will Improve the Health of Swine Herds Worldwide

Université de Montréal

Maintaining healthy livestock is one of the best ways for producers and ranchers to ensure profitability, as well as food safety. Researchers at the Université de Montréal in Quebec, Canada, have developed an oral vaccine that prevents and controls post-weaning diarrhea in swine.

The product, ColiPROtec, was developed from 1999 to 2001 at the Department of Veterinary Medicine at the Université de Montréal by John M. Fairbrother, Ph.D., and Dr. Eric Nadeau, D.M.V. Because it is an oral vaccine, ColiPROtec does not require needles to administer, which results in minimal handling and less stress for the pigs.

The research was funded by the Department of Veterinary Medicine, Gestion Univalor Limited Partnership, and Valorisation Recherche Quebec. Univalor, the commercial arm of Université de Montréal, supported launching and invested in Prevtec Microbia Inc., a spin-off company that is commercializing the technology. The company has raised investment from three venture capital firms and used that funding to launch the sale of ColiPROtec during the fourth quarter of 2007 and to accelerate pipeline development.

Index: Products by Geographic Location

New York

Ohio

Pennsylvania

Tennessee

Texas

Utah

Vermont

Virginia

Washington

Wisconsin

These 100 innovations illustrate the many ways in which collaboration among many talented individuals leads to the success of academic technology transfer. Whether the product is a new surgical tool for glaucoma, a device that eliminates head lice in 30 minutes or biodegradable composites made of plant materials, the world is certainly a better place thanks to the hard work and determination of the many individuals involved in these featured stories.

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