

March Madness for the Mind 2009

A showcase
of student
technology
innovations

THE SMITHSONIAN NATIONAL
MUSEUM OF AMERICAN HISTORY
WASHINGTON, DC

 NCIA
13th Annual Meeting
March Madness for the Mind

New ideas in a new venue

The National Collegiate Inventors and Innovators Alliance (NCIIA) is proud to present our 13th Annual March Madness for the Mind E-Team Exhibition.

This exciting event showcases some of the exciting work of our E-Teams: multidisciplinary innovation teams of students, faculty and industry advisors working together to bring their cutting edge technologies to commercialization.

Visitors to this year's March Madness for the Mind will see prototypes of innovations that will make a difference in the world. Many of these technologies are being revealed to the public here for the first time. The exhibiting E-Team members (the "E" stands for excellence and entrepreneurship) will gladly explain their ideas. Questions are encouraged!

We are delighted to work with the Smithsonian's Lemelson Center for the Study of Invention and Innovation on this project. The Lemelson Center was the site of our first five March Madness exhibitions. Not only are we thrilled to present our students' work for the first time in the beautifully renovated museum, but this year represents a kind of homecoming as well as a celebration of our shared mission..

We hope you will enjoy this exciting opportunity to share innovative ideas and look to the future at March Madness for the Mind.



Sincerely,

Phil Weilerstein, Executive Director
NCIIA

Welcome to the Lemelson Center's new space!

The Smithsonian's Lemelson Center for the Study of Invention and Innovation is proud to welcome the NCIIA E-Teams and March Madness for the Mind back to the halls of the recently renovated National Museum of American History. As the Museum celebrates its reopening year, the Lemelson Center is very proud of its new exhibition and public spaces presenting the significance of invention and innovation to our visitors. These include Spark!Lab, a hands-on invention space, and "Invention at Play," where visitors explore the creativity behind invention.

Hosting March Madness for the Mind is a natural extension of the mission of the Lemelson Center to encourage the exploration of invention and innovation. All of us at the Center applaud the E-Teams' ingenuity and look forward to the lively discussion their inventions will inspire.

Arthur Molella, Director

The Jerome and Dorothy Lemelson Center for the Study of Invention and Innovation



Invention at Play Dedication & March Madness for the Mind E-Team Exhibition

Friday, March 20, 2009

6:45 pm **Invention at Play Exhibit Dedication**

Brent D. Glass, Director
National Museum of American History

Arthur Molella, Director
Jerome and Dorothy Lemelson Center
for Invention and Innovation

Phil Weilerstein, Executive Director
National Collegiate Inventors and
Innovators Alliance

Mrs. Dorothy Lemelson
The Lemelson Foundation

7:00 pm **March Madness for the Mind
Exhibition & Reception**



About the NCIIA

The NCIIA funds and supports technology innovation and entrepreneurship in higher education to create commercially viable and socially beneficial businesses.

With a membership of nearly 200 colleges and universities from all over the United States, we engages more than 5,000 student entrepreneurs each year, leveraging their respective school campuses as working laboratories and incubators for businesses and ultimately helping them to bring their concepts to commercialization.

We provide grants to faculty and emerging student entrepreneurs, workshops, investments and other resources that enhance experiential education in technology innovation. More than 40 technology companies have emerged from student ventures funded by NCIIA, and many more ventures have benefited from our training and resources.

Learn more about our work at www.nciia.org.

About The Lemelson Foundation

Founded by Jerome Lemelson, one of U.S. history's most prolific inventors, the Lemelson Foundation has donated and committed more than \$140 million in support of invention-led economic, social and environmentally sustainable development in the U.S. and developing countries. It works with partners to recognize and celebrate accomplished inventors, mentor young people to nurture their budding scientific curiosity, and provide guidance to grassroots inventors. The Foundation also helps with the research and spread of information and technologies that improve people's lives and illuminate the value of invention to society.

Jerome Lemelson, the holder of more than 600 patents, was one of America's most prolific inventors. His inventions have been part of the fabric of daily life in the U.S. and elsewhere, making possible – wholly or in part – innovations like automated warehouse systems, audio cassette players, machine vision, cordless phones, bar code readers, illuminated highway markers, and talking thermometers.

Lemelson understood that invention and innovation are vital to shaping economies and cultures, and ensuring a bright future. With his family, he created the Lemelson Foundation to spark, sustain and celebrate the inventive spirit.

To learn more about the Lemelson Foundation and its work, visit www.lemelson.org.



About the Lemelson Center

Since 1995, the Jerome and Dorothy Lemelson Center for the Study of Invention and Innovation at the Smithsonian's National Museum of American History has explored the critical role of invention and innovation in the United States.

The Lemelson Center draws on the Smithsonian's vast collections of artifacts and archival materials to produce exhibitions, programs and publications that show how invention and innovation are essential elements of American history and heritage. The new Jerome and Dorothy Lemelson Hall of Invention in the recently renovated National Museum of American History features "Invention at Play," an award-winning, hands-on exhibition that allows visitors to see the similarities between the way children and adults play and the creative processes used by innovators. Also featured is Spark!Lab, the newest hands-on science and invention space, which helps kids and families learn about the history and process of invention through games, science experiments and other fun activities.

Examining invention across disciplines, the Lemelson Center has developed quality scholarship on subjects ranging from communications and computing to health and medicine, sharing this knowledge through conferences and publications. The Lemelson Center provides lessons, stories and study guides to help educators and parents teach young people about the history of invention and innovation.

The Lemelson Center at the National Museum of American History was established through a generous gift from The Lemelson Foundation, a private philanthropy named for its benefactors—Jerome and Dorothy Lemelson. For more information on the Lemelson Center, visit invention.smithsonian.org or call (202) 633-3450.



About the National Museum of American History

The National Museum of American History collections include many significant inventions, including Edison's phonographs, a portion of Bell's original telephone and a Jobs and Wozniak Apple I computer. Museum artifacts also include approximately 10,000 patent models—one of the most comprehensive collections in any public institution.

The museum's Archives Center contains materials that complement the artifacts and support the study of many different aspects of American life. Important invention-related collections include the George H. Clark "Radioana" collection related to the industrial development of the radio and the Earl S. Tupper papers describing the invention and marketing of Tupperware. Through the Lemelson Center's support, the Archives Center has increased its collections of personal papers and business records documenting the history of American enterprise, innovation and technology.

The National Museum of American History collects, preserves and displays American heritage in the areas of social, political, cultural, scientific and military history. The museum shines new light on American history after having been dramatically transformed by a two-year renovation. To learn more about the museum, visit <http://americanhistory.si.edu>. For Smithsonian information, the public may call (202) 633-1000, (202) 633-5285 (TTY).

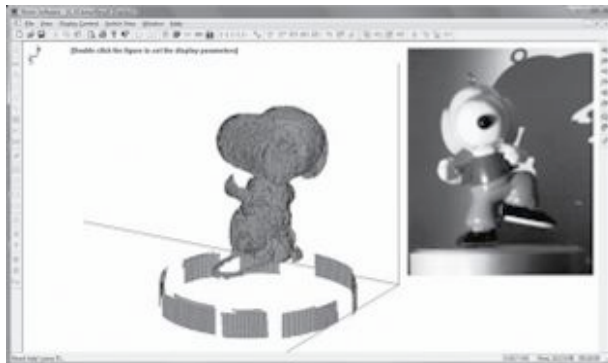


Exhibiting Teams

Mashavu: Networked Health Solutions for the Developing World

Pennsylvania State University

The Mashavu E-Team is looking to take advantage of wide cell phone use in rural Africa to overcome the severe lack of healthcare professionals in the area. The idea: enable medical professionals around the world to connect with patients in the developing world using modern technology and communications infrastructure. Trained operators at Mashavu stations in developing communities would collect essential medical information, including weight, body temperature, lung capacity, blood pressure, photographs, stethoscope rhythms, and basic hygiene and nutrition information for each patient on a regular basis. Web servers aggregate this information over a cell phone link and provide it on a web-based portal. Medical professionals can then view the information and respond to the patient and the nearest doctor with recommendations.



Real-Time, High-Accuracy 3D Imaging System

Catholic University of America

While 3D imaging has found numerous applications in a variety of fields, there is an increasing demand for 3D imaging techniques that provide not only very accurate, but also very fast measurements. The objective of this project is to develop a real-time, high-accuracy, low-cost, broad-range, and full-field 3D imaging system. The system will consist of one capture unit and one projection unit, with each system component able to be arbitrarily positioned. The technique employs advanced phase shifting, multi-frequency projection fringes, and ultra-fast direct phase unwrapping schemes to perform real-time and automatic 3D imaging for general objects, such as multiple objects with complex shapes.

The team has completed development of the algorithms and preliminary software, and is currently building a prototype (including both hardware and software).





Intelligent Mobility

California Institute of Technology

According to the World Health Organization, of the 600 million people with disabilities worldwide, 80% live in developing nations. Twenty million of these individuals need wheelchairs. Of the millions of children who need wheelchairs to have access to education or rehabilitation services, only 2% have them, and even the existing wheelchairs are second-hand and aren't suited to the rugged, off-road terrain often found in developing countries. As a result, many disabled people in the developing world

Socia-Light: Solar Lighting Systems for Remote Rural Communities

Cooper Union

There is a desperate need for an economic lighting system that can be assembled, installed and maintained by the millions of rural poor who live in remote regions of the developing world. Traditional light sources such as lamps with cotton cloth wicks are expensive to run, provide poor quality illumination and degrade the air quality in the enclosed spaces where they're used.

The objective of this project is to provide solar-powered lighting systems for rural communities that use white-light-emitting diodes and photovoltaic panels. These systems can improve the economic and physical wellbeing of users throughout the area by facilitating community-wide activities. The

rely on their family members for support or resort to begging in order to live.

To combat the problem, this team has founded a non-profit, Intelligent Mobility International (IMI), to produce and distribute safe, durable, and affordable wheelchairs made primarily from old mountain bicycles. The pedal axles on the bike are converted to rear-wheel axles on the chair; the pedals are used for both the footrests and front caster assembly; the x-brace is cut from the metal on the back end of the bike frame; and the handle bars are used as push handles. This makes for a less expensive, more durable, and more appropriate wheelchair for the developing world. It also takes less time to make than a standard wheelchair—about one-sixth of the current production time.

IMI is an NCIIA-funded 501(c)(3) non-profit organization spun out of California Institute of Technology and Art Center School of Design in 2007. Their ultimate aim is to produce truly sustainable, infinitely replicable, rugged, appropriately fitted and locally repairable wheelchairs.

team has designed, constructed, installed and tested a solar lighting system that can be built in rural regions; it does not require specialized tools or highly skilled labor. It has been designed to utilize locally available components, and is robust, easy to maintain, and repair.





mPedigree: Using Cell Phones to Protect Patients from Fake Drugs in the Developing World

Dartmouth College

According to the World Health Organization, over 30% of the medicines sold in the developing world are inauthentic copies containing little or no active ingredients. When fake drugs are laced with lethal ingredients they can lead to mass fatalities, as was the case in a 1995 outbreak of false meningitis vaccine in Niger that killed 195,000 people. mPedigree has collaboratively developed mobile-based drug authentication and tracking technologies appropriate for developing nations. Similar to the very popular scratch card method for replenishing cellular talk-time, users reveal a single-use code on a drug bottle and text message it to a provisioned mobile shortcode identical on all cellular networks. An instant response lets the user know if the drug is real or not. The shortcode is easy to remember and there is no cost to the user.

mPedigree is slated to scale up current operations by authenticating key at-risk drugs in Ghana: anti-malarials, pediatric drugs, and health products.

PneumoCheck: A Novel Specimen Collection Device for Diagnosing Pneumonia

Georgia Institute of Technology

Although pneumonia is a common disease that affects 1.4 million Americans annually, diagnosing its cause can still be difficult. Pneumonia is caused by a large variety of viral and bacterial pathogens, and traditional pneumonia diagnostic methods are limited, primarily because they're unable to reliably collect a high quality specimen from the lower respiratory tract, where the disease originates.

In order to improve pneumonia diagnosis, this team is developing PneumoCheck, a simple medical device that is safe for patients, non-invasive and easy to use. The patient simply coughs once into the device, expelling the air in his or her lungs. PneumoCheck catches the air from the upper respiratory tract in a reservoir and collects only the aerosolized particles and pathogens from the lower respiratory tract in a filter. The filter is detached and sent to a microbiology lab to be tested for the presence of pathogens.





Surgypack: An Improved Means for Bowel Packing

Johns Hopkins University

Abdominal and pelvic laparotomies require temporary removal of the intestines to create adequate exposure to the surgical site. This is currently accomplished through the use of cotton surgical towels, which have three significant drawbacks: the cotton packs are time-consuming to apply, stick to the bowel tissue (creating trauma to the tissue when they have to be removed), and shed fibers that encourage inflammatory reactions.

This team is developing an alternative approach, called Surgypack. Surgypack is a transparent, semi-rigid, one-piece device placed within the abdomen and able to encompass the bowels without the use of cotton packs. By foregoing the use of cotton packs, the team hopes to reduce the time required for bowel packing by at least 50%, reducing operating room costs to the patient by approximately \$4,000 per surgery. In addition, the device will decrease the occurrence of post-operative adhesions by 50%.

Affordable Solar Thermal Microgenerator Technology for Rural Cogeneration in Southern Africa

Massachusetts Institute of Technology

There are 1.6 billion people worldwide who lack access to electricity or affordable energy solutions. Few good options exist for those living in deeply rural locations: diesel generators, while inexpensive up-front, require costly fuel, while photovoltaic panels have a high up-front cost and a high risk of theft.

The Solar Turbine Group (STG) is developing a novel solar thermal technology that lowers up-front and fuel costs while decreasing the risk of theft. The turbine uses parabolic concentrating solar collectors and a heat engine constructed from mass-manufactured HVAC and automotive parts. STG's technology can affordably supply both electricity and hot water/heating to rural institutions such as primary schools or health clinics.

Working in conjunction with local partners, including the government and National University of Lesotho, along with entrepreneurs and engineers, STG has been conducting technology development, testing, and transfer for over four years and will complete installation of a next-generation system at a rural health clinic in Lesotho in 2009. The ultimate aim is to provide a sustainable, renewable, and affordable energy option for rural areas.



MineWerks

Rensselaer Polytechnic Institute



Millions of people around the world are affected each day by the lingering threat of landmines left over from previous years of war. There is currently no inexpensive, practical method to quickly and safely neutralize the threat posed by landmines: manual demining (a person in protective gear prodding the ground for hours), while effective, is very slow and can be dangerous; and mechanical demining (using robots to explode mines) is either very expensive or isn't proven to work.

The MineWerks team is developing two proprietary technologies, the MineWhip and the MineFinder, packaged together as a complete, inexpensive solution for unexploded mine detection and removal. Using a patent-pending microwave spectroscopy sensor, the MineFinder remotely senses chemical compounds by measuring a suspect area's absorption of low power radio waves of varying frequencies. Once found, the buried landmines are then remotely detonated by the MineWhip.

The team plans on partnering with the International Campaign to Ban Landmines, Mines Advisory Group, and HALO Trust to distribute its demining technology.

Therapeutic Systems

University of Massachusetts Amherst

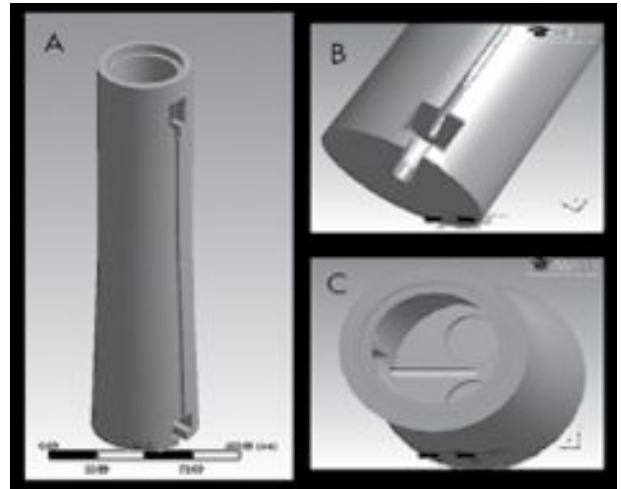
Therapeutic Systems has developed a personal deep pressure touch stimulation system (DPTS) for use with autistic children. DPTS is a proven form of therapy in which physical touch, such as a hug, is used to relieve anxiety, increase focus, and reduce self-damaging behaviors in some children on the autism spectrum. Current DPTS products on the market consist of simple weighted or neoprene vests and have a host of issues and problems that make them less than ideal. The Therapeutic Systems' product is a more advanced, functional, and customizable solution: a vest-like garment that can be worn discreetly under normal clothing, enabling the application of a range of DPTS anytime, anywhere.



Kent Klamp University of Virginia

Over three million women worldwide who undergo a Cesarean section each year suffer from uterine atony, the failure of the uterus to contract postpartum. Uterine atony results in severe hemorrhaging, which can lead to hysterectomy or even death. While there is a wide array of treatments for uterine atony (manual stimulation, drug therapy, surgery, medical devices), none are particularly effective and their cost and complexity often precludes their use outside western hospitals.

In an effort to create a standardized treatment for uterine atony following C-sections, this team has designed a mechanical device to suppress atony by compressing the uterus, encouraging contraction and emptying the uterus of blood. The basic design consists of an upper clamp piece, a lower clamp piece, and three interlocking cylinders. The outermost cylinder is attached to the stationary lower clamp arm while the main shaft is connected to the handle of the device and the top clamp arm. The user squeezes the handle to unlock the device and move the upper clamp arm.



Good Instentions University of Virginia

Approximately 40,000 patients per year suffering from pancreatico-biliary disease receive Self-Expanding Metal Stents (SEMS) to alleviate pain. SEMS placement is normally a 30-60 minute outpatient procedure that involves passing an endoscope through the patient's mouth and navigating through the stomach to the entrance of the biliary duct. The sharp angle that the catheter must make to enter the biliary duct from the duodenum, however, complicates the procedure by kinking the instrument, leading to a high rate of stent misplacement (10-25%).

This team is developing a device to make SEMS procedures easier. The device is an after-market addition to the existing SEMS catheter that acts like a shock absorber, slowing any sudden increases in insertional speed and giving the technician enough time to retract the inner catheter before SEMS misplacement occurs.



Developing World Technologies: WaterCycle Malawi Pump Project

Washington State University



WaterCycle is a non-profit organization designing human-powered irrigation pumps for farmers in developing countries. Their two products thus far are bicycle-powered and hand-powered irrigation pumps that are easy to use, durable, affordable, and easily transportable by bicycle. The pumps

allow farmers to greatly increase their crop output, providing their families and communities with a path out of poverty and an opportunity for a better life.

The hand-powered irrigation pump is currently being tested in Malawi.

Dizziness Diagnostic Device

Johns Hopkins University

Dizziness is the number one medical complaint among the elderly and the third most frequent complaint that brings people to primary care and emergency rooms. Dizziness often leads to falls, which can be fatal or cause serious bodily injury, and results in billions of dollars in health care fees. While many causes of dizziness are treatable, current diagnostic techniques are complicated, costly, and uncomfortable for patients.

This E-Team is developing a motorized head-moving device that effectively diagnoses dizziness. The team's device, the D3, is an integrated head rotating, eye recording, and analysis system that is simple, user-friendly, and reliable. The patient wears a helmet and places in his or her mouth a "bite bar" that has been molded to their dentition. A video camera monitors eye rotation responses while the head is rotated. It is the first platform on the market that can fully characterize the three-dimensional balance system in the inner ear, which will lead to better diagnosis of dizziness disorders.

Coyote Inventors: A Lemelson-MIT InvenTeam

Clarksburg High School Clarksburg, MD
Montgomery County Public Schools

Faced with the universal problem of trying to determine the path of a specific cord from the jumble of connected cords behind a computer, the Clarksburg High School InvenTeam invented a pressure-sensitive illuminated computer cable called Torch Cord™. Torch Cord™ is designed as a replacement for an existing computer cable. When pressure is applied at any point along a length of cord, the entire cable will momentarily illuminate, allowing computer users to easily identify each cable and the path it takes.



Notes



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