

## Welcome to March Madness for the Mind 2010!

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**T**he National Collegiate Inventors and Innovators Alliance (NCIIA) is proud to present our 14th annual March Madness for the Mind E-Team exhibition.

This event showcases some of the exciting work of our E-Teams—multidisciplinary 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 thrilled to present our students' work for the first time in the Exploratorium, an experimental, hands-on museum designed to spark curiosity—the perfect backdrop to March Madness for the Mind.

We hope you enjoy this opportunity to share innovative ideas and look to the future with us.

Sincerely,



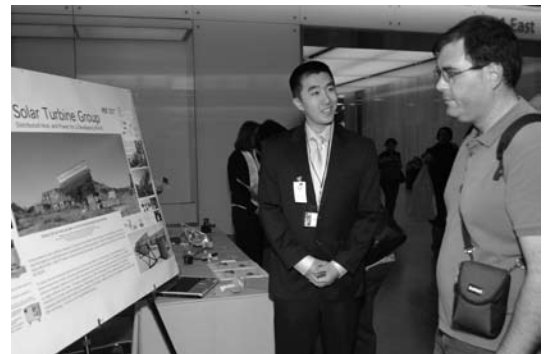
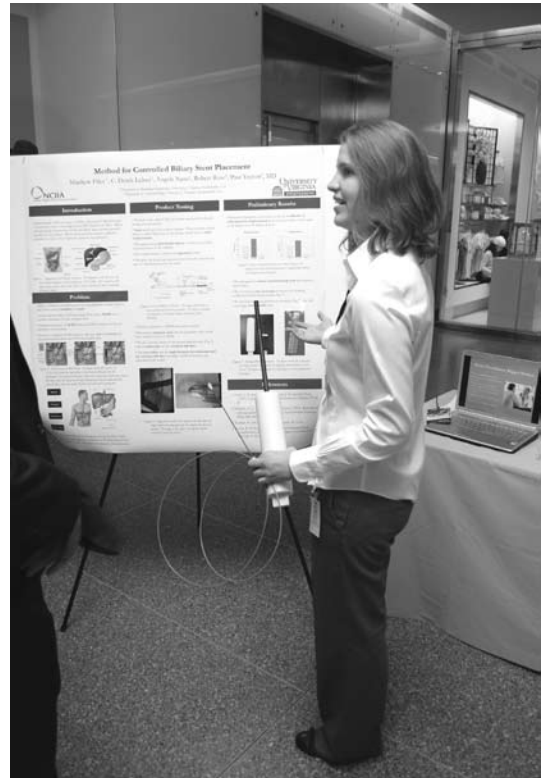
Phil Weilerstein  
Executive Director, NCIIA

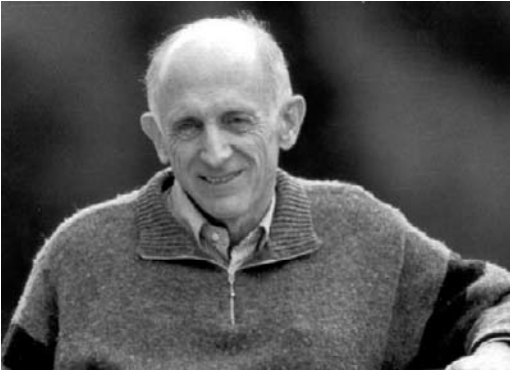
## About the NCIIA

The NCIIA supports technology innovation and entrepreneurship in universities and colleges to create experiential learning opportunities for students and successful, socially beneficial businesses.

The NCIIA catalyzes positive and sustainable social and environmental impact by providing grants, entrepreneurship and venture training labs, mentoring, investment advice, and other experiential resources to faculty and students at universities and colleges. With a membership of nearly 200 colleges and universities from all over the United States, the NCIIA engages more than 5,000 student entrepreneurs each year, leveraging their respective school campuses as working laboratories and incubators for businesses, ultimately helping them to bring their ideas and innovations to commercialization.

For more information, please visit <http://nciia.org>.





Jerome Lemelson

## About The Lemelson Foundation

**E**stablished by Jerome Lemelson, one of America's most prolific inventors, the Lemelson Foundation sparks, sustains and celebrates innovation and the inventive spirit. The Foundation focuses on educating the inventors of tomorrow, supporting innovators from idea to impact, and delivering technologies that improve people's lives:

- **From the Classroom to the Real World.** The Foundation builds the next generation of inventors by engaging students in hands-on learning opportunities. Education and Inspiration support includes The Lemelson-MIT program, The Lemelson Center at the Smithsonian, and the National Collegiate Inventors and Innovators Alliance (NCIIA).
- **From the Garage to the Marketplace.** Because inventors around the world frequently lack resources and capital, The Foundation provides them with the financial, technical and mentoring assistance they need to bring their ideas to reality. Inventor Support activities include the Recognition and Mentoring Programs (RAMPs) in India, Indonesia and Peru.
- **From the Marketplace to Individual Lives.** The Foundation supports sustainable enterprises that design and deliver technologies to those who need them most. Its Technology Dissemination portfolio includes support for organizations and activities in Water, Energy, Health, Agriculture and Biodiversity (WEHAB).

To date the Foundation has donated or committed more than \$150 million in support of its mission. Staff efforts are guided by the expertise of the Board of Directors, an International Advisory Committee, and support from other advisors.

## About the Exploratorium

**T**he Exploratorium is an educational institution for people of all ages. This innovative museum of science, technology, art, and human perception provides the general public with an experience enabling them to understand science and nature. Scientists and artists play at the Exploratorium, and so do our visitors. Play is the basis for discovery, innovation and invention, which makes the Exploratorium a fertile environment for everyone, whether scientist, artist, educator, learner or maker. The curious and the creative of all kinds have been nurtured at the Exploratorium.

This year the Exploratorium's audience numbers over 20 million at exhibits at science centers and other locations worldwide. More than 575,000 visitors will come to the Exploratorium to interact with the original, hands-on exhibits; 6,000 teachers will participate in professional development programs; 110,000 students and teachers will visit on school field trips; and another 5,000 students, many from San Francisco's underserved neighborhoods, will benefit from the Children's Educational Outreach Program. 50,000 copies of Exploratorium publications are sold, and its award-winning Web site receives 24 million unique visits during the year. At the 4th Science Center World Congress in Rio in 2005, science centers from five continents ranked the Exploratorium as the number one science center in the world.

Dr. Andy Grove, co-founder of Intel, says, "The Exploratorium hooks kids on the beauty of science. Intel takes kids and trains them to be world-class innovators in science. It's a perfect match." Artist/composer Brian Eno says, "Silicon Valley has spawned so much creativity because all these creative folks went to the Exploratorium when they were young..."



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## Anza

### Brown University



Anza (meaning “Start” in Swahili) is a technology-focused international development company that sells low-cost, high-utility products made from recycled materials to villagers in rural Africa. Anza, which currently sells solar cookers made from recycled plastic bags in East Africa, is now developing a cart for transporting water and other items, such as firewood and produce. By designing a wheel from upcycled automobile tires and a frame from low-cost, locally available materials (including bamboo, wood, and rubber lashings cut from old tires themselves), the cart can carry over 200 pounds of water and will retail for under \$10.

The Anza cart opens up the potential for small-scale farmers to collect enough water to irrigate a small kitchen vegetable plot. Due to the low supply of off-season vegetables, a simple 100-200 acre plot irrigated with the Anza cart could enable a family to earn between \$150-\$300 in supplemental income per year and pull themselves out of poverty.

## ApneAlert

### Northwestern University



A popular alternative to incubator care for premature infants in developing areas is kangaroo mother care (KMC), a technique in which the infant is kept on the caregiver's chest at all times. While KMC is accepted as a valid alternative to incubator care by the World Health Organization, premature infants remain at risk for apnea when the caregivers are sleeping or distracted and therefore unable to monitor breathing.

This E-Team is developing the ApneAlert, a low-cost, KMC-compatible apnea detection system. The device detects apnea by monitoring signs of sufficient breathing, and if an apnea episode is detected, an alarm is activated. In addition, data can be stored and accessed easily, allowing further detailed evaluation.

Applications of the ApneAlert can even be extended beyond KMC practice. Many exciting opportunities are currently under development.

## **AYZH, Inc.**

### **Colorado State University**

AYZH is a new venture taking a for-profit approach to developing, commercializing, and scaling low-cost, high-quality products that rural women want and need to help improve their standard of living. The first two products AYZH is bringing to market, JANMA and SHEBA, are focused on women's health. JANMA is an inexpensive (\$2) clean birth kit intended to reduce maternal and infant mortality. SHEBA is an innovative household water filter targeted specifically at women in rural Indian communities. It consists of an internal filtration system that can be customized according to local needs.



## **Banyan Environmental, Inc.**

### **Brown University**

While compact fluorescent lamps (CFLs) last longer and use much less electricity than standard incandescent light bulbs, they also contain 3-5 mg of volatile mercury per lamp. Mercury exposures are anticipated to rise as a result, and this Brown University E-Team, incorporated as Banyan Environmental, Inc., is looking to combat them. Brown University researchers identified a form of elemental selenium (nSe) with the ability to capture mercury vapor, a finding that was widely reported in the news in the summer of 2008 (New York Times, Discovery, etc.). Banyan is now developing user-friendly disposal and remediation methods to minimize accidental mercury exposures from fractured or broken fluorescent lamps, including box liners for CFL packages and shipping/recycling containers, consumer clean-up kits, air cleaning products for large spills, and dental office products. The company's mission is to provide a safer environment through cost-effective technologies tailored to customers' needs.



# Bombyx Technologies

## Cornell University



Each year seven million people suffer from eye injuries caused by trauma, disease, infection, or surgery. Eye wounds are extremely painful and can cause vision loss. The most severe incidences can take months to heal and may even result in blindness. Bombyx Technologies in collaboration with Cornell University is developing a transparent bandage that rapidly heals eye wounds. The bandage resembles a contact lens and when placed on a damaged eye it relieves pain and protects from further damage. Most importantly, the bandage regenerates and heals damaged tissue while dissolving naturally over a few days. No other regenerative eye bandage exists today. The material is completely unique, patented, inexpensive to produce, and reaches a half a billion dollar US market. In the future, this material has the potential to treat other wounds and even be used as a diagnostic tool to help identify diseases.

## Enhancing Bio-Morphological (EBM) Helmet Team

### Michigan Technological University

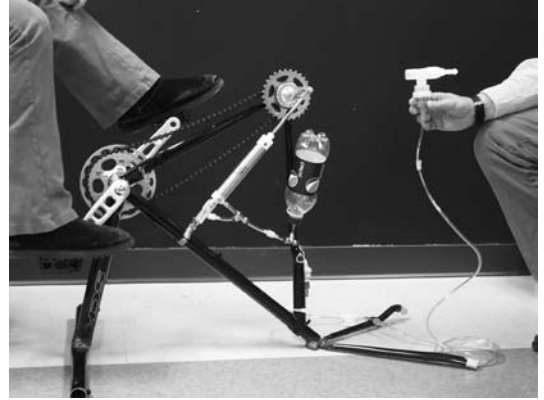


Today's standard football helmet design includes a hard outer shell, protective foam layer, and comfort foam layer resting on the head. An impact occurring directly to the hard shell is distributed over the padding, which deforms in compression. This works well for direct impacts, protecting against concussion, but doesn't perform as well for indirect or rotational impacts, since the padding is relatively stiff with respect to the shear forces. This E-Team is developing the Enhanced Bio-Morphological Helmet Layer, an improved design better able to withstand indirect impacts. The design of the helmet layer imitates the protection system of the human brain, i.e. the scalp and skull. The scalp is simulated by a viscoelastic material sandwiched between the outer shell and an inner composite shell mimicking the skull. The layer, which can be inserted into a helmet in addition to the regular helmet liner, is being designed for football, lacrosse and motorcycle helmets.

# Human-powered Nebulizer

## Marquette University

A nebulizer is a device that delivers aerosolized liquid medicine deep into the lungs. Commercial nebulizers use electric compressors to maintain a constant rate of air flow, and while this is effective, it presents a problem in the developing world where electricity is often unavailable. At the same time, chronic respiratory diseases and acute lower respiratory infections are the third major cause of morbidity and mortality in the developing world. This E-Team is developing a human-powered nebulizer (HPN) to replace the electric compressor with a leg-powered source of air flow. The HPN is a two-piston system, with each piston connected to a pedal. Stepping on the pedal generates air flow from the pistons, and the flow is dampened by a one-liter plastic bottle. The idea has been tested and confirmed as a workable low-cost alternative to traditional compressor-based nebulizers.



## LifeServe Innovations

### Lehigh University

The emergency surgical airway, or emergency tracheotomy, is a critical procedure learned by every medical professional as a last resort procedure to gain direct access to the trachea of patients under respiratory distress. In the most urgent emergency situations, a cricothyroidotomy is considered the procedure of choice, although this is not an effective long-term airway and can result in severe complications. In less urgent situations, it is preferable to have a surgeon perform a definitive tracheotomy whenever possible. LifeServe is developing a product line for critical care airway management using patent-pending, minimally invasive SMART (Seldinger-Modified Airway Rescue Tracheotomy) Emergency Airway Technique. The team has developed three novel airway devices for its product line: The Cobra: SMART Percutaneous Tracheostomy Kit, The Viper-Cric Emergency Percutaneous Cricothyrotomy Kit, and The Fang: Transtracheal Catheterization Device. These devices will improve and serve previous unmet needs in the emergency airway market, including pediatric applications and the ability to perform a definitive emergency tracheostomy under non-ideal conditions in the hospital and in the field.





## LoChlorine

### University of California, Berkeley

Chlorination is a cheap and safe method to actively disinfect water for several days, unlike other methods that cannot guard against biological recontamination. Programs in the developing world using household-level chlorination have seen water-borne illness decrease, but have faced dosing errors, leading to under-chlorinated or over-chlorinated water. In Kenya, simple community chlorine dosers increased usage from 8-61%; however these dosers showed limited ability to adapt to different volumes of water. The LoChlorine Producer and LoChlorine Doser aim to safeguard family health by improving both access to and the performance of chlorination. The LoChlorine Producer is a local method of chlorine production that yields a reliable concentration of chlorine for pennies using local materials and human power. The LoChlorine Doser is unique in its ability to automatically and appropriately dose arbitrary volumes of water. The design has no moving parts, uses no electricity, and could be mass-manufactured for less than ten dollars.

## OneBreath

### Stanford University

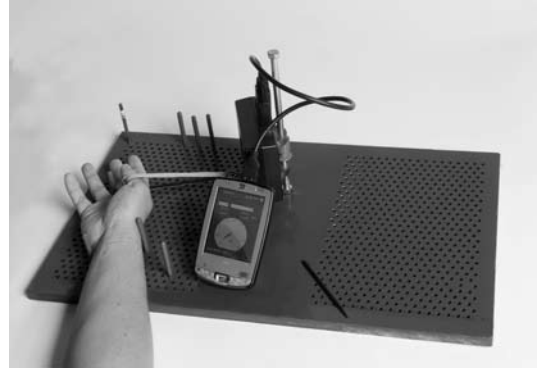


The recent H1N1 pandemic ignited concern in the healthcare community over our preparedness in the event of a mass critical care emergency. In a flu pandemic, millions of people could die from acute respiratory distress syndrome (ARDS), a common consequence of severe influenza. Many of these deaths could be prevented by placing the patient on a ventilator, but the US doesn't have enough ventilators to support patients with respiratory distress in even a mild flu pandemic. It is cost prohibitive to stockpile enough ventilators to meet projected pandemic need. Further, most ventilators in use today are ill-equipped for use in emergencies, where electricity and oxygen are limited and portability and durability are critical. Outside the US, many countries face chronic ventilator shortage. For example, the US has approximately 205,000 ventilators for a population of 300 million, but India, where the population exceeds 1.1 billion, has only 35,000 ventilators. This E-Team is developing a low-cost ventilator for acute respiratory distress patients in low-resource, pandemic and emergency environments. The device costs \$300, and is rechargeable, portable, and disposable.

# OrthoIntrinsics

## Rice University

OrthoIntrinsics is a medical device venture positioned to be a leader in the orthopedic space focused on hand-related disorders. For initial market entry, OrthoIntrinsics is targeting carpal tunnel syndrome; this affliction accounts for 500,000 surgeries and costs society \$2 billion dollars each year. However, 20% of surgeries are unsuccessful. Often times carpal tunnel manifests in the weakening of intrinsic hand muscle strength (IHMS). OrthoIntrinsics's first product, PRIME (Peg Restrained Intrinsic Muscle Evaluator), is a medical device that provides the first method to accurately, reliably, and directly measure IHMS. The current gold standard, manual muscle testing, involves an examiner physically estimating a subject's strength by feel on a 0-5 scale. This method lacks sensitivity to clinically significant change and reports high bias. PRIME has been validated in clinical studies at two leading hospitals and the technology has been highlighted in international conferences, boasts three pending peer-reviewed publications, and has been featured in prestigious media sources such as Mechanical Engineering Magazine and Medical Device Daily. As a true platform technology, PRIME can be expanded to spinal cord injury, muscular dystrophy, and other neuromuscular disorders.



# OsmoPure

## Rensselaer Polytechnic Institute

This E-Team is developing OsmoPure, a low-cost water purification device for developing countries based on simple membrane filtration technology. While there are a number of water filtration devices being marketed to the poor, many of them don't work in murky water (they get easily clogged), often require a large energy input in order to work (e.g., hand pumping), and fail to remove all contaminants. OsmoPure is a compact, cartridge-based, multi-stage water purification system. To produce potable water, the user fills a plastic bottle with dirty water, screws on the purifier like you would screw on a cap and squeezes the bottle to dispense clean water. When the filter looks dirty, the user simply shakes the fluid inside to remove debris. The purifiers are meant for plastic bottles that exist currently as rubbish in the target areas, cutting production and distribution costs and creating an environmentally friendly solution to the global water crisis.



## **Polytech Waterbag, Water Treatment for Disaster Relief**

### **California Polytechnic State University, San Luis Obispo**



Providing people with clean drinking water is one of the biggest challenges following a natural disaster, when thirst can force survivors to drink contaminated water. Currently, relief agencies and governments deliver five-gallon jugs of water, a costly and slow undertaking. Mobile treatment units require technicians, setup time, and provide only a few centralized water sources. This E-Team is developing the Polytech Waterbag, a ten-liter plastic bladder with carrying straps and an integrated filter with dispensing port. It is used with Procter & Gamble's PUR chemical treatment packets; using the packet with the filter, particles and pathogens are removed. Other Waterbag features include a wide mouth for easy filling in shallow streams, a sediment trap to prevent recontamination, and baffles to enhance mixing. Waterbags are twenty times more compact than five-gallon water jugs to ship, and can treat enough water to supply a family of four for up to ten days.

## **Safe and Innovative Chemotherapy Preparation and Delivery Device**

### **University of Iowa**

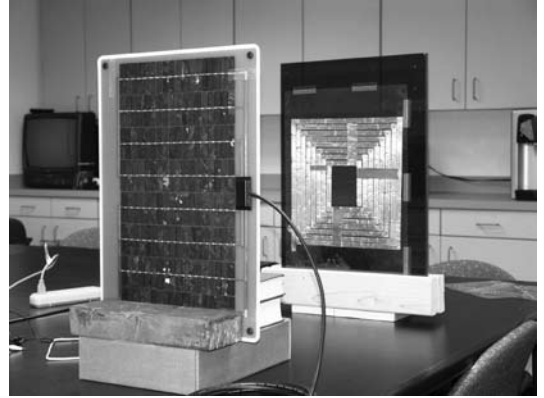


The National Institute of Occupational Safety and Health estimates that 5.5 million healthcare workers are exposed to toxic chemotherapy pharmaceuticals and related health risks in the workplace. Independent research shows current products fall short in addressing all the market needs, with many users complaining current devices are ineffective at eliminating exposure, difficult to use, error-prone, inefficient, and costly. This E-Team, incorporated as J & J Solutions, has developed innovative technology to optimize safety, increase efficiency, and reduce the cost of preparing and administering chemotherapy pharmaceuticals. Hospital pharmacies and oncology clinics create a \$500 million U.S. market potential, with a current market opportunity near \$100 million and growing over 20% annually. The company has pending patents, working product, proven technology, strong management, and commitments from cancer centers across the country.

# Solar Ease

## University of Pittsburgh

While solar energy is an attractive option to provide green energy, it remains burdened by high installation costs and has not been widely adopted. Part of the problem is the physical process of installation: solar panels require mounting brackets, outside breakers and ground connections, and through-holes for the wiring. This E-Team is developing a solar panel system that utilizes novel wireless energy transfer technology (WiTricity) to transmit solar power from outside panels to storage units inside, eliminating the need for cable connections through walls, interior/exterior wiring, and structural modifications. Reducing cost, complexity, and long term investment risk normally associated with solar installation will encourage adoption of this “green” source of energy, coinciding with government initiatives and energy efficiency programs.



# Universal Joint Assembly for Developing Regions

## San Jose State University

This E-Team is looking to solve three interrelated problems in Lebialem, Cameroon with products derived from bicycle parts. Most people in Lebialem earn \$2 a day, primarily from agriculture, which requires people to walk 20-40 kilometers to get to market bringing only what they can carry. While there is a longstanding metalworking industry in the region, it is currently on the decline. The E-Team is developing three products, derived mostly from old bicycles, to help stimulate the metalworking industry and overcome the first two problems: the Market-Cart, the Bamboo Backpack and the Universal Joint Assembly (a steel joint that can be the central unit for other products). The team’s goal is for families to increase their incomes by at least 30% in the first six months of ownership.



## Motorized Physical Therapy Chair to Reduce Muscular Atrophy: A Lemelson-MIT InvenTeam



Each year, NCIIA welcomes a Lemelson-MIT InvenTeam to participate in March Madness for the Mind along with the exhibiting E-Teams. The Lemelson-MIT InvenTeam initiative is a national grants program designed to excite the next generation of inventors and problem solvers through hands-on learning, while encouraging an inventive culture in schools and communities. Teams showcase their prototypes at EurekaFest, an annual celebration of the inventive spirit, presented by the Lemelson-MIT Program at the Massachusetts Institute of Technology (MIT) campus in Cambridge, Mass. Learn more about the Lemelson MIT program and about InvenTeams at: <http://web.mit.edu/invent/index.html>.

This InvenTeam from Cesar Chavez High School in Laveen, Arizona will design a fully adjustable motorized chair for medically fragile individuals to be used primarily for physical therapy. The chair will accommodate patients weighing between 40 and 150 pounds and have motorized platforms for the upper arm, forearm, thigh, lower leg, and torso. These supports will move through daily programmed ranges of motion specifically prescribed for each individual, increasing the patients' flexibility and mobility. The prototype will cost between \$3,500 and \$4,000, which is within the price range of similar currently available devices.

# NOTES