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"The World is Waiting… Are You Ready?"

Mission

iFEST exists to advance global entrepreneurship in the sciences, engineering, and medicine by bringing together young entrepreneurs and mentors around the world. To this end, we empower talented technology students from the US and overseas with the international experience, labs, teamwork skills, contacts, and knowledge they need to pursue their dreams and achieve their entrepreneurial goals in the global marketplace.

iFEST International Innovation Camps: Summary

In partnership with the Rensselaer Polytechnic Institute (RPI), and colleagues at the Ministry of Science and Technology of China (MOST) and the Indo-US Science & Technology Forum (IUSSTF), iFEST will launch **International Innovation Camps** for gifted undergraduate students and their mentors from the US, China, and India over an estimated 25 day period in the summer of 2009.

The main goal of the International Innovation Camp is to provide hands-on research based learning in the lab and creative transnational entrepreneurial teamwork experiences to apply what students have learned, which will prepare them to better navigate their own career paths in the real world. Our overall objective is to generate new ideas and teams which enable new globally scalable start-ups. To get there, we must cultivate the rising generation of innovation and entrepreneurship - - and inspire, teach, and connect gifted undergraduate students and their mentors in a collaborative transnational setting. We will accomplish these aims through early exposure at the undergraduate level to entrepreneurship coursework, management training, hands-on project based learning, and involvement in laboratory intensive teamwork under the supervision of experienced mentors. Future programs will include students and mentors from not only the US, China, and India, but also Japan, Korea, the UK, Israel, Russia, Brazil, and other countries in both developed and developing economic conditions.

The **iFEST International Innovation Camp** will achieve its goal for young people to acquire the entrepreneurship, experience, contacts, and tools needed to navigate their careers in an increasingly global economy by providing the following:

- ***Authentic Research Experience*** *– Students will conduct discipline-specific laboratory research in IT/Computer Engineering, Nanotechnologies, Biomedical & Life Sciences, Clean Technologies, and Robotics related topics in a real world setting under expert guidance and supervision;*
- ***International Team Building*** *– Students will work together in transnational teams in a collaborative effort to explore new ideas at the intersection of global technology start-up opportunities, and high impact science and engineering disciplines;*
- ***Hands-on Entrepreneurship Experience*** *– Students will work together on entrepreneurship coursework and exercises, and with experienced mentors will develop viable strategies, prototypes, and business plans;*
- ***International Presentation and Communication*** *– Students will work in their teams toward a final presentation before a panel of high-profile innovation and start-up experts; and*
- ***Substantive International Exchange*** *– Students will be mentored and encouraged to build lasting relationships and teamwork in a content rich setting as they further develop their understanding of global opportunities and the means to pursue their entrepreneurial dreams in the global marketplace.*

In the US, we will recruit from a talent pool of award winning students, based on national and international science and engineering competitions, e.g. the National Collegiate Inventors Competition, the National Science Foundation's Research Experience for Undergraduates (REU) and other NSF programs, undergraduate student alumni of the Intel Science Talent Search, International Science & Engineering Fair,

Toshiba's ExploraVision, Lemelson-MIT's InvenTeams, Oracle's ThinkQuest, Physics-, Biology-, and Chemistry-Olympiads, among others. Mentors from the US will be drawn from among the excellent entrepreneurial alumni of RPI. In China and India, students and mentors will be nominated from national talent pools developed by MOST and IUSSTF, in consultation with iFEST and RPI.

The time is right for the iFEST International Innovations Camps to unleash the next generation of technology driven creativity and entrepreneurship, and build constructive bridges between the US, India, and China that harness common interests in free enterprise, innovation, and economic growth. The International Innovation Camp at RPI will bring world class scientists, engineers, entrepreneurs, investors, and business leaders together with the students and mentors to learn about the start-up process and how to scale up creative new ideas for global markets.

The first Innovation Camp between the US, China, and India is slated to take place at RPI in Summer, 2009. Based on the success of university venues in hosting previous prototypical summer programs (see http://www.sciencestorm.com/award/9810525.html and http://kusec.ksf.or.kr/), a strong technical university such as RPI works best as the first host venue. For their part, the professors at the RPI facilities selected as host labs for the US, Chinese, and Indian students and their mentors, will benefit from:

- ***Discretionary Financial Support*** – Hosting professors obtain $10,000 in discretionary funding, and their post-doc and graduate students acting as Lab Supervisors will receive a Leadership Stipend of $2,000 for their time during the camp;
- ***Student Recruitment*** – The gifted US, Chinese, and Indian students will be well positioned for recruitment to RPI graduate programs. Professors have total right of review and refusal to any student or mentor;
- ***Summer Leadership and Teaching Experience*** – Graduate students and post-docs serving as Lab Supervisors can hone their lab leadership, teaching, and teamwork skills overseeing students in cooperation with experienced mentors.
- ***Mentoring and Networking Experience*** – Professors and Lab Supervisors have the chance to work with hand-picked mentors who have cutting edge research and industrial experience. Also, all will enjoy a focused networking and coaching session with innovative thought leaders (such as Vinton Cerf, John E. Kelly III, David S. Rose, Alpheus Bingham, Eric Lander, and Craig Venter) in an exclusive program focused on creativity, innovation, pitching, and mentoring for breakthroughs.
- ***Participation in the Camp Alumni Group*** – Professors and Lab Supervisors will be able to interact and do follow-up work with the students and mentors through the Camp Alumni Group, facilitated online using an email listserv, Facebook and Second Life resources, and also via follow-up iFEST programs.

The Camp will organize the students and veteran mentors in small international 3-6 person teams evenly divided between nationalities to work together on projects in the laboratory and the field, all in the English language. The teams will enjoy at least 70 hours of hands-on research and development working on projects in RPI facilities. Each team will participate in entrepreneurial exercises, programs in the city of New York, and there will be a special focus on the long term value of ethical business building practices. The camp will conclude with final presentations from each team, which will be critiqued and evaluated by a panel of leading experts. Representatives of the national and international media as well as sponsoring institutions and government agencies will observe the final sessions and interact with the students and mentors.

After the Camp, there will be an opportunity for summative and yearly downstream evaluations coordinated via the Alumni Group with listserv, website and Web 2.0 online community resources. Post-Camp, the Alumni Group will help participants stay connected, follow up on their projects, and benefit from ongoing mentoring and coaching. Given that the camp students and mentors will be selected through competitive processes, outreach to under-served populations especially in the United States will be essential, in order to broaden grass roots learning opportunities. The Camp will include cultural site visits and weekend field trips as relationship building opportunities, in addition to the lab work and entrepreneurship exercises at RPI.

Camp Venue(s) and Dates

The first iFEST Camp for US, Indian, and Chinese participants is slated to take place in 2009, at the RPI campus in Troy, New York. It is worth noting that if the Camp at RPI is successful, we plan to also build a similar summer program overseas for 2010, most likely at a leading national university such as Fudan University or Tsinghua University in China. iFEST has established a network of host universities, companies, foundations, and interested government agencies with which to partner for future growth of the International Innovation Camp program.

Working with its partners in China, India, and especially RPI (as host venue) iFEST expects to hold the first International Innovation Camp over the course of about 25 days during the July 10-August 3, 2009 timeframe.

Hosting Labs at Rensselaer Polytechnic Institute

The first Innovation Camp between the US, China, and India will be hosted by RPI, one of the oldest science and engineering focused schools in the English speaking world. The Camp will enjoy presentations and mentoring sessions with innovative and experienced thought leaders and entrepreneurs in an exclusive program focused on creativity, innovation, pitching, communication, and mentoring for breakthroughs.

RPI and iFEST are pleased to identify the following labs and professors who are enthusiastically willing to open their labs and make their unique science and engineering facilities available as host labs for the teams of students and their mentors.

1. O.T. Swanson Multidisciplinary Design Laboratory; School of Engineering

   Professor Mark Steiner, Director

   http://mdl.rpi.edu

   The O.T. Swanson Multidisciplinary Design Laboratory (the Design Lab) provides clinical real-world research and engineering experiences that teach integration of discipline-specific knowledge with practice on challenging multidisciplinary design projects in the real world. The Design Lab joins together a multitude of resources, programs, courses, curricula, faculty, and staff from across RPI. Because the Design Lab works each semester primarily with senior engineering students from computer systems, electrical, industrial, and mechanical engineering it is ideal for hosting multiple teams of students (six students each, drawn equally from the US, China, and India) and at least one mentor for each team for the first International Innovation Camp.

   The Design Lab deploys pre-qualified student teams on sponsored research projects for Albany International, Apieron, Boeing, Comfortex, Fleetcross, GE, IBM, Northrop Grumman, Gerber Scientific, GM, Morgan Stanley, NYISO, Harris Communications, Schick, and others. The Design Lab also integrates the social sciences into the Engineering Curriculum at RPI, and in affiliation with the Partners for the Advancement of Collaborative Engineering Education (PACE), provides the entire RPI community with advanced engineering, design, and management related software. The Manufacturing Network at RPI (see http://www.eng.rpi.edu/manufacturing/) is an integral part of the Design Lab. For the Innovation Camp, undergraduate students from the US, China, and India will work in Design Lab and enjoy hands-on project based learning on topics (see below) in the Haas Tech Center and Advanced Manufacturing Laboratory.

   The Design Lab serves as a working forum for invention and entrepreneurship, which will serve as a platform for regional leaders to work with the international teams. For example, at the Camp the Design Lab will host Burt Swersey (NCIIA 2007 Olympus Innovation Award winner) for presentations and exercises in his Inventor's Studio in the Lab. His course is offered every semester at RPI, and has led to numerous patents and entrepreneurs who have started new businesses. The Design Lab works closely with the Center for Advanced Automation Technology to develop new tools and applications in

mechanical engineering, focused on robotics, artificial intelligence, haptics, and other fields. In addition, the Design Lab actively teaches invention and entrepreneurship, and supports campus wide entrepreneurship initiatives integrating concepts into project-based design experiences.

Through projects drawn from the real world, the Design Lab will allow the student teams to gain experience in cross-disciplinary problem-solving, engineering, research and development. The Camp at RPI will benefit from the Design Lab's world class engineering design program, known for producing exceptionally resourceful graduates, who achieve technical excellence through innovation and entrepreneurship.

As part of the Design Lab program, students will help to address some of the world's ongoing challenges and learn about entrepreneurship and innovation as they acquire real-world problem solving skills. The projects for the student teams at the Camp will include the following:

Distributed Shared Immersive Visualization Environment

IBM, Sony, and Toshiba jointly developed the Cell Broadband Engine (CBE) chip for computationally intensive tasks. Today, the chip is used in the Sony Playstation 3 (PS3). The objective of this project is to develop new applications of the CBE that are not typically part of computer games. Previous work showed the feasibility of a vision-based industrial inspection system that detected eroded steam turbine blades. One of the methods for determining the quality of a blade was based on the feature extracted by the 2D Fourier transform. The team will implement codes in Matlab running on a PC and will seek to write codes for the CBE. IBM wants to study the 2D Fourier transformation approach further. At the Camp, one team will extend the work and develop a fully functional prototype using a PS3. In addition, the team will research other applications of this technique, and explore developing demonstration projects based on their work in the Design Lab, if possible. The team will also research possible connections, cross-utilities, and portability to other extant virtual environments (such as Second Life, Intel's ScienceSim, Sony's Home, Gaia Online, etc.) for enterprise development and education uses, and include all relevant ramifications in its final presentation.

Sustainable Design

A sustainable product has a designed life cycle for the purposes of furthering its functional life or reclaiming its value for future products, so that minimal waste is generated. While there are some generally accepted methods and guidelines to increase the recycle-ability and reduce the number of parts (DFx, value analysis, modular methodologies, axiomatic design, etc.), these have yet to yield proven designs that are more sustainable than other designs. Ongoing research has identified a set of sustainability metrics that could be used to "score" a product or family of products for sustainability. In order to test and validate these new metrics, the scoring model must be iterated through case studies of well-known designs. The team of students at the camp will work on this task and aim to develop tools that will form the basis of the new metrics, and also apply the metrics to several design problems underway at the Design Lab.

Pollution Capturing Wind Turbine

The data suggest that decades of human activity has led to significant increases in carbon dioxide and methane in the atmosphere. Although the complete picture of the effect of increased concentration of these greenhouse gases is complex, most scientists agree that the current global warming is in large measure caused by increasing levels of greenhouse gases, and ways to restrain the emission of these gases must be developed. The industrial partner in this project has filed an application for a provisional patent for an approach to remove pollutants from air that is based on pollutant absorbing surfaces attached to wind turbines. This project involves experiments and analyses to gauge the feasibility of the invention with an initial focus on methane absorption in association with Savonius vertical axis wind turbines. There will be work on materials research and engineering which will be included in the focus of a team at the Camp, with the goal of testing and finding a range of materials that serve this purpose, and integrating them into a real world prototype working turbine.

Document Processing, Database Development, and Integration

Morgan Stanley maintains over four million documents containing 26 terabytes of information. These documents were prepared using MS Excel, Power Point, Word and Adobe PDF. New documents are added to the repository every day. This is not an uncommon problem for large firms and public institutions, therefore it is useful for one team at the Camp to work on a new system. Therefore, to utilize the stored information more efficiently, the team will develop a scalable document processing system using a variety of software tools and architectures. The team may also work on integration of various databases to improve data retrieval, display, and search functions. For example, FleetCross Holdings, Inc. provides custom database, software, and network solutions to the *Transportation and Equipment Industry*. Their customized parts and service referencing systems for vehicles, equipment, and parts cross reference are utilized by both fleet and parts sales organizations throughout the industry. End users are service technicians, parts personnel, procurement officers, and inventory managers.

Currently the users often need to access multiple systems to get information they need. This is a common problem for large firms like FleetCross and Morgan Stanley. The team's object will be to develop a means to integrate their vehicle related information systems seamlessly so that the end users will be able to find and read information more easily and quickly. Previous work in this area has involved developing a method for detecting duplicated PowerPoint files consisting of the same slides in the same order. But in the future, these problems will require development of methods for detecting similar PowerPoint or other files and a Graphical User Interface (GUI) that allows the user to review and search through the results easily.

Erosion and Aero Probe Field Testing

As energy is extracted from the steam flow in a low pressure steam turbine, the steam eventually decreases in temperature and pressure resulting in a two phase flow. The water droplets suspended in the steam cause erosion to the turbine's buckets, resulting in lower efficiency. Monitoring the erosion rate is an issue. In past work, a number of methods for measuring and evaluating erosion have been investigated and experiments conducted. The most promising of these has been the use of a boroscope with a digital camera for image capture for inserting into a turbine in a maintenance mode. The goal of this project is to transition the experimental apparatus into a practical configuration that can be installed on a 1/3 scale test turbine. Then the team will try to make it portable. To understand and improve the performance of steam turbines it is extremely useful to measure actual steam flows in operating machines at utility sites. Such measurements are typically done with pneumatic probes. To determine the steam Mach number and flow direction at a given location in a turbine, four differential measurements and one absolute pressure measurement must be recorded. This requires leak-free connections between the probe ports, the digital pressure meters, and the various valves for purging the gas lines. It also requires that the analog signals from the pressure meters be conditioned and noise sources be eliminated. Currently, when field tests are done, the individual system components are assembled at the turbine site. The integrated system is then tested and often leaks, erosion, and electrical problems are discovered that are fixed before measurements can begin. The goal of this project is to integrate erosion monitoring and create a preassembled Field Test Unit (FTU) that can be transported to the customer site and be ready to take data. This will require software development, image capture refinement including lighting, and complete design of packaging for the equipment. The team of students will seek to design a prototype, and test it in the field.

2. Center for Biotechnology and Interdisciplinary Studies

   Prof. Glenn M. Monastersky, Director of Operation

   http://www.rpi.edu/research/biotech/index.html

The Center for Biotechnology and Interdisciplinary Studies is a recently established research and training center for the biosciences bringing researchers and students from many technical disciplines working together focused on problems in biomedicine, agriculture, and other fields of research and development. This new center at RPI ranks among the world's most advanced research facilities focused on the application of engineering and the physical and information sciences to the life sciences.

The Center is a 218,000-square-foot, $80 million facility on the RPI campus. With its high-tech and expansive laboratories, it provides a platform for collaboration among many diverse academic and research disciplines to enhance discovery and encourage innovation. Research and/or office space includes room for approximately 400 faculty, staff, and students. RPI is rapidly recruiting world-class investigators to lead research in the focal areas. Each focal area will be supported by a constellation of "star" faculty, junior faculty, and others who are experts in their fields. These constellation groupings provide for communities of distinguished researchers and the programmatic resources to ensure their success.

The Center houses faculty and researchers engaged in interdisciplinary research, and hosts world-class programs and symposia. It exemplifies a new research paradigm, as no department offices reside in the building; rather, it is occupied by researchers and their laboratories. The core research facilities within the Center contain laboratories for molecular biology, analytical biochemistry, microbiology, imaging, histology, tissue and cell culture, proteomics, and scientific computing and visualization. The Center contains an 800 MHz Nuclear Magnetic Resonance (NMR) spectrometer and the computing and visualization infrastructure needed to model molecular structure at the atomic level. In addition, the Center will become home to a new $22.5 million Gen*NY*sis Center for Bioengineering and Medicine funded by New York State. RPI has received significant Federal funding to support the creation of a new Center for Quantitative and Computational Bioscience to be housed in this facility.

Biocatalysis and Metabolic Engineering

The International Innovation Camp will provide two teams (because of technical constraints only three students will be on each team, in this case) with lab intensive learning, mentoring, and problem solving at the Center focused using analytical tools to better understand biocatalysis and metabolic processes for novel molecular synthesis. The teams will use state of the art understanding of biocatalysis and metabolic engineering tools seeking to elucidate and perhaps control the complex interplay and regulation of multi-enzyme processes. The steps and understanding required for the students to perform complex chemical reactions that can produce costly or difficult to manufacture substances, perhaps at an economical and efficient scale. Often considered integral to synthetic biology, this rapidly growing area shows promise for the creation of new techniques for developing useful bioactive macromolecules and polymers.

The work of the teams will be aimed at understanding and taking advantage of natural metabolic processes found in cellular pathways for chemical transformation, energy transfer, and supramolecular construction. This technology has become increasingly important to chemical and pharmaceutical companies for numerous commercial applications in healthcare and industrial chemical processes. The teams require capabilities and collaboration across disciplines and capabilities in a wet lab setting working with a variety of tools. Although the US, Indian, and Chinese students will meet basic pre-requisites, the teams of students will be trained as needed on the Center's advanced equipment and tools, and gather data to document their researches into the chemical biology underlying identifiable natural metabolic pathways and biocatalysis.

A particular focus for the team will be in pharmaceutical and nanoscience applications of biocatalysis and metabolic engineering. For example, the teams will focus on bioactive carbohydrates, particularly the complex polysaccharide heparin. Heparin is a major clinical anticoagulant with more than 500 million doses used worldwide each year. Heparin and related molecules exhibit a large number of newly discovered biological activities and have great therapeutic potential. Glycoprotein,

proteoglycans, and other glycoconjugates are prepared by fermentation using recombinant technology, extraction from tissues, or by chemical and enzymatic synthesis. After determining the structure of these molecules, the teams will study their biological activities. By establishing a structure-activity relationship, these molecules often become lead compounds for new drug development.

Mapping of the mouse glycome is underway with a focus on heparan sulfate proteoglycans. Heparan sulfate is being isolated from tissues obtained from wild type and knock out mice, missing various isoforms of enzymes involved in heparin sulfate biosynthesis. Mouse embryonic stem cell proteoglycan glycomics are also being studied. The structures of these sulfated polysaccharides are being determined, and biochips and microarrays containing heparin sulfate from these tissues are being prepared as a tool for glycomic screening. If possible, the teams will use the microarrays to perform the screening studies and document their results.

The teams may also conduct biochemistry and structural biology studies which focus on the preparation, purification, and characterization of carbohydrates and glycoconjugates. The team will seek to develops methods to purify these glycoconjugates and determine their structure by microsequencing using mass spectrometry (MS). The teams may also explore the kinetics and thermodynamics of protein-carbohydrate interactions, relying primarily on isothermal titration calorimetry and surface plasmon resonance (SPR) spectrometry. X-ray crystallography and nuclear magnetic resonance (NMR) solution structure analysis are used in conjunction with molecular modeling to determine the molecular contacts in the protein carbohydrate complex.

The teams may also use chemical and enzymatic synthesis to prepare target carbohydrates for biological evaluation. An artificial Golgi is also being used to study the parameters affecting glycan biosynthesis in the cell. The group's current focus is to prepare acidic carbohydrates. Targets include: sialic acid C-glycoside analogues as vaccines and glycosaminoglycan oligosaccharides for therapeutic evaluation by high throughput activity screening. Using the various approaches at the Center, the teams will be able to deliver useful data that may help guide drug discovery and other therapeutic studies.

3. Center for Automation Technologies and Systems

   Prof. John Wen, Director

   http://www.cats.rpi.edu/index.html

   The Center for Automation Technologies and Systems (CATS) at RPI is a New York state designated research and education center under the NYSTAR program, focused on combing quantitative analyses with creative engineering solutions at the large scale level as well as the micro- and nano-scales. CATS is known around the world for its industrial-university partnerships, and professors and students work which has lead to successful start-ups and numerous useful technologies in industry and also in the US space program at NASA. CATS is a leading center of excellence at RPI focused on robotics, automation, artificial intelligence, micro-electromechanical systems (MEMS), biomechanical micro-engineering, and related frontiers of research and mechanical engineering. State of the art labs and cooperation with other facilities at RPI and peers around the world is a hallmark of the CATS community. For example, CATS maintains working cooperative relationships with the following centers and facilities around the RPI campus system, including:

   - Flexible Manufacturing Center (FMC)
   - Multidisciplinary Design Laboratory (MDL)
   - Center for Future Energy Systems (CFES)
   - Scientific Computing and Research Center (SCOREC)

- Fuel Cell Center
- Center for Polymer Synthesis
- Center for Terahertz Research
- Center for Integrated Electronics (CIE)
- Rensselaer Office of Entrepreneurship
- Career Development Center (CDC)
- Education for Working Professionals (EWP)

CATS also maintains ongoing relationships and exchanges with numerous world-class engineering and robotics research, measurement, and training centers in the US and around the world. For example, CATS has long-standing partnerships with:

- National Institute of Standards and Technology, Manufacturing Engineering Laboratory (NIST/MEL)
- Chinese Academy of Sciences (CAS), Institute of Automation (IA), and Laboratory for Complex Systems and Intelligent Science
- Technical University of Eindhoven (Focused on micro- and nano-scale engineering)

As part of the International Innovation Camp at RPI, CATS will host one student team working in the general area of dynamical systems modeling, network control, and planning with applications to vibration suppression, robot manipulation, electro-mechanical systems, advanced material design, projectiles, network flow and power control, and systems integration.

Controller Area Network and Remote Controlled Vehicles
A growing number of automobiles use multiple microcontrollers for providing sophisticated functions. Controller Area Network (CAN) is one of the standard protocols for managing communication among microcontrollers and modules. The goal of this project is to develop course materials that teach the CAN technology and its role in automotive applications in ECSE-4790 Microprocessor Systems, a senior-level engineering course. Previous teams have developed the course materials that utilized a remote controlled car. Future teams will create additional lab experiments that will use real components. For example, during emergency situations involving hostage standoffs, kidnapping, or other potentially life-threatening scenarios, police use many tactical techniques to investigate and resolve the situation. Among these is the use of an "eyeball" camera that is thrown into a room and remotely controlled to observe the room and its inhabitants. The goal of this project is to design and construct a low cost remote controlled motorized vehicle with the eyeball camera that can improve their capabilities. The vehicle will include attachments for the camera (including a pan/tilt capability), the ability to mount lights, and a remotely-controlled tear gas canister dispenser that can be used to precisely deliver this agent when needed. The team of students will design, build, and test a robust prototype that uses the CAN technology in a real world and sometimes unpredictable setting.

4. Smart Lighting Engineering Research Center

Prof. Ken Connor, Director of Education (and Professor of Electrical Engineering)

http://smartlighting.rpi.edu/

The Smart Lighting Engineering Research Center (ERC) advances LED technology by making substantial progress in novel materials, device technologies and system applications. The main goal at the Smart Lighting ERC is to demonstrate revolutionary lighting systems with controllability and tunability for, but not limited to, bio-imaging, high-efficiency displays and illumination devices, safer transportation and novel modes of communications. Innovations at The Smart Lighting ERC will be rapidly commercialized through industrial partnerships, while securing intellectual property. Another long term goal of the ERC is to bring more intelligent and innovative young people to science and engineering education through

focused outreach educational programs.

The Smart Lighting ERC is funded by an $18.5 million, five-year award from the National Science Foundation Generation Three Engineering Research Center Program. The Smart Lighting ERC is also the only ERC centered in New York state. The ERC also benefits from active partnerships with other schools, in particular the University of New Mexico and nearby Boston University.

The RPI facilities provide an unparalleled vertically integrated array of fabrication, processing, characterization, and system assessment tools. The wealth of experimental methods of the combined Smart Lighting ERC facilities is extensive and unique. The operation of the shared ERC Central Laboratories at RPI is guided by:

1. Rapid access to facilities and equipment by partners, enabled by expedited training schedules;
2. Initial supervised usage of equipment by visiting personnel until they are fully cleared;
3. Stringent maintenance and high availability of equipment by skilled technical support personnel including one laboratory manager.

The program offers students at the Camp real-world, hands-on technical experience focused on ongoing research and development at the Smart Lighting labs at RPI. A sample research focus for the team in ERC labs at the Camp stems from the fact that light consumes a lot less energy than other wireless networking technologies like WiFi, and it is more localized - - providing an opportunity leading to more energy-efficient communications. For example, LEDs use about 15 percent as much electricity as light bulbs of equivalent brightness. At present, about 22 percent of the world's electricity is used for lighting, but it could be reduced to 11 percent if all existing lamps were replaced with LEDs. Smart lighting is the only technology that can make a huge dent in electricity consumption, but for now at least, it is expensive. While a 100-watt bulb costs less than $1, an equivalent LED lamp can cost as much as $80. This may change as commercial and industrial users with high power costs increase their use of LED lamps, leading to increased production by lighting companies and a lower price per lamp. Moreover, the cost will come down faster as customers realize LED lamps could double as a data network. This presents exciting prospects for economies of scope, as the research is developed and challenges are addressed in depth by the team. Therefore, the team will explore how LED data networks could find applications beyond homes and offices.

In addition, the team at the ERC may study automotive applications, such as smart traffic signals designed to make the transportation system more safe by developing traffic lights that would prohibit cars from running a red light. Some recent examples of other projects students may work on at the Camp include:

- The impact of the 9/11 attacks on critical infrastructure interdependence;
- Subsurface sensing and imaging for bridge decks and pavements; and
- Sensitivity analysis on a linear programming model of world trade.

During the Camp, the student team will focus on applying knowledge to actual problems and research situations, networking with faculty in research labs, and establishing support groups consisting of faculty and other students. The students will gain critical leadership and team building skills, making industry connections that could lead to future opportunities, and gaining experience in performing real-world projects. The student teams will receive hands-on research and communication experience, and obtain knowledge of conducting research that could be applicable to graduate studies. Through the teamwork at the ERC, students will be able to improve critical thinking skills and creativity in developing solutions to key industrial and social problems common in the US, China, India, and everywhere else around the world.

New York Program

RPI offers unique proximity to the City of New York City, just a short 2.5 hour bus ride away. The program of the International Innovation Camp will take advantage of that geography to expand and leverage the experience at the Camp for the students, and also exploit the national and foreign media presence in New York. Working with iFEST colleagues and RPI alumni in Manhattan, we will arrange for the student teams to make presentations and perform visual demonstrations for an audience of generalists and journalists at national television news outlets, as well as newspapers, magazines, and internet publications. In this way, we hope that the Camp will successfully demonstrate to the United States and the rest of the world via the wide media lens that the potential level of trust and cooperation among young American, Indian, and Chinese students and their mentors is high enough to bring our countries and our people together to work in a more purposeful and mutually beneficial manner. The Camp can serve as proof of concept that working together toward the resolution of pressing global problems via creative capitalism and international cooperation is one constructive path forward. It is certainly better than not working together, among other alternatives.

Therefore, over three days near the end of the Camp, we plan to take the students and mentors to New York where we will give them a brief yet in-depth introduction to the leading center of global commerce today. As part of the program, we will take the Camp participants to visit key institutions and listen to presentations from leaders at the United Nations (including the Indian and Chinese missions to the UN), the New York Stock Exchange, City Hall, the NASDAQ NY offices, Goldman-Sachs, the Ford and Rockefeller Foundations, the New York Academy of Sciences, the Council on Foreign Relations, Columbia University, the Fashion Institute of Technology, Endeavor, and TIAA-CREF headquarters. In addition, we will also arrange enjoyable site visits to notable art and science museums, Time Square, Rockefeller Center, Liberty Island, the World Trade Center Memorial, Wall Street, the Empire State Building, and Chinatown for example. We expect this part of the program will take place over the last full weekend of the Camp, leading up to the concluding presentations.

Follow-up

Developments after the International Innovation Camp will be the true measure of success in reaching our goals. We will plan a program of follow up after the events for the students, mentors, and other participants. Follow up plans will include post-camp communications, evaluations, follow through on business model development, enablement of further technical and business related collaborations, and development of an official Camp alumni group and networks using an email listserv, the Camp website, a Facebook Group, and the International Innovation Island in Second Life. The focus of the Camp alumni group with these web 2.0 tools is to encourage further mentoring and coaching, as well as ongoing teamwork toward real-world business plans suitable for future investment.