The key objective of I-CARES is to foster research on energy, environment, and sustainability that cannot be done by single investigators alone. I-CARES nurtures collaboration within Washington University and with regional and international partners and will contribute to more rapid progress in addressing great challenges facing our world.

Mark S. Wrighton, Chancellor
Washington University in St. Louis

I-CARES, as an umbrella organization, coordinates all research activities in the areas of energy, environment, and sustainability. In collaboration with regional and international partners, I-CARES investigators are engaged in cutting-edge research and the development of various forms of renewable energy.

Himadri B. Pakrasi
Director, I-CARES
Washington University in St. Louis

I-CARES:
International Center for
Advanced Renewable Energy and Sustainability

WASHINGTON UNIVERSITY HAS UNDERTAKEN A MAJOR INITIATIVE IN
EDUCATION AND RESEARCH RELATED TO ENERGY, ENVIRONMENT, AND
SUSTAINABILITY THAT WILL BENEFIT FUTURE GENERATIONS.

I-CARES PROVIDES A UNIQUE AND EXCITING COLLABORATIVE ENVIRONMENT
FOR EVERYBODY AT WASHINGTON UNIVERSITY WHO IS INTERESTED IN
GLOBAL ISSUES IN ENVIRONMENT AND SUSTAINABILITY.
I-CARES
INTERNATIONAL CENTER
FOR ADVANCED RENEWABLE ENERGY
AND SUSTAINABILITY

AN INITIATIVE FOR INTERNATIONAL RESEARCH & COLLABORATION

Washington University in St. Louis is addressing the challenges of energy and sustainability on a global scale. The International Center for Advanced Renewable Energy and Sustainability (I-CARES) was created in June 2007 to encourage and coordinate University-wide and external collaborative research on energy, environment, and sustainability that cannot be done by single investigators or by single disciplines alone.

A key goal of I-CARES is to foster institutional, regional, and international research on:
- the development and production of biofuels from plant and microbial systems;
- the exploration of sustainable alternative energy; and
- the exploration of environmental systems and practices.

Research at the center will also focus on the region’s important coal resources and efforts to:
- mitigate carbon dioxide accumulation,
- improve combustion processes, and
- reduce emissions.

INSTITUTIONAL
At the University, from the application of basic science to the business of greening America, all faculty from all departments and schools are invited to work in partnership with I-CARES to address the immense energy challenges of the 21st century.

REGIONAL
I-CARES coordinates research efforts at the University and works with other organizations in the greater St. Louis region to explore alternative energy sources and to develop novel products, applications, and sustainability practices. Sponsorships will be developed with energy and technology companies and other corporate supporters as well.

INTERNATIONAL
I-CARES encourages international collaborative research on energy and environmental issues by working closely with a global partnership of leading universities forged by the University’s McDonnell International Scholars Academy. An outgrowth of an international symposium sponsored by the McDonnell Academy, the McDonnell Academy Global Energy and Environmental Partnership (MAGEEP) is a consortium of 25 universities worldwide and corporate partners that supports the development of innovative ideas in collaborative education and a wide range of research activities in energy and environmental areas.

Prozin Biswas
Lucy & Stanley Lopata Professor of Environmental Engineering, Chair, Department of Energy, Environmental & Chemical Engineering, School of Engineering & Applied Science, and Director, McDonnell Academy Global Energy and Environmental Partnership

Evan D. Kharasch
MD, PhD, Vice Chancellor for Research and Russell D. & Mary B. Sheldon Professor of Anesthesiology

Bruce Lindsey
Dean, College of Architecture and Graduate School of Architecture & Urban Design and E. Desmond Lee Professor for Community Collaboration

Edward S. Macias
Provost, Executive Vice Chancellor for Academic Affairs and Barbara & David Thomas Distinguished Professor in Arts & Sciences

Himadri B. Pakrasi
George William & Irene Keenig Freiberg Professor of Biology, Arts & Sciences and Professor of Energy, School of Engineering & Applied Science

Ralph S. Quatrano
Dean, School of Engineering & Applied Science and Spencer T. Olin Professor of Arts & Sciences, Biology

Barbara Schaal
Mary–Dell Chilton Distinguished Professor in Arts & Sciences, Vice President of the National Academy of Sciences, and Director of Tyson Research Center

Michael Sherraden
Benjamin E. Youngdahl Professor of Social Development, George Warren Brown School of Social Work

Jennifer Smith
Associate Professor of Earth & Planetary Sciences and Environmental Studies

Gary Whîl
Dean, Arts & Sciences and Hortense & Tobias Lewin Distinguished Professor in the Humanities in Arts & Sciences

Michael Sherraden, PhD, the Benjamin E. Youngdahl Professor of Social Development, founder and director of the Center for Social Development at the George Warren Brown School of Social Work. Sherraden, a leader in asset building and community development research, has received widespread recognition for his impact on public policy.

J. Hord Armstrong, III
Chairman and CEO, Armstrong Energy

Gregory H. Boyce
Chairman and CEO, Peabody Energy

Doug Cameron
Founder & Managing Director, Alters Advisors, LLC

Betsy Cohen
Vice President, Sustainability, Nestlé Purina PetCare Company

Daniel F. Cole
President & CEO, Ameren Services Co.

Clark Davis
Vice Chairman, HOK

Robert T. Fraley
Executive Vice President and Chief Technology Officer, Monsanto

Kenneth Goldman
General Manager, Energy Solutions, Inc.

James K. Harlan
CEO, Vendevco

Ganesh Kishore
Managing Director, Burrell & Company

Randall Ledford
Senior Vice President and Chief Technology Officer, Emerson

Steven F. Leer
Chairman and CEO, Arch Coal

Cassandra Pan
President, Fenner Dunlop Americas

Shaker Sadaoivam
Senior Vice President R&D, MEMC Electronic Materials, Inc.

Martha A. Schlicher
Vice President, Bioenergy Technology, Monsanto

S. Richard Tolman
CEO, National Corn Growers Association

Doug Yaeger
Chairman, President & CEO, Laclede Group

ADVISORY COMMITTEE

Michael Sherraden, PhD, the Benjamin E. Youngdahl Professor of Social Development, founder and director of the Center for Social Development at the George Warren Brown School of Social Work. Sherraden, a leader in asset building and community development research, has received widespread recognition for his impact on public policy.
Dedicated in September 2011, Preston M. Green Hall is the newest building in the state-of-the-art complex of engineering buildings at the northeast corner of the Danforth Campus. The 83,849-square-foot building, designed by the architectural firm RMJM and constructed by Clayco, is located at the northeast corner of the Danforth Campus. An archway diagonal to the intersection of Skinker Blvd. and Forest Park Parkway echoes architecturally the archway of the university’s signature building, Brooksings Hall, providing a dramatic entrance to the campus.

The hall’s location makes a powerful statement about the university’s commitment to research and education in renewable energy and sustainability. With its immediate access to the Metrolink, St. Louis’ light rail system, Green Hall increases accessibility to the Washington University Medical School and provides greater access to members of the campus community choosing to utilize public transportation.

Construction of Green Hall began in April 2010 and was completed by the start of fall 2011 classes. The hall includes three classrooms and state-of-the-art complex of engineering buildings at the northeast corner of the Danforth Campus. The 83,849-square-foot building, designed by the architectural firm RMJM and constructed by Clayco, is located at the northeast corner of the Danforth Campus. An archway diagonal to the intersection of Skinker Blvd. and Forest Park Parkway echoes architecturally the archway of the university’s signature building, Brooksings Hall, providing a dramatic entrance to the campus.

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In 2006, Chancellor Mark S. Wrighton announced an $8 million commitment from the estate of Preston M. Green to support the School of Engineering & Applied Science and its Department of Electrical & Systems Engineering. In addition to housing the permanent home of I-CARES, Green Hall is home to the Preston M. Green Department of Electrical and Systems Engineering and includes space for the Department of Energy, Environmental & Chemical Engineering.

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I-CARES AT PRESTON M. GREEN HALL

Preston M. Green Hall is home to the International Center for Advanced Renewable Energy and Sustainability (I-CARES).

I-CARES’ PERMANENT HOME

I-CARES’ space in Preston M. Green Hall was designed for flexibility and collaboration. It provides meeting rooms, video conferencing capability, and has been designed for use by the broader campus community working under the umbrella of I-CARES on issues of energy, environment and sustainability.

SUSTAINABLY DESIGNED

Green is more than just the name of the building, like all of the University’s recent construction projects, the hall meets LEED specifications for a Gold rating. LEED, the acronym for Leadership in Energy and Environmental Design, is a nationally accepted rating system for the design, construction and operation of buildings that use its specifications for achieving environmental sustainability. Sustainable features include: more than 50 percent of the building’s wood products came from sustainably managed forests; more than 90 percent of the construction waste was diverted from landfill; and 100 percent of irrigation is provided by captured rainwater stored in a turn-of-the-century brick sewer converted to a cistern.

I-CARES AT PRESTON M. GREEN HALL

Christof Jantzen, AIA, LEED AP
I-CARES Professor of Practice
Sam Fox School of Design & Visual Arts

Professor Jantzen is the Sam Fox School’s inaugural I-CARES professor. Formerly a partner of Behnisch Architekten, Prof. Jantzen operates his own firm, Christof Jantzen Architecture. In his research and practice Prof. Jantzen continues to explore architectural theory while remaining grounded in the realization of built projects that synthesize design excellence with sustainability.

The Genzyme Center in Cambridge, Massachusetts, a project directed by Prof. Jantzen, achieved LEED Platinum certification and is an early precedent in advanced sustainability.

John Fortner
I-CARES Career Development Assistant Professor
Energy, Environment & Chemical Engineering School of Engineering & Applied Sciences

Professor Fortner’s focuses on the environmental implications and applications of advanced materials. He has studied the environmental fate, reactivity and impacts of engineered carbon nanomaterials, including fullerenes and carbon nanotubes, in aqueous systems. Prof. Fortner is developing nanoscale iron-based materials for detecting low levels of heavy metals and similar, metal oxide materials for novel, high-efficient, water-treatment processes.

I-CARES AT PRESTON M. GREEN HALL

Brent Williams
Raymond R. Tucker Distinguished I-CARES Career Development Assistant Professor
Energy, Environmental & Chemical Engineering School of Engineering & Applied Sciences

Professor Williams’ research focuses on the composition, chemistry and physical properties of Earth’s atmosphere, particularly the role of biogenic and anthropogenic gases and particles in Earth’s climate system. Prof. Williams joined the Washington University faculty as an assistant professor in fall 2010. He earned a doctorate from the University of California, Berkeley, where he developed novel organic aerosol measurement instrumentation — which he deployed to study urban and agricultural pollution and the long-range transport of pollutants.

Professor Williams’ professorship is named in honor of Raymond R. Tucker, who earned a bachelor of science degree in mechanical engineering from Washington University in 1920. Tucker, who died in 1965, was an associate professor of mechanical engineering from 1927-1934, head of the Department of Mechanical Engineering from 1942-1953 and a three-term mayor of the City of St. Louis.

I-CARES AT PRESTON M. GREEN HALL

I-CARES AT PRESTON M. GREEN HALL

A fundamental goal of I-CARES is the recruitment, support and engagement of endowed professors working in the fields of energy, environment and sustainability. These professorships will be recruited across the University for a variety of appointment types, enabling the University to recruit, support and attract a range of professionals. It is expected that their interdisciplinary focus will model the collaborative nature of I-CARES. As of fall 2011 there are three active I-CARES Professors. Searches for additional professors are underway across the university, including in the departments of Biology and Political Sciences in Arts & Sciences and in the School of Engineering & Applied Sciences.
Global climate change poses threats to many areas of human endeavor as well as to the natural environment. Energy, biodiversity, agriculture, economics, national security, the future of coastal regions, and international relations are all affected, presenting one of the greatest challenges to future human well-being.

Faculty participants in the discussion include:

Top: Crickette Sanz, Assistant Professor of Anthropology, studies wild chimpanzees in the Republic of Congo’s Goualougo Triangle. Here she is seen with colleagues David Morgan and Marcello Mekotii. (Photo by Ian Nichols, National Geographic Society)

Far right: David Marchant, Professor of Practice in Dance, develops movement pieces in trees as part of his research in somatic studies. This performance took place outside of Graham Chapel on the Danforth campus.

Right: The work of geoarcheologist and I-CARES researcher Jennifer Smith, Associate Professor of Earth and Planetary Sciences, examines the effects of climate change on water resources in currently and areas which contain evidence of a much wetter past.

### TOPOGRAPHIC SYMBIOTIC SYSTEMS: LOCATION, DEVELOPMENT AND EMBODIMENT

The building and development of our cities and communities are at a crossroads. The newly-found awareness of the very fragile relationship between the natural and our built environments challenges politicians, city planners, urban designers, architects, investors, sociologists, and all those concerned with the design and development of, and investment in our cities, to adopt new strategies for a common future for our cities. Our world is getting increasingly more urban, and population growth, health, ecology, energy, as well as social, cultural and economic considerations are some of the many challenges we face to shape the future of our urban centers.

**WE HAVE ANTHROPOLOGISTS, WE HAVE ENGINEERS, WE HAVE ARTISTS, WE HAVE SOCIAL SCIENTISTS. THE BROADER THE BETTER … ONCE YOU KNOW WHAT SOMEBODY ELSE IS DOING, YOU CAN SEE REALLY WONDERFUL AREAS OF OVERLAP WHERE THERE COULD BE COLLABORATIONS. SO THE PURPOSE OF THE CONVERSATION IS TO LOCATE THE SYNERGIES AMONG FACULTY.”**

— **BARBARA SCHAALE**

**BUILDING FOR THE FUTURE OF OUR CITIES**

The building and development of our cities and communities are at a crossroads. The newly-found awareness of the very fragile relationship between the natural and our built environments challenges politicians, city planners, urban designers, architects, investors, sociologists, and all those concerned with the design and development of, and investment in our cities, to adopt new strategies for a common future for our cities. Our world is getting increasingly more urban, and population growth, health, ecology, energy, as well as social, cultural and economic considerations are some of the many challenges we face to shape the future of our urban centers.

**WE HAVE AN OPPORTUNITY FOR A JUST AND INTERESTING FUTURE. MANY ACADEMIC DISCIPLINES MUST BE PART OF THE DISCUSSION TO CREATE THAT FUTURE.**

— **BRUCE LINDSEY**

**THE I-CARES CONVERSATIONS ARE SIMILAR TO START-UP COMPANIES; THEY WILL LIVE OR DIE BY THEIR SUCCESS IN ENGAGING THE UNIVERSITY COMMUNITY.**

— **I-CARES DIRECTOR HIMADRI PAKRASII**
A key goal of I-CARES is to foster institutional, regional, and international research on the development and production of bioenergy and the exploration of sustainable alternative energy, as well as environmental systems and practices.

At the institutional level, from basic science to the business of greening our planet, all faculty from all departments and schools are invited to work in partnership with I-CARES to address the immense energy, environment, and sustainability challenges of the 21st century.

As part of its mission, I-CARES awards seed funding to Washington University faculty undertaking innovative and collaborative research in the broad areas of bioenergy and sustainability through an annual call for proposals. Current awards have been given to faculty in Arts & Sciences, the School of Engineering & Applied Science, the College of Architecture, the School of Social Work, the School of Medicine, and the Olin Business School.

The annual seed funding program specifically provides financial support to engage students in I-CARES research. Undergraduate and graduate students receive valuable experience working with faculty in their labs and external field research sites.
Washington University’s Tyson Research Center is a 2,000-acre field station located 20 miles from the Danforth campus. Tyson’s mission is to provide a living landscape for environmental research and education as a component of Washington University’s International Center for Advanced Renewable Energy and Sustainability (i-CARES).

**Initiatives at Tyson**

The size of the human footprint on the planet continues to grow, and it is becoming increasingly necessary to recognize the important interactions between humans and the ecosystems in which they live. Initiatives at Tyson include the development of a landscape-scale experimental venue for studies on ecosystem sustainability and restoration. Major research projects include studies on the conservation of biodiversity for ecosystem services, control and impacts of invasive species, emerging infectious diseases of humans and wildlife, wetland restoration and mitigation, amphibian declines, and effects of global change on biodiversity and ecosystem functioning.

In collaboration with local government agencies, including the Missouri Department of Conservation, the Missouri Department of Natural Resources, and St. Louis County Parks, as well as private organizations such as the Missouri Botanical Garden and the Nature Conservancy, researchers at Tyson are examining the effects of land use on patterns of biodiversity and ecosystem sustainability in a variety of local ecosystems throughout the St. Louis region. In all, the implications of this research are broad in scope, and will provide essential information for maintaining sustainable ecosystems locally, nationally, and internationally.

**The Living Learning Center**

Tyson also provides a venue for research on a variety of other topics related to i-CARES, including archaeology, hydrology, geology, environmental education, engineering, and sustainable energy architecture. A 2,900-square-foot building was completed at Tyson in 2009. The Living Learning Center uses zero net energy and water through photovoltaic cells and rain capture, meeting standards even more stringent than LEED Platinum. It is powered by solar energy with enough efficiency to put electricity back into the grid to be purchased by the local energy company. The Living Learning Center is now fully certified as a Living Building, one of the first two buildings in the world to meet this standard.

The center houses a seminar/classroom and is also a location for summer high school outreach programs.

**Educational Opportunities**

Finally, Tyson provides a wealth of educational opportunities to the Washington University community, as well as other local institutions. Several undergraduate and graduate courses use Tyson as a living laboratory for environmental education; these range from an afternoon field trip to the entire semester. Furthermore, an active undergraduate research program takes place every summer where students work closely with senior research mentors on cutting-edge research questions.

PARC aspires to maximize photosynthetic antenna efficiency in living organisms and to fabricate robust micro-scale biophotonic light harvesting systems to drive chemical processes or generate photocurrent. This vision will be achieved through transformational research, including optimizing antenna size and composition for natural photosynthetic function, and developing versatile synthetic macromolecular solar collectors that can be tailored for specific applications.

**Research and Education**

PARC’s research and educational activities will build a legacy of intellectual and technical capacity for harvesting solar energy for the future. Through basic scientific research, PARC seeks to understand the principles of light harvesting and energy funneling as applied to three programmatic themes:

1. **Natural Antennae: Structure and Efficiency**
2. **Biophotonic Antennas: Organization and Implementation**
3. **Bioinspired Antennae: Design and Characterization**

The three scientific themes are connected by the idea that enhancements of photosynthetic light harvesting and the design of the biophotonic and bioinspired antenna will draw upon the lessons learned from natural systems. The thematic activities are joined by interrelated research threads, including to:

- Elucidate antenna structure and dynamics
- Improve solar coverage
- Optimize antenna size and architecture
- Develop antenna fabrication and characterization tools

In addition to the scientific objectives focused on harvesting solar energy, all of the PARC activities have broader goals to enrich education and outreach, and to build intellectual and technical capacity.

**Researchers**

PARC draws together a core of researchers from Washington University, other academic institutions, and national labs. This international interdisciplinary team brings extraordinary breadth and depth of intellectual and technical expertise to this important research area.

Washington University researchers come from the College of Arts & Sciences—

**PARC: Photosynthetic Antenna Research Center**

Established with a five-year $20 million award from the U.S. Department of Energy, the Photosynthetic Antenna Research Center (PARC) is one of 46 nationwide Energy Frontier Research Centers (EFRCs). EFRCs bring together groups of leading scientists to address fundamental issues in fields ranging from solar energy and electricity storage to materials sciences, biofuels, advanced nuclear systems, and carbon capture and sequestration.

PARC draws together a core of researchers from Washington University, other academic institutions, and national labs. This international interdisciplinary team brings extraordinary breadth and depth of intellectual and technical expertise to this important research area.

Washington University researchers come from the College of Arts & Sciences—

**PARC**

**Director**, PARC

Barbara A. Schaal

Mary-Dell Chilton Distinguished Professor of Biology in the School of Arts & Sciences

Vice-President of the National Academy of Sciences (NAS)

Department of Biology in the School of Arts & Sciences

The Living Learning Center, one of the first certified “Living Buildings” in the world, is designed to require zero energy and zero water from outside sources over the course of a year.
The Consortium for Clean Coal Utilization was founded in 2008. It is a center for research in advanced coal and carbon capture technologies. The Consortium’s mission is to be a resource to industry for the advancement of technologies that foster clean utilization of coal by creating an international partnership between universities, industries, foundations, and government organizations.

**Consortium for Clean Coal Utilization**

Richard L. Axelbaum
Stifel & Quinette Jens Professor of Environmental Engineering Science
Director, Consortium for Clean Coal Utilization
cccu.wustl.edu

The establishment of the Consortium was made possible through generous commitments from the lead sponsors: Arch Coal, Peabody Energy, and Ameren Corporation. Funding is used to support research facilities, education and outreach activities, and collaborative research projects. The Consortium research affiliate is Photon Systems Instruments.

**Consortium Goals**
- to advance technologies for clean utilization of coal
- to develop solutions to mitigate carbon dioxide emissions
- to improve public understanding of the role of coal as a source of energy
- to train a motivated, talented workforce that is capable of addressing the future challenges of utilizing coal.

The development and scale-up of fledgling technologies conceived of in laboratories will be critical to meet future worldwide demands for clean and reliable energy. The Advanced Coal and Energy Research Facility (ACERF) is a unique 1 megawatt combustion test lab where research scientists and students may perform studies in the areas of: carbon dioxide capture; process efficiency improvement; air pollution control; biomass combustion and co-firing; oxy-coal combustion and novel burner design. In addition to the combustion testing equipment, ACERF is also home to a series of research photobioreactors manufactured by Consortium research affiliate Photon Systems Instruments, for the production of algae and other aquatic organisms. Algae, through natural photosynthesis, capture and consume carbon dioxide contained within the combustion exhaust gas.

**Advanced Coal and Energy Research Facility**

The Advanced Coal and Energy Research Facility (ACERF) with control room at top right.

**Education and Research**

To accomplish the major changes that are needed in how we produce and use energy, a large and talented workforce must be trained. The CCCU attracts students from around the world to the field of engineering and applied science — with a focus on energy technologies — educating tomorrow’s global energy leaders.

The Consortium funds research projects in multiple areas, including: geological CO₂ sequestration; CO₂ Utilization; Carbon Capture; Biomass Co-firing and Coal Byproducts.

As an international consortium, CCCU recognizes climate change as a global concern and supports international research to foster the environmentally responsible use of coal for three main purposes: power generation, materials/chemicals synthesis, and fuel production. Faculty members at Washington University lead the research projects and collaborate with researchers from partner universities around the world.

**28 universities and corporate partners working together**

The McDonnell Academy Global Energy & Environmental Partnership (MAGEEP) is a consortium of 28 universities and corporate partners working together in energy, environmental and sustainability research, education, and operations.

**HIGHLIGHTS OF ACTIVITIES**

- More than 500 attendees — including Presidents of Partner Universities, Faculty, Corporate and Government Leaders; Students
- Keynote addresses by John Holdren, Science Advisor, White House; Kristina Johnson, US Department of Energy; Gary Calabrese, VP, Coming; Greg Boyce, CEO, Peabody; Richard Meserve, President, Carnegie Institution and several others
- Student organized GREEN CAMPUS Competition
Additional details at: www.mageep.wustl.edu/Symposium2010

2 | Released GLOBAL ENERGY FUTURE report. A comprehensive report identifying the key aspects of our energy future as prepared by faculty from the partner Universities. Also summarized are areas for collaborative work.

3 | 4th International Symposium on Energy and Environment to be held in Mumbai, India between December 9 to 12, 2012. The theme of this MAGEEP Symposium is Abundant Clean Cost Effective Energy Systems for Sustainability (ACCESS). Several collaborative educational initiatives to be launched at the Symposium. Additional details at: http://mageep.wustl.edu/Symposium2012

4 | IL&FS Inc., India endows the MAGEEP Visiting Scholar Program. This will provide opportunities for members of any MAGEEP University to avail themselves of collaborative project opportunities related to Energy and Environment.

The McDonnell Academy Global Energy & Environmental Partnership (MAGEEP) is a consortium of 28 universities and corporate partners working together in energy, environmental and sustainability research, education, and operations.

**Vision/Mission**

The vision and mission of the partnership is to collectively identify and collaboratively tackle important global energy and environmental challenges in an integrated and holistic manner.

**The Goals of MAGEEP**

- Promote collaborative projects in various aspects of energy and environment with seed funding.
- Act as a forum for the exchange of ideas and promote interactions via international symposia.
- Explore opportunities for sustaining research collaborations.
- Share educational experiences. Achieve best practices in campus operations.

**Presidents’ Forum at the MAGEEP Symposium providing perspectives on our Global Energy Future.**

Dr. John Holdren, White House Science and Technology Advisor, addressing attendees at the 3rd MAGEEP Symposium held in St. Louis, between October 1-4, 2010.

Dr. Steven Chu visiting Washington University in St. Louis. Photo taken with faculty involved in Energy and Environmental research after a meeting in Brauer Hall (LEED Gold rated building).
The Office of Sustainability leads Washington University’s efforts to transform its campus into a living learning laboratory that connects scholarship and discovery directly to campus operations. The Office of Sustainability was created in 2007 with the charge of integrating sustainability values and practices into: strategic planning processes, operations and resource management, and overall University practices.

The Office of Sustainability worked with students, faculty, and staff to develop the University’s first Strategic Plan for Sustainable Operations, adopted in 2010. The overarching goal of the plan is that the University will reduce its greenhouse gas emissions to 1990 levels by the year 2020 without purchasing carbon offsets. The Strategic Plan outlines a series of 6 key goal areas: energy reduction, green buildings, alternative transportation, food systems, waste and culture. Highlights include:

**ENERGY REDUCTION**
The Energy Reduction Committee’s 2010 report identifies $46 million in energy conservation projects, which the University has been and will continue to implement over the next series of years. The projects include lighting retrofits and upgrading major building systems to significantly improve efficiency. As part of this, the University recently converted more than 400 exterior lights to LED bulbs.

**GREEN BUILDING**
The University adopted guidelines that all new construction and major renovations must achieve standards equivalent to or exceed the U.S. Green Building Council’s LEED Silver certification. To date, 15 buildings have been LEED certified, with 9 achieving LEED Gold certification, totaling over 1.2 million square feet of certified space. This includes Preston M. Green Hall (LEED Gold) and the Tyson Research Center’s Living Learning Center, which is one of the first two buildings in the world to complete the Living Building Challenge, using net zero energy and net zero water.

**WASTE**
Washington University is committed to reducing campus waste through waste diversion to recycling and composting and through purchasing practices that reduce the amount of material that comes to campus. The University banned the sale of bottled water on campus beginning January 1, 2009, and was the first North American university to have done so.

**CULTURE**
Through a series of events and initiatives, including the Green Cup student energy reduction competition, Campus Sustainability Week, and the Green Labs Initiative, which has been partially supported through I-CARES research funding, the Office of Sustainability is working to create a culture of sustainability among members of the University community.

Through these efforts and more, Washington University was recently recognized by the Association for the Advancement of Sustainability in Higher Education (AASHE) as a Silver-Level institution under the Sustainability Tracking Assessment and Rating System (STARS). This is a voluntary and transparent self-reporting system that looks at education and research as well as planning, administration and operations. Washington University is a “charter participant” in the program.

Through the Office of Sustainability’s network of students, administration, faculty, staff, and community partners the University is ideally positioned to leverage the passion, skills and resources of the entire community to identify, improve and apply sustainable solutions to local and global challenges.

Office of Sustainability coordinator Will Fischer, bottom left, with twelve new Sustainability Interns, including three graduate students and nine undergraduates. They will work in the areas of: Research, Alternative Transportation, Green Offices, Communications and Marketing, Green Labs, Green Cup/Earth Week and Intern Coordination.
A premier research and teaching institution located in St. Louis, Missouri, Washington University in St. Louis is counted among the world leaders in higher education. The University is known for its commitment to excellence in fulfilling its mission of teaching and learning, research, and service to society.

Washington University—medium-sized and independent—is dedicated to challenging its students and faculty to seek new knowledge and greater understanding of an ever-changing, multicultural world. The University draws students and scholars from all 50 states and more than 110 countries.

The University offers more than 90 programs and nearly 1,500 courses that lead to bachelor's, master's, and doctoral degrees in a broad spectrum of traditional and interdisciplinary fields, with additional opportunities for minor concentrations and individualized programs.

Six of the University’s seven academic divisions are located on the Danforth Campus, a beautiful combination of new and restored Collegiate Gothic buildings on. The Medical Campus houses the acclaimed School of Medicine. Altogether, Washington University occupies more than 2,300 acres of land and 150 major buildings throughout the St. Louis area.
I-CARES researchers Robert Pless, Professor of Computer Science and Engineering and Jay Turner, Associate Professor of Energy, Environmental and Chemical Engineering work to integrate global imaging and atmospheric and environmental measurement. Through I-CARES they explored the use of AMOS (the Archive of Many Outdoor Scenes), to log images of the same scene, day after day, and capture annual life-cycles of vegetation, atmospheric particulates, and urban visibility. This montage shows a summary of images over the course of one year from one of the 17000 cameras in AMOS.