ANDLINGER CENTER

FOR ENERGY AND THE ENVIRONMENT

ANNUAL REPORT
ACADEMIC YEAR
2011-2012

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PRINCETON UNIVERSITY

MESSAGE FROM THE DIRECTOR

AFTER A YEAR OF GREAT PROGRESS, A LOOK FORWARD

This annual report reviews many important milestones for the Andlinger Center over the last year, but I believe the most exciting measure of our progress has been the tremendous engagement by faculty and students in the work of the center. I've been in scores of meetings across the University as we seek to accelerate education and research, and I always emerge proud to be working alongside people who are the very best in their fields and who are dedicated to developing sustainable sources of energy and solving environmental problems related to energy use. Faculty members have responded eagerly to requests for proposals for grants from our research and innovation funds. Many students applied for the first and second rounds of research internships through the Lewis Fund for Student Innovation. As I look forward to the next year, this engagement inspires me to take the center to the next level.

Also fueling our momentum is the terrific team we're building within the center. Professor Lynn Loo of the Department of Chemical and Biological Engineering has joined as deputy director with a mandate to build our corporate affiliates and graduate education programs. The former is leaping forward with PSEG, Lockheed Martin, and DuPont signing on as Charter and General Members. Faculty searches last year resulted in the hiring of two exceptionally talented scholars into joint junior faculty appointments between the Andlinger Center and Electrical Engineering and Mechanical and Aerospace Engineering who will begin in 2013. We also added staff, bringing in a business and communications manager and an administrative assistant. Our intellectual community has been broadened further by world leaders in the energy field who came to campus over the last year for our inaugural Highlight Seminar Series.

As a backdrop to all this activity, the construction of the center's future home on the corner of Olden and Prospect Streets reminds us of things to come. The extensive excavation and infrastructure work has been completed and focus has moved to the construction phase. The building, a marvel of beauty and utility, is on track for occupancy in early 2015. Princeton University's five-year Aspire fundraising campaign – which yielded our founding gift from Gerhard R. Andlinger '52 in 2008 – furnished an enduring financial foundation for the center, including new term and endowed funds for research and equipment over the last year. The enthusiastic support and generosity of Princeton alumni, parents, and friends has been nothing short of astonishing.

PLANS FOR 2012-2013

To build on this progress, we spent time this past year on a strategic planning process that set priorities and will help guide our work. In the next academic year, we plan to initiate with the Keller Center a new undergraduate program, the Certificate in Energy Technology and Society, geared toward humanities and social science undergraduates. We are creating a new category of courses that will be gathered under the three-letter subject code ENE, giving students a one-stop look at energy-related courses. Next year we will begin to cross-list ENE courses with courses across all divisions of the University, including anthropology, astrophysics, and most engineering departments. Three junior and two senior faculty searches in collaboration with academic departments are underway or planned for this year. And among many other activities, we will sponsor working groups, symposia, and workshops on specific research questions that present intriguing opportunities for progress.

Most generally, in the coming year I look forward to making more connections, establishing new relationships externally and internally, and continuing to work with the people who have already given so much and invested their time, talent, and resources to make the center become the place for finding practical solutions to solve the world's energy and environmental problems. I am grateful for the never-ending support of staff at the School of Engineering, and our many colleagues and partners across campus; for the wisdom of the Andlinger Advisory Council and the Faculty Executive Committee; and the generosity of Gerry Andlinger and all of the alumni, parents, and friends who have contributed to our success thus far.

I am proud to offer our first annual report, which highlights our major activities for academic year 2012.

Emily A. Carter
Founding Director

STRATEGIC PLANNING

As charged by our Advisory Council, the Andlinger Center's Faculty Executive Committee (FEC) convened in the winter/spring of AY12 to map out a comprehensive plan that includes short-term and long-term activities for the center in order to support our mission and goals. The process resulted in an inclusive but flexible roadmap for the center's staff to follow with milestones for faculty hiring, research funding, educational activities, and external partnerships. The plan was reviewed with various stakeholders and will continue to be reviewed by the Advisory Council and other experts to ensure it remains useful and meets the program and operation standards that the center set over this past year. The process began with a confirmation of the mission of the center and the identification and prioritization of its goals.

MISSION

TO DEVELOP SOLUTIONS TO ENSURE OUR ENERGY AND ENVIRONMENTAL FUTURE.

GOALS

- Foster a vibrant, intellectual community that engages people from many academic disciplines.
- Accelerate innovative multidisciplinary research through funding, infrastructure, and intellectual discourse.
- Train the next generation of thought leaders by educating students in their own disciplines and in a broader context.
- Partner with industry, not-for-profit, and government to reach practical technology and policy solutions.
- Become the center that the U.S. government turns to for information and advice.

Once the goals were confirmed, the FEC identified specific activities to support each goal and metrics for measuring our progress and success. The activities include:

- Growing the energy community by recruitment of senior faculty, junior faculty, and visiting scholars.
- Inspiring an intellectual community through seminars, panel discussions, conferences and workshops, topical working groups, and visiting and associated faculty activities.
- Seeding new high-risk/high-payoff research by distributing competitively awarded faculty research funds, supporting undergraduate internships, seeking external grants, building and maintaining an inventory of state-of-the-art equipment, and enabling the corporate affiliates program.
- Expanding education through the creation of an undergraduate certificate program geared toward A.B. students; developing new energy and energy-related environmental courses; providing opportunities for graduate training programs, including sponsoring fellowships, independent project and thesis funding sources.
- Leading a campus-wide corporate affiliates program at the University to create a self-funded, sustainable program that fosters partnerships between industry and Princeton faculty engaged in energy-related research.
- Collaborating with governments, not-for-profits, other research centers, and international institutions in order to participate in and influence the future of energy research and policy.

Many of these activities have one- and three-year metrics identified, while others have start dates farther out (e.g., international collaborations) and will require identification of appropriate milestones as their launches approach. As a start-up operation, the center is frequently presented with new ideas for collaboration, opportunities for programming, and inspirational ideas from across the Princeton community and beyond. The center's staff will use the strategic plan as a guide when considering new activities and will continually identify and track the corresponding resources (i.e., physical, financial, and/or personnel) necessary to support adequately the activities.

RESEARCH AREAS

More than 90 faculty at Princeton are part of a growing community of researchers whose work features energy or energy-related environmental issues as a component of their overall research portfolios. The Andlinger Center serves as a clearinghouse and a point of entry for external organizations and individuals who seek information about energy-related research at Princeton, and also for the campus community that seeks opportunities for collaboration. The center has developed an online research directory (http://acee.princeton.edu/research/) that displays the intellectual foundation of the center through a catalog of specific faculty expertise and research activities available currently at Princeton.

The entries in the research directory are organized by topical areas. Thirteen topics, from renewable energy to the social science of energy and the environment, are divided into sub-categories such as biofuels, batteries, or transportation. Visitors to the website have easy access to descriptions of current faculty research through the meaningful groupings and a search function.

ENERGY EFFICIENCY
- Buildings
- Industrial Processes
- Information Technology
- Transportation

RENEWABLE ENERGY
- Biofuels
- Fuel cells
- Solar
- Wind

NUCLEAR ENERGY
- Fission
- Fusion

ENERGY STORAGE
- Batteries
- Fuels
- Supercapacitors

CLEAN, EFFICIENT FUEL COMBUSTION

CARBON CAPTURE AND STORAGE

WASTE HEAT RECOVERY
- Thermoelectrics
- Water Desalination

TRANSMISSION
- Smart Grid
- Superconducting Materials

ENERGY SYSTEMS ANALYSIS

POLLUTANT DETECTION AND REMEDIATION

IMPACT OF ENERGY AND LAND USE
- Climate Change and Adaptation
- Hydrology

GREEN MANUFACTURING

SOCIAL SCIENCE OF ENERGY & ENVIRONMENT
- Behavior
- Economics
- Policy

The faculty members included have self-identified and come from all divisions of the University – in particular, the natural sciences, engineering, architecture, economics, and policy. The center accepts new entries on a rolling basis and audits the list annually to ensure it remains current. The faculty members in the research directory as of this report date represent the following schools, departments, programs, and centers:

School of Architecture
School of Engineering and Applied Science
Woodrow Wilson School of Public and International Affairs

Department of Astrophysical Sciences
Department of Chemical and Biological Engineering
Department of Chemistry
Department of Civil and Environmental Engineering
Department of Computer Science
Department of Ecology and Evolutionary Biology
Department of Electrical Engineering
Department of Geosciences
Department of Mechanical and Aerospace Engineering
Department of Near Eastern Studies
Department of Operations Research and Financial Engineering
Department of Psychology
Department of Physics

Lewis-Sigler Institute for Integrative Genomics
Princeton Environmental Institute
Princeton Institute for the Science and Technology of Materials

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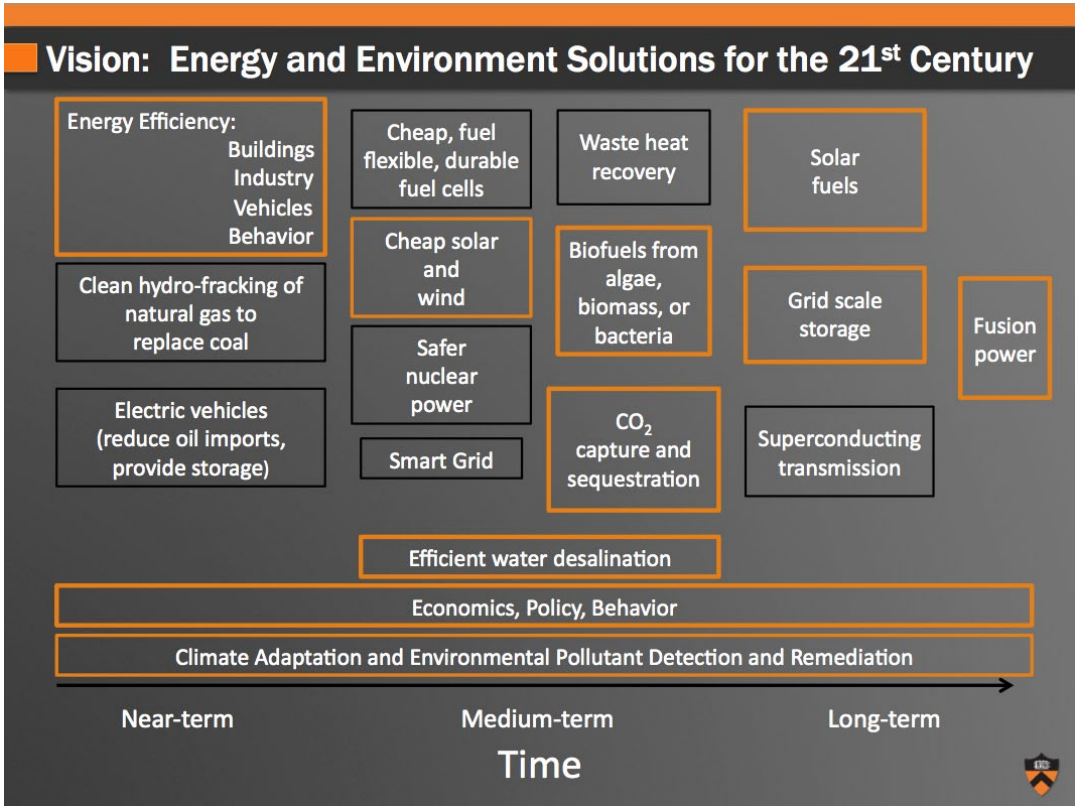
The Program in Applied and Computational Mathematics
The Program in Architecture and Engineering
The Program in Atmospheric and Oceanic Sciences
The Program in Geological Engineering
The Program in Plasma Physics
The Program in Population Studies

The Center frequently receives requests for information about what research is taking place on campus and we point to the research directory to communicate effectively with alumni and potential industry, academic, and government partners and to the general public. It is one way the center presents the broad landscape of expertise and interests at Princeton.

Like the work already taking place in labs and research groups across campus, our vision of energy and energy-related environmental research at Princeton crosses disciplinary boundaries and requires a robust faculty focused on all types of sustainable energy and environmental solutions. Because there is no crystal ball to predict from where the next big idea will come, it's important to promote research in many fields. The image below depicts our vision of energy-related issues that require practical solutions over time. The orange represents the current strengths of Andlinger Center faculty's research and/or our priorities for enhancing research and education in those areas.



Princeton's science and engineering departments, the Princeton Environmental Institute (PEI), the Princeton Institute for the Science and Technology of Materials (PRISM), the Woodrow Wilson School of Public and International Affairs (WWS), and the School of Architecture are key partners in the work of the Andlinger Center. In addition, the fusion energy and climate modeling research undertaken respectively in the federally funded Princeton Plasma Physics Laboratory and the Geophysical Fluid Dynamics Laboratory augment the center's mission.

SEED FUNDING

The Andlinger Center awards internal funds to catalyze and support faculty and student research. Grants are peer-reviewed and competitively distributed for both individual faculty projects and those that involve collaboration between faculty members from different departments and different disciplines. Student support is provided in the form of undergraduate summer research internships and a graduate student fellowship. These funds fostered a wide variety of innovative research in the 2011-2012 academic year.

The Addy/ISN North American Low Carbon Emission Self-Sufficiency Fund provides funding for research aimed at reducing carbon emissions and creating an energy self-sufficient North America. This year, five faculty research projects were awarded up to $100,000 each; their research will continue into AY13. **Professor Craig Arnold** is exploring magnesium-ion battery systems; **Professor Jay Benziger** is studying flow battery energy storage for solar and wind power; **Professor Paul Chirik** is exploiting modern alchemy for carbon neutrality; **Associate Research Scholar Meytal Higgins and Professor Joshua Rabinowitz** are investigating the optimization of algal biofuel production; and **Professor Bruce Koel** is researching the production of renewable hydrogen. The project abstracts are available at http://acee.princeton.edu/news/addy2012.

The Andlinger Innovation Fund encourages interdisciplinary collaboration among Princeton scientists and engineers, and allows for the purchase of equipment to support research in energy. In AY12, four interdisciplinary faculty research projects were awarded up to $100,000 each. **Professors Bruce Koel and Peter Jaffe** tested whether plastic-coated iron nanoparticles are effective for environmental cleanup; **Professors Margaret Martonosi and Warren Powell** studied energy efficient routing of data; **Professors Michael McAlpine and Naveen Verma** researched new materials for waste heat recovery; and **Professors Howard Stone and Elie Bou-Zeid** investigated the use of "wet walls" for evaporative cooling in buildings. Abstracts and more information about the faculty teams are available on our website at http://acee.princeton.edu/news/innovation2012.

The Peter B. Lewis Fund for Student Innovation supports summer internships for undergraduates. Recipients perform research on campus for a minimum of eight weeks under the guidance of faculty advisors and receive stipends and funds for research expenses. In the summer of 2011, five students received a total of $35,000; in summer 2012, seven students received a total of $40,000. The students come from departments in and beyond the School of Engineering and their research projects span a range of topics, including magnesium ion batteries, water cleanup utilizing green chemistry, building innovative trace-gas sensors, organic solar-cell flexibility and durability, the reduction of biofilm formation on transport ship hulls, wind turbine aerodynamics, new catalytic methods for chemical transformations, oxygen reduction in fuel cells, novel battery materials, heat harvesting, optimization of building design, and photochemical carbon dioxide reduction. More information about these innovative student projects is available on the center's website at http://acee.princeton.edu/funding_entry/lewis2012.

LEWIS INTERNSHIP RECIPIENTS

SUMMER 2011

- **Christina M. Chang '12** (Faculty Advisor – John Groves, Chemistry)
- **Jingkang Gao '13** (Faculty Advisors – James Smith and Elie Bou-Zeid, Civil and Environmental Engineering)
- **Emmeline Kao '12** (Faculty Advisor – Craig Arnold, Mechanical and Aerospace Engineering)
- **Androniki Tsakiridou '12** (Faculty Advisor – Winston Soboyejo, Mechanical and Aerospace Engineering)
- **Bowen Zhou '12** (Faculty Advisor – Mark Brynildsen, Chemical and Biological Engineering)

SUMMER 2012

- **Alexander Beebe '13** (Faculty Advisor – Alexander J. Smits, Mechanical and Aerospace Engineering)
- **Kavya Desai '13** (Faculty Advisor – Bruce E. Koel, Chemical and Biological Engineering)
- **Benjamin Foulon '13** (Faculty Advisor – Craig B. Arnold, Mechanical and Aerospace Engineering)
- **James Martino '13** (Faculty Advisor – Michael C. McAlpine, Mechanical and Aerospace Engineering)
- **Andrew Mayfield '13** (Faculty Advisor – David MacMillan, Chemistry)
- **Mariam Wahed '14** (Faculty Advisor – Sigrid M. Adriaenssens, Civil and Environmental Engineering)
- **Anna Wuttig '13** (Faculty Advisors – Andrew B. Bocarsly and Robert J. Cava, Chemistry)

The inaugural **Maeder Graduate Fellowship** in Energy and the Environment, funded by the Paul A. Maeder '75 Fund for Innovation in Energy and the Environment, was awarded to **Josephine Elia**, a fifth year graduate student in Professor Christodoulos Floudas' group in the Department of Chemical and Biological Engineering. The fellowship will cover her tuition and stipend for AY13. Ms. Elia's work on supply chains for transportation fuels is described at http://acee.princeton.edu/news/maeder2012.

An **anonymous** research gift administered as a term fund is providing three years of support to three faculty projects, which are currently underway. The projects and their faculty teams are:

- New Advances in Urban Air Quality Monitoring: a China-Princeton Collaboration: **Professors Claire Gmachl, Gerard Wysocki, and Mark Zondlo**
- Harvesting Sunlight for Electricity and Fuels: **Professors Craig Arnold, Emily Carter, Bruce Koel, Lynn Loo, and Sigurd Wagner**
- Water in China: **Professors Elie Bou-Zeid, Ignacio Rodriguez-Iturbe, and James Smith**

FACULTY RECRUITING

Searches for joint junior faculty in the departments of Civil and Environmental Engineering (CEE), Electrical Engineering (ELE), Mechanical and Aerospace Engineering (MAE), and a senior search for a world leader in energy, broadly defined, were launched in AY12. Offers were made to **Barry Rand** (a senior researcher at IMEC vzw) in the area of solar cell device engineering (joint with ELE) and **Daniel Steingart** (an assistant professor at City College of New York) in the area of energy storage (joint with MAE). Both candidates accepted the offers and will join the Andlinger roster in 2013. Prof. Steingart will introduce a course on energy storage in spring 2013. The searches with CEE and for the senior scholar did not result in offers being made and will be renewed in AY13. A visiting professorship offer to an energy policy practitioner (joint with WWS) was unsuccessful but we will continue to make efforts in this area as an interim measure until permanent faculty searches are completed. We are also fortunate to have **Professor Daniel Giammar**, the Kenan Visiting Professor for Distinguished Teaching, join the Andlinger community in AY13. Professor Giammar will be home-based in CEE and will be developing and teaching a course "Environmental Implications of Energy Technologies" in spring 2013.

CORPORATE AFFILIATES PROGRAM

The Princeton Energy and Environment Corporate Affiliates Program was launched in December 2011 with the announcement of PSEG, New Jersey's largest energy utility, as the first Charter Member. Led by Deputy Director Lynn Loo, with extensive support from the Office of Corporate and Foundation Relations, the program aims to enhance collaboration and promote technology transfer between Princeton University and corporate partners to address global energy needs and environmental concerns. The program is led by the Andlinger Center in partnership with the Woodrow Wilson School of Public and International Affairs, the Princeton Environmental Institute, and the School of Architecture.

The corporate affiliates program offers member companies special access to expertise at Princeton in scientific, engineering, economic, and public policy issues related to energy and the environment. Member companies provide Princeton with financial support that seeds new research and education initiatives. The companies also have opportunities to use shared laboratory facilities, to hire students, and to offer strategic guidance to Princeton researchers on the practical opportunities and barriers in transferring research to the marketplace.

The program is structured with three levels of participation by businesses: Charter Members, General Members, and Affiliate Members. Charter and General Members have seats on a corporate affiliates advisory committee, which meets annually to give advice on the strategic direction of the program. Charter Members also have pre-negotiated royalty-free licenses to intellectual property derived from research they sponsor. In addition, Charter Members may assign an individual from the company as a visitor-in-residence and also may designate a named post-doctoral researcher.

DuPont and Lockheed Martin signed on in spring/summer 2012 as General Members. Additional corporations continue to be approached to participate in the program and town hall meetings were held in spring 2012 to inform Princeton faculty about the new program and enlist their involvement. New sponsored research opportunities, in addition to projects supported by the pre-defined collaborations with members, should increase as the opportunities expand and faculty come to rely on the program as a way to initiate new ideas in the advancement of technology solutions.

A search is underway for a business development manager to seek and manage corporate memberships and manage the day-to-day activities of the program, under the direction of Professor Loo. While collaborative activities are already underway with the members, including the PSEG visitor-in-residence, the inaugural members meeting will be held in fall 2012 and other formal events will be added to the agenda when the new manager is in place.

FACILITIES

Currently the center is a virtual laboratory and home for the University's energy-related research, education, and outreach activities. Staff members are temporarily located in the Engineering Quadrangle, thanks to the generosity of the Department of Electrical Engineering. Enabling work was underway in summer 2011, the architectural design was finalized early in 2012, and construction began in February 2012 on a 129,000 gross square foot, state-of-the-art facility that will provide laboratory, classroom, meeting, and office spaces built around a network of gardens. Occupancy is targeted for spring 2015.

The new building, located in the University's engineering neighborhood, will be the energy hub on campus. The three-structure complex will employ advanced energy-saving technologies, with an emphasis on sustainable building practices. It will provide state-of-the-art central facilities for synthesizing and analyzing materials and fabricating and testing devices, which are critical capabilities for achieving a sustainable energy and environmental future. PRISM's Micro/Nanofabrication Lab and Imaging and Analysis Center, and other tools and facilities, will move to the new building on the corner of Prospect and Olden Streets. Laboratory spaces, including "clean rooms" that meticulously control dust, will facilitate industrial collaborations and translation of research into industrial products. The lab also will include ultra-low-vibration environments to house electron microscopes and other sensitive instrumentation.

New central use equipment has already been purchased in AY12 with Andlinger-managed funds, including high-resolution inkjet printers and a Raman microscope. These tools are currently housed in existing faculty laboratories and will be moved into the new building.

The first central equipment purchase made by the Andlinger Center is a group of inkjet printers that are capable of printing thin layers of materials to produce photovoltaics (PVs) that can convert sunlight to electricity. The Dimatix and Pixdro printers are capable of dispensing several inks during a single pass so devices can be constructed for testing. The printed active layers can then be studied to elucidate how the details of print conditions affect device characteristics.

The second centrally available acquisition is a LabRAM ARAMIS Fully Automated Confocal Raman Microscope system equipped with four lasers. This microscope will be the first of its kind on campus available as a standard tool in a central user facility where it will be used for characterizing nanoscale materials for photovoltaic, energy storage, and photonic applications.

BUILDING FACTS

- Approx. 129,000 square feet at occupancy
- Designed to LEED silver standards
- Space for cleanroom, imaging & analysis, and research laboratories
- 200-seat lecture hall, meeting rooms, classrooms
- Faculty, visitor, postdoc, and student space
- Administrative offices and facilities support

BUILDING PROGRESS TO DATE

- Initial program study performed by Davis Brody Bond Aedas (Fall 2008)
- Tod Williams and Billie Tsien selected as architects (February 2009)
- Design development completed (November 2010)
- Design review completed (November 2011)
- Enabling work completed (January 2012)
- Construction began (February 2012)

EDUCATION

The Andlinger Center will soon provide undergraduates the opportunity to concentrate in energy studies though the Certificate in Energy Technology and Society (ETS), developed in collaboration with the Keller Center. This new program was approved by the University's Academic Planning Group as a companion to the Information Technology and Society program already in place. After reviews by dean of the college and faculty committees, we expect to gain approval from the faculty this fall, which will allow us to start advertising the certificate to undergraduates. The certificate will complement the existing Program in Sustainable Energy, which is more technically focused. Specifically, the goal of the ETS program is to educate humanities and social science students about energy technologies and to provide engineering and natural science students an understanding of the societal implications of energy technology.

As part of the planning for the ETS program, the Andlinger Center identified more than 50 existing undergraduate and graduate course offerings that have energy as the focus or as a major component. The center requested and received approval to create an energy subject code (ENE) to bring attention to energy studies as a cohesive grouping at Princeton. Courses included in the Program in Sustainable Energy also will benefit from the energy cross-listing.

EVENTS

The Andlinger Center has launched a robust program of speakers and events to engage and educate the communities of Princeton and beyond on topical subjects related to energy and the environment as it is impacted by energy. Throughout 2011-2012, the center brought to campus academic and industrial experts as part of its inaugural Highlight Seminar Series. In addition, the center co-sponsored talks by New Jersey U.S. **Representative Rush Holt**, GE Energy's Director of Global Strategy and Planning **Dr. Peter Evans**, and other experts who brought large audiences to the Friend Center. The inaugural Highlight Seminars covered topics such as thermoelectrics, sustainable lithium ion batteries, solar thermochemical and bacterial fuel production, wind energy, and photovoltaics. The AY13 Highlight Seminar Series promises to be equally as engaging and relevant to the center's goals and current energy–related issues.

2011-2012 HIGHLIGHT SEMINAR SERIES

November 15, 2011
Ali Shakouri, Purdue University
Nanostructured Thermoelectric Materials for Waste Heat Recovery Applications and for Microrefrigeration

November 23, 2011
Jean-Marie Tarascon, Universitié de Picardi Jules Verne
Materials/Synthesis Approaches for Developing Sustainable Li-ion Batteries for Energy Storage

February 9, 2012
James Miller, Sandia National Laboratories
Solar Thermochemical Conversion of Carbon Dioxide & Water to Hydrocarbon Fuels

March 6, 2012
Mercouri Kanatzidis, Northwestern University
Nanostructured Thermoelectrics

April 5, 2012
David Berry, Flagship Ventures
Biocatalytic Conversion of Carbon Dioxide to Liquid Fuels

April 19, 2012
Pratima Rangarajan, Vestas Technology
Wind Energy … The Journey

May 10, 2012
David Eaglesham, First Solar, Inc.
Challenges for the Photovoltaic Industry

LEADERSHIP

ANDLINGER CENTER

Professor Emily A. Carter
Founding Director

Professor Yueh-Lin (Lynn) Loo
Deputy Director

Laura Strickler
Associate Director

Brenda Mikeo
Business and Communications Manager

Moira Selinka
Administrative Assistant

ADVISORY COUNCIL

A. Paul Alivisatos
Laboratory Director, Lawrence Berkeley National Laboratory

Dwight W. Anderson '89
Principal, Ospraie Management, LLC

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Chairman of the Board, Andlinger & Company, Inc.

Merrick G. Andlinger '80
President, Andlinger & Company, Inc.

Yet-Ming Chiang
Kyocera Professor of Ceramics, Massachusetts Institute of Technology

David W. Crane '81 S86
President and Chief Executive Officer, NRG Energy, Inc.

Francis J. DiSalvo
Director, David R. Atkinson Center for a Sustainable Future, Cornell University

David Eaglesham
Former Chief Technology Officer, First Solar, Inc.

Ralph Izzo
Chairman, President and CEO, PSEG

Paul A. Maeder '75
Managing General Partner & Founder, Highland Capital Partners

Gregory H. Olsen
President, GHO Ventures, LLC

Mark F. Rockefeller '89
Chief Executive Officer and Founder, Rockefeller Consulting/Insight Capitalists

Timothy Sands
Executive Vice President for Academic Affairs and Provost, Purdue University

FACULTY EXECUTIVE COMMITTEE

Rene A. Carmona (term ends 7/1/2015)
Paul M. Wythes '55 Professor of Engineering and Finance
Professor of Operations Research and Financial Engineering.

Emily A. Carter (term ends 7/1/2014)
Gerhard R. Andlinger Professor in Energy and the Environment
Professor of Mechanical and Aerospace Engineering and Applied and Computational Mathematics
Founding Director, Andlinger Center for Energy and the Environment

Christopher F. Chyba (term ends 7/1/2015)
Professor of Astrophysical Sciences and International Affairs, Woodrow Wilson School
Director, Program on Science and Global Security

Michael A. Celia (replaced by James Smith)
Theodora Shelton Pitney Professor of Environmental Studies
Professor of Civil and Environmental Engineering
Former Chair, Department of Civil and Environmental Engineering

Pablo G. Debenedetti, serving ex-officio (term ends 7/1/2014)
Class of 1950 Professor in Engineering and Applied and Science
Professor of Chemical and Biological Engineering
Vice Dean and Acting Dean, School of Engineering and Applied Science

Claire F. Gmachl (term ended 7/1/2012)
Eugene Higgins Professor of Electrical Engineering

Chung K. (Ed) Law (term ends 7/1/2013)
Robert H. Goddard Professor of Mechanical and Aerospace Engineering

Yueh-Lin (Lynn) Loo (term ends 7/1/2014)
Professor of Chemical and Biological Engineering
Deputy Director, Andlinger Center for Energy and the Environment

Guy J. Nordenson (term ended 7/1/2012, reappointed to 7/1/2015)
Professor of Architecture and Structural Engineering

Stephen W. Pacala (term ends 7/1/2014)
Frederick D. Petrie Professor in Ecology and Evolutionary Biology
Director, Princeton Environmental Institute

Stewart C. Prager (term ends 7/1/2013)
Professor of Astrophysical Sciences
Director, Princeton Plasma Physics Laboratory

Jorge L. Sarmiento (term ended 7/1/2012)
George J. Magee Professor of Geoscience and Geological Engineering
Professor of Geosciences
Director, Program in Atmospheric and Oceanic Sciences

James A. Smith (replaced Michael Celia, term ends 7/1/2013)
Professor of Civil and Environmental Engineering
Chair, Department of Civil and Environmental Engineering
Director, Program in Geological Engineering

SUPPORTERS

The Andlinger Center for Energy and the Environment is grateful to the following supporters who help to realize the vision of the center.

- **Gerhard R. Andlinger '52** Founding Gift

- **Lydia and William M. Addy '82** to establish the *Addy/ISN North American Low Carbon Emission Energy Self-Sufficiency Fund* to support innovative research, equipment, policy development, and teaching
- **Dwight Anderson '89** to establish the *Anderson Family Professorship in Energy and the Environment*
- **Anonymous** gift to establish the *Parallax Fund for Energy and the Environment* to support faculty and student research
- **Anonymous** gifts for construction of the Andlinger Center building
- **Anonymous** gift for equipment
- **Anonymous** gift for professorship
- **Anonymous** gift for research
- **Tia Barancik '83** to establish the *Class of 1983 Fund for Energy and the Environment*
- **John E. Bartlett '03** to establish the *Dede T. Bartlett P03 Fund for Student Research in Energy and the Environment*
- **Charlene de Carvalho-Heineken P14** to establish the *de Carvalho-Heineken Family Fund for Environmental Studies to support faculty and student research*
- **Mary Tiffany and John E. Cross '72** for discretionary spending
- **John O. Dabiri '01** to fund the *John O. Dabiri '01 Family Fund for Excellence in Energy and Environmental Research*
- **John Drzik '83 and Ann Thorsell** to establish the *John Drzik and Ann Thorsell Fund for Innovation*
- **High Meadows Foundation** to establish the *Director's Fund for Energy Efficiency*
- **Kerry and William F. Holekamp P14** to support equipment purchases
- **Peter B. Lewis '55** to establish the *Peter B. Lewis Fund for Student Innovation in Energy and the Environment* to support student projects, particularly field work and laboratory research
- **Paul A. Maeder '75** to establish the *Paul A. Maeder '75 Fund for Innovation in Energy and the Environment* to support a graduate fellowship
- **Jay P. Mandelbaum '84** to establish the *Laurie and Jay P. Mandelbaum '84 Fund for Energy and the Environment*
- **Ernest H. Reuhl, Jr. '85** to establish the *Ruehl Family Fund for the Environment* to support faculty and student research
- **Mark F. Rockefeller '89** to establish the *Renee and Mark F. Rockefeller '89 Fund for the Environment* to support faculty and student research
- **Kent C. Simons '57** to establish the *David P. Simons Fund for Energy and the Environment*

IN THE NEWS

The faculty listed in the Andlinger Center's research directory are often cited in local, national, and international news publications or have their research highlighted in journals and scientific publications. In fact, faculty listed in the Research Directory were referenced more than 160 times during 2011-2012 in sources ranging in size and audience such as *The New York Times, The Washington Post, Rolling Stone Magazine, Bloomberg Business Week, and U.S. News and World Report*. A few that represent the range of sources and topics are:

Professor Emily Carter featured in a video for the National Science Foundation's "Science for a Sustainable Future" (http://news.science360.gov/obj/video/4ce76c33-05ed-49b9-9190-e3e0c1f9ff2e/science-sustainable-future).

Professor Frank von Hippel referenced in a Nature.com article on evacuation challenges during nuclear disasters like Fukushima (www.nature.com/news/it-s-not-just-fukushima-mass-disaster-evacuations-challenge-planners-1.10165).

Professor Michael Oppenheimer cited in a *U.S. News and World Report* article about the reduction of greenhouse gas emissions as a solution to the increasing violent storms (www.usnews.com/news/articles/2011/12/07/natural-disasters-smash-us-record).

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