

**annual
report**



Emily Carter
Founding Director

Some of the most exciting moments in my career as a researcher have emerged from collaborations in which colleagues with deep knowledge in different fields inspire each other and work together to solve tough problems that demand multiple perspectives and expertise. Catalyzing that kind of collaboration is a core goal of the Andlinger Center for Energy and the Environment. We need new, creative, multifaceted solutions to find economically viable and environmentally sustainable sources of energy for a world population expected to approach ten billion people by the end of this century. I can say from experience that the high-risk, high-payoff collaborations we envision are easier said than done. In an era of tight government funding, safe, incremental advances are more likely to win grants than are ambitious, exploratory proposals, especially those that take the risk of working across disciplines. In this year's annual report, I am very pleased to highlight our seed funding initiatives and other ways in which the center is sparking creative, groundbreaking research.

For instance, Forrest Meggers, an assistant professor of architecture and the Andlinger Center, is collaborating with Sigrid Adriaenssens, an assistant professor of civil and environmental engineering. With Andlinger funding, they are building an experimental pavilion to demonstrate how an enclosed space can be made to feel comfortably cooled without air conditioning. Their design makes clever use of evaporation, simple piping for water, and careful attention to the shape of the structure. The 10-fold savings in electricity could bring enormous reductions in greenhouse gas emissions, but because the idea is not part of current approaches to saving energy, it would be difficult to fund through conventional grants.

As another example, colleagues from three different disciplines teamed up to create a new statistical model of hurricane intensity, which aims to predict hurricane damage and disruption to coastal infrastructure. Their analysis demonstrates the impacts of greenhouse-gas-induced climate change on weather extremes. Ning Lin, an assistant professor of civil and environmental engineering, Michael Oppenheimer, a professor of geosciences and international affairs, and Jianqing Fan, a professor of operations research and financial engineering, combined their expertise in science, policy, and statistics to tackle this challenge. Their Andlinger-funded work helped them win a follow-up grant from the National Oceanic and Atmospheric Administration to continue work on the model.

Other research projects have drawn the interest and support of industry. Studies of high energy density batteries conducted by Daniel Steingart, an assistant professor of mechanical and aerospace engineering and the Andlinger Center, and Bruce Koel, a professor of chemical and biological engineering, have led to collaborations with IBM and ICL Industrial Products, among others. Their work may lead to innovations in long-term electricity storage for the grid and in electric vehicles.

Seed funding is not the only way the Andlinger Center is encouraging innovation. We have recruited a diverse and highly talented cadre of researchers and we are building collaborations with industry via the Princeton E-affiliates Partnership. In a next stage of growth for E-affiliates, ExxonMobil joined the partnership with a five-year, \$5 million commitment. Another enormous step forward comes this year with the completion of our spectacular new building — 129,000 square feet of laboratory, classroom, and office spaces connected by gardens. These beautiful and state-of-the-art spaces will foster collaboration and creativity with an impact far beyond our campus.

When I talk about collaboration, I am including you. Please visit our new building, attend our seminars, and find ways to partner with us in pursuit of a better energy and environmental future. Together we accomplish far more than any one of us could achieve alone.

Emily Carter
Founding Director

to develop solutions to ensure our energy and
environmental future

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 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



Egemen Kolemen



José Avalos



Fabian Wagner



Sander van der Linden

Faculty and Research Appointments

In January of 2015, the Andlinger Center for Energy and the Environment (ACEE) achieved a key strategic goal: with the addition of **Egemen Kolemen** in September 2014 and **José Avalos** in January, the center has successfully recruited six joint junior faculty members. Kolemen and Avalos joined our existing junior faculty **Daniel Steingart**, **Barry Rand**, **Claire White**, and **Forrest Meggers** to establish a firm foundation from which the center's work will grow exponentially in coming years.

Egemen Kolemen was appointed to the faculty on September 1, 2014 as assistant professor of mechanical and aerospace engineering and the Andlinger Center for Energy and the Environment with a joint appointment at the Princeton Plasma Physics Laboratory (PPPL). Kolemen is a specialist in the field of control of fusion plasmas. After receiving his Ph.D. in mechanical and aerospace engineering from Princeton in 2008, Kolemen spent several years at PPPL working on the National Spherical Torus Experiment. He then served as a research scientist at the DIII-D Tokamak at General Atomics in San Diego before returning to Princeton in September 2014.

José Avalos began on January 1, 2015 as assistant professor of chemical and biological engineering and the Andlinger Center for Energy and the Environment. Avalos' research focuses on synthetic biology and metabolic engineering for the production of biofuels and bio-derived chemicals. Before joining the faculty at Princeton, Avalos was a postdoctoral researcher in the Department of Chemical Engineering at the Massachusetts Institute of Technology, where he was a recipient of a National Institutes of Health Ruth L. Kirschstein National Research Service Award. Avalos earned his Ph.D. in biochemistry, cellular, and molecular biology from the Johns Hopkins School of Medicine.

In the past year, ACEE also added a visiting professor and a postdoctoral research associate. Gerhard R. Andlinger Visiting Professor in Energy and the Environment, **Fabian Wagner**, is a senior research scholar at the International Institute for Applied Systems Analysis in Austria where he leads the Mitigation of Air Pollution and Greenhouse Gases Program. Wagner joined the center for the first year of a two-year appointment, contributing to our efforts by teaching three courses and collaborating with faculty and corporate partners through the Princeton E-ffiliates Partnership on projects involving energy policy. **Sander van der Linden**, who focuses his research on behavioral issues related to energy and the environment, was appointed on September 1, 2014 as a postdoctoral research associate in psychology, the Woodrow Wilson School of Public and International Affairs, and the Andlinger Center for Energy and the Environment.

ACEE Faculty News

José Avalos, assistant professor of chemical and biological engineering and the Andlinger Center for Energy and the Environment, was featured in the journal *International Innovation*. The feature explores Avalos' research in subcellular engineering methods.

Egemen Kolemen, assistant professor of mechanical and aerospace engineering and the Andlinger Center for Energy and the Environment, was invited to speak at the International Atomic Energy Agency (IAEA) Fusion Energy Conference in St. Petersburg, Russia, a flagship fusion/plasma conference held every two years. Kolemen delivered a talk entitled “Experimental Simulation of Burn Control Using DIII-D In-vessel Coils.”

Forrest Meggers, assistant professor of architecture and the Andlinger Center for Energy and the Environment, was invited to speak as part of the Baumer Lecture Series at The Ohio State University in the fall of 2014. Meggers’ lecture “Technology Invigorating Architecture: From the Singapore Bubble ZERO to the Princeton Thermoheliodome” explored ways in which building systems can become part of the building fabric and achieve high performance while simultaneously expanding design freedom. Meggers authored the chapter “Hidden Surface Effects: Radiant Temperature as an Urban and Architectural Comfort Culprit” in the book *Future City Architecture for Optimal Living* released by Springer in April 2015.

Barry Rand, assistant professor of electrical engineering and the Andlinger Center for Energy and the Environment, was awarded the 2015 DuPont Young Professor Award. The award, which aims to help promising untenured research faculty begin their careers, is routinely granted to chemists but in this case Rand’s work in photovoltaics drew the organization’s attention.

Daniel Steingart, assistant professor of mechanical and aerospace engineering and the Andlinger Center for Energy and the Environment, garnered attention in the popular press for an experiment testing the notion that batteries bounce when fully discharged. Inspired by popular YouTube videos demonstrating significant battery “bounce” when dead, Steingart and his lab group tested a number of batteries. The results of the test, reported in the *Journal of Materials Chemistry A*, showed that as batteries discharge, zinc changes to zinc oxide and the bounces increase because the zinc oxide forms tiny bridges within the zinc material, which decreases the mechanical damping of the battery. Steingart generated a second wave of press with his Gizmodo post “How Tesla’s Powerwall Stacks Up to Conventional Energy, By the Numbers.”

Claire White, assistant professor of civil and environmental engineering and the Andlinger Center for Energy and the Environment, was invited to present “Uncovering the Local Atomic Structure of Hydrated Amorphous Magnesium Carbonate: The Computational Chemistry and Total Scattering Iterative Methodology” at the 249th American Chemical Society (ACS) National Meeting and Exposition in March 2015. As the center’s lead advocate for educational outreach, White spoke at a colloquium on high school education sponsored by the Society of Women Engineers at Princeton University and at Montgomery High School in Montgomery, New Jersey.

Andlinger Center Associated Faculty Selected Awards and Honors

Emily Carter – 2015 Hirschfelder Prize in Theoretical Chemistry; Elected Fellow of the National Academy of Inventors

Michael Celia – 2015 Argyris Visiting Professorship, University of Stuttgart

Paul Chirik – Editor-in-Chief of *Organometallics*; Xingda Lecturer, Peking University; First International Award for Creative Work from the Japanese Society of Coordination Chemistry

Yiguang Ju – Distinguished Paper Award, 35th International Symposium on Combustion

Denise Mauzerall – Named Chartered Member of Science Advisory Board, U.S. Environmental Protection Agency

H. Vincent Poor – 2015 Athanasios Papoulis Award from the European Association for Signal Processing Board of Directors; Booker Gold Medal from the Union Radio Scientifique Internationale Board of Directors; Honorary Doctorate from Aalto University Schools of Technology

Barry Rand – 2015 DuPont Young Professor Award

Richard Register – Elected Fellow of the American Institute of Chemical Engineers

Ignacio Rodriguez-Iturbe – 2014 Donald R. F. Harleman Memorial Water Resources Lecture, Pennsylvania State University

Eldar Shafir – Named Director of the new Kahneman and Treisman Center for Behavioral Science and Public Policy, Princeton University

Recruiting

The focus of the center's recruiting efforts during the 2014-2015 academic year was the continued push to recruit stellar faculty at the senior level. Senior energy and environmental science and engineering faculty searches, broadly defined, are ongoing with exciting and promising candidates identified in three areas.

Searches for visiting faculty members in engineering and the natural sciences yielded two incoming 2015-2016 visitors. **Mitchell Small** is the H. John Heinz III Professor of Environmental Engineering and Engineering and Public Policy at Carnegie Mellon University. Small's research involves mathematical modeling of environmental systems, environmental statistics, and risk assessment. In the fall semester 2015 he will teach a class in the Department of Civil and Environmental Engineering (CEE) and during the balance of the year he will work collaboratively with the Andlinger Center for Energy and the Environment (ACEE) and CEE faculty and partners. In the spring semester 2016 we will welcome **Martin Hansen**, an expert in wind engineering, from the Technical University of Denmark. Martin will teach an undergraduate course in wind engineering for ACEE, cross-listed with mechanical and aerospace engineering (MAE), and will work jointly with MAE faculty on wind energy research.

education

Internship Recipients and Faculty Advisors

Summer 2015

Anna Blyth '18

(Claire White, Civil and Environmental Engineering and the Andlinger Center for Energy and the Environment)

Isabella Douglas '17

(Forrest Meggers, School of Architecture and the Andlinger Center for Energy and the Environment)

Samantha Ip '18

(José Avalos, Chemical and Biological Engineering and the Andlinger Center for Energy and the Environment)

Anastasia Ivanushkina '17

(Yueh-Lin (Lynn) Loo, Chemical and Biological Engineering)

Hanley Ong '16

(Paul Chirik, Chemistry)

Michael Wang '16

(Daniel Steingart, Mechanical and Aerospace Engineering and the Andlinger Center for Energy and the Environment)

The Andlinger Center for Energy and the Environment's (ACEE) educational activities continue to grow under the direction of **Niraj Jha**, associate director for education. The Energy track of the Program in Technology and Society (ETS), run jointly by the Andlinger Center and Princeton University's Keller Center, continues to expand with 41 undergraduate students taking courses and attending information sessions. There are now 48 ETS courses from which humanities and social science students, along with students studying engineering and the natural sciences, can learn about energy technologies, engineering approaches to energy and environmental challenges, and the societal and environmental implications of such technologies. In AY15, certificates were awarded to the following students: **Sharon Gao**, a senior graduating with an A.B. in economics, for her work entitled "Shedding Light on the Equity vs. Efficiency Debate: Distributional Impacts of Dynamic Residential Electricity Pricing"; **Theresa Meyer**, a senior graduating with a B.S.E. in computer science, for her work entitled "Getting Greener: Graphical Display for Princeton University Campus Energy Awareness"; and **Saumya Singh**, a senior graduating with a B.S.E. in operations research and financial engineering, for her work entitled "Princetonian Electricity: Managing an Isolated Microgrid." All three students presented their work at the Program in Technology and Society symposium in May 2015. **Ryan Fauber**, a 2015 graduate who received an A.B. in Near Eastern Studies, presented the results of his junior-year work "Examining American Values Rhetoric."

The Andlinger Center offers undergraduate and graduate level courses under the ENE subject code. There are currently 32 ENE courses: 24 undergraduate and eight graduate courses. The center introduced several new courses in 2014-2015. **Claire White**, assistant professor of civil and environmental engineering and the Andlinger Center for Energy and the Environment, presented her new course, ENE 506: *Synchrotron and Neutron Studies of Materials*, to 16 graduate students. This past spring, **José Avalos**, assistant professor of chemical and biological engineering and the Andlinger Center for Energy and the Environment, presented his new course, CBE 418/ENE 418: *Fundamentals of Biofuels*, to 19 undergraduate students. Visiting professor **Fabian Wagner** offered an original course, WWS 586E/ENE 588: *Topics in STEP: Energy Policy & Energy Technologies*, to 21 students. In addition, the Andlinger Center's first postdoctoral appointee, **Sander van der Linden**, developed and taught a new graduate class, ENE 561: *The Psychology of Environmental Decision Making*.

The **Peter B. Lewis Fund for Student Innovation in Energy and the Environment** and the **Dede T. Bartlett P03 Fund for Student Research in Energy and the Environment** support summer internships for undergraduates. Recipients perform research on campus for a minimum of eight weeks under the guidance of faculty advisors. In the summer of 2015, six students received more than \$42,000 in stipends and funds for research materials and supplies. The students came from departments within and beyond the School of Engineering and Applied Science, and their research projects spanned a range of topics, including investigations into long-term durability of sustainable cements, cooling and heating for architecturally-optimized systems, mevalonate pathways in yeast for synthesizing biofuels, flash nanoprecipitation for creating amorphous polymer semiconducting layers with applications in electronics,



Saumya Singh '15 presents the results of her research into the Princeton University microgrid. Singh completed the Energy track of the Program in Technology & Society.

Photo by Frank Wojciechowski

education

Maeder Fellowship Recipients and Faculty Advisors

2014-2015 Academic Year

Janam Jhaveri

(James C. Sturm, Electrical Engineering, Princeton Institute for the Science and Technology of Materials)

Jennifer Obligacion

(Paul J. Chirik, Chemistry)

2015-2016 Academic Year

Wenkai Liang

(Chung K. (Ed) Law, Mechanical and Aerospace Engineering)

We are happy to announce that in June, **Moira Selinka** was appointed to the position of ACEE Education and Outreach Coordinator.

developing sustainable base metal catalysts, and studying zinc electroplating in alkaline batteries. More information about these innovative student projects is available on the center's website at acee.princeton.edu/news/2015-undergraduate-interns.

The **Maeder Graduate Fellowship in Energy and the Environment** supported **Janam Jhaveri** and **Jennifer Obligacion** in 2014-2015. Jhaveri is earning his Ph.D. in the Department of Electrical Engineering and spent the year researching suitable materials for a "hole-blocking" silicon heterojunction for solar photovoltaics with the goal of developing new silicon-based solar cells that are both low-cost and highly efficient. Obligacion is earning her Ph.D. in the Department of Chemistry. Throughout the year she conducted research to develop inexpensive, less toxic, and earth-abundant metal alternatives to precious metal catalysts in C-H borylation, which has applications in the discovery of new polymers, pharmaceuticals, and electronic materials. This past spring a committee selected the next Maeder recipient from a competitive pool of applicants: **Wenkai Liang**, a graduate student in the Department of Mechanical and Aerospace Engineering. Information about the fellowship and these recipients can be found at acee.princeton.edu/news/maeder-2014 and acee.princeton.edu/news/maeder-wenkai-liang.

Laboratory Learning Program

Each summer, the university provides research opportunities to highly-motivated high school students through its Laboratory Learning Program. Faculty members in the engineering and natural science disciplines offer projects to which interested students from around the country can apply. The program offers an opportunity for students to participate in scientific research at the university level using state-of-the-art equipment and procedures. In summer 2014, two of the center's assistant professors supervised students in their labs. **Claire White** and her students simulated X-ray scattering data to analyze the atomic structure of a new type of sustainable concrete that significantly reduces CO₂ emissions. **Forrest Meggers'** students investigated how geothermal energy at mild temperatures can be harnessed to improve the performance of building HVAC systems, researched how radiant heating and cooling can provide higher levels of thermal comfort with minimal energy demand, and used an industrial robot to analyze heat gain and loss through single pane glass structures. While the projects helped hone problem-solving and data analysis skills, the most important benefit to students was the ability to explore potential career options related to issues in energy and the environment.

Other Activities

The Andlinger Center funded additional student research projects that involved optimizing the structure of organometal halide perovskite solar cells to minimize environmental impacts, biodigester roof construction to allow anaerobic composting function, development of geochemical models capable of forecasting contaminant levels in waste from hydraulic fracturing, and study of water resource management and sustainable practices in Peru.



From left, Claire White, an assistant professor of civil and environmental engineering and the Andlinger Center, mentors high school students Haley Mander and Jocelyn Tolpin through the Laboratory Learning Program.

Photo by Denise Applewhite



Photo by Frank Wojciechowski

From left, Forrest Meggers, assistant professor of architecture and the Andlinger Center for Energy and the Environment; and Dorit Aviv *14 pose inside the Cool Oculus, a project funded by the Tides Foundation.

Seed Funding

The Andlinger Center for Energy and the Environment (ACEE) awards funds to catalyze and support Princeton faculty and student research aimed at solving a broad range of energy and environmental problems. Following on our successful joint seed funding initiative in 2014, in 2015 the center collaborated with the **Princeton Environmental Institute (PEI)** to jointly issue a call for proposals. Under the leadership of **Peter Jaffé**, the center's associate director for research, who worked in concert with colleagues from PEI, applications were peer-reviewed and funds were distributed to projects that allow faculty to explore new areas of research, promote collaboration among faculty of different disciplines, or have potential to leverage funding to attract larger extramural grants. Funded projects foster innovative research, teaching, and mentorship in energy and the environment. A wide variety of new research was supported in 2014–2015.

The Andlinger Center awarded six interdisciplinary projects up to \$140,000 each:

- Professors **Antoine Kahn**, **Lynn Loo**, and **Barry Rand** are leading an effort to develop knowledge of an exciting class of hybrid organic-inorganic semiconductors that will be used in applications for solar energy conversion.
- Professors **Robert Cava** and **Andrew Bocarsly** have made it their goal to find new semiconductor-photocatalysts to increase the diversity of energy-converting materials while reducing excess greenhouse gas in the atmosphere.
- Professor **Howard Stone** will conduct laboratory studies of environmentally-friendly foam that could be used to reduce the negative environmental impacts of chemicals used during the process of hydraulic fracturing.
- The Climate Futures Initiative, led by professors **Marc Fleurbaey**, **Melissa Lane**, and **Robert Socolow**, will expand an interdisciplinary effort to examine the forces and dimensions shaping the future of humanity in the face of climate change.
- Professor **Yiguang Ju** and energy systems modeler **Tom Kreutz** will research methods for natural gas and alternative fuel combustion that have the potential for higher efficiency and direct capture of CO₂, while lowering costs and water usage.
- Professors **Peter Jaffé** and **Daniel Steingart** plan to lay the foundation for the development of a novel wastewater treatment method that will yield energy, as opposed to being energy intensive, by studying the use of a feamox-based treatment system.

Funding was provided by the **Addy/ISN North American Low Carbon Emission Self-Sufficiency Fund**, the **Andlinger Innovation Fund**, the **Clifford and Helen Cross Memorial Charitable Lead Annuity Trust**, the **Nancy A. Curtin '79 and John Stafford Research Innovation Fund**, the **de Carvalho-Heineken Family Fund for Environmental Studies**, the **John Drzik '83 and Ann Thorsell '83 Fund for Innovation**, the **Peter C. Klosowicz '76 Fund for Energy and the Environment**, the **Marathon Oil Foundation**, the **Parallax Fund for Energy and the Environment**, the **Renee and Mark F. Rockefeller '89 Fund for the Environment**, the **Ruehl Family Fund for Energy and the Environment**, and the **David P. Simons Fund for Energy and the Environment**. More information about the faculty teams and their work can be found at acee.princeton.edu/news/1-05m-awarded-for-innovative-research.

research

In the past year the center has streamlined the process for reporting on ACEE-funded projects. The ACEE website has been updated to show research results, summarized in terms understandable to the general public, as well as links to publications that have resulted from ACEE-sponsored research.

Externally-Funded Sponsored Research Awards 2014–2015:

Emily A. Carter

Air Force Office of Scientific Research, “Shedding Light on Plasmon-based Photochemical and Photophysical Processes,” subaward from Rice University

Office of Naval Research, “Advancing Orbital-free Density Functional Theory: Physics, Algorithms, and Applications”

Forrest Meggers

Tides Foundation, “Downdraft Solar Chimney for Passive Cooling in Arid Climates”

Daniel Steingart

National Science Foundation, “Collaborative Research: High-density, Cost-effective Electrochemical Power Management with Real-time Diagnostics,” collaboration with Dartmouth University

Continuing work on the “Intelligent Glazing for Intelligent Buildings” project, professors **James Sturm**, **Naveen Verma**, and **Sigurd Wagner** are developing a building energy management system in which invisible light and temperature sensors and actuators are incorporated into window panes for self-powered operation and wireless communication. Funding for this project is provided by the **Andlinger Center for Energy and the Environment Director’s Fund**.

Professor **Bruce Koel** is continuing his work on the “Harvesting Sunlight for Electricity and Fuels” project. Koel recognizes that photoelectrochemical water splitting to produce H_2 gas and CO_2 reduction to produce hydrocarbon fuels using solar radiation have great potential for sustainable carbon neutral solar fuels production. Currently, however, solar water splitting suffers from a high overpotential and sluggish kinetics and photoelectrochemical CO_2 reductions suffer from poor product selectivity. One solution to these problems is to incorporate additional catalysts to lower reaction barriers and improve selectivity. Koel and his research group hope to use earth abundant transition metal oxides and bimetallic alloys to develop efficient, affordable, and selective catalysts. Funding for this project is provided by an anonymous gift.

Two ACEE faculty members designed research projects utilizing the Princeton campus as a living laboratory. These projects are part of the Campus as a Lab program, which supports research into sustainability on campus. Using sensors and infrared cameras, **Forrest Meggers** and his students modeled the air flow in large indoor spaces and monitored the energy efficiency of Princeton’s buildings. **Daniel Steingart** worked with students to monitor the temperature and humidity at numerous locations on campus to give facilities managers better information about climate-control system performance. Funding for these projects came from an anonymous gift.

Start-up funds allow new faculty to equip their labs, build their research programs, and support students and postdoctoral research associates. In 2014–2015, the Andlinger Center contributed more than \$300,000 to start-up funds for new junior faculty. Support for these funds came from the **Addy/ISN North American Low Carbon Emission Energy Self-Sufficiency Fund**, the **Andlinger Center for Energy and the Environment Director’s Fund**, and the **Andlinger Innovation Fund**.

Extramural Sponsored Research

While the Andlinger Center provides seed funding to promote and support faculty and student research in its beginning stages, the center’s faculty also seek extramural research funding, including for projects that build on work previously seeded through ACEE. During the 2014–2015 academic year, ACEE faculty brought in more than \$1.7 million through four new research grants. During the same period, 22 new proposals were submitted.

Energy Technology Distillates

The center continues to pursue its goal of becoming a leading source of reliable, timely information on energy and the environment for policymakers, corporate leaders, educators, students, and other interested citizens through the Energy Technology Distillates project. In June, the second Energy Technology Distillate: *Small Modular Reactors*:

A *Window on Nuclear Energy*, was published. This new Distillate is a collection of concise articles about nuclear energy with a focus on small modular nuclear reactors, written for the interested non-expert, co-authored by expert faculty and researchers at Princeton, with Professor Emeritus **Robert Socolow** leading the effort. The center will release additional Distillates covering basic concepts, as well as technological, economic, environmental, and policy considerations associated with other emerging energy technologies, in the years to come. With this project the Andlinger Center leverages the wealth of expertise available through Princeton's world-class faculty and researchers. It is our hope that by becoming a trusted source of information, the Andlinger Center will encourage collaboration among academia, government, industry, and other entities to facilitate the practical technology and policy solutions we need.

Return on Investment

One way the Andlinger Center tracks the results of its efforts is by monitoring the impact seed funding has on future research activities. While not a complete list, the results described below have been aggregated from information supplied by award recipients. Princeton faculty, students, and researchers are polled annually about the ways in which Andlinger Center funds resulted in projects, awards, publications, patent activity, post-graduate student activities, and collaborations.

Many of the awardees are continuing their research in spin-off projects, some with external funding. Andlinger funds have inspired proposals that have been funded by the National Science Foundation, the U.S. Department of Energy, the National Oceanic and Atmospheric Administration, the Tides Foundation, Siemens, the University of São Paulo, the Army Research Lab, the Danish Council for Independent Research, ICL Industrial Products, Inc., and the National Research Council. Projects have also propelled new research efforts involving faculty, students, and other collaborators. Examples include: research performed at the Advanced Photon Source, Argonne National Lab; postdoctoral research in carbon capture and storage; and senior thesis work for which one student was awarded the Goudie senior thesis prize for outstanding work relating to energy and the environment.

Researchers have published results of their Andlinger-funded research in *American Chemical Society Applied Materials & Interfaces*, *Climate Risk Management*, *Computers and Chemical Engineering*, *Proceedings of the Combustion Institute*, *Energies*, *Environmental Sciences: Processes and Impacts*, *Inorganic Chemistry*, *Journal of Heat Transfer*, *Journal of Materials Chemistry*, *Nanoparticle Research*, *Nano Letters*, *Optics Letters*, *Organic Letters*, *Physical Chemistry Chemical Physics*, *Science*, and *Journal of Wind Engineering and Industrial Aerodynamics*. Others have presented at conferences including the Sixth International Building Physics Conference, the 2014 International Association for Shell and Spatial Structures Conference, the Ninth International Symposium on Turbulence and Shear

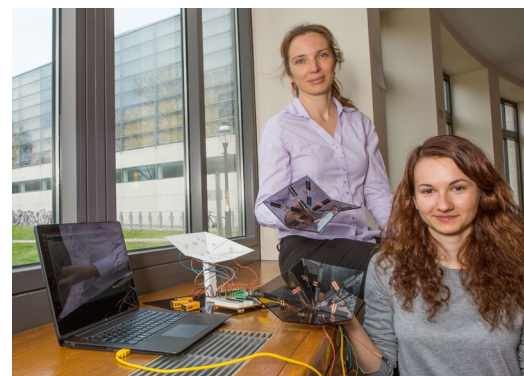


Photo by Denise Appewhite

For her senior thesis, Denisa Buzatu '15 (front) worked with Sigrid Adriaenssens (rear), assistant professor of civil and environmental engineering. Buzatu began investigating adaptive structures during an internship through the Andlinger Center in the summer after her sophomore year.

research

Return on Investment (since inception in 2011)

Total amount awarded:
\$4 million

Projects supported:
44 faculty, 31
undergraduate students,
and 5 graduate fellows

Derivative funding:
More than \$3.5 million

Journal publications: 28

Journal articles under
review: 12

Conference presentations:
23

Patent disclosures and
applications: 5

Flow Phenomena, the American Geophysical Union (AGU) 2014 Fall Meeting, the AGU Science Policy Conference, the American Meteorological Society 31st Conference on Hurricanes and Tropical Meteorology, the AGU 2013 Fall Meeting, the American Institute of Aeronautics and Astronautics Fluid Dynamics and Co-located Conferences, the 19th Australasian Fluid Mechanics Conference, the 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, the 9th International Symposium on Turbulence and Shear Flow Phenomena, the International Association for Shell and Spatial Structures Conference 2014, and the 12th International Conference on Computational Structures Technology. Civil and Environmental Engineering Professor Ning Lin's paper published in *Science* evaluating flood resilience strategies for coastal mega-cities received the prestigious Lloyd's Science of Risk Prize in 2014.

While many students and postdoctoral researchers supported by seed funds are still at Princeton, some have gone on to graduate school or have taken positions in industry and academia. Undergraduates have joined graduate programs at California Institute of Technology (M.S. in mechanical engineering), Yale University (M.Arch. in architecture), Harvard University (Ph.D. in chemistry), Massachusetts Institute of Technology (one for an M.S. in transportation and one for a Ph.D. in chemistry with an NSF Graduate Research Fellowship), Northwestern University (Ph.D. in chemistry), The Ohio State University (M.S. in public health), Georgia Institute of Technology (Ph.D. in materials science and engineering), the Colorado School of Mines (M.S. in Engineering), and Imperial College (M.Sc. in advanced chemical engineering). Undergraduates have also gone on to work at the Otherlab in San Francisco, the Natural Resources Defense Council, Cardinal Scholars, Columbia University Medical Center, Crossix Solutions, Facebook, SunEdison, Eckersley O'Callaghan, and Gilbane Building Co. Graduate students and postdoctoral researchers have secured positions as assistant professors at Arizona State University (civil and environmental engineering), Texas Tech University (civil and environmental engineering), Pennsylvania State University (statistics), University of Melbourne (urban analytics), Western Washington University (chemistry), the Danish Technical University (mechanical engineering), ESITC Caen (École supérieure d'Ingénieurs des Travaux de la Construction) in Normandy, France, and as research scholars at Massachusetts Institute of Technology (chemical engineering), École des Ponts, the U.S. Naval Research Laboratory, and ExxonMobil.

Collaboration is a trademark of many Andlinger-funded projects. Indeed, our researchers have reported new partnerships with DuPont, Dow Chemical, Arkema, Coolerado, A.F. Mensah, WhalePower Corporation, Gas Technology Institute, Bielefeld University, École des Ponts, University of Cambridge, Temple University, University of Bielefeld, the Wharton School of Business at the University of Pennsylvania, Massachusetts Institute of Technology, King Abdullah University of Science and Technology, University of Massachusetts-Dartmouth, National Wind Resource Center at Texas Tech University, University of São Paulo, École des Ponts' Laboratoire Navier, IBM, U.S. Naval Research Laboratory, Harvard China Project at Harvard University, Energy Research Institute at the National Development and Reform Commission in Beijing, Center for Earth System Science at Tsinghua University, International Institute of Advanced System Analysis in Austria, Peking University, and ICL Industrial Products, Inc.

2014-2015 Highlight Seminar Series

September 29

David Mitzi, Duke University

Solution Processing of Thin-film Solar Cells: Opportunities and Challenges

2014-2015 Highlight Seminar Series continued

October 20

Michael Aziz, Harvard University

Organic-based Aqueous Flow Batteries for Massive Electrical Energy Storage

November 10

Amilcare Porporato, Duke University

On the Active Role of Plants on Land-Atmosphere Processes

December 8

David Ginley, National Renewable Energy Laboratory

Computational Identification of Materials for Solar Energy Conversion Including Semiconductors for Water Splitting

January 16

Joan Brennecke, University of Notre Dame

Ionic Liquids for Post-combustion CO₂ Capture

February 16

Kartik Chandran, Columbia University

Production of Bio-based Fuels and Chemicals Using Novel Process Platforms

March 23

Clare Grey, University of Cambridge

Following Function in Real Time: New NMR and MRI Methods for Studying Structure and Dynamics in Batteries and Supercapacitors

April 20

Michelle Addington, Yale University

Disciplinary Mis-translations

May 8

Mark O'Malley, University College Dublin

Low Carbon Integrated Energy Systems: Challenges and Opportunities



Photo by Frank Wojciechowski

Shoham Bhadra, a doctoral student in electrical engineering (left), and Daniel Steingart, an assistant professor of mechanical and aerospace engineering and the Andlinger Center, found that changes in the bounce of common batteries signal important changes that occur as the battery discharges.

princeton e-filiates partnership

Princeton E-filiates
Partnership Member
Companies during the
2014-2015 academic
year:

ExxonMobil

DuPont

Lockheed Martin

PSEG

Southern Company

Archewild

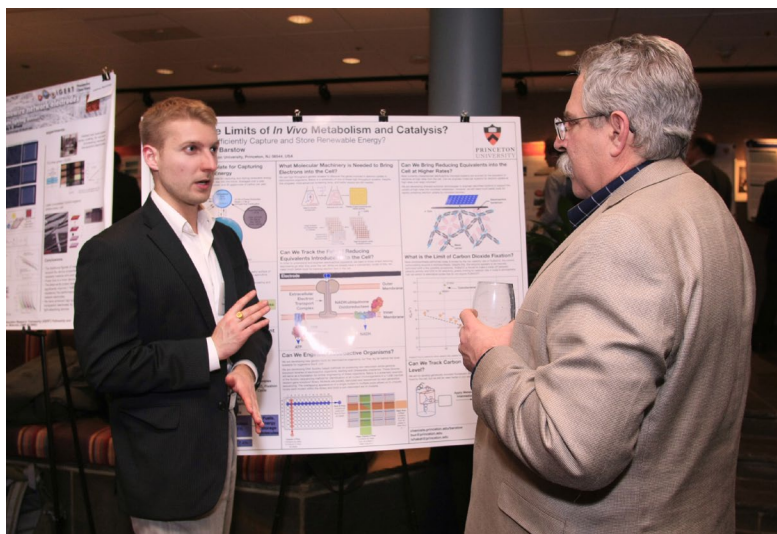
Power Survey Company

Princeton Power Systems

[Princeton E-filiates Partnership](#) (E-filiates) aims to enhance collaboration and promote technology transfer between Princeton University and its corporate partners to address global energy needs and environmental concerns. **Paul Chirik**, the Edwards S. Sanford Professor of Chemistry, was appointed associate director for external partnerships of the Andlinger Center to lead E-filiates as of July 1, 2015, succeeding **Lynn Loo**, the Theodora D. '78 and William H. Walton III '74 Professor in Engineering.

The E-filiates third annual meeting was held on November 14, 2014. **Stewart Prager**, director of the Princeton Plasma Physics Laboratory and professor of astrophysical sciences at Princeton University, gave the keynote address on the status of fusion energy technologies before an audience of approximately 200. The annual meeting included faculty presentations by professors **José Avalos**, **Michael Oppenheimer**, **Warren Powell**, and **Claire White**, as well as panel discussions on grid-scale electricity storage and financial investments in sustainability technologies. A poster session featuring more than 50 students and postdoctoral researchers was another highlight of the meeting, and allowed for extensive interaction among industrial and academic attendees. Planning is underway for the fourth annual meeting that will take place on November 20, 2015 and will feature Franklin (Lynn) Orr, the Under Secretary for Science and Energy, U.S. Department of Energy.

The 2014 E-filiates annual request for research proposals resulted in two funded projects. The first, led by **Marcus Hultmark**, assistant professor of mechanical and aerospace engineering, and in collaboration with E-filiates member Lockheed Martin, proposes a new facility for testing hydrokinetic turbines. The second project, headed by **Daniel Steingart**, assistant professor of mechanical and aerospace engineering and the Andlinger Center for Energy and the Environment, examines the kinetic and phase behavior of the zinc bromine system in flow batteries.



Research specialist Lev Shaket presents his work during a poster session at the 2015 E-filiates Retreat.

Photo by Frank Wojciechowski

Coleen Burrus has been appointed director of the Office of Corporate and Foundation Relations; her office will support E-ffiliates in identifying and building relationships with prospective corporate members.

E-ffiliates hosted and sponsored its second Gordon Research Conference-style retreat in February 2015. The retreat fostered strong connections and open discussion between students, postdoctoral fellows, faculty, and representatives from E-ffiliates member companies and included panel discussions on renewable energy production, electrochemical energy storage, the future of fuels and combustion, and considerations of scaled systems. A poster session that featured the research of more than 30 students and postdoctoral fellows followed a keynote address by **Steve Wilson**, the head of research and development for Southern Company, an E-ffiliates member.

Membership benefits for E-ffiliates members were expanded in response to member feedback and include a named postdoctoral fellow for charter members and provisions to use a portion of annual membership fees to direct research projects on campus.

E-ffiliates welcomed Princeton Power Systems as an affiliate member and ExxonMobil as a charter member. They joined members DuPont, Lockheed Martin, Power Survey Company, PSEG, Southern Company, and Archewild.



Photo by David Kelly Crow

Panelists Carter Bales, Emily Carter, Andrew Golden, and Richard Kauffman addressed the topic of investing in energy and sustainability at the 2014 E-ffiliates Annual Meeting.

Save the Date:

May 18 – 20, 2016 ACEE will host a celebratory event to publicly announce and showcase our new building and facilities. The event will feature a multi-day symposium exploring topics related to energy and the environment with presentations from leaders in government, academia, and industry. We hope you can join us!

Building and Equipment

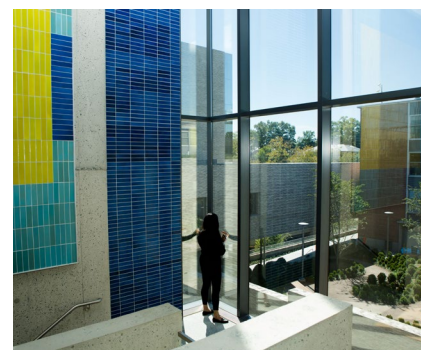
The physical embodiment of the Andlinger Center for Energy and the Environment (ACEE) is a uniquely beautiful structure designed as a place for state-of-the-art energy and environmental research and education. The building is organized around three garden courtyards featuring a lush landscape that lends a feeling of intimacy and warmth absent from many other modern science and engineering buildings. Despite delays that set back its opening, the building and landscape is rapidly coming together adjacent to the Engineering Quadrangle at the corner of Olden Street and Prospect Avenue. We expect to occupy the space in late fall 2015 and will host an official celebratory building opening in May 2016. Inside the building behind the soft gray bricks that serve as the exterior envelope, occupants and visitors will be surrounded by a wealth of textures, including spectacular felt wallcoverings displaying images abstracted from the original scientific notebooks of scientific luminaries, along with stone flooring, concrete, tile, and millwork finishes. Maeder Hall and meeting spaces have been equipped with state-of-the-art media components, and warm furnishings are placed throughout.



Andlinger Center, view from Olden Street.

Photo by Denise Applegate

In preparation for the scientific work that the new building will enable, the Andlinger Center has purchased a number of sophisticated tools that will be deployed in the imaging and analysis center and clean rooms, critical centralized research facilities located within the building and operated by the Princeton Institute for the Science and Technology of Materials (PRISM). The Titan Themis Scanning Transmission Electron Microscope (S/TEM), manufactured by FEI, is sure to be the flagship tool. The Titan was purchased as part of an advanced multi-tool platform that includes a Helios Nanolab dual electron and focused ion beam microscope and a Verios ultra-high resolution scanning electron microscope. The collective tools will provide an unprecedented ability to image, characterize, and analyze materials and material structure for a wide range of samples at the atomic resolution level. With the purchase of these three imaging and analysis tools, Princeton has created a truly world-class facility. The Titan Themis S/TEM will be one of only a handful of like tools in the U. S. and throughout the world. The full complement of tools purchased from FEI positions ACEE and PRISM as leaders in electron microscopy, and ACEE as one of the top centers for energy and materials research for many years to come.



Andlinger Center interior, overlooking gardens.

Photo by Denise Applegate

facilities

Building Facts

The building is designed to meet LEED Silver standards and will employ many energy efficient elements including:

- Heat-recovery systems for air handling units
- Radiant panel heating and cooling systems
- Energy-efficient lighting
- Daylight harvesting
- Green roofs
- Recycled rainwater

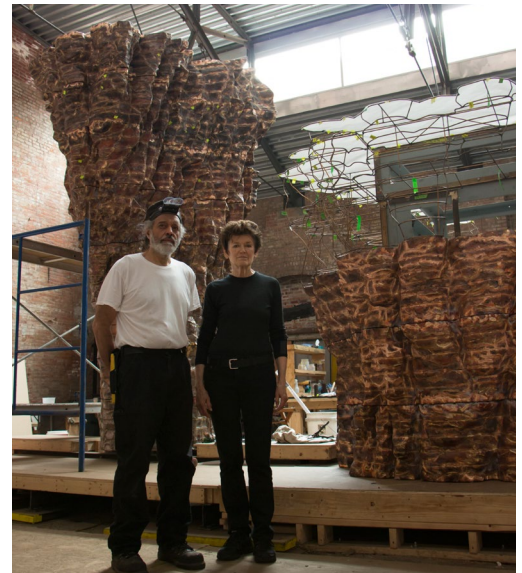
Some of the materials and components used in the final structure:

- 1,045 tons of steel
- 295,000 soft-gray Petersen Kolumba bricks
- 100,548 pounds of aluminum shielding in the Imaging and Analysis Center
- Auditorium with seating for 208
- 2 custom plant growth chambers
- 25,000 square feet of green roof

In addition to this impressive suite of electron and ion microscopy tools, the Andlinger Center, in collaboration with PRISM, has procured a number of other instruments for installation in the building. Acquisitions include the following:

- Heidelberg DWL 66+ Maskless Lithography System, a unique laser-based maskless lithography tool that enables both direct patterning onto a substrate and the ability to build a master copy (photomask) of a device design that can be used in conjunction with conventional optical lithography systems.
- Oxford PlasmaPro System 100 ICP-PECVD, a plasma-enhanced chemical vapor deposition system that enables deposition at temperatures lower than those used with conventional CVD and PECVD systems.
- Oxford PlasmaPro NGP80 RIE, a state-of-the-art reactive ion etching tool.
- Oxford OpAL-PEALD, an atomic layer deposition system that enables deposition of new and novel materials at low temperatures.
- Linkam Heat Stage for our existing Wollman spectroscopic ellipsometer, a component that enables measurements over a temperature range of -60 to 300 degrees Celsius.
- Agilent Cary Universal Measurement Accessory (UMA) for our existing Agilent Cary 5000 UV-Vis NIR spectrophotometer, a device that allows measurement of scattered light and angle-resolved spectroscopy. The UMA will also extend the tool's capabilities to handle a wide variety of sample types and form factors.
- Edinburgh Instruments steady-state and time-resolved photoluminescence (PL) spectrometer. This PL measurement tool is the world's most sensitive spectrofluorimeter, and provides unparalleled analysis of a broad range of materials.
- Two Olympus MX-51 optical microscopes with state-of-the-art camera systems.

We are delighted to announce that a monumental new sculpture by Ursula von Rydingsvard has been commissioned for outdoor installation to highlight the entrance to the new building. The 19-foot-tall untitled work is the artist's first sculpture made of pounded copper. The work will be a welcoming beacon for the center, emblematic of our high aspirations.



A 19-foot-tall copper sculpture by artist Ursula von Rydingsvard (right) will highlight the entrance to the new Andlinger Center. The sculpture is fabricated by metal artist Richard Webber (left).

Andlinger Center for Energy and the Environment

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Founding Director

Professor Peter Jaffé
Associate Director for Research

Professor Niraj Jha
Associate Director for Education

Professor Yueh-Lin (Lynn) Loo
Associate Director for External Partnerships

Jennifer L. Poacelli
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Moira Selinka
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Chairman and Founder, Andlinger & Company

Merrick G. Andlinger '80
President, Andlinger & Company

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

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President and Chief Executive Officer, NRG Energy, Inc.

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

David Eaglesham
Chief Executive Officer, Pellion Technologies

Ralph Izzo
Chairman and Chief Executive Officer, PSEG

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President and Chief Executive Officer, Calor Energy

Gregory H. Olsen
President, GHO Ventures, LLC

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Vice-Chairman, Rockefeller Financial Services

Timothy Sands
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Assistant Professor of Chemical and Biological Engineering and the Andlinger Center for Energy and the Environment

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Founding Director, Andlinger Center for Energy and the Environment

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Edwards S. Sanford Professor of Chemistry

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Associate Director for Research, Andlinger Center for Energy and the Environment

Niraj Jha

Professor of Electrical Engineering
Associate Director for Education, Andlinger Center for Energy and the Environment

Egemen Kolemen

Assistant Professor of Mechanical and Aerospace Engineering and the Andlinger Center for Energy and the Environment

Yueh-Lin (Lynn) Loo

Theodora D. '78 and William H. Walton III '74 Professor in Engineering
Professor of Chemical and Biological Engineering
Associate Director for External Partnerships, Andlinger Center for Energy and the Environment

Forrest Meggers

Assistant Professor of Architecture and the Andlinger Center for Energy and the Environment

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Professor of Architecture and Structural Engineering

Stewart C. Prager

Professor of Astrophysical Sciences
Director, Princeton Plasma Physics Laboratory

Barry Rand

Assistant Professor of Electrical Engineering and the Andlinger Center for Energy and the Environment

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Professor of Civil and Environmental Engineering
Chair, Department of Civil and Environmental Engineering

Daniel A. Steingart

Assistant Professor of Mechanical and Aerospace Engineering and the Andlinger Center for Energy and the Environment

Claire White

Assistant Professor of Civil and Environmental Engineering and the Andlinger Center for Energy and the Environment

associated faculty

Associated Faculty members are elected by the Executive Committee based on their significant service contributions to the Andlinger Center. All members of the Executive Committee are named Associated Faculty.

Craig B. Arnold

Professor of Mechanical and Aerospace Engineering
Director, Program in Materials Science and Engineering
Associate Director, Academic Affairs, Princeton Institute for the Science and Technology of Materials

Michael A. Celia

Theodora Shelton Pitney Professor of Environmental Studies
Professor of Civil and Environmental Engineering
Director, Program in Environmental Engineering and Water Resources

Pablo G. Debenedetti

Class of 1950 Professor in Engineering and Applied Science
Professor of Chemical and Biological Engineering
Dean for Research

Claire Gmachl

Eugene Higgins Professor of Electrical Engineering

Mikko Haataja

Professor of Mechanical and Aerospace Engineering

Yiguang Ju

Robert Porter Patterson Professor of Mechanical and Aerospace Engineering
Director, Program in Sustainable Energy

Chung (Ed) Law

Robert H. Goddard Professor of Mechanical and Aerospace Engineering

A. James Link

Associate Professor of Chemical and Biological Engineering

Denise L. Mauzerall

Professor of Civil and Environmental Engineering and Public and International Affairs, Woodrow Wilson School

Michael Oppenheimer

Albert G. Milbank Professor of Geosciences and International Affairs, Woodrow Wilson School
Director, Center for Science, Technology and Environmental Policy

H. Vincent Poor

Michael Henry Strater University Professor of Electrical Engineering
Dean, School of Engineering and Applied Science

Warren Powell

Professor of Operations Research and Financial Engineering
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Ignacio Rodriguez-Iturbe

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Professor of Civil and Environmental Engineering

Jorge L. Sarmiento

George J. Magee Professor of Geoscience and Geological Engineering
Professor of Geosciences
Director, Program in Atmospheric and Oceanic Sciences

Eldar Shafir

William Stewart Tod Professor of Psychology and Public Affairs

James C. Sturm

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Director, Princeton Institute for the Science and Technology of Materials

Sankaran Sundaresan

Professor of Chemical and Biological Engineering

Sigurd Wagner

Professor of Electrical Engineering

supporters

The Andlinger Center for Energy and the Environment is grateful to the following supporters whose gifts help to realize the vision of the center. (Those with an asterisk are new or renewed in 2014–2015.)

Gerhard R. Andlinger '52 P80 P91 Founding Gift

Lydia and William M. Addy '82 P14 P18 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 gifts for construction of the Andlinger Center building

Anonymous gift for environmental policy research

Anonymous gift for the highest priorities of the center, including research, equipment, and a visitors program

Anonymous gift for research

Anonymous gift to establish the *Parallax Fund for Energy and the Environment* to support faculty and student research

Anonymous gift 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

Anonymous gift to establish the *Sustainability Fund* to support student research

Tia Barancik '83 P19 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*

Peter Bartlett '77 and **Erin P. Bartlett P09 P10 P14** for discretionary spending

Charles A. Bernheim '67 for discretionary spending*

Erik C. Blachford '89 for discretionary spending*

John E. Cross '72 and **Mary Tiffany Cross** for discretionary spending

Nancy A. Curtin '79 P18 and **John Stafford** to establish the *Nancy A. Curtin '79 and John Stafford Research Innovation Fund*

John O. Dabiri '01 to establish the *John O. Dabiri '01 Family Fund for Excellence in Energy and Environmental Research*

Charlene de Carvalho-Heineken P09 P14 to establish the *de Carvalho-Heineken Family Fund for Environmental Studies* to support faculty and student research

John P. Drzik '83 and **Ann L. Thorsell '83** to establish the *John Drzik and Ann Thorsell Fund for Innovation*

High Meadows Foundation to establish the *Andlinger Center for Energy and the Environment Director's Fund*

Kerry and William F. Holekamp P14 to support equipment purchases

Thomas W. Horton Family to support equipment purchases

Peter C. Klosowicz '76 P19 to establish the *Peter C. Klosowicz '76 Fund for Energy and the Environment* to support research and teaching

Sally Liu '87 and **Bay-Wei W. Chang '87** to establish the *Sally Liu '87 and Bay Chang '87 Fund for Energy and the Environment**

Paul A. Maeder '75 for construction of Maeder Hall and to establish the *Paul A. Maeder '75 Fund for Innovation in Energy and the Environment* to support graduate fellowships

Jay P. Mandelbaum '84 P17 to establish the *Laurie and Jay P. Mandelbaum '84 Fund for Energy and the Environment*

Lisa Lee Morgan '76 *79 to support research in renewable energy

Nicholas J. Nicholas, Jr. '62 P83 P00 to establish the *Nicholas Family Fund for the Environment* to advance public understanding of important issues related to energy and the environment

Nicholas G. Nomicos '84 and **Kathleen Connor Nomicos '84** to establish the *Nicholas and Kathleen Nomicos Class of 1984 Fund for the Andlinger Center for Energy and the Environment* to advance public understanding of important issues related to energy and the environment

Mark F. Rockefeller '89 to establish the *Renee and Mark F. Rockefeller '89 Fund for the Environment* to support faculty and student research

Ernest H. Ruehl, Jr. '85 to establish the *Ruehl Family Fund for the Environment* to support faculty and student research

Elchin A. Safarov and **Dilyara Allakhverdova P15** for discretionary spending

Gloria and Karl F. Schlaepfer '49 P85 to establish the *Schlaepfer Family Fund* for equipment

Kent C. Simons '57 to establish the *David P. Simons Fund for Energy and the Environment*

Lewis W. van Amerongen '62 to establish the *Lewis W. van Amerongen '62 Fund for Energy Research* for equipment

research directory

Our online research directory of Princeton faculty, whose portfolios include energy or energy-related environmental issues as a component of their overall research pursuits, continues to grow with 116 entries at the end of June 2015. 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 campus community members who seek opportunities for collaboration. The online research directory (acee.princeton.edu/research) charts the intellectual foundation of the center.

The faculty members in the research directory, as of this report date, represent the following schools, departments, programs, and centers:

School of Architecture	Program in Applied and Computational Mathematics
School of Engineering and Applied Science	Program in Architecture and Engineering
Woodrow Wilson School of Public and International Affairs	Program in Atmospheric and Oceanic Sciences
	Program in Engineering and Management Systems
Department of Astrophysical Sciences	Program in Engineering Physics
Department of Chemical and Biological Engineering	Program in Environmental Engineering and Water Resources
Department of Chemistry	Program in Environmental Studies
Department of Civil and Environmental Engineering	Program in Geological Engineering
Department of Computer Science	Program in Materials Science and Engineering
Department of Ecology and Evolutionary Biology	Program in Planets and Life
Department of Economics	Program in Plasma Physics
Department of Electrical Engineering	Program in Population Studies
Department of Geosciences	Program in Science, Technology, and Environmental Policy
Department of Mechanical and Aerospace Engineering	Program in Sustainable Energy
Department of Near Eastern Studies	Program in Technology and Society
Department of Operations Research and Financial Engineering	Program in Urban Studies
Department of Physics	Program on Science and Global Security
Department of Psychology	
Department of Sociology	Geophysical Fluid Dynamics Laboratory
	Princeton Plasma Physics Laboratory
Andlinger Center for Energy and the Environment	
Center for Architecture, Urbanism, and Infrastructure	
Institute for the Transregional Study of the Contemporary Middle East, North Africa and Central Asia	
Lewis-Sigler Institute for Integrative Genomics	
Keller Center	
Princeton Environmental Institute	
Princeton Institute for the Science and Technology of Materials	

Faculty associated with the Andlinger Center are often cited in local, national, and international news publications or have their research highlighted in journals and scientific publications. In 2014–2015, 53 faculty listed in the ACEE research directory were referenced more than 220 times in sources such as *The Boston Globe*, *NPR*, *The New York Times*, *National Geographic*, *Time Magazine*, *The Guardian*, and *The Washington Post*. A few that represent the range of sources and topics are:

Professor **Sigrid Adriaenssens'** and her student, **Denise Buzatu's** research was featured in “Electrical Origami for Environmentally Sustainable Buildings” in *AZO Build* (<http://www.azobuild.com/news.aspx?newsID=19995>).

Professor **José Avalos** was featured in “Pioneering engineering” in *International Innovation* (<http://www.internationalinnovation.com/pioneering-engineering/>).

Professor **Andrew Bocarsly** was quoted in “‘Bionic Leaf’ Makes Fuel from Sunlight” in *Scientific American* (<http://www.scientificamerican.com/article/bionic-leaf-makes-fuel-from-sunlight/>).

Professor **Sonya Legg's** research was featured in “Gigantic underwater waves explained for first time, study says” in *The Washington Post* (<http://www.washingtonpost.com/news/morning-mix/wp/2015/05/11/gigantic-underwater-waves-mysterious-life-explained-for-first-time-study-says/>).

Professor **Denise Mauzerall** was quoted in “Curbing air pollution could help crops thrive” by the Thomas Reuters Foundation (<http://www.trust.org/item/20140728133158-po82k>).

Professor **David Medvigy's** research was highlighted in “Is this the end of autumn as we know it?” on the *BBC* (<http://www.bbc.com/earth/story/20140929-why-is-autumn-changing>).

Professor **Michael Oppenheimer** was quoted in “Abundant Natural Gas Won't Slow Climate Change, Study Says” in *The Huffington Post* (http://www.huffingtonpost.com/2014/10/15/natural-gas-climate-change_n_5990888.html).

Director of the Princeton Plasma Physics Laboratory and Professor **Stewart Prager** was interviewed by CBC Radio's *Quirks & Quarks* program “The Next Big Thing: Fusion power and ITER” (<http://www.cbc.ca/radio/quirks/quirks-quarks-for-sept-13-2014-1.2842801/the-next-big-thing-fusion-power-and-iter-1.2842802>).

Professor **Annabella Selloni's** research was featured in “Theoretical calculations help to determine the structure of an active component of nickel oxide catalyst” in *AZO Materials* (<http://www.azom.com/news.aspx?newsID=43044>).

Professor **Daniel Steingart** was quoted in *The New York Times* in “Nevada a winner in Tesla's Battery contest” (http://www.nytimes.com/2014/09/05/business/energy-environment/nevada-a-winner-in-teslas-battery-contest.html?_r=1).

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In the Nation's Service and in the Service of All Nations