

Melting ice caps and \$4-a-gallon gasoline

have focused the global spotlight on problems of energy and the environment, but Princeton University's commitment to the field extends for more than half a century.

Free thinking on a ski lift in Aspen, Colo., in 1951 led Princeton astrophysicist Lyman Spitzer to conceive an idea for harnessing the nuclear reaction that drives stars as a source of energy here on Earth. Later that year, the U.S. Atomic Energy Commission invested in what would become the Princeton Plasma Physics Lab, which continues to be the premier facility in the United States for developing nuclear fusion as a clean and essentially limitless energy source. Over the decades, Princeton also became a leader in understanding the history of the planet's climate and predicting its future course.

Today, Princeton's strengths in engineering and public policy are increasingly important in translating scientific understanding into creative and practical solutions. The graphic at the center of these pages, reprinted from a recent issue of the *Princeton Weekly Bulletin*, examines the range of energy and environment research projects that intersect at Princeton. In addition to those appearing in that sampling, the column on the right provides a partial list of many other engineering faculty members who lead projects with great potential to provide sustainable energy sources and protect the environment.

Spanning the globe: A sampling of

Robert Williams PEI

Systems that provide electricity and synthetic fuels with near-zero greenhouse gas emissions while storing carbon dioxide underground

David Wilcove EEB/WWS

Conservation of endangered and migratory species, impacts of climate change on invasive species, and management of parks and protected areas

Bess Ward GEO

Role of microbes in transforming nitrous oxide, a greenhouse gas

Shivaji Sondhi PHY

Interplay between the geology of oil, technological change in the energy sector and political developments in the Middle East

Robert Socolow MAE

Global carbon management and fossil-carbon sequestration

Wole Soboyejo MAE

Sustainable materials for affordable housing and energy-efficient technologies in developing nations

James Smith CEE

Urbanization's impact on air and land

Danny Sigman GEO

Interaction between climate and atmospheric carbon dioxide

George Scherer CEE

Risk of leakage of carbon dioxide stored in exhausted petroleum reservoirs

Jorge Sarmiento GEO

Oceanic uptake of carbon dioxide produced by fossil fuel burning and deforestation

Daniel Rubenstein EEB

Response of migrating animal populations to human-induced land use change

Ignacio Rodriguez-Iturbe CEE

Impact of water dynamics in ecological processes

George Philander GEO

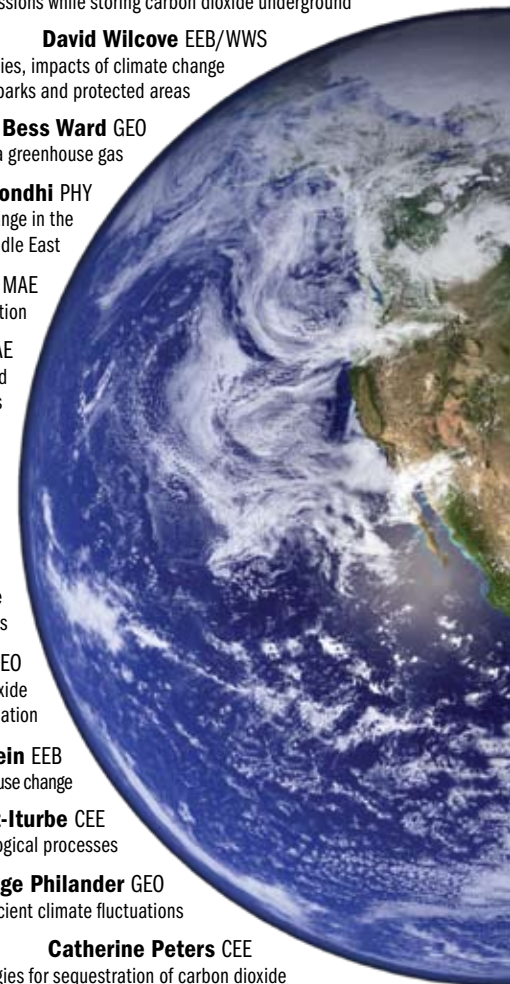
Recurrent ice ages and other ancient climate fluctuations

Catherine Peters CEE

Role of geochemical reactions in technologies for sequestration of carbon dioxide

Stephen Pacala EEB/PEI

Global carbon management and interactions between biosphere and climate



sustainability research at Princeton

Stan Allen ARC

Ecology and sustainability incorporated with landscape and urban design

Craig Arnold MAE

Technology related to batteries and solar cells

René Carmona ORF

Mathematical models for carbon cap-and-trade schemes that reduce emissions and costs

Michael Celia CEE

Storing carbon dioxide in deep geological formations

Charles Dismukes CHM

Replicating the chemistry of photosynthesis to generate clean energy

Fred Dryer MAE

Reaction chemistry of fuels used in propulsion systems to improve performance while reducing emissions

Bernard Haykel NES

Solutions to the challenges of energy production in the Middle East

Lars Hedin EEB

Influence of human activity on tropical forest ecosystems

Isaac Held GEO

Computer modeling of the variability and sensitivity of the Earth's climate

Emmanuel Kreike HIS

Sustainable environments in post-conflict societies

Tom Kreutz PEI

Coal conversion directly to electricity without greenhouse gas emissions

Eric Larson PEI

Advanced renewable and fossil fuel systems

Simon Levin EEB

Mechanisms that sustain biological diversity in ecosystems, and socio-economic links

Denise Mauzerall WWS

Links between air pollution and health, energy and climate change

Tullis Onstott GEO

Long-term sustainability of microbial ecosystems beneath planetary surfaces

Michael Oppenheimer GEO/WWS

Potential effects of global warming, including consequences for sea level, ecosystems and species

Jay Benziger CHE

Advanced hydrogen fuel cells

Elie Bou-Zeid CEE

Low atmosphere dynamics and their relation to climate change, air quality and sustainable development

Emily Carter MAE

Molecular design of high-performance materials for non-fossil-fuel energy production and more efficient vehicles

Kelly Caylor CEE

Interactions of plants and land use with water resources

Stephen Chou ELE

Nanotechnology for more efficient lighting sources and solar cells as well as tunable lasers for environmental sensing

Claire Gmachl ELE

Science and technology of quantum cascade lasers for sensing pollutants in the atmosphere

Peter Jaffe CEE

Use of plants and microbes to remediate environmental contaminants

Yiguang Ju MAE

New technology and fundamental research for alternative fuels and improved combustion

Antoine Kahn ELE

Novel organic semiconductor materials with potential for large-area solar power systems

Chung K. Law MAE

Fundamental research on combustion and applications for improved energy efficiency and alternative fuels

A. James Link CHE

Genetic engineering of enzymes to increase the economic efficiency of converting plant waste to biofuels

Lynn Loo CHE

Flexible organic electronics for inexpensive and versatile solar cells

Margaret Martonosi ELE

Power-efficient computing systems and wireless networks

James Sturm ELE

Atomic-level processes in new materials for low-cost and/or high-efficiency solar cells

Mark Zondlo CEE

Atmospheric chemistry and the microphysics of clouds, including development of technology for sensing environmental role of aerosol particles