

ROBERT H. SOCOLOW

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Education: Harvard University, M.A., 1961 and Ph.D. 1964 (Physics)
Harvard College, B.A. (summa cum laude, Physics), 1959
Fieldston School, New York, NY

Chronology

1979-present: Professor, Mechanical and Aerospace Engineering (formerly Dept. of Aerospace and Mechanical Sciences), Princeton University

1979-98: Director, Center for Energy and Environmental Studies (formerly Center for Environmental Studies), Princeton University

1978-79: Professor, Department of Aerospace and Mechanical Sciences; Acting Director, Center for Environmental Studies, Princeton University

1977-78: Professor, Department of Aerospace and Mechanical Sciences; Associate Director, Center for Environmental Studies, Princeton University

1971-77: Associate Professor, Department of Aerospace and Mechanical Sciences; Member, Center for Environmental Studies, Princeton University

1971: Summer: Research Associate, Department of Geology and Geophysics, Yale University

1966-1971: Assistant Professor, Department of Physics, Yale University.

1970-71: Yale University Junior Faculty Fellowship

1971: Spring Term: Member, Institute for Advanced Study, Princeton, NJ

1964-1966: National Science Foundation Post-doctoral Fellow in Physics, University of California at Berkeley and European Center for Nuclear Research (CERN), Geneva

Robert H. Socolow
Curriculum Vitae

Honors and Awards

Grand Challenges for Engineering Committee (Convened by the U.S. National Academy of Engineering at the Request of the U.S. National Science Foundation).

"Innovators: A President, a Banker, and an Eclectic Group of Researchers Tackle Earth's Vexing Issues." (Steve Pacala and I are two of the four in the eclectic group.) *Time Magazine*, April 9, 2007, pp. 63-66.

Axelson Johnson Commemorative Lecture award: For "outstanding research in global carbon management and the hydrogen economy," from the Royal Academy of Engineering Sciences, Sweden (IVA) and the Axel Axelson Johnson Endowment. The award, given every five years, in principle, had last been given in 1995. The inscription on the medal reads: "For a remarkable effort in the application of engineering science research in mankind's service [and] for presenting this to the academy in the Academy in the Axel Axelson Johnson lecture", 2005

Lifetime National Associate of the National Academy: "In recognition of extraordinary service to the National Academies in its role as advisor to the Nation in matters of science, engineering, and health, by the authority of the Council of the National Academy of Sciences and the Governing Board of the National Research Council," 2004

The Leo Szilard Lectureship Award, American Physical Society: "For leadership in establishing energy and environmental problems as legitimate research fields for physicists, and for demonstrating that these broadly defined problems can be addressed with the highest scientific standards," 2003

Fellow, American Association for the Advancement of Science (elected 1990)

Fellow, American Physical Society (elected 1984, nominee of the Forum on Physics and Society)

Guggenheim Fellowship, 1976-77, for study of international energy issues at the Cavendish Laboratory, University of Cambridge, U.K.

German Marshall Fund Fellowship, 1976-77, for study of international energy issues at the Cavendish Laboratory, University of Cambridge, U.K.

University Activities

Present

Director, Princeton Energy and Climate Scholars (PECS), an honors program for graduate students, 2008-

Co-chair (with William Brinkman), Study of Capture of Carbon Dioxide Directly from Air and from Flue-Gas, Panel on Public Affairs, American Physical Society, 2008-

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Co-organizer, Ethics and Climate Lecture Series (jointly with the University Center for Human Values), 2008-

Head, Siebel Grand Challenge in Energy, Climate and Security (Princeton Environmental Institute, Woodrow Wilson School, School of Engineering and Applied Science)

Co-convenor (with David Tilman), one-day workshop on the environmental dimensions of biofuels resources, June 2008

Member, PEI Energy Group

Teacher, Undergraduate and Graduate Courses, Mechanical and Aerospace Engineering, Woodrow Wilson School of Public and International Affairs, and Princeton Environmental Institute

Associated Faculty, Program in Science, Technology, and Environmental Policy, Woodrow Wilson School of Public and International Affairs

Member, Princeton Environmental Institute Executive Committee, 1994-2005 and 2007-

Fellow, Rockefeller College

Past

Member of Planning Group, Initiative on Oil and the Middle East (with Stephen Pacala, Shivaji Sondhi, and Michael Cook)

Convener, Princeton Environmental Institute Faculty Lecture Series

Member, Faculty Advisory Committee on Policy, 1999-2001

Member, Council of the Princeton University Community (Executive Committee, 1999-2001)

Director, Center for Energy and Environmental Studies, 1979-98

Member, Council on Science and Technology, 1991-97

Faculty Advisor, Marshall Scholarship Competition, 1991-97

Faculty Fellow, Princeton Society of Fellows of the Woodrow Wilson Foundation, 1995-97

Boards, Committees, Editorships

Vice-chair, Panel on Public Affairs (POPA) of the American Physical Society, 2008.

Member, Science and Security Board, Bulletin of the Atomic Scientists, 2008-

Invited participant, Ideas Festival of the Aspen Institute, 2006 and 2008.

Deutsche Bank , Climate Change Advisory Board, 2008-

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Member, America's Climate Choices, a Committee of the National Academies, 2008-

Member, week-long summer study on aerosol injection into the stratosphere (Steve Koonin, chair; sponsored by Novim, a Santa Barbara CA non-governmental organization), 2008-

Member, Editorial Board, Energy and Environmental Science, a new peer-reviewed journal of the Royal Society of Chemistry, 2007-

MissionPoint Capital Partners, Scientific Advisor, 2007-

Invited Guest, World Economic Forum, Davos, Switzerland, 2007.

Chair of the Academic Review Panel, "Reducing U.S. Greenhouse Gas Emissions: *How Much at What Cost?*," U.S. Greenhouse Gas Abatement Mapping Initiative, Executive Report, McKinsey & Company, December 2007.

Member, Program Committee, 50th Anniversary of the Global Carbon Dioxide Record, Symposium and Celebration, 2007.

Member, Program Committee, NETL Meeting: Sixth Annual Conference on Carbon Capture & Sequestration, 2007.

Member, National Academies Committee on America's Energy Future (Chair, Harold Shapiro).

Member, "Grand Challenges for Engineering committee," National Academy of Engineering, conducting "a high profile 14-month project to identify the world's grand challenges and opportunities -- specifically, those that might be addressed with the help of engineering -- in roughly the next century," 2006-

Member, The National Petroleum Council CO₂/Environment committee, contributing to its "Global Oil and Gas Study," requested by the secretary of the U.S. Department of Energy, 2006-

Consultant, Vattenfall and McKinsey "Global Energy Study", 2006.

Convener, International Energy Workshop of the InterAcademy Council, held under the auspices of the Indian National Science Academy, New Delhi, India, May 30-31, 2006.

Consultant, International Energy Agency, assisting in the development of the "Alternative Policy Scenario" presented in the World Energy Outlook-2006, 2005-2006

Consultant, World Wildlife Fund, assisting its WWF-wide "Energy Task Force," 2005-2007.

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Curriculum Vitae

Member, InterAcademy Council committee, charged with conducting an energy study, “Transitions to Sustainable Energy Systems,” 2005-2007.

Member, Steering Committee, U.S. Department of Energy/National Energy Technology Laboratory, Fourth Annual Carbon Capture and Sequestration Conference, May 2005

Member, Managing Board, *Journal of Industrial Ecology*, 1997-2005

Member, IIASA Evaluation Committee on Energy and Technology, 2004

Member, Oxford Commission on Sustainable Consumption, Oxford Centre for the Environment, Ethics and Society, Mansfield College, University of Oxford, 1999-2004

Contributing Editor, *Environment*, 1999-2007

Member, Future of Coal subproject, Energy Futures Project, Turner Foundation and U.N. Foundation, 2002-2003

Member, Environmental Science Advisory Committee, Environmental Defense Fund, 1999-2001

Member, Editorial Board, *Perspectives in Energy* (Pion)

National Research Council:

Member, “National Research Council,” Panel on Carbon Sequestration, 2005-2006

Member, Committee on Alternatives and Strategies for Future Hydrogen Production and Use, 2002-2004 (Report 2004)

Member, Committee to Review DOE’s Vision 21 R&D Program, 2002 (Report 2002, Report 2004)

Member, Board on Energy and Environmental Systems, 1999-2002

Member, Ecosystems Panel, National Research Council, Washington, DC, 1997-2000

Member, Committee on R&D Opportunities for Advanced Fossil-Fueled Energy Complexes, National Research Council, 1999-2000

Member, Steering Committee, Exploratory Workshop on Earth Systems Engineering, National Academy of Engineering, 2000

Member, Steering Group, Fusion Science Assessment Committee, National Research Council, 1999-2000

Member, Committee on the Human Dimensions of Global Change, National Research Council, 1992-98

Member, Committee for the Study on Transportation and a Sustainable Environment, National Research Council, 1994-97

Member, Board on Global Change, National Research Council, 1993-95

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U.S. Department of Energy:

Member, Nuclear Energy Research Advisory Committee, U.S. Department of Energy, 1998-2000

Member, Coordinating Committee, Project to prepare the “Working Paper on Carbon Sequestration Science and Technology,” U.S. Department of Energy, 1999

Co-chair, Workshop on Technological Opportunities for Fuels Decarbonization and Carbon Sequestration, Washington, DC, sponsored by the U.S. Department of Energy, July 28-29, 1997

Member, Conference Organizing Committee, “Basic Research Needs for Environmentally Responsive Technologies of the Future”; and Chairperson, Cross-Cutting Workshop, “Health, Ecological, and Environmental Impacts.” Sponsored by NSF and DOE, New Orleans, January 4-5, 1996

Member, Conference Organizing Committee, “Basic Research Needs for Vehicles of the Future.” Sponsored by NSF and DOE, New Orleans, January 5-7, 1995

Editor, *Annual Review of Energy and Environment* (Annual Reviews), 1992-2002;
Associate Editor 1988-1992

Member, Science and Policy Program Committee, Second International Nitrogen Conference, 2001, 1999-2002

Member, Editorial Committee for the special issue of *Ambio*, Vol. 31, presenting the edited papers for the Second International Nitrogen Conference, October 14-18, 2001, Potomac, MD, 2002

Member, Advisory Committee for the Foundation’s Initiative in the Former Soviet Union, The John D. and Catherine T. MacArthur Foundation, 1993-2001

Member, Board of Directors, National Audubon Society, 1992-1999

Member, Research Planning Committee, International Human Dimensions Program-Industrial Transformation (IHDP-IT) 1997-1999

Member, National Council, Federation of American Scientists, 1995-1999

Member, Project on the Long-Term Future for Nuclear Power, Atlantic Council of the United States, 1997-1999

Member, U.S. Team. Comparative Study of Environment and Development Values, Carnegie Council on Ethics and International Affairs, 1997-1998

Member, World Bank Energy and Environment Steering Committee, 1996-97

Member, Board of Directors, Harvard Club of Princeton, 1995-1997

Member, Panel on Public Affairs (POPA), American Physical Society, 1994-1996

Chairman, Advisory Committee, Environmentally Conscious Design Strategic Initiative Group, National Center for Manufacturing Sciences, Ann Arbor, MI, 1993-1996

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Member, Fusion Review Panel, The President's Committee of Advisors on Science and Technology, 1995

Member, U.S. Advisory Group to the U.S. Steering Committee, Project on Energy Policies for the Newly Independent States of the Former Soviet Union, The Atlantic Council, 1993-95

Chairman of the Board, American Council for an Energy-Efficient Economy, 1989-93; founding member, ca. 1980

Director, Global Change Institute, "Industrial Ecology and Global Change," Snowmass, CO, July 1992

Member, Advisory and Selection Committee, Pew Scholars Program in Conservation and Environment, 1989-92

Member of the Board, American Energy Assurance Council, 1989-92

Member, US-Soviet Committee on Energy Conservation Research and Development, National Academy of Sciences, 1986-89

Member, Editorial Board, *Energy and Buildings* (Elsevier)

Selected Publications

Books

Environmentally Significant Consumption, co-editor, with P.C. Stern, T. Dietz, V.W. Ruttan, and J.L. Sweeney, Committee on the Human Dimensions of Global Change, Commission on Behavioral and Social Sciences and Education, National Research Council, Washington, DC, National Academy Press, 1997.

Industrial Ecology and Global Change, co-editor, with Clinton Andrews, Frans Berkhout, and Valerie Thomas. Cambridge University Press, 1994.

Saving Energy in the Home: Princeton's Experiments at Twin Rivers, editor. Ballinger Press, 1978.

Boundaries of Analysis: An Inquiry into the Tocks Island Dam Controversy, co-editor, with Harold Feiveson and Frank Sinden. Ballinger Press, 1976.

Efficient Use of Energy, co-editor with Kenneth Ford, Gene Rochlin, and Marc Ross. American Institute of Physics, 1975.

Patient Earth, co-editor with J. Harte. Holt, Rinehart, 1971.

Recent Refereed Articles & Book Chapters

"Understanding Long-Term Energy Use and Carbon Dioxide Emissions in the USA," with Richard S.J.Tol, and Stephen W. Pacala. *Journal of Policy Modeling*, May/June 2009. Volume 31, Issue 3.

Robert H. Socolow
Curriculum Vitae

"Atmospheric Stabilization and the Timing of Carbon Mitigation," with B. K. Mignone, J. L. Sarmiento, and M. Oppenheimer. *Climatic Change*, June 2008, Volume 88, Numbers 3-4.

R. Socolow, 2008. "Sustainable Wedges and Climate Change." In D. Hafemeister, B. Levi, M. Levine and P. Schwartz, eds., *Physics of Sustainable Energy: Using Energy Efficiently and Producing It Renewably*. American Institute of Physics (AIP) Conference Proceedings, Volume 1044, pp. 28-48.

Perspective (Cover Story, Invited): "Sustaining Fossil Fuel Use in a Carbon-Constrained World by Rapid Commercialization of Carbon Capture and Sequestration," Michael C. Sheppard, Robert H. Socolow. *AIChE Journal*, John Wiley & Sons, Hoboken, NJ, Volume 53, No. 12, December 2007, pp. 3022-3028.

"Good Enough Tools for Global Warming Policy Making," Robert H. Socolow and Sau-Hai Lam. *Philosophical Transactions of the Royal Society*, 365: 897-934, February 2007.

"Baseload Wind Energy: Modeling the Competition between Gas Turbines and Compressed Air Energy Storage for Supplemental Generation," Jeffery B. Greenblatt, Samir Succar, David C. Denkenberger, Robert H. Williams, and Robert H. Socolow. *Energy Policy*. Vol. 35, Issue 3, Pages 1474-1492, March 2007.

"A Plan to Keep Carbon in Check," Robert Socolow and Stephen Pacala. *Scientific American*, Vol. 295, No. 3, pp. 50-57, September 2006.
~ Selected for inclusion in: ***The Best American Science and Nature Writing, 2007***, Richard Preston (ed). Boston: Houghton Mifflin Company, pp. 259-267, 2007.

"Stabilization Wedges: An Elaboration of the Concept," Robert H. Socolow, a chapter in *Avoiding Dangerous Climate Change*, H. J. Schellnhuber, W. Cramer, N. Nakicenovic, T. Wigley, G. Yohe (eds), Cambridge University Press (Cambridge), pp. 347-354, 2006.

"Understanding Long-Term Energy Use and Carbon Dioxide Emissions in the USA," with Richard S. J. Tol, and Stephen Pacala. *Climate Change Modeling and Policy Working Papers*, August 2006.

"Can We Bury Global Warming," Robert H. Socolow, *Scientific American*, July 2005, pp. 33-40.

Robert H. Socolow
Curriculum Vitae

- “Solving the Climate Problem: Technologies Available to Curb CO₂ Emissions” (with Roberta Hotinski, Jeffery B. Greenblatt, and Stephen Pacala), *Environment*, Vol. 46, No. 10, pp. 8-19, December 2004.
- “Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies,” S. Pacala and R. Socolow, *Science*, Vol. 305, Issue 5686, pp. 968-972, August 13, 2004.
- “The Century-Scale Problem of Carbon Management,” *The Carbon Dioxide Dilemma: Promising Technologies and Policies. Proceedings of a Symposium, April 23-24, 2002*, pp. 11-14, The National Academies Press, Washington, DC, 2003.
- “The Century-Long Challenge of Fossil-Carbon Sequestration,” *U.S. Policy on Climate Change: What Next?*, John A. Riggs, editor. Washington, DC: The Aspen Institute, 2002, pp. 97-107.
- “Reactive Nitrogen: Too Much of a Good Thing?,” (with J. Galloway, E. Cowling, and S. Seitzinger), Special Issue of *Ambio*: “Optimizing Nitrogen Management in Food and Energy Productions, and Environmental Change,” Vol. 31, No. 2, pp. 60-63, March 2002.
- “Scale, Awareness, and Conscience: The Moral Terrain of Ecological Vulnerability,” *New Dimensions in Bioethics*, Arthur W. Galston and Emily G. Shurr, eds. Kluwer Academic Publishers, Norwell, MA, 2001, pp. 65-78.
- “Effects of Reducing Lead in Gasoline: An Analysis of the International Experience,” (with Valerie M. Thomas, James J. Fanelli, and Thomas G. Spiro), *Environ. Sci & Technol.*, Vol. 22, November 15, 1999, pp. 3942-3948.
- “Nitrogen Management and the Future of Food: Lessons from the Management of Energy and Carbon,” *Proc. Natl. Acad. Sci. USA*, Vol. 96, pp. 6001-6008, May 1999.
- “Cooling the Greenhouse,” with Sean O’Brien, *Energy*, Vol. XXIII, No. 1, March 1998, pp. 21-24.
- “The Industrial Ecology of Lead Batteries for Electric Vehicles,” with Valerie M. Thomas, *Journal of Industrial Ecology*, M.I.T. Press, Cambridge, MA, Volume 1, No. 1, Winter 1997, pp. 13-36; see also Volume 1 No. 2, Spring 1997, pp. 33-40.
- “Human Impacts on the Nitrogen Cycle,” with Ann P. Kinzig, *Physics Today*, November 1994, pp. 24-31.
- “Achieving Sustainable Development that is Mindful of Human Imperfections,” *Ecological Applications*, 3 (4), 1993, pp. 581-583.
- “Fulfilling the Promise of Environmental Technology,” with Marc Ross, *Issues in Science and Technology*, Vol. VII, No. 3, National Academy of Sciences, Spring 1991, pp. 61-66.

Reports and Unrefereed Articles

- “The Critical Role of Energy Efficiency in Mitigating Global Warming,” R. H.

Robert H. Socolow
Curriculum Vitae

- Socolow. *Government Law & Policy Journal*, Summer 2008, Vol. 10, No. 1.
- Updated "Wedges" Figure for lead essay "Carbon's New Math," Bill McKibben. *National Geographic*, October 2007, pp. 32-37 (Figure is a two page spread, pp. 36-37).
- Invited *Foreword* : "CCS Technology: Ready to Go," Robert Socolow. *Fundamentals of Carbon Capture and Storage Technology*, The Petroleum Economist Ltd, London 2007.
- "Special Report: Approaching Midnight -- Facing new unknowns," Robert H. Socolow. *Bulletin of the Atomic Scientists*, Vol. 63, No. 1, pp. 45-46, January/February 2007.
- "Understanding Long-Term Energy Use and Carbon Dioxide Emissions in the USA," Nota di Lavoro 107.2006, Richard S. Tol, Stephen W. Pacala, and Robert Socolow. *Fondazione Eni Enrico Mattei*, August 2006.
- "Tribute to Amulya Reddy," Robert Socolow. *Energy for Sustainable Development*, Vol. X, No. 2, pp. 15, June 2006.
- "Modeling Technology Choice under Alternative CO₂ Policies," Luca De Lorenzo and Robert H. Socolow. *Proceedings of the 8th International Conference on Greenhouse Gas Control Technologies (GHGT-8)*, June 19-22, 2006, Trondheim, Norway. Issued on CD-ROM, by Elsevier/IEA GHG.
- "A Wedges Analysis of the IPCC SRES Scenarios," Jeffery Greenblatt, Keywan Riahi, and Robert H. Socolow. *Proceedings of the 8th International Conference on Greenhouse Gas Control Technologies (GHGT-8)*, June 19-22, 2006, Trondheim, Norway. Issued on CD-ROM, by Elsevier/IEA GHG.
- "Technological Development, Commercialisation, and Diffusion" (with Michael Grubb), A Ministerial Briefing Paper ("Annex 2") for the Energy and Environment Roundtable, London, UK, March 15-16, 2005.
- "'Wedges': Early Mitigation with Familiar Technology," Robert Socolow, Stephen Pacala, and Jeffery Greenblatt. *Greenhouse Gas Control Technologies: Proceedings of the 7th International Conference on Greenhouse Gas Control Technologies (5-9 September 2004, Vancouver, Canada)*. Vol. II, Part 2, Pages 1983-1986, Elsevier, Amsterdam, 2005.
- "Oxford Commission on Sustainable Consumption Report," (with John Gummer, Clive Butler, Eileen Claussen, Henrique Cavalcanti, Dianne Dillon-Ridgley, Dipak Gyawali, Saburo Kato, Li Lailai, Julia Marton-Lefèvre, Steve Rayner, Ted Smyth, Sir Crispin Tickell, and Nina Witoszek Fitzpatrick), published by Mansfield College, Oxford, April 2004.

Robert H. Socolow
Curriculum Vitae

One of the "Responses to the invitation to a discussion on the São Paulo Declaration" requested by Amulya Reddy; *Energy for Sustainable Development*. Vol. VII, No. 2, pp 23-24, June 2003.

"Production of Hydrogen and Electricity of Coal with CO₂ Capture," (with T.G. Kreutz, R. Williams, P. Chiesa, and G. Lozza) *Proceedings of the 6th International Conference on Greenhouse Gas Control Technologies (GHGT-6)*, September 30-October 4, 2002, Kyoto, Japan.

"Optimizing Nitrogen Management in Food and Energy Production and Environmental Protection" (with Ellis Cowling, et al.), *Summary Statement from the Proceedings of the 2nd International Nitrogen Conference on Science and Policy*, Potomac, MD, October 14-18, 2001, published December 2001.

"Human Impacts and Management of Carbon Sources" (with Sally Benson, James Edmonds, and Terry Surles), *Basic Research Needs for Sustainability: The Carbon Problem*, ed. Peter M. Eisenberger and Michael Knotek (sponsored by the National Science Foundation and the Department of Energy), published by Columbia University, 1999, pp. 15-20.

Industrial Transformation Scientific Plan (contributor), Pier Vellinga and Nadia Herb, eds., IHDP Report No. 12, Bonn, Germany, December 1999.

Carbon Sequestration Research and Development, Dave Reichle, John Houghton, Bob Kane, Jim Ekmann, et al. (contributor: 20 authors), A U.S. Department of Energy Report, Office of Science and Office of Fossil Energy, DOE/SC/FE-1, December 1999; web address: www.ornl.gov/carbon_sequestration.

Fuels Decarbonization and Carbon Sequestration: Report of a Workshop, editor, Princeton University/Center for Energy and Environmental Studies Report No. 302, September 1997.

"The Weapons Shadow over the Future of Nuclear Power," *Proceedings of the Second MIT International Conference on the Next Generation of Nuclear Power, October 1993*. MIT Press, 1994, pp. 1-14 - 1-20.

National Research Council Reports and Other Reports

Grand Challenges for Engineering, National Academy of Engineering (R.H. Socolow, Committee Member), National Academy of Sciences, 2008.

Lighting the Way: Toward a Sustainable Energy Future. InterAcademy Council (R.H. Socolow, Study Panel Member). October, 2007.

"Report of the Panel on DOE's Carbon Sequestration Program," in *Prospective Evaluation of Applied Energy Research and Development at DOE (Phase Two)*, Member of the Panel of DOE's Carbon Sequestration Program that contributed to the Committee on Prospective Benefits of DOE's Energy Efficiency and Fossil Energy R&D Programs (Phase Two), 2007.

Robert H. Socolow
Curriculum Vitae

Hard Truths: Facing the Hard Truths about Energy: A comprehensive view to 2030 of global oil and natural gas (Contributor). A Report of the National Petroleum Council, July 2007.

The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs (contributor), Board on Energy and Environmental Systems, Washington, DC: National Academy Press, 2004.

Review of DOE's Vision 21 Research and Development Program, Phase I (contributor), Board on Energy and Environmental Systems, Washington, DC: National Academy Press, 2003.

An Assessment of the Department of Energy's Office of Fusion Energy Sciences Program (contributor), Fusion Science Assessment Committee, Washington, DC: National Academy Press, 2001.

Vision 21: Fossil Fuel Options for the Future (contributor), Committee on R&D Opportunities for Advanced Fossil-Fuel and Energy Complexes, Washington, DC: National Academy Press, 2000.

Global Change Ecosystems Research (contributor), Ecosystems Panel, Oversight Group for the Ecosystems Panel, Washington, DC: National Academy Press, 2000.

Environmentally Significant Consumption, co-editor, with P.C. Stern, T. Dietz, V.W. Ruttan, and J.L. Sweeney, Committee on the Human Dimensions of Global Change, Commission on Behavioral and Social Sciences and Education, National Research Council, Washington, DC. National Academy Press, 1997.

Toward a Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology (contributor), Committee for a Study in Transportation and the Environment, Transportation Research Board, National Research Council, Washington, DC, 1997.

Completed Graduate Student Theses Advised or Co-Advised Since 1990

Department of Mechanical and Aerospace Engineering

Scott Englander, MSE, 1990; Mark Fulmer, MSE, 1990; Alistair Lloyd, MSE, 1990; Stefano Consonni, Ph.D., 1992; Ryan Katofsky, MSE, 1993; Jeffrey Chen, MSE, 1995; Laura Iwan, MSE, 1997; Wendy Hughes, Ph.D., 1998; Theodore Caplow, MSE, 1998; Bruce Lin, MSE, 1999; Paul Henderick, MSE, 2000; Chao Chen, MSE, 2002; Christopher Yang, Ph.D., 2003; Wei Wang, MSE, 2004; David C. Denkenberger, MSE, 2005; Luca De Lorenzo, MSE, 2005.

Other Departments

Bryan Mignone, Ph.D. (Geosciences), 2006; Samir Succar, Ph.D. (Electrical Engineering), 2008; Chi-Jen Yang, Ph.D. (Woodrow Wilson School), 2008.

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Curriculum Vitae

Senior Theses Recently Supervised

Fowler, William Ulysses, *Jumpstarting a Geologic Carbon Sequestration Industry*, 2007
Lacayo, Antonio I., *Lessons from the Brazilian Ethanol Experience: The Case for Nicaragua*, 2007.

Post-Docs

Shoibal Chakravarty, Physics
Massimo Tavoni, Economics

Details of Research Presentations Made in the Past 4 Years

Details of Research Presentations Made in the Past 4 Years

2008

External presentations 2008

“Putting CO₂ Capture and Sequestration into First Gear,” Global Task Force on Carbon Capture and Storage, Earth Institute, Columbia University, February 14, 2008.

“Living in a Greenhouse with the Help of Stabilization Wedges:
A talk for researchers and teachers,” American Institute of Physics Governing Board,
Washington, D.C., March 28, 2008

“Living Ethically in a Greenhouse,” Conference keynote, Energy and Responsibility: A
Conference on Ethics and the Environment, University of Tennessee, Knoxville,
Tennessee, April 10, 2008.

Invited remarks (three-member panel), “What is the Right Economic Approach to Global
Warming?”, McKinsey Executive Roundtable Series in International Economics, Council
on Foreign Relations, New York, NY, April 14, 2008.

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” Annual Meeting,
MissionPoint Capital Partners, Norwalk, CT
May 21, 2008

“Toward an American Solution,” Conference on the American Response to Climate
Change, Wild Center - Tupper Lake, NY, June 25, 2008.

“Carbon Mitigation Initiative: How Fast Can We Go If We Really Spend Some Money?
What Will It Take to Get Us There?”, Aspen Ideas Festival, Aspen, Colorado, June 30-
July 6, 2008.

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“Technologies for Living in a Greenhouse,” Energy Leadership Lecture Series (co-hosts: Institute for Energy Efficiency and Kavli Institute for Theoretical Physics), University of Santa Barbara, California, August 12, 2008.

“Setting the Stage,” Future of Nuclear Energy Conference, Chicago, Illinois, September 25-26, 2008.

“Place-based Mitigation of Climate Change” Conference keynote, Re-Imagining Cities: Urban Design After the Age of Oil, Penn Institute for Urban Research, University of Pennsylvania, Philadelphia, Pennsylvania, November 6, 2008.

“Efficiency through Technology,” Panel on Product Design and Engineering, Re-Imagining Cities: Urban Design After the Age of Oil, Penn Institute for Urban Research, University of Pennsylvania, Philadelphia, Pennsylvania, November 7, 2008.

“The Challenge of Climate Stabilization,” URI Honors Colloquium, University of Rhode Island, Kingston, Rhode Island, December 2, 2008.

Presentations at Princeton University and for the local Community 2008

“Living in a Greenhouse with the Help of Stabilization Wedges,” National Academy of Engineering Regional Meeting, Friend Center, Princeton University, March 4, 2008.

“Technology and Policy for Living in a Greenhouse,” Maclean House Alumni Lecture Series, Princeton University, April 8, 2008.

“Lessons Learned,” Conference on China and the Environment: The Challenges Ahead, Solutions and Future Research, April 19, 2008

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” Guest lecture, EGR194-MAT194-PHY194 (EMP-1), April 24, 2008

“Sustainable Princeton: Toward Town Targets?”, sponsored by Princeton Future, Princeton Public Library, Princeton, NJ, May 3, 2008

“Living Ethically in a Greenhouse,” Biofuels Workshop, Princeton University, June 19-20, 2008.

“Climate Policy: Based on Individual Emissions,” Princeton Energy and Environment Scholars Lecture, September 23, 2008

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“The Challenge of Climate Stabilization,” Guest lecture, EGR 495: Special Topics in Entrepreneurship: Ventures to Address Global Challenges, October 6, 2008

“Prospicience (The Art and Science of Looking Ahead) and Geoengineering: What If We Can Dial Our Future?”, Ethics and Climate Change Lecture Series, Princeton University, October 14, 2008.

“Geoengineering: The Looming Challenge,” SEAS-GFDL Workshop, Princeton University, October 29, 2008.

“The Challenge of Climate Stabilization,” Hun School, Princeton, New Jersey, December 5, 2008.

“From the Carbon Mitigation Initiative to the Sustainable Aviation Initiative, presentation to Netjets Princeton Review Group, December 16, 2008

2007

External presentations 2007

"Stabilization Wedges: A Concept and a Game for Teaching about Cutting Carbon Emissions," *Keynote, 2007 AAAS Annual Meeting*, Town Hall: Climate-Change Special Session SE-109, Communicating and Learning about Global Climate Change: An Event for Teachers, Students, and other Communicators and Learners, San Francisco, CA, February 18, 2007 (with Roberta Hotinski).

"U.S. Climate Policy: Avoiding Mitigation Lite," *Invited, Testimony to the Finance Committee, U.S. Senate*, Washington, DC, February 27, 2007.

"Stabilization Wedges and the Management of Global Carbon for the Next 50 Years: A Primer for the Physicist as Researcher and Teacher," *Invited, Fermi National Accelerator Laboratory*, Batavia, IL, April 18, 2007.

"Scouting the carbon management frontier: Technology, policy, and economics," *Keynote, Washington Energy Conference, School of Advanced International Studies, Johns Hopkins University*, Baltimore, MD, April 20, 2007.

"Climate Change Mitigation: A New Source of Wealth and Jobs," *Keynote, North American Labor Assembly on Climate Crisis*, New York, NY, May 7, 2007.

"Mitigating Global Scorching: Getting Real!" *Invited, Shalom Center*, Philadelphia, PA, June 18, 2007.

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"Solving the Carbon Problem," *Invited, Texas Pacific Group, Retreat, Aspen, Colorado, June 26, 2007.*

"Wedges, Global Warming Mitigation, and Business Opportunity," *Invited, Mission Point Capital Partners, Norwalk, CN, July 18, 2007.*

"The Critical Role of Energy Efficiency in Mitigating Global Warming," *Keynote, Public Service Commission, State of New York. Albany Law School, Albany, New York, July 19, 2007.*

"Equitable Climate Change Mitigation: A New Formulation," *Invited, Informal Thematic Debate of the UN General Assembly on Climate Change as a Global Challenge Panel on Mitigation Strategies in the context of Sustainable Development, United Nations, July 31, 2007.*

"The Critical Role of Energy Efficiency in Mitigating Global Warming," *Keynote, Housing into the Future: Stepping toward Carbon Neutrality: A seminar of the Household Energy End-Use Project (HEEP). Victoria University of Wellington, Wellington, New Zealand, by video-conference, August 28, 2007.*

"Energy Security Wedges," *Invited Participant, BP Discussion Group, New York, NY, September 10-11, 2007.*

"Options for Mitigation," *Invited, World Bank Executive Directors Colloquium 2007: Climate Change: Implications for the Bank's Mission for Sustainable Development, Washington, DC, September 20-21, 2007.*

"Technology and Policy for Global Carbon Mitigation," *Keynote, Vinson & Elkins Climate Change Program, Washington, D.C., September 24, 2007.*

"Ethics and the Greenhouse," *Invited, Bioethics Seminar, Yale University, September 27, 2007.*

"Energy and the Global Environment for the Physicist as Researcher and Teacher," *Invited, Department of Physics, Yale University, September 28, 2007.*

Invited Participant for the October 5 Working Lunch on US-China Climate Change Initiative at the Asia Society, New York, NY, October 5, 2007.

"U.S. Carbon Challenge: Policy and Technology," *Keynote, Sanford C. Bernstein 2007 Carbon Symposium, Investment in the Carbon Chain from Producer to Purchaser, New York, NY, October 9, 2007.*

"Tackling Carbon by Using Electricity Efficiently," *Invited, Greenplug Alliance Conference, San Francisco, CA, October 29, 2007.*

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"Policy and Technology for Living in a Greenhouse," *Invited, P8 Summit of Trustees of Major Pension Funds*, London, UK, November 5, 2007.

"The Stratospheric Aerosol Injection Wedge: Competitive, Transient, Distracting, and Scary," *Invited Comment, Climate Engineering Workshop, Harvard University*, Cambridge, MA, November 8-9, 2007.

"Climate Change Mitigation under Strong Carbon Constraints," *Invited, 50th Anniversary of the Global CO2 Record Symposium and Celebration*, Kona, Hawaii, November 28-30, 2007.

Chair, Academic Review Panel, *Invited Comment, McKinsey & Company: Reducing U.S. Greenhouse Gas Emissions How Much At What Cost?*, New York, NY December 4, 2007.

"Technology and Tough Global Targets," *Invited, Lehman Brothers Climate Change Workshop*, New York, NY, December 6-7, 2007.

Presentations at Princeton University and for the local Community 2007

"Climate Change: Globe, Region, and Educational Opportunities," *Invited, Environmental Education: Bringing the Lessons Home. The 22nd Annual New Jersey Environmental Education Conference Alliance for New Jersey Environmental Education. Mid-Day Plenary Panel. Princeton University, February 2, 2007 (with Roberta Hotinski).*

"Energy, Climate, and the Activist Student," *Invited, PEI Advisory Committee, Princeton University, February 9, 2007.*

"A Review of CMI," *Contributed, CMI 6th Annual Meeting, Princeton University, February 20, 2007.*

"Getting Serious about Carbon Mitigation," *Invited, Conference on States and Climate Change, Sponsored by the Policy Research Institute for the Region (Princeton University) and Environmental Defense, Princeton University, March 30, 2007.*

"Getting Serious about Carbon Mitigation," *Invited, Remarks to Dow Chemical visitors. Princeton University, April 4, 2007.*

Invited Remarks for Princeton Community Climate-Change Rally, Scudder Plaza, Princeton University, April 14, 2007.

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"Strategies for mitigating climate change: Enabling the stabilization wedges," *Invited, Science, Technology and Environmental Policy (David Bradford) Seminar*, Princeton University, April 16, 2007.

"Stabilization Wedges: Mitigation Tools for the Next Half-Century," *Invited, Guest lecture for EGR194-MAT194-PHY194 (EMP-One) An Integrated Introduction to Engineering, Mathematics, Physics*, Princeton University, April 26, 2007.

"Energy Security and Climate Change: Drivers of transformation for the global energy system," *Invited, Conference on Saudi Arabia: Oil, Energy, and Middle East*, Princeton University, May 11, 2007.

"Wedges and How We Can Best Combat Global Climate Change," *Invited, New Jersey Meadowlands Commission (NJMC) Symposium*, Lyndhurst, NJ, May 15-17, 2007.

"Stabilization Wedges: A Concept and a Game for Teaching about Cutting Carbon Emissions," *Invited, Meeting for Supporters, Stony Brook Millstone Watershed Association*, Pennington, NJ May 17, 2007.

"Mitigating Global Warming: Getting Real!" *Invited, Millennial Class of '00 Reunions Lecture*, Princeton University, June 2, 2007.

"Building Capacity for Living in a Greenhouse," *Invited, Founders' Societies Meeting, SEAS*, Princeton University, June 20, 2007.

"Strategic Opportunities for MAE in Energy," *Invited, MAE Retreat*, Cherry Valley Country Club, November 1, 2007.

"Policy and Technology for Living in a Greenhouse," *Invited, Guest Lecturer in Class: Physics 104, Energy, Environment, and Man, Rider University*, Lawrenceville, NJ, November 19, 2007.

"Policy and Technology for Living in a Greenhouse," *Invited, Presentation for ENV FRS 175 Seminar: Signals, Yardsticks and Tipping Points of Global Warming*, Princeton University, December 6, 2007.

2006

External presentations 2006

"Stabilization Wedges and the Importance of R&D on Near-Term Options for Carbon Mitigation," *Invited, InterAcademy Council Energy Workshop, Lawrence Berkeley National Laboratory*, January 6, 2006.

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“Stabilization Wedges: A Challenge to the Social Sciences,” *Invited, Center for Advanced Study in the Behavioral Sciences, Palo Alto, CA, January 9, 2006.*

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited, WWF Energy Task Force, World Wildlife Fund, London, February 20, 2006.*

“Some Highlights from the Carbon Mitigation Initiative,” *Invited, BP Joint University Meeting – Thought and Leadership in Energy, Cambridge, UK, February 22, 2006.*

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Keynote, World Bank Energy Week, World Bank, Washington, DC, March 6, 2006.*

“Living in a Greenhouse: How Far Can Technology Take Us?” *Invited, Harvard Club of Princeton, Princeton, NJ, March, 12, 2006.*

“Stabilization Wedges and the Management of Global Carbon for the Next 50 Years,” *Invited, Los Alamos National Laboratory, Los Alamos, NM, March 23, 2006.*

“Stabilization Wedges and the Management of Global Carbon for the Next 50 Years,” *Invited, Future of Energy Series, Harvard University Center for the Environment, Cambridge, MA, April 5, 2006.*

“Stabilization Wedges and the Management of Global Carbon for the Next 50 Years,” *Keynote, The Royal Society, London, UK, April 10, 2006.*

“The Urgency of Energy Efficiency,” *Invited, Rosenfeld Energy Symposium University of California, Berkeley, CA, April 28, 2006.*

“The Urgency of Carbon Mitigation,” *Invited, J.P. Morgan, New York City, May 9, 2006.*

“The Urgency of Carbon Mitigation,” *Invited, U.S. Senate, Department of Environmental Forestry and Rural Affairs, Washington, DC, May 10, 2006.*

“Technological Options to Stabilize Global CO₂ Emissions up to 2050,” *Keynote, First Regional Symposium on Carbon Management, Saudi Aramco, Dhahran, Saudi Arabia, May 22, 2006.*

“Welcome”, “A Tribute to Amulya Reddy”, “A Global View of Energy Challenges,” *Invited (and chair of meeting), InterAcademy Energy Workshop, InterAcademy Council and Indian National Science Academy, New Delhi, May 30-31, 2006.*

“Confronting Climate Constraints – Sustainable Cities and Ecosystems,” *Invited, Aspen Ideas Festival, Aspen, CO, July 3-9, 2006.*

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“Energy and the Environment for the Physicist as Researcher and Teacher,” *Invited*, Energy Forum, *Aspen Center for Physics*, Aspen, CO, July 10, 2006.

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Keynote*, *Solar 2006* - Climate Change Action II, Denver, CO, July 12, 2006.

“Carbon Dioxide Capture and Storage: The New Kid on the Block,” *Invited*, *Solar 2006* – Alternative Future Scenarios for Tackling Climate Change, Denver, CO, July 12, 2006.

“The BP-Ford-Princeton Carbon Mitigation Initiative and the Wedge Model,” *Invited*, *Carson Refinery Visit/BP Visit*, Carson, CA, July 18, 2006.

“The world’s climate and energy challenges: A global perspective on innovation and incentives,” *Keynote*, *ISIS (International Sustainability Innovation Council of Switzerland)*, Zurich, Switzerland, September 1-2, 2006.

“Carbon Dioxide Capture and Storage and Future U.S. Fuel,” *Invited*, *Defense Science Board, Task Force on DOD Energy Strategy*, Arlington, VA, September 6, 2006.

“Climate Change Technology: Do we need a Manhattan project for the Environment?” *Invited*, US Congress - *Testimony for US House of Representatives*, Committee on Government Reform, Washington, DC, September 21, 2006.

“A Plan to Keep Carbon in Check,” *Invited*, US Congress - Briefing and presentation for *US Senate Staff*, Washington, DC, September 21, 2006.

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited*, *World Economic Forum, Industry Partnership Meeting for Energy*, New York City, September 28, 2006.

Participant in the “Global Warming” panel moderated by Elizabeth Kolbert, *Invited*, *New Yorker (Magazine) Festival*, October 7, 2006.

“Energy and the Global Environment for the Physicist as Researcher and Teacher,” *Invited*, *Rutgers University*, Physics Department, New Brunswick, NJ, October 11, 2006.

“Carbon Sequestration: A Source of Promising ‘Stabilization Wedges’ for Solving the Climate Problem,” *Keynote*, International Seminar on Carbon Sequestration and Climate Change – hosted by *Petrobras*, Rio de Janeiro, Brazil, October 24, 2006.

“Brazilian and Petrobras Leadership in Carbon Management,” *Invited*, *Petrobras Business Committee*, Rio de Janeiro, Brazil, October 26, 2006.

Presentations at Princeton University 2006

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“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited, WWS Policy Task Force 402d – Energy for Sustainable Development* (D. Mauzerall’s course), Princeton University, February 15, 2006.

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited, EGR194-MAT 194-PHY194 - EMP–One* (P. Debenedetti’s course), Princeton University, February 27, 2006.

“The Carbon Mitigation Initiative: Five Years Back and Five Years Forward,” *Contributed, CMI 5th Annual Meeting*, Princeton University, March 2, 2006.

Discussant at “Bridging Disciplines, Spanning the World: Approaches to Development, Diversity and Democracy,” *Invited, PIIRS Graduate Student Conference 2006*, Princeton University, NJ, April 7, 2006.

“Science and Technology of Alternative Energy Sources,” *Invited, Energy, Security, and the Middle East*, Princeton University, April 21, 2006.

Remarks on “Rising Above the Gathering Storm: Technological Leadership for the 21st Century,” *Invited, Princeton Reunions Panel*, Princeton University, June 2, 2006.

Remarks on “National Intelligence Council Workshop on Global Scenarios Relating to Global Climate Change,” *Invited, Woodrow Wilson School*, Princeton University, June 7, 2006.

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited, WWS Policy Task Force 401c – A Worldwide Phase-Out of Nuclear Power*, Princeton University, September 26, 2006.

“Carbon Capture and Storage,” *Invited, National Petroleum Council Meeting*, hosted by Princeton University, October 4, 2006.

“The Carbon Mitigation Initiative at Princeton,” *Invited, DuPont visit/PRISM Meeting*, Princeton University, October 5, 2006.

“Technology for Living in a Greenhouse,” *Invited, MAE Departmental Colloquium*, Princeton University, October 13, 2006.

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited, Seminar for AOS graduate students*, Princeton University, November 9, 2006.

“The Carbon Mitigation Initiative and the Urgency of CCS,” *Invited, Presentation to BP Executives*, Tony Hayward and Vivienne Cox, Princeton University, November 17, 2006.

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“Living in a Greenhouse,” *Invited, Rockefeller College Seminar, Princeton University, December 7, 2006.*

2005

External presentations 2005

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Keynote, Met Office Symposium: Avoiding Dangerous Climate Change, Exeter, UK, February 3, 2005.*

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Keynote, Energy and Environmental Ministerial Roundtable Preparatory Meeting, London, UK, February 4, 2005.*

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited, London BP (corporate headquarters), London, UK, February 7, 2005.*

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited, Belgian Federal Council for Sustainable Development, Brussels (video), February 18, 2005.*

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited, WWF Climate Change Program, Istanbul (phone), February 21, 2005.*

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited, BP (strategy workshop), Richmond, UK, April 18, 2005.*

“Mobilizing the World for Climate Stabilization,” *Invited, Atlantic Council, Washington, DC, May 2, 2005.*

“Developing Potential Paths Forward Based on the Knowledge, Science and Experience to Date,” *Contributed, Fourth Annual Conference on Carbon Capture and Sequestration, Washington, DC, May 3, 2005.*

“The WEO-2004 Alternative Scenario and Demiwedges: Sustaining the Momentum,” *Keynote, IEA Workshop: Policies to Shape an Alternative Energy Future, Paris, France, May 25, 2005.*

“The Stabilization of CO₂ Emissions in the Coming 50 Years,” *Keynote, Institut Français de Petrol, Paris, France, September 15, 2005.*

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Invited, World Conservation Union and WWF International, Gland, Switzerland (video), October 15, 2005.*

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“Emission-free Options for Energy from Fossil Fuels: The Issues for CO₂ Sequestration,” *Invited, Geological Society*, London, UK, October 12, 2005.

“Stabilization Wedges and the Urgency of Scale-Up,” *Keynote, SEFI Roundtable*, New York City, October 27, 2005.

“Stabilization Wedges and the Urgency of Scale-Up,” *Invited, National Commission on Energy Policy*, Washington, DC, November 9, 2005.

“Stabilization Wedges: Mitigation Tools for the Next Half-Century,” *Keynote, Workshop: Global Roundtable on Climate Change, Earth Institute*, Columbia University, New York City, November 14, 2005.

“Stabilization Wedges and the Management of Carbon for the Next 50 Years,” *Invited, Royal Swedish Academy of Engineering Sciences (IVA)*, Stockholm, Sweden, December 1, 2005.

Presentations at Princeton University 2005

“2004 Highlights: Integration and Carbon Capture,” *Contributed, CMI Annual Meeting*, Princeton University, January 12, 2005.

“Physics for the Earth,” *Invited, New Jersey Chapter, American Association of Physics Teachers*, Princeton, NJ, March 11, 2005.

“Contributions from the University’s Carbon Mitigation Initiative,” *Invited, Alumni Panel: Solving the Carbon Crisis*, Princeton University, May 27, 2005.

“Can We Bury Global Warming?” *Invited, Central Jersey AIChE (Chapter of American Institute of Chemical Engineers)*, Princeton, NJ, October 18, 2005.

“Emission-free Options for Energy from Fossil Fuels: The Issues for CO₂ Sequestration,” *Invited, CMI Leakage Workshop*, Princeton University, November 3, 2005.

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