

CURRICULUM VITA

CHARLES D. KOLSTAD

OFFICE: Room 235, John & Cynthia Fry Gunn Building
Stanford Institute for Economic Policy Research (SIEPR)
Stanford University
366 Galvez Street
Stanford, CA 94305-6015
E: ckolstad@stanford.edu; P: +1-650-721-1663; F: +1-650-723-8611

EDUCATION:

Ph.D. Stanford University (1982)
Eng.-Econ. Systems (Economics and Operations Research)
Fields: Econometrics, Development Economics
M.A. University of Rochester (1973) Mathematics
B.S. Bates College (1969) Mathematics (High Honors)

PERMANENT FACULTY POSITIONS:

Nov. 2012 to present Stanford University
Senior Fellow, Stanford Institute for Economic Policy Research (50%)
Senior Fellow, Precourt Institute for Energy (50%)
Professor, Department of Economics (courtesy)
Senior Fellow, Woods Institute for the Environment
Faculty Co-Director, Stanford Bits & Watts Initiative (from 2018)

January 1993 to present University of California, Santa Barbara
Distinguished Professor, Department of Economics (50%) and
Bren School of Environmental Science and Management (50%) [to 2012]
Distinguished Professor Emeritus (from 2012)
Affiliate Professor, Environmental Studies Program
2008-11, *Chair* and, 2005-6, *Vice Chair*, Department of Economics;
2001-2006—*Donald Bren Distinguished Professor of Environmental Economics*.

August 1983-
August 1994 University of Illinois, Urbana-Champaign, *Professor*
Institute for Environmental Studies and Department of Economics;
affiliate, Regional Science Program, Institute for Govt & Public Affairs
(1983-88: *Assistant Professor*; 1988-92 *Associate Professor*)

OTHER PROFESSIONAL POSITIONS:

Fall 2018	Stanford University BING Program at Oxford University <i>Professor in Residence</i>
2018—present	Bits & Watts Initiative, Stanford Univ., <i>Co-Faculty-Director</i> (w/ A. Majumdar)
2009--2012	University of California Center for Energy & Environmental Economics, UC Berkeley and UC Santa Barbara, <i>Co-Director</i> (with S. Borenstein).
2007--	National Bureau of Economic Research, Cambridge, Mass. <i>Faculty Research Associate</i> (Environmental and Energy Economics Program)
2009--	CESifo (Munich Society for the Promotion of Economic Research), <i>Fellow</i>
Fall 2007	Department of Agricultural and Resource Economics, University of California, Berkeley, <i>Visiting Professor</i> .
2002--	Resources for the Future, Washington, DC, <i>University Fellow</i> .
AY2002-3	Department of Economics, Massachusetts Institute of Technology <i>3M Visiting Professor of Environmental Economics</i>
Spring 99 & 00	Stanford University, <i>Visiting Professor of Economics</i>
Spring 02 & Fall 95	Stanford University, Institute for International Studies, <i>Visiting Scholar</i>
Summer 1998	New Economic School, Moscow, Russia, <i>Visiting Professor of Economics</i>
April 1998	Catholic University of Leuven, Belgium, <i>Visiting Professor of Economics</i>
January 1993	Catholic University of Leuven, Belgium, <i>Visiting Professor of Economics</i>
Winter, 1992	Univ. of California, Santa Barbara, <i>Visiting Assoc. Professor of Economics</i>
AY1986-7	Massachusetts Institute of Technology <i>Visiting Assistant Professor of Applied Economics</i>
June 1985- August 1985	Norwegian School of Economics and Business Administration, Bergen, Center for Applied Research, <i>Visiting Scholar</i>
August 1974- August 1983	University of California, Los Alamos National Laboratory (Economics Group), Los Alamos, New Mexico, <i>Staff Member</i> .

CURRENT AND RECENT RESEARCH AREAS:

Environmental and resource/energy economics; industrial organization and regulation; public economics; coal and electricity markets; economics of climate change; environmental regulation and valuation; economics of information; computation of equilibrium.

PROFESSIONAL SOCIETY SERVICE:

President, Association of Environmental and Resource Economists (2000-2002)

Board of Directors, Association of Environmental and Resource Economists (1995-97; 2000-03)

EXPERT TESTIMONY and LITIGATION SUPPORT:

US Department of Justice, 2015-16 [Murray Energy v. EPA; expert testimony on coal markets, electric power, employment and environmental regulations]

Brief of C.D. Kolstad to US Supreme Court as *Amicus Curiae* in Support of Petitioners, *FERC v. Electric Power Supply Association*, 577 U.S. ____ (2016). [regarding Demand Response in electricity markets]

Matheny Sears Linkert & Jaime, 2011-12 [USA vs. Sierra Pacific Industries – Moonlight Fire; expert testimony for a defendant on ecosystem services damages from forest fire]

US Department of Justice, 2006-2007 [expert testimony for DOJ regarding coal contracts, coal markets and electric utilities]

Latham & Watkins, for PG&E, 2006 [independent review of valuation studies in support of EPA regulatory issue].

Paul, Weiss, Rifkind, Wharton and Garrison, for California Public Utilities Commission, 2002 [expert testimony regarding environmental regulations and regulated utilities, pertaining to PG&E bankruptcy].

Campbell, George and Strong, Houston, 2002 [consultant regarding a natural resource damage claim for groundwater contamination in New Mexico].

Economic Analysis Corporation, 1994-96 [expert testimony on valuing environmental resources -- American Trader Oil Spill, Huntington Beach, California].

Charles River Associates (Boston, MA), 1989-1990 (consultant on antitrust and economics of coal markets).

Coudert Brothers (New York) and Worsham, Forsythe, Sampels and Wooldridge (Dallas, TX), 1988-90 (expert testimony for plaintiffs in private Sherman Act case on alleged price fixing case—testified on antitrust, relevant market definition, coal markets and electric power).

OTHER CONSULTING AND SELECTED POSITIONS:

Natural Resources Defense Council (NRDC), consultant on Clean Air Act (employment effects of CAA) (2010, 2014)

Coordinating Lead Author, Intergovernmental Panel on Climate Change (IPCC), AR5 (2010--14), Chapter 3 of WGIII: *Economics and Ethics*.

Industrial Economics, Inc., Chair of Review Panel to Review computable general equilibrium economic models (DGEM & ADAGE) used by EPA for regulatory analysis (2010)

Lead Author, Intergovernmental Panel on Climate Change (IPCC), AR4 (2004-7), Policy Chapter (13) of WGIII.

Massachusetts Institute of Technology, review of “Aviation Environmental Portfolio Management Tool” (APMT), 2007.
United Nations Environment Programme, January 2000 (co-taught in Kenya, to African water managers, short course on management of lake eutrophication).
The World Bank, 1991--present (various projects).
Oak Ridge National Laboratory (Tenn.), 1990 (review of EIA data collection).
Oak Ridge National Laboratory (Tenn.), 1992-1993 (review Natl Energy Modelling System)
CMT International (Cambridge, MA), May 1987--October 1987 (Kuwait energy policy).
Energy Laboratory, Massachusetts Institute of Technology, 1984-1986 (review of NAPAP Advanced Utility Simulation Model for EPRI, DOE and EPA).
Resource Economics Corporation (Urbana, IL), 1984-94 (coal market software development).
Los Alamos National Laboratory (New Mexico), 1983-1988 (European gas, technical change).
New Mexico Energy Research and Development Institute, 1982-1984 (NM Coal Market Study).
Raytheon Corporation, 1973-1974.
Peace Corps, Ghana (West Africa), 1969-1971.

CONGRESSIONAL TESTIMONY:

"The Use of Economic Incentives for Air Pollution Control in the Southwest," presented before the Committee on Environment and Public Works, U.S. Senate, Albuquerque, New Mexico (July 6, 1983).
"The Four Corners Regional Study," presented before the Subcommittee on Health and Environment, U.S. House of Representatives, Washington, D.C. (May 19, 1981).

AWARDS/RECOGNITION:

Fellow, Association of Environmental and Resource Economists (2009)
Fellow, CESiFO, Munich (2009)
Faculty Research Associate, National Bureau of Economic Research (2007)
University Fellow, Resources for the Future, Washington, DC (2002)
Harvard Center for the Environment, Visiting Fellow (December 2007).
Nobel Peace Prize, 2007 [awarded jointly to Al Gore and Intergovernmental Panel on Climate Change (IPCC), of which I was a lead author]
Coordinating Lead Author, UN IPCC, WGIII, AR5 (2010--)
Lead Author, UN IPCC WG III, AR4 (2004—2007)
Appointed 3M Visiting Professor of Environmental Economics, MIT (2002-3)
Nominated, Distinguished Teaching Award, UCSB, March 1999
University Scholar, University of Illinois, 1988-91
List of Faculty Rated as Excellent by Students, University of Illinois, Fall 1989
Arnold O. Beckman Award, 1983-84
Fellowship, Center for Operations Research and Econometrics, Catholic University of Louvain, Belgium, 1983-84, 1992-93 (declined)

ADVISORY BOARDS and COMMITTEES:

Member, California Council on Science and Technology (2016--)
Member, External Review Committee, Environmental Studies Program, Chapman University (2014).

Member, External Review Committee, Department of Economics, University of Colorado (2013)

Chair, External Review Committee, Nicholas School of Environment, Duke University (2008)

Member, Research Screening Committee, California Air Resources Board (2008--).

Member, Scientific Advisory Committee, California Energy Commission PIER program (2007-9).

Member, Advisory Board, Institute for Global Conflict and Cooperation (IGCC), University of California (2006--2007)

Member, Committee on Strategic Advice on the U.S. Climate Change Science Program, National Academy of Sciences (2006-09)

Member, External Review Committee, College of Sustainability, Arizona State University (2006).

Member, External Review Committee, Economics, Business and Finance, Penn State (2006)

Member, Advisory Board, Institute for the Study of Science and the Environment, National Center for Atmospheric Research, Boulder (2005-8)

Member, US National Committee for IIASA, National Academy of Sciences (2005--14)

Member, Environmental Advisory Committee, Cal. Public Utilities Commission (2005-8)

Lead Author, Intergovernmental Panel on Climate Change (IPCC), AR4, WGIII (2004-8).

Member, Committee to Review President's Climate Change Research Initiative, *National Academy of Sciences/National Research Council*, 2002--2005.

Member, Scientific Steering Committee, *University of California Revelle Program on Climate Science and Policy*, UCSD Scripps Institution, 2000--2003.

Member, University of California Delegation to Climate Change Conference of the Parties 6 (COP-6), The Hague, Netherlands (Nov. 2000).

Member, Committee on Building a Long-Term Environmental Quality R&D Program in the US Department of Energy, *National Academy of Sciences/National Research Council*, 2000-1.

Member, Board of Advisors, National Ocean Economics Project, 1999 – 2003 .

Member, Advisory Council on Clean Air Act Compliance Analysis, *US Environmental Protection Agency*, 1999 – 2004 .

Member, Review Committee, Decision and Information Sciences Division, *Argonne National Laboratory*, Chicago, IL, 1998 – 2003 .

Member, Environmental Economics Advisory Committee, Science Advisory Board, *US Environmental Protection Agency*, 1992 -98.

Member, Risk Reduction Committee, Science Advisory Board, *US Environmental Protection Agency*, 1996-7.

Member, Board on Energy and Environmental Systems, *National Academy of Sciences/National Research Council*, 1994-95

Member, Committee on Fuel Economy of Automobiles and Light Trucks, *National Academy of Sciences/National Research Council*, 1991-92

Member, Energy Engineering Board, *National Academy of Sciences/National Research Council*, 1990-94

Participant, U.S. National Academy of Sciences -- Academy of Sciences of the USSR Program for Young Professional Economists, 1990-91

Participant, Economics Advisory Committee, *Electric Power Research Institute*, 1992

Member, University of Chicago Review Committee for Energy and Environmental Systems Division, *Argonne National Laboratory*, 1988-91

JOURNAL EDITORIAL POSITIONS:

Editor and Co-Editor, *Review of Environmental Economics & Policy* (Editor, 2009-2014; Co-Editor, 2006-9, 2015-).
Co-Editor, *Resource and Energy Economics* (2002-05 & 1994-97; Editor, 1998--2002)
Board of Editors, *Berkeley Electronic Press Journals in Economic Analysis and Policy* (2001--)
Board of Editors, *Land Economics* (1998-2009)
Editorial Council, *Journal of Environmental Economics and Management* (1989-91; 1998-01)
Associate Editor, *Journal of Economic Dynamics and Control* (1995-1997)
Associate Editor, *Journal of Environmental Economics and Management* (1992-93)
Board of Editors: *Energy Journal* (1984 -94), *Resource and Energy Economics* (1993 -94)

CONFERENCES ORGANIZED:

Challenges in Decarbonizing the Grid, Bits and Watts Workshop Series, Winter-Spring 2021 (with Liang Min).
Advances in Estimating Economic Effects from Climate Change Using Weather Observations, Stanford University, co-organized with Prof. Fran Moore, UC Davis. (May 18-19, 2017)
Post-Paris Progress for Action on Climate Change, Stanford University, co-organized with L. Goulder (Jan 28, 2016).
The IPCC at a Crossroads: Enhancing the Usefulness of IPCC to the UNFCCC Process, Official Side Event at COP-21, Paris, co-organized with Rob Stowe and Potsdam Institute for Climate (December 9, 2015).
Research Frontiers in the Economics of Climate Change, Stanford University (Oct 9-10, 2015).
Summer Institute, National Bureau of Economic Research, Cambridge, MA (July 2010), with J. List.
Uncertainty and Learning in Environmental Management, Santa Barbara (December 2009), with C. Costello.
Voluntary Approaches to Environmental Protection, Santa Barbara (April 2009), with M. Kotchen.
California Climate Policy Forum, Santa Barbara, California (March 2007).
Retrospective on Twenty Years of Economic Incentives for Environmental Protection, Santa Barbara, California (August 2003), with Jody Freeman.
Economics of Biodiversity, Santa Barbara, California (May 2001), with Geoff Heal.
National Bureau of Economic Research *Workshop on Trade and Environment*, Snowmass, Colorado (Aug. 12, 1998).
1st, 2nd, 3rd, 4th, 5th, 8th, 9th, 12th and 13th *California Environmental Economics Workshop*, Santa Barbara, CA (May, 1993; Oct. 1994; May, 1996; Oct 1998; May 2000; Oct. 2001; Oct. 2003; Oct 2005; Nov. 2006; Nov. 2010; Feb 2012) [co-organizer]
Environmental Policy with Economic and Political Integration: The European Community and the United States, University of Illinois, (1993)

PROFESSIONAL ORGANIZATIONS (MEMBERSHIP):

American Economic Association
Association of Environmental and Resource Economists
European Association of Environmental and Resource Economics

RESEARCH GRANTS AND CONTRACTS:

ClimateWorks Foundation, "Workshop: Measuring Impacts of Climate on Economic Activity Using Weather Observations," 2017, \$25,000 (PI).

US Department of Energy, "Workshop: Empirical and Methodological Advances in the Economic Analysis of Climate Change Policy," 2014-15, \$60,000 (PI)

US Environmental Protection Agency, "Dissertation Workshops in Environmental Economics," 2011-15, \$150,000 (PI).

US Environmental Protection Agency, "Current Issues Workshops in Environmental Economics," 2011-15, \$150,000 (PI).

California Air Resources Board, "An Assessment of ARB Economic Analysis Program," 2011-13, \$300,000 (PI).

California Energy Commission, "Effects of Climate Change on Agriculture," 2008-2009, \$99,000 (PI).

US Environmental Protection Agency, "Workshops in Environmental Economics," Cooperative Agreement, 2007—2010, \$150,000 (PI).

US Environmental Protection Agency, "Workshops in Environmental Economics," Cooperative Agreement, 2005—2006, \$50,000 (PI)

National Science Foundation, "Integrated Training Program in Economics and Environmental Science," IGERT grant, \$2,696,278, 9/01 – 8/06 (PI).

US Department of Energy, "Measuring Adaptation and Adjustment to Climate Change from the Historic Record," \$164,443, 9/00 -- 8/02 (PI).

University of California Energy Institute Grant, \$17,000, 7/00–6/00 (declined).

US Environmental Protection Agency, "California Workshop on Environmental Resource Economics," \$51,459, 10/98 – 9/01 (PI).

US Department of Agriculture, "Testing Models of Learning and Adaptation for Agriculture in Responding to Climate and Other Shocks," \$25,000, 10/96--12/97 (PI).

US Department of Energy, "Climate Variability, Stochasticity and Learning in Integrated Assessment Models," \$380,182, 9/96 -- 9/99 (PI).

Minerals Management Service, "Valuation of Coastal Resources--Understanding Substitution in Time and Space," \$57,399, 7/1/95--8/1/96 (co-PI).

US Department of Energy, "Learning and Enhanced Climate Representation in Integrated Assessment Models," \$230,000, 9/94--12/96 (PI).

National Institute for Global Environmental Change, Midwest Regional Center, "Incorporating Learning into an Integrated Assessment Model of Climate Change," \$168,109, 7/94--6/97 (PI).

Committee on Research, University of California, Santa Barbara, "The 'Hypotheticalness' of Contingent Valuation," \$4,000, 1994-5 (PI).

University of Illinois Research Board, "An Experimental Test of the Hypothetical Aspect of Contingent Valuation," \$1,950, 1994 (PI).

National Science Foundation, "The Timing of Control of Stock Externalities in the Presence of Learning with an Application to Global Warming," \$121,000, 1991-95 (PI).

US Agency for International Development, "Environmental Policy and Training," approx. \$35,000 per year 1992-94 (part of larger multi-university project).

US Information Agency, "Environmental Policy and the 1992 Integration of Europe," \$99,744, 1991-94 (Co-PI).

University of Illinois Research Board, "The Timing of Control of Stock Externalities with Learning: An Application to Global Warming," \$4,500, 1990-91 (PI).

Illinois World Trade Center Association, "Eastern and Western European Boiler Inventory," \$19,320, 1990 (PI).

Illinois Department of Energy and Natural Resources, "Review of the State-of-the-Art of Measuring Environmental Benefits," \$39,000, September 1987--February 1988 (PI).

Illinois Center for Research on Sulfur in Coal, "The Utility Market for Desulfurized Coal," \$124,000, September 1986--August 1988 (PI).

Illinois Department of Energy and Natural Resources, "Promoting Illinois Coal through Clean Coal Technologies," \$46,000, July 1987--July 1988 (Co-PI).

Massachusetts Institute of Technology, Center for Energy Policy Research, "Studies in Electric Utility Regulation," \$10,000, January 1987--June 1988 (PI).

University of Illinois Research Board, "Studies in Electric Utility Behavior: Bias and Efficiency in Response to Emission Regulations," \$1600, Summer 1986 (PI).

University of Illinois Research Board, "Measuring Market Conduct in a Spatial Market: The Case of US Coal," \$7500, September 1984--July 1985 (PI).

U.S. Department of Energy, "Evaluating Oil and Gas Backout from Electric Utilities," \$100,000, October 1981--September 1982 (PI).

Los Alamos National Laboratory, "Studies in Bi-Level Programming," \$120,000, October 1980--September 1982 (PI).

Los Alamos National Laboratory, "Modeling the International Steam Coal Market, \$100,000, October 1981--September 1982 (PI).

National Commission on Air Quality, "Four Corners Study of Alternatives to the Clean Air Act," \$650,000, October 1980--May 1981 (Co-PI).

PUBLICATIONS:

Books

Intermediate Environmental Economics, Oxford University Press (2011).

[International version of *Environmental Economics*, 2nd Ed].

Environmental Economics, 2nd Ed, Oxford University Press, New York (2010), 480 pp. [1st edition published 2000 and translated into Japanese, Spanish and Chinese; 3rd edition expected 2022]

Human-Induced Climate Change, Cambridge University Press, edited with M. Schlesinger, et al. (2007).

Moving to Markets in Environmental Regulation: Lessons from Thirty Years of Experience, Oxford University Press (2007), 488pp, edited with Jody Freeman.

Spatial Environmental and Resource Economics, Edward Elgar (2000), 447pp.

Measuring the Demand for Environmental Quality, North-Holland, Amsterdam (1991), 370 pp., edited with John Braden.

Currently Active Working Papers

“

“Regulating Carbon in a Small Open Economy,” Working Paper (June 2018).

“[Mining and Quasi-Option Value](#),” National Bureau of Economic Research Working Paper 21325, with C. Costello (July 2015; Revised July 2017).

“[Public Goods Agreements with Other Regarding Preferences](#),” National Bureau of Economic Research Working Paper #17017 (Current version: May, 2014).

Refereed Journal Articles

“William Nordhaus: A Pioneer,” *Climate Change Economics*, 11(4) (2020).

“[Estimating the Economic Impacts of Climate Change Using Weather Observations](#),” *Rev. Env. Econ. Pol.* (2020), with F. Moore.

“Reforming the US Coal Leasing Program,” *Science*, **354**:1096-8 (2016), with K. Gillingham et al.

“[Opportunities for Advances in Climate Change Economics](#),” *Science*, **352**:292-3 (2016), with M. Burke et al.

“Some research challenges in the economics of climate change”, *Climate Change Economics*, 7: (2016), with M. Burke, M. Craxton, C. Onda.

“Reforming the IPCC’s Assessment of Climate Change Economics” *Climate Change Economics*, 7: (2016), with Gabe Chan et al.

“[The IPCC at a Crossroads: Opportunities for Reform](#),” *Science*, **350**:34-35, with Carlo Carraro et al. (2015)

“[An Economic Perspective on the EPA’s Clean Power Plan](#),” *Science*, **346**:815-16, with Meredith Fowlie et al. (2014)

“[Uncertainty, Learning and Heterogeneity in International Environmental Agreements](#)” *Environmental and Resource Economics*, 50:389-403, with A. Ulph (2011).

“[Economic Impacts of Climate Change on California Agriculture](#),” *Climatic Change*, with O. Deschenes (2011)

“[Equity, Heterogeneity and International Environmental Agreements](#),” *B. E. Journal of Economic Analysis and Policy*, 10(2), Article 3 (2010).

- ["Who Pays a Price on Carbon?"](#) *Environmental and Resource Economics*, **46**:359-76 (2010), with C. Grainger.
- ["A Statement on the Appropriate Role for Research and Development in Climate Policy."](#) *The Economists' Voice*, 6(1), Article 6 (2009), with K. Arrow et al.
- ["Learning and International Environmental Agreements"](#) *Climatic Change*, **89**:125-41 (2008), with A. Ulph.
- ["Researching Preferences, Valuation and Hypothetical Bias,"](#) *Environmental and Resource Economics*, **37**:465-87 (2007), with R.M. Guzman.
- ["Systematic Uncertainty in Self-Enforcing International Environmental Agreements,"](#) *J. Env. Econ. & Mgmt.*, **53**:68-79 (2007).
- ["Learning and Climate Change,"](#) *Climate Policy*, **6**:585-89 (2006), with B. O'Neill et al.
- ["Interpreting Estimated Environmental Kuznets Curves for Greenhouse Gases,"](#) *The Journal of Environment & Development*, **15**:42-49 (2006).
- ["Adjustment Costs from Environmental Change,"](#) *J. Env. Econ. & Mgmt.*, **50**:468-95 (2005), with D. Kelly and G. Mitchell.
- ["Piercing the Veil of Uncertainty in Transboundary Pollution Agreements,"](#) *Env. and Res. Econ.*, **31**:21-34 (2005).
- "The Simple Analytics of Greenhouse Gas Intensity Reduction Targets," *Energy Policy*, **33**:2231-36 (2005).
- "Do Lax Environmental Regulations Attract Foreign Investment?," *Env. and Res Econ.*, **21**:1-22 (2002), with Y. Xing.
- "Solving Infinite Horizon Growth Models with an Environmental Sector," *Computational Economics*, **18**:217-31 (2001), with D. Kelly.
- ["Malthus and Climate Change: Betting On a Stable Population,"](#) *J. Env. Econ. and Mgmt.* **41**:135-61 (2001), with D. Kelly.
- "Is Coal Desulphurisation Worthwhile? Evidence from the Market," *Energy Policy*, **29**:217-25 (2001), with J. Braden, R. Woock, J. Machado.
- "Valuing Beach Recreation Lost in Environmental Accidents," *J. Water Resources Planning & Mgmt.*, **126**:374-81 (2000) with R. Deacon.
- "Energy and Depletable Resources: Economics and Policy, 1973-98," *J. Env. Econ. and Mgmt.*, **39**:282-305 (2000).
- "Information and the Divergence Between Willingness-to-accept and Willingness-to-pay," *J. Env. Econ. and Mgmt.*, **38**:66-80 (1999), with R.M. Guzman.
- ["Bayesian Learning, Growth and Pollution,"](#) *J. Econ. Dyn. And Control*, **23**:491-518 (1999), with D. Kelly.
- "Research Trends and Opportunities in Environmental and Resource Economics," *Environmental and Resource Economics*, **11**:383-97 (1998), with R. Deacon, D. Brookshire, A. Fisher, A. Kneese, D. Scrogin, V. Smith, M. Ward and J. Wilen.
- "Cost Functions and Nonlinear Prices: Estimating a Technology with Quality-Differentiated Inputs," *Review of Economics and Statistics*, 80:444-53 (1998), with M. Turnovsky.
- ["Learning and Stock Effects in Environmental Regulation: The Case of Greenhouse Gas Emissions,"](#) *J. Env. Econ. and Mgmt.*, **31**:1-18 (1996).
- ["Fundamental Irreversibilities in Stock Externalities,"](#) *J. Public Economics*, **60**:221-33 (1996).
- ["Foreign Direct Investment, Exchange Rate Variability and Demand Uncertainty,"](#) *Int'l Economic Review*, **36**:855-73 (1995), with L. Goldberg.
- "Is Technical Change Embodied in the Capital Stock or New Investment?," *Journal of Productivity Analysis*, **5**:385-406 (1994), with J-K Lee.
- ["Hotelling Rents in Hotelling Space: Product Differentiation in Exhaustible Resource Markets,"](#) *J. Env. Econ & Mgmt.*, **26**:163-180 (1994).

- "George Bush vs. Al Gore: Irreversibilities in Greenhouse Gas Accumulation and Emission Control Investment," *Energy Policy*, 22:771-78 (1994).
- "The Specification of Dynamics in Cost Function and Factor Demand Estimation," *Review of Economics and Statistics*, 75:721-26 (1993), with J-K Lee.
- "Measuring the Energy Efficiency and Productivity Impacts of Embodied Technical Change," *Energy Journal*, 14:33-55 (1993) with E. Berndt and J.-K. Lee.
- ["A Model of Homogeneous Input Demand Under Price Uncertainty,"](#) *American Economic Review*, 81:514-538 (1991) with F. Wolak.
- ["Computing Cournot-Nash Equilibria,"](#) *Operations Research*, 39:739-748 (1991) with Lars Mathiesen.
- ["Ex Post Liability for Harm vs. Ex Ante Safety Regulation: Substitutes or Complements?,"](#) *American Economic Review*, 80:888-901 (1990) with T. Ulen and G. Johnson.
- "Acid Deposition Regulation and the U.S. Coal Industry," *Energy Policy*, 18:845-852 (1990).
- "Clean Air and Energy: Reform of the PSD Provisions of the Clean Air Act," *J. Air Poll. Control Assn.*, 40:177-184 (1990).
- "Derivative Evaluation and Computational Experience with Large Bi-Level Mathematical Programs," *J. Opt. Theory & Applic.*, 65:485-499 (1990) with L. Lasdon.
- "Aggregate Source/Receptor Relations for the Economic Analysis of Ambient Regulations," *J. Air Poll. Control Assn.*, 39:824-830 (1989) with M. Williams.
- "Measuring Relative Market Power in the Western US Coal Market Using Shapley Values," *Resources and Energy*, 10:293-314 (1988) with F. Wolak.
- ["Necessary and Sufficient Conditions for Uniqueness of a Cournot Equilibrium,"](#) *Rev. Econ. Stud.*, 54:681-690 (1987) with Lars Mathiesen.
- ["Uniformity vs. Differentiation in Regulating Externalities,"](#) *J. Env. Econ. & Mgmt.*, 14:386-399 (1987).
- "Imperfectly Competitive Equilibria in International Commodity Markets," *Amer. J. Agric. Econ.*, 68(1):27-36 (1986), with A. Burris.
- "Conjectural Variation and the Indeterminacy of Duopolistic Equilibria," *Canadian J. Economics*, 19:656-677 (1986) with F. Wolak.
- "Empirical Properties of Economic Incentives and Command-and-Control Regulations for Air Pollution Control," *Land Economics* 62:250-268 (1986).
- "A Short-Run Capital-Labor-Energy Model of Fuel Demand in the Manufacturing Sector of Seven Major OECD Countries," *OPEC Review*, 10(2):179-214 (Summer 1986), with A. Bopp, R. Pendley and F. Wolak.
- "Strategy and Market Structure in Western Coal Taxation," *Rev. Econ. Stat.*, 67(2):239-249 (1985), with F. Wolak.
- "The Effect of Market Conduct on International Steam Coal Trade," *Eur. Econ. Rev.*, 24:39-59 (1984), with D. Abbey.
- ["Competition in Interregional Taxation: The Case of Western Coal,"](#) *J. Political Economy*, 91(3):443-460 (1983), with F. Wolak.
- "The Structure of International Steam Coal Markets," *Natural Resources J.*, 23:859-891 (Oct. 1983), with D. S. Abbey.
- "Alternative Air Quality Policy Options in the Four Corners Region," *Southwestern Rev. of Mgmt. and Econ.*, 1(2):29-58 (Summer 1981), with J. F. Roach, A. V. Kneese, and M. D. Williams.
- "Air Quality Implications of a Nuclear Moratorium: An Alternative Analysis," *The Energy Journal*, 2(3):33-48 (July 1981), with Anthony Bopp, Verne Loose and Robert Pendley.
- "American Indians and National Energy Policy," *J. of Energy and Development*, 5(2):221-251 (Spring 1980), with Robert E. Pendley.

- "Thermal Evolution Models for the Valles Caldera with Reference to a Hot-Dry-Rock Geothermal Experiment," *J. of Volcanology and Geothermal Res.*, 3, pp. 197-218 (1978), with T. R. McGetchin.
- "Temperature Coefficient of Resistivity of Silicon and Germanium Near Room Temperature," *Solid-State Electronics*, 11, 639 (1968), with W. M. Bullis, F. H. Brewer and L. J. Swartzendruber.

Chapters in Books

- "Bridging Reality and the Theory of International Environmental Agreements," in R. Hahn and A. Ulph (Eds), *Climate Change and Common Sense: Essays in Honour of Tom Schelling* (Oxford University Press, Oxford, 2012).
- "Thinking through the Climate Change Challenge," in R. Hahn and A. Ulph (Eds), *Climate Change and Common Sense: Essays in Honour of Tom Schelling* (Oxford University Press, Oxford, 2012), with R. Hahn et al.
- "Regulatory Choice with Pollution and Innovation," in D. Fullerton and C. Wolfram (Eds), *The Design and Implementation of US Climate Policy*, (University of Chicago Press for NBER, Chicago, 2012).
- "Distribution and Climate Change Policies," in X. Labandeira and Emilio Cerdá (Eds), *Climate Change Policies: Global Challenges and Future Prospects* (Edward Elgar, Cheltenham, UK, 2010), with C. Grainger.
- "Prescriptive Environmental Regulations versus Market-Based Incentives," in Freeman and Kolstad (Eds), *Moving to Markets in Environmental Regulation* (Oxford, New York, 2007).
- "Climate Change Policy Viewed from the U.S.A. and the Role of Intensity Targets," Ch 7 in Bernd Hanjürgens (Ed), *Emissions Trading for Climate Policy: US and European Perspectives*, pp 96-113 (Cambridge University Press, Cambridge, UK, 2005).
- "The Economics of Climate Policy," Ch 30 in K.-G. Maler and J. Vincent (Eds), *Handbook of Environmental Economics*, Vol. 3, pp 1561-1618 (Elsevier, Amsterdam, 2005), with M. Toman.
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INVITED PRESENTATIONS (Most Recent 3 years):

CEsifo, Munich “Regulating Carbon in Small Open Economy,” Keynote address (October 2016).

Congreso Social [Conference on Pope’s Encyclical on Environment], “The Papal Encyclical as it Relates to IPCC Findings,” October 5, 2016 [Keynote address]

Pontificia Catolica Universidad Chile, “Regulating Carbon in a Small Open Economy,” October 2016.

Indian Econometric Society Golden Jubilee Meeting, Delhi: “Green Growth” (Plenary talk, August 2013)

Asian Development Bank, Tokyo “The Ethics and Economics of Climate Change: Findings from the IPCC” (July 2014)

World Congress of Environmental and Resource Economists, Istanbul, “International environmental agreements with other-regarding preferences” (July 2014)

Environmental Economics Conference, Skodsborg, Denmark, “The Ethics and Economics of Climate Change” (August 2014)

Conference on Environmental Economics, Talca, Chile, “The Ethics and Economics of Climate Change” (October 2014)

Beyond IPCC - Future paths for climate research, Goteborg, Sweden, “IPCC Economics Research Recommendations” (October 2014)

Panel: “The Economic and Financial Risks of a Changing Climate”, Resources for the Future, Washington (Nov 2014)

MCC/Stanford/Harvard/FEEM Workshop on Economics in IPCC, Berlin: “Priorities for Future Climate Assessments” (Feb 2015)

Duke University Law School, *Inequality and the Economic Analysis of Climate Change: “Inequality and the IPCC”* (May 2015)

Toulouse School of Economics/SCOR Foundation, Paris, Seminar on Climate Risks: "Risk, Adaptation and Mitigation" (June 2015)
Department of Economics, University of Wyoming, "Mining and Quasi-Option Value" (Sept. 2015)
AAAS/Carnegie Institution, Washington, *Climate Science 50 Years Later*: "Costs" (Oct. 2015)
Portland State University: "Obama, Carbon and the 2015 Paris Climate Negotiations" (Oct 2015)
Stanford/Potsdam Institute for Climate, COP-21, Paris, "The IPCC at a Crossroads: Enhancing the Usefulness of IPCC to the UNFCCC Process" (Dec 2015)

POSTDOCTORAL SUPERVISION:

David L. Kelly, Ph.D., Carnegie-Mellon University (1994), 5/95 -- 7/98
Currently: Professor of Economics, University of Miami.

DISSERTATION COMMITTEES:

Doctoral (Research Supervisor)

Chikara Onda (Stanford, EIPER, 2020) [currently at Boston Consulting Group]
Casey Maue (Stanford, EIPER, expected 2021)
Corbett Grainger (UCSB, Economics, 2010) [currently Dept of Ag and Applied Economics, University of Wisconsin, Madison]
Ross Mohr (UCSB, Economics, 2014) "Essays on International Environmental Agreements" [currently Visiting Assistant Professor at Chapman University]
Elizabeth Ashley (UCSB, Economics, 2008), "Essays in Environmental Valuation" [currently with Food & Drug Administration, Washington, DC]
Leopoldo Soto (UCSB, Economics, PhD, 2012) [currently with FERC, Washington, DC]
Sarani Saha (UCSB, Bren School, PhD, 2007), "Three Essays in Environmental and Public Economics" [currently at Department of Economics, IIT, Kanpur]
Glenn Mitchell (UCSB, Economics, PhD, 2000, "Technology, Energy and the Environment") [currently with Competition Policy Associates, Los Angeles]
Gregory Hunter (UCSB, Economics, PhD, 2000, "Essays on Public Goods Provision Under Uncertainty: Incomplete Markets, Hyperbolic Discounting, and Alienable Emission Permits) [currently at Department of Economics, California State University, Pomona]
Jeff Wagner (UIUC, Economics, Ph.D., 1998, "Economic Aspects of Radioactive Waste Management") [Currently faculty member at Rochester Institute of Technology]
Yuqing Xing (UIUC, Economics, Ph.D., 1995, "Trade and Environment") [Currently a faculty member at International University of Japan]
Maria Cunha-e-sa (UIUC, Economics, Ph.D., 1994; Thesis title: "Essays in Environmental Economics: An Application to the Case of the Accumulation of Pollution") [Currently a faculty member at New University of Lisbon, Portugal]
Jong-Kun Lee (UIUC, Economics; Ph.D., 1991; Thesis title: "Modeling and Measuring Technical Change and Productivity Growth") [Currently with the Bank of Korea]
Rodger Woock (UIUC, Economics; Ph.D., 1989; Thesis title: "Market Power and Transportation Price Formation: Theory and an Application to the Captive Shipper Problem") [Currently at FCC]

Doctoral (Committee Member Only)

Sudatta Ray [Stanford, EIPER, pending]
 Gordon Leslie (Stanford, Economics, 2018) [now at Monash University]
 Chris Bruegge (Stanford, Economics, 2018) [now at Cornerstone Research]
 Melanie Craxton (Stanford, MS&E, 2018)
 Trevor Davis (Stanford, Economics, pending)
 Maria Roumpani (Stanford, MS&E, 2018)
 Ty Robbins (UCSB Economics, PhD, 2017)
 Ben Leibowicz (Stanford, MS&E, 2016) [Now at UT Austin]
 Grant Jacobsen (UCSB Economics, PhD, 2010) [Now at U Oregon]
 Laura Grant (UCSB Bren School, PhD, 2010) [Now at Claremont McKenna]
 Alison Huang (UCSB Bren School, PhD, 2008)
 Sofia Franco (UCSB, Bren School, Ph.D., 2007)
 Edmund Balsdon (UCSB, Economics; Ph.D., 2000) [currently at University of San Diego]
 Shawn Knabb (UCSB, Economics, Ph.D., 2001)
 Rolando M. Guzman (UIUC, Economics; Ph.D., 1997)
 Roxanna Barrantes (UIUC, Economics; Ph.D., 1992)
 Noelwal Netusil (UIUC, Economics; Ph.D., 1992)
 Aisling J. Reynolds (UIUC, Geography; Ph.D., 1989)
 Khalid Abdul Rahim (UIUC, Agricultural Economics, Ph.D., 1989)
 Dan Biller (UIUC, Economics; Ph.D., 1990)
 Sundak Suh (UIUC, Urban and Regional Planning; Ph.D., 1989)
 Omar Ben-Ayed (UIUC, Business Administration; Ph.D., 1988)
 Dah-Nein Tzang (UIUC, Economics; Ph.D., 1985)
 Lon Carlson (UIUC, Economics; Ph.D., 1984)

TEACHING

STANFORD:

Econ 251: *Resource & Energy Economics* (PhD level)
 ENVRES 300: *Environmental and Resource Economics* (PhD multidisciplinary)
SEEPAC Research Lunch (co-organized with Prof. L. Goulder)

UCSB:

ESM 229: *Science, Economics & Policy of Climate Change* (Masters)
 Econ 115/EnvSt 175: *Environmental Economics* (upper level undergrad)
 EnvSt 174: *Environmental Policy and Economics* (lower level undergrad)
 Econ 260B: *Environmental Economics* (PhD level)
 ESM 243: *Environmental Policy Analysis* (Masters level)
 ESM 204: *Economics for Environmental Management* (Masters level)
 Econ 594ER: *Workshop in Env. & Res Econ* (PhD level, with other faculty)
 ESM 595EE: *Cross-disciplinary Seminar in Economics & Env. Science* (Ph.D.)

UIUC:

Economics 300: *Intermediate Microeconomics* (undergrad)
 EnvSt 236: *Tomorrow's Environment* (lower level undergrad)
 Economics 495: *Public and Environmental Economics Workshop* (PhD level)
 Economics 464: *Environmental Economics* (PhD level)
 EnvSt 341: *Environmental Simulation* (upper level undergrad)
 Economics 389: *Industrial Organization* (upper level undergrad)

Economics 288: *Government Regulation of Economic Activity* (undergrad)
LAS 295: *Environmental Quality* (Honors, lower level undergrad)
Economics 463: *Resource Economics* (PhD level)

MIT:

14.42/14.420: *Environmental Economics & Policy* (Undergrad and Grad level)
15.019: *Energy Economics and Policy* (Masters level)

STANFORD:

Economics 101 *Economic Policy Analysis* (upper level undergrad)
Economics 155 *Environmental Economics and Policy* (upper level undergrad)