

Molly K. Macauley

Education

- Ph.D., Economics, 1983, The Johns Hopkins University, Baltimore, Maryland.
- M.A., Economics, 1981, The Johns Hopkins University, Baltimore, Maryland.
- B.A., Economics, 1979, College of William and Mary, Williamsburg, Virginia.

Experience

- 1993 to present Senior Fellow, Resources for the Future, Washington, DC
- 1995 to present Director of Academic Relations and Programs, Resources for the Future, Washington, DC
- 2008, 2006, 1999 – 2000, 1989 – 1995 Visiting Professor, Johns Hopkins University
- 1996 Visiting Professor, Princeton University, Woodrow Wilson School of Public Affairs
- 1983 – 1993 Fellow, Resources for the Future
- 1979 – 1983 Policy Analyst, Communications Satellite Corporation, Washington, DC

Selected Awards

- 2006 Federal Aviation Administration: Award for outstanding support of the rulemaking on licensing and safety requirements for the commercial space launch industry
- 2002 National Aeronautics and Space Administration: Award for contributions to policy development for US earth observations
- 2001 International Academy of Astronautics (elected to Full Membership)
- 1994 Top 25 “Rising Stars,” National Space Society
- 1984 Investment in People and Ideas Award, Resources for the Future
- 1979 – 1983 Johns Hopkins University Fellowship

Major Professional Activities

Offices and Memberships on Boards of Directors and Other Boards:

- National Research Council/National Academy of Sciences: Space Studies Board, 2007 – 2009; also Executive Committee, Space Studies Board
- National Research Council/National Academy of Sciences: Aeronautics and Space Engineering Board, 2004 – 2007.
- American Astronautical Society: Board of Directors, 2007-2010
- College of William and Mary, Board of Advisors, Thomas Jefferson Public Policy Program, President, 1997-2005; Advisor 2005 - present
- The Johns Hopkins University Applied Masters’ Degree Program, Advisory Council
- Women in Aerospace, Board of Directors, 1996-2003, 2006-2009; Vice-Chair 2006-2007.

Appointments:

- Advisory Committee for the 1988 ITU World Administrative Radio Conference, Federal Communications Commission

- Panels convened by the Committee on Science and Technology of the U.S. House of Representatives and the American Institute of Aeronautics and Astronautics
- Organizing Committee for 1988 and 1989 of the Annual Telecommunications Policy Research Conference; Chair, 1989-1990
- Review panel, NASA Remote Sensing Commercialization Research Announcement
- Panels by the Space Studies Board, National Research Council
- Task Force on Priorities in Space Research, Space Studies Board, National Research Council
- Review panel, Congressional Budget Office, Spectrum Management Workshop
- Advisory panel, Earth Observations Project, U.S. Congress, Office of Technology Assessment
- Ad Hoc Group on Data Exchange and Charging, American Meteorological Society
- Subcommittee on Space Debris, International Astronautical Association
- Planning Committee, National Meeting, American Astronautical Society
- Space for America Committee, American Astronautical Society
- Space Activities and Society Committee, International Academy of Astronautics
- Study Group, John Heinz III Center for Science, Economics, and the Environment
- Chair, Congressionally mandated “Economic Study of Space Solar Power”
- NASA Space Science Advisory Committee
- NASA Space Science Outreach and Public Education Committee
- National Research Council, Board on Physics and Astronomy, Helium Reserve Committee
- National Research Council, Space Studies Board, Steering Group on Space Applications and Commercialization
- National Research Council, Aeronautics and Space Engineering Board, Committee for Independent Assessment of the NASA Investment Strategy in Space Solar Power
- National Research Council, Review of a Technology Assessment on Concentrating Solar Power Energy Systems
- National Research Council, Aeronautics and Space Engineering Board, Steering Committee for Workshops on Human and Robotic Exploration and Development of Space
- National Research Council, Space Studies Board, Workshop Study on Earth Observations and Applications from Space: A Community Assessment and Strategy for the Future
- National Research Council, Space Studies Board, Review Team for Science Roadmaps for the National Aeronautics and Space Administration
- International Futures Program, Organization of Economic Cooperation and Development (OECD), Paris, France: OECD, winter 2004 (with David Chen), contribution on earth observations and energy security
- Interagency Modeling and Atmospheric Assessment Center Senior Advisory Group, US Department of Homeland Security
- National Research Council, Space Studies Board, Use of Spectrum for Scientific Purposes
- National Research Council, Aeronautics and Space Engineering Board, Member
- National Research Council, Space Studies Board
- National Research Council, Space Studies Board Executive Committee

Member:

- American Economic Association
- Outstanding Young Women of America
- Media Resource Service of the Scientists' Institute for Public Information
- Editorial Board, *Space Policy*
- Editorial Board, *Astropolitics*
- Women in Aerospace
- International Academy of Astronautics
- American Institute of Aeronautics and Astronautics
- American Astronautical Society

Congressional Testimony:

- “Commercial Space.” U.S. House of Representatives, Subcommittee on Space and Aviation, April 20, 2005.

- “Advantages and Disadvantages of Prizes in a Portfolio of Financial Incentives for Space Activities.” U.S. House of Representatives, Committee on Science, July 15, 2004.
- “The Economics of Satellite Solar Power.” U.S. House of Representatives, Committee on Science, Subcommittee on Space and Aeronautics, September 7, 2000 (delivered by John S. Fini).
- “Financing Commercial Space Ventures.” U.S. House of Representatives, Committee on Science, Subcommittee on Space and Aeronautics, July 18, 2000.
- “The Commercial Space Act of 1997: Commercial Remote Sensing.” U.S. House of Representatives, Committee on Science, Subcommittee on Space and Aeronautics, May 21, 1997.
- “The Omnibus Space Commercialization Act of 1996 and the Space Business Incentives Act” H.R. 1953. U.S. House of Representatives, Committee on Science, March 5, 1996.

Reviewer: National Science Foundation; National Academy of Sciences; National Aeronautics and Space Administration; Federal Aviation Administration Office of Commercial Space Transportation; U.S. Congress, Office of Technology Assessment; U.S. Congress, Congressional Budget Office; Federal Communications Commission.

Consultant: Benner, Burnett and Coleman, Washington, DC; Conner and Winters, Tulsa, Oklahoma; Shooshan and Jackson, Washington, DC; Space Development Services, Washington, DC; National Aeronautics and Space Administration; EUROCONSULT, Paris; U.S. Congress, Office of Technology Assessment; Boeing Corporation; SAIC; Federal Aviation Administration; Jackson Kelly LLC.

Special projects: October 1998 -- Spearheaded joint effort of Mount Vernon and Women in Aerospace for U.S. space shuttle flight of replica flag flown by George Washington during the Revolutionary War; flag now on display at Mount Vernon.

Selected Peer-Reviewed Journal Articles, Books, Book Chapters

“The Supply of Natural Resources Information Infrastructure: Issues in the Theory and Practice of Estimating Costs,” *Space Policy*, 24, 2008, 70-79.

“Uses and Limitations of Observations, Data, Forecasts, and Other Projections in Decision Support for Selected Sectors and Regions: US Climate Change Science Program, Synthesis and Assessment Report Product 5.1” (co-editor, with Fred Vukovich), forthcoming (peer-reviewed; also subject to public comment and US federal agency review), April 2008.

“Earth Observations and its Economic Value in Agriculture Decision Support,” in US Climate Change Science Program, *Synthesis and Assessment Product 5.1*, “Uses and Limitations of Observations, Data, Forecasts, and Other Projections in Decision Support for Selected Sectors and Regions,” forthcoming (peer-reviewed; also subject to public comment and US federal agency review), April 2008.

“Provision of Waste Management and Recycling Services by a Tatweer / National Projects Joint Venture within the Tatweer Zones, Dubai UAE” (A Report for the RAND Corporation) (with Scott Hassell, Shelly Culbertson, Mike Toman, Ghassan Schbley, Brian Shannon, and Ian Cook), July 2008.

“The Role of Earth Observations in Revolutionizing Management of Natural Resources and the Environment: Identifying the Landsat Contribution” (a report to the US Geological Survey), April 2008.

“Environmentally Sustainable Human Space Activities: Can Challenges of Planetary Protection be Reconciled?” *Astropolitics*, September – December 2007, 5(3), 209-236.

“Ascribing Societal Benefit to Applied Remote Sensing Data Products: An Examination of Methodologies Based on the Multi-angle Imaging SpectroRadiometer Experience,” (with David J. Diner) *Journal of Applied Remote Sensing*, Vol. 1, September 2007.

“Economics and Technology in Space Policy,” encyclopedia entry in *Space Exploration and Humanity* (multivolume encyclopedia) (California: ABC Clío), forthcoming.

- “The U.S. Department of Commerce and the US Aerospace Industry,” encyclopedia entry in *Space Exploration and Humanity* (multivolume encyclopedia) (California: ABC Clio), forthcoming.
- “Satellite Solar Power: Renewed Interest in an Age of Climate Change?” (with Jhih-Shyang Shih) *Space Policy*, May 2007.
- “The Value of Information: Measuring the Contribution of Space-Derived Earth Science Data to Resource Management,” *Space Policy*, v. 22, no. 4, November 2006, pp. 274-282.
- “Flying in the Face of Uncertainty: Human Risk in Space Activities,” *Chicago Journal of International Law*, Summer 2005.
- “Public Policy: Inducing Investments in Innovation,” Chapter 11 in R. David Simpson, Michael A. Toman, and Robert U. Ayres (eds.), *Scarcity and Growth Revisited: Natural Resources and the Environment in the New Millennium*, Washington, DC: RFF Press, 2005, pp. 225-249.
- “A Herculean Task? Economics, Politics, and Realigning Government in the Case of U.S. Polar-Orbiting Weather Satellites,” *Space Policy*, vol. 19, 2005, pp. 249 - 259.
- “Private Markets, Contracts, and Government Provision: What Explains the Organization of Local Waste and Recycling Markets?” (with Margaret Walls and Soren Anderson) *Urban Affairs Review*, May 2005.
- “Advantages and Disadvantages of Prizes in a Portfolio of Financial Incentives for Space Activities,” *Space Policy*, vol. 21, no. 2, May 2005, pp. 121 - 128.
- “Is the Vision of the Earth Observation Summit Realizable?” *Space Policy*, vol. 21, February 2005, pp. 29-39.
- “Smarter Budgeting for Space Missions, in *New Approaches on Energy and the Environment: Policy Advice for the President*, Richard D. Morgenstern and Paul R. Portney, eds (Washington, DC: Resources for the Future), Chapt. 19, 2004.
- “Regulation on the Final Frontier,” *Regulation Magazine*, vol. 26, no. 2, Summer 2003, 36-41.
- “Dealing with Electronic Waste: Modeling the Costs and Environmental Benefits of Computer Monitor Disposal,” with Karen Palmer and Jhih-Shyang Shih, *Journal of Environmental Management*, vol. 68, no.1, May 2003, pp. 13-22
- “Spatially and Intertemporally Efficient Waste Management: The Costs of Interstate Trade Restrictions” (with Eduardo Ley and Stephen Salant), *Journal of Environmental Economics and Management*, vol. 43, no. 2, March 2002, pp. 188-218.
- “An Economic Assessment of Space Solar Power as a Source of Electricity for Space Based Activities” (with James F. Davis), *Space Policy*, February 2002.
- “Economics of Space,” Chapter 10 in *Space Politics and Policy*, Eligar Sadeh (ed.), Boston, MA: Kluwer Academic Publishers, 2002, pp. 181-200.
- “Cutting through Environmental Issues: Technology as a Double-Edged Sword” (with David Austin), *Brookings Review*, Winter 2001, vol. 19, no. 1, pp. 24-27.
- “Enforcing Environmental Regulation: Implications of Remote Sensing” (with Timothy J. Brennan), in *Improving Regulation: Cases in Environment, Health and Safety*, Paul Fishbeck and Scott Farrow, (eds.), Washington, DC: Resources for the Future, 2001.
- “Estimating Future Benefits from ATP Funding of Digital Data Storage” (with David Austin), in *The Advanced Technology Program: Assessing Outcomes*, Charles W. Wessner (ed.) (Washington, DC, National Academy Press), 2001.

“Solid Waste Reduction and Resource Conservation: Assessing Goals of Government Policy” (with Margaret Walls), in *Public Policies for Environmental Protection*, Paul Portney and Robert Stavins (eds.), Resources for the Future, 2000.

“Report: Can Power from Space Compete?” *Space Policy*, February 2000, vol. 16, no. 4, pp. 283-285.

“Restricting the Trash Trade” (with Eduardo Ley and Stephen Salant), *American Economic Review*, May 2000, vol. 90, no. 2, pp. 243-246.

“NASA’s Affiliated Research Center Program: Bridging Basic Research and the Quality of Life” (with Bruce A. Davis), *Journal of Photogrammetry and Remote Sensing*, November 2000.

“Heredity or Environment: Why is Automobile Longevity Increasing?” (with Bruce Hamilton), *Journal of Industrial Economics*, June 1999, vol. 47.

“Allocation of Orbit and Spectrum Resources for Regional Communications: What’s At Stake?” *Journal of Law and Economics*, October 1998, pp. 737-764.

“Managing Foreign Participation in Government-Funded Applied Space Research and Product Development” (with David Austin, David Simpson, and Mike Toman), *Space Policy*, August 1997, pp. 203-214.

“Technology and Coordination: Antitrust Implications of Remote Sensing Satellites” (with Tim Brennan), *Antitrust Bulletin*, Summer 1997, pp. 477-502.

“The Impact of Uncertain Environmental Liability on Industrial Real Estate Development: Developing a Framework for Analysis” (with Jim Boyd, Winston Harrington and Mary Elizabeth Calhoun), *Journal of Law, Economics, and Real Estate*, Spring 1996, vol. 12, no. 1.

“Exchanging Environmental Resource Management for Peaceful Space Practices: Blue Sky or ‘Blue Sky?’,” in *Space Power Interests*, Peter Hayes (ed.), Westview Press, 1996.

“Remote Sensing Satellites and Privacy: A Framework for Policy Assessment” (with Tim Brennan), *Law, Computers, and Artificial Intelligence*, vol. 4, no. 3, 1995.

“NASA’s Earth Observations Commercialization Application Program: A Model for Government Promotion of Commercial Space Opportunities,” *Space Policy*, February 1995, vol. 11, no. 1, pp. 53-66.

“Close Encounters of the Trash Kind,” *Journal of Policy Analysis and Management*, vol. 13, no. 3, 1994, pp. 560-564.

“In Pursuit of a Sustainable Space Environment: Economic Issues in Regulating Space Debris,” in *Preservation of Near-Earth Space for Future Generations*, John A. Simpson (ed.), Cambridge University Press, 1994.

“Land Remote Sensing Policy Act—Analysis Reveals Deficiencies, Implications,” *GIS World*, vol. 6, no. 7, July 1993, pp. 42-47.

“In Pursuit of Cost Effective Regulation of Toxic Chemicals,” in *Enhancing Environmental Quality through Economic Growth*, American Council on Capital Formation, December 1993.

“Collective Goods and National Sovereignty: Conflicting Values in Global Information Acquisition,” in *Space Monitoring of Global Change*, Sally Ride and Gordon MacDonald (eds.), Conference Proceedings, 1992.

“Advanced Materials,” in *Competitiveness in Metals: The Impact of Public Policy*, Merton J. Peck, Hans H. Landsberg, and John E. Tilton (eds.), London, Mining Journal Books, 1992.

“The NASA Budget: For Whom, For What, and How Big?” in *Space Policy Alternatives*, Radford Byerly (ed.), San Francisco, Westview Press, 1992.

“Highway Robbery: Social Costs of Hazardous Materials Incidents on the Capital Beltway” (with Theodore Glickman and Paul R. Portney), *Transportation Research Record*, No. 1313, 1992.

Using Economic Incentives in Regulating Toxic Substances (with Karen Palmer and Michael Bowes) (Washington, DC, Resources for the Future), 1992.

- "Supplying Earth Observation Data from Space," (with Michael A. Toman), *Space Policy*, February 1992.
- "Providing Earth Observation Data from Space: Economics and Institutions" (with Michael A. Toman), *American Economic Review*, vol. 81, no. 2, May 1991, pp. 38-41.
- "Determinants and Consequences of the Public-Private School Choice" (with Bruce Hamilton), *Journal of Urban Economics*, vol. 29, no. 3, May 1991.
- "Communications in Space: Economics and Public Policy Issues," in *Telecommunications, Values, and the Public Interest*, Sven Lundstedt (ed.), Ablex Press, 1990.
- "Consumption of Fuelwood and Other Household Cooking Fuels in Indian Cities," (with J. Dunkerley, M. Naimuddin, and P.C. Agarwal), *Energy Policy*, vol. 18, no. 1, January/February 1990.
- "Rethinking Space Policy: The Need to Unearth Economics," in *Space Policy Reconsidered*, Radford Byerly (ed.), Westview Press, 1989.
- "Fuelwood in Urban Areas: A Case Study of Raipur, India" (with M. Naimuddin, P.C. Agarwal, and J. Dunkerley), *The Energy Journal*, vol. 10, no. 3, July 1989, 157-180.
- "Launch Vouchers for Space Science Research," *Space Policy*, vol. 5, no. 4, November 1989, 311-320.
- "No Free Launch: Efficient Space Transportation Pricing" (with Michael A. Toman), *Land Economics*, vol. 65, no. 2, May 1989, 91-99.
- "Tracing News Orbits: Cooperation and Competition in Global Satellite Development" (book review), *Information Economics and Policy*, September 1988.
- "Economic Issues in Innovation in Satellite Communications" in *Space Communications Research and Development R&D*, Washington, DC, Space Applications Board, National Research Council, March 1988, pp. 191-197.
- Economics and Technology in U.S. Space Policy* (editor) (Washington, DC, Resources for the Future), 1987.
- "The Contribution of a Partnership between Economics and Technology," in *Economics and Technology in U.S. Space Policy*, M. K. Macauley (ed.), Washington, DC, Resources for the Future, 1987.
- "Space Transportation Policy: Commercial Policies and International Competition," in *Economics and Technology in U.S. Space Policy* (see above) (with Michael A. Toman), 1987.
- "Out of Space? Regulation and Technical Change in Communications Satellites," *American Economic Review*, vol. 76, no. 1, May 1986.
- "Risk Aversion and the Insurance Value of Strategic Oil Stockpiling" (with Michael A. Toman), *Resources and Energy*, vol. 8, no. 2, 1986.
- "Recent Behavior of Urban Population and Employment Density Gradients," *Journal of Urban Economics*, vol. 18, September 1985.
- "Slicing the Geostationary Pie: Property Rights in Orbit" (with Paul R. Portney), *AEI Journal on Regulation*, July/August 1984.
- "Ras Maden Koentjaraningrat" (book review), *Third World Anthropology Research Bulletin*, Spring 1979.

Other Selected Publications

Op-eds and Commentary

- "A World of Information: In Shadow of Climate Debate, A Comprehensive File on Data about Earth," *The Houston Chronicle*, June 23, 2007 (with William B. Gail and Neal F. Lane).
- "Changing Our Perspective," *Space News*, March 26, 2007 (with Roberta Balstad and Anthony Janetos).
- "A National Earth-Information Initiative," *Space News*, April 2, 2007 (with William B. Gail and Neal F. Lane).
- "Who Collects? Trash Pickup Controlled by Monopolies," *The Charleston Gazette*, July 10, 2006, p. 5A.

- “The Priority of Earth Science in the Space Budget,” *Space News*, February 7, 2005.
- “Look Before you Launch,” *The Baltimore Sun*, March 5, 2004, p. 13A.
- “Water, Water, Everywhere?” *Space News* 15 (5), February 2, 2004, p. 13.
- “Keep Exploring the Final Frontier?” solicited letter to the editor, *The Baltimore Sun*, April 26, 2003, p. 13A.
- “Ensuring the Real Potential of Remote Sensing,” *Space News*, April 14, 2003 14(15), p. 17.
- “Rethinking NASA Centers,” *Space News*, February 4, 2002, vol. 13, no. 5, p. 15.
- “Commercializing Space,” *Space News*, January 29, 2001, vol. 12, no. 4, p. 15.
- “Costs Outweighs Benefits of Space Solar Power,” *Space News*, June 5, 2000, vol. 11, no. 22, , p. 19.
- “Commercialization without NASA,” *Space News*, February 16-22, 1998, vol. 9, no. 7, p. 29 (with Tim Brennan).
- “A Merger of Science and Commerce,” *Space News*, March 31-April 6, 1997.
- “Managing Orbital Debris,” *Space News*, September 30-October 6, 1996, vol. 7, no. 33, p. 13.

Short Articles, Government Reports, Discussion Papers

- “Space as the Canonical global Commons: An Introduction to its Economics,” *Resources*, Spring 2008, 8-12.
- “A Cost-Index Approach to Valuing Investment in ‘Far into the Future’ Environmental Technology,” *Resources for the Future Discussion Paper 07-29*, June 2007 (with Jhih-Shyang Shih).
- “Measuring Ecosystem Services: The Potential Contribution of New Opportunities to ‘See’ our Environmental Relationships,” *Resources*, Spring 2007, with William B. Gail and Shalini Vajjhala).
- “‘Environmentally Sustainable’ Space Exploration: Reconciling Challenges of Planetary Protection,” proceedings chapter in *Policy and Law Relating to Outer Space Resources: The Example of the Moon, Mars and Other Celestial Bodies*, McGill University International Institute of Space Law, July 2007. Chapter 2 in “*Study of the Liability Risk-Sharing Regime in the United States for Commercial Space Transportation*, Report prepared for the Volpe National Transportation Systems Center, US Department of Transportation under auspices of The Aerospace Corporation, August 2006.
- “The Prospective Value of Space Solar Power as Renewable Energy: Implications for the Biosphere and Electricity Reliability,” (with Jhih-Shyang Shih), Report to the National Science Foundation, the US National Aeronautics and Space Administration, and the Electric Power Research Institute, November 2006.
- “Water, Property Rights, and Security – IGARSS 2006 Conference Proceeding and Invited Presentation (with Fred M. Vukovich). September 2006.
- Workshop Summary: Applications of NASA Earth Science Data and Model Results Toward the Future: Workshop on Energy-Related Policy Issues: 2010 – 2020, held 28 June 2006 (Washington, DC: SAIC and RFF) at <http://appl-policy.saic.com/>
- “Ascribing Societal Benefit to Environmental Observations of the Earth from Space: The Multi-angle Imaging Spectroradiometer (MISR),” *Resources for the Future Discussion Paper 06-09*, March 2006.
- Workshop Summary: Applications of NASA Earth Science Data and Model Results Toward the Future: Workshop on Drought-Related Policy Issues: 2010 – 2020, held 8 September 2005 (Washington, DC: SAIC and RFF) at <http://appl-policy.saic.com/>
- “Some Issues at the Forefront of Public Policy for Environmental Risk,” *Resources for the Future Discussion Paper 06-01*, January 2006 (paper prepared for the American Meteorological Society Summer Policy Colloquium, Summer 2005).
- “Taking Risks on the Space Frontier,” *Resources*, Summer 2005, Issue No. 158, 24-31.

“Earth Science Remote Sensing Data: Contributions to Natural Resources Policymaking,” Resources for the Future Discussion Paper 05-35, August 2005 (with Fred M. Vukovich).

“The Value of Information: A Background Paper on Measuring the Contribution of Space-Derived Earth Science Data to National Resource Management,” RFF Discussion Paper 05-26, May 2005.

Workshop Summary: Applications of NASA Earth Science Data and Model Results Toward the Future: Workshop on Water and Ocean Policy Issues: 2010 – 2020, held 11 February 2005 (Washington, DC: SAIC and RFF) at <http://appl-policy.saic.com/>

“Public Policy and Climate Change: The Essential but Little Known Contribution of Earth Science Remote Sensing Data and Products,” in *Proceedings of the 24th IEEE International Geoscience and Remote Sensing Symposium*, Anchorage, Alaska, September 2004.

“Is the Vision of the Earth Observation Summit Realizable?” paper prepared for the American Meteorological Society Summer Policy Colloquium, Summer 2004.

“Space Resources and the Challenge of Energy and the Environment,” background paper published by the International Futures Program, Organization of Economic Cooperation and Development (OECD), Paris, France: OECD, winter 2004 (with David Chen).

“A Herculean Task? Economics, Politics, and Realigning Government in the Case of U.S. Polar-Orbiting Weather Satellites,” paper prepared for the American Meteorological Society Summer Policy Colloquium, Summer 2003.

“Effects of Carbon Policies and Technological Change on Consumer Surplus in Electricity Generation,” (with Jhih-Shyang Shih), Resources for the Future Discussion Paper 03-14, June 2003.

“Exploring the Promises and Perils of Technology,” *Resources* (Washington, DC, Resources for the Future), Fall 2002/Winter 2003, 15-17.

“An Index-Based Performance Measure for Public Investment in New Technology,” in *Benchmarking Evaluation of Public Science and Technology Programs*, Tekes Reports 1/2003 (Washington, DC: Embassy of Finland), Workshop Report, 2003.

“The Value of Information: A Background Paper on Measuring the Contribution of Earth Science Applications to National Initiatives,” Report to the Office of Earth Science, National Aeronautics and Space Administration, September 2002.

“The Organization of Local Solid Waste and Recycling Markets: Public and Private Provision of Services,” (with Margaret Walls and Soren Anderson) RFF Discussion Paper 02-35 (Washington, DC: Resources for the Future), June 2002.

Liability Risk-Sharing Regime for US Commercial Space Transportation: Study and Analysis, with Steve Mirsky and Dr. Roy Karimi, prepared for the US Department of Transportation, Federal Aviation Administration, Associate Administrator for Commercial Space Transportation, April 2002.

“Measuring the Contribution to the Economy of Investments in Renewable Energy: Estimates of Future Consumer Gains,” RFF Discussion Paper 02-05 (Washington, DC, Resources for the Future), February 2002 (with Jhih-Shyang Shih, Emily Aronow, David Austin, Tom Bath, and Joel Darmstadter).

“The Organization of Local Solid Waste and Recycling Markets: Public and Private Provision of Services and the Nature of Contracts,” Report to the Economic and Social Research Institute of Japan, February 2002 (with Margaret Walls).

“The Environment and the Information Age: The Costs of Coping with Used Computer Monitors,” *Resources*, no. 145, Fall 2001, pp. 6-9 (with Karen Palmer, Jhih-Shyang Shih, Sarah Cline, and Heather Holsinger).

“An Economic Assessment of Space Solar Power as a Source of Electricity for Space-Based Activities,” RFF Discussion Paper 01-46 (Washington, DC, Resources for the Future), October 2001 (with James F. Davis)

“Modeling the Costs and Environmental Benefits of Disposal Options for End-of-Life Electronic Equipment: The Case of Used Computer Monitors,” RFF Discussion Paper 01-27 (Washington, DC, Resources for the Future), June 2001 (with Karen Palmer, Jih-Shyang Shih, Sarah Cline, and Heather Holsinger).

“Can Power from Space Compete? The Future of Electricity Markets and the Competitive Challenge to Satellite Solar Power,” Resources for the Future Discussion Paper 00-16 (Washington, DC, Resources for the Future), April 2000 (with Joel Darmstadter and coauthors).

“Estimating Future Consumer Welfare Gains from Innovation: The Case of Digital Data Storage” (Resources for the Future Discussion Paper 00-13 (Washington, DC, Resources for the Future), March 2000 (with David Austin).

“A Quality Adjusted Index for Estimating Future Consumer Surplus from Innovation: A Case Study for the Advanced Technology Program” (with David Austin) in *The Evaluation of Technological Change*, Workshop sponsored by the National Institute of Standards and Technology, U.S. Department of Commerce (Washington, DC), 1998.

“Some Dimensions of the Value of Weather Information: General Principles and a Taxonomy of Empirical Approaches” in Roger A. Pielke, ed., 1997, *Report of the Workshop on the Social and Economic Impacts of Weather* (National Center for Atmospheric Research, Boulder, CO).

“Life in the Universe and the Economics of Asking ‘What if’ Questions,” in John Logsdon, ed., *Life on Mars: What are the Implications?*” Symposium Proceedings, George Washington University, Washington, DC, June 1997, pp. 67-74.

“Data Policy and Industry Structure as They Relate to Market Value,” in *Global Networks for Environmental Information*, Proceedings of Eco-Informa '96, vol. 10 (Michigan, Environmental Research Institute), pp. 221-228.

“Spatially and Intertemporally Efficient Waste Management,” report to the U.S. Environmental Protection Agency (with Eduardo Ley and Stephen Salant), 1996.

“Performance Measures in the Earth Observations Commercialization Applications Program,” in *Space Technology and Applications International Forum* (Mohammed El-Genk, ed.), American Institute of Physics, 1996, pp. 279-283.

“Enforcing Environmental Regulation: Implications of Remote Sensing Technology,” (with Tim Brennan), report to the U.S. Environmental Protection Agency, 1996 and RFF Discussion Paper 98-33 (Washington, DC, Resources for the Future).

“The Economic Value of Space Exploration,” *Resources*, no. 188, Winter 1995, pp. 15-18.

“Comparing Expected and Actual Economic Impacts of OSHA Safety Regulation: A Case Study of the Use of Alternative Stabilization Systems for Powered Platforms,” Molly K. Macauley and Paul R. Portney, unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, February 1994; available from the National Technical Information Service (NTIS), Springfield, VA.

“Comparing Expected and Actual Economic Impacts of OSHA Safety Regulation: A Case Study of Presence Sensing Device Initiation for Mechanical Power Presses,” Molly K. Macauley and Paul R. Portney, unpublished contractor report prepared for the Office of Technology Assessment, U.S. Congress, Washington, DC, January 1994; available from the National Technical Information Service (NTIS), Springfield, VA.

“The Impact of Environmental Liability on Industrial Real Estate Development,” *Resources* (with Jim Boyd), no. 114, Winter 1994, pp. 19-23.

“Common Law and Market-Based Incentives for Toxic Substances Labeling,” RFF Discussion Paper ENR93-13 (Washington, DC, Resources for the Future) (with Jim Boyd).

“In Pursuit of a Sustainable Space Environment: Economic Issues in Regulating Space Debris,” *Resources*, no. 112, Summer 1993, pp. 12-16.

- "Managing Municipal Solid Waste: Advantages of a Discriminating Monopolist," RFF Discussion Paper ENR93-05 (Washington, DC, Resources for the Future) (with Stephen Salant, Margaret Walls, and David Edelstein), 1993.
- "Remote Sensing of Earth from Space: Economic and Policy Issues," *Resources*, no. 107, Spring 1992, pp. 1-5 (with Michael A. Toman).
- "NASA'S Earth Observations Commercialization Program: A Model Government Approach," report to the John C. Stennis Space Center, National Aeronautics and Space Administration, 1992.
- "Incentive-Based Approaches to Regulating Toxic Substances," *Resources*, no. 8, Summer 1992, pp. 5-9 (with Karen Palmer).
- "The Value of Information and the Cost of Advocacy," RFF Discussion Paper QE92-20 (Washington, DC, Resources for the Future, August 1992) (with Winston Harrington).
- "Using Economic Incentives to Regulate Toxic Substances, report submitted to U.S. Environmental Protection Agency, March 1992 (with Karen Palmer and Michael Bowes).
- "Highway Robbery: The Social Costs of Hazardous Materials Incidents on the Capitol Beltway," *State and Local Issues in the Transportation of Hazardous Waste Materials Proceedings*, ASCE UT Division, St. Louis, MO, May 1990 (with Theodore Glickman and Paul R. Portney).
- "Economic Considerations in Supplying Earth Observation Data From Space," RFF Discussion Paper ENR91-11 (Washington, DC, Resources for the Future, April 1991), (with Michael A. Toman).
- "The NASA Budget: For Whom, For What, and How Big?" RFF Discussion Paper ENR91-08 (Washington, DC, Resources for the Future, February 1991).
- "Statistical Information on Advanced Materials: The Role of Government," in *Advanced Materials: Outlook and Information Requirements* (Washington, DC, U.S. Bureau of Mines, 1990).
- "Social Costs of Current Transportation Policies for Hazardous Materials: A Case Study," *NC State Economist*, November 1989 (with Theodore Glickman).
- "Launch Vouchers Offer New Space Research Opportunities," *Resources*, no. 96 Summer 1989, pp. 1-4.
- "Launch Vouchers for Space Science Research," RFF Discussion Paper ENR89-04 (Washington, DC, Resources for the Future, February 1989).
- "Encounter with the Advanced Materials," report to the U.S. Department of Interior, February 1988 (with Hans Landsberg).
- "Decision Time for Allocating Resources on the Space Station," *Resources*, no. 89, Fall 1987, pp. 5-7.
- "Space Transportation Policy: A Year of Upheaval," *Resources*, no. 86, Winter 1987, pp. 5-8.
- "The Transition to Commercial Energy in Developing Countries: A Case Study of Households in Raipur, India," report to the Agency for International Development; RFF Discussion Paper EM87-01 (Washington, DC, Resources for the Future, June 1987).
- "An Economic Perspective of the 21st Century Space Station," *Space Station in the Twenty-First Century*, American Institute of Aeronautics and Astronautics Paper 86-2348, September 1986.
- "No Free Launch: Analysis of Space Transportation Pricing," RFF Discussion Paper EM86-02 (Washington, DC, Resources for the Future, April 1986) (with Michael A. Toman).
- "The Site Value of Locations in the Geostationary Orbital Arc," RFF Discussion Paper EM85-01 (Washington, DC, Resources for the Future, May 1985).
- "The Welfare Cost of Regulatory Policy Governing the Geostationary Arc," RFF Discussion Paper EM85-02 (Washington, DC, Resources for the Future, May 1985).
- "Implementing an Auction: Steps Toward Improved Allocation of the Geostationary Arc," RFF Discussion Paper EM85-03 (Washington, DC, Resources for the Future, May 1985).
- "Geographic Variation in Fuel Flexibility: Implications for the Regional Incidence of Oil Supply Disruptions," RFF Discussion Paper D-82-V (Washington, DC, Resources for the Future, April 1984).