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PUBPOL 481/PHYSICS 481 SYLLABUS: WINTER TERM 2009

NATIONAL SCIENCE POLICY IN THE 21ST CENTURY

Professor Homer A. Neal and Professor James J. Duderstadt

8:30 – 10:00 am
Tuesday/ Thursday
1120 Weil Hall

Over the course of the last century an overwhelming number of societal advances have been driven by progress in science and technology. Medical treatments and cures have been developed, new economic frontiers have been opened, and the overall quality of life has been enhanced. Yet, the public has generally treated these advances as things that just "happen", without there being any recognition that many are, in fact, the result of sustained commitment by the nation to support science and technology through a deliberate set of policies. This course will highlight the important role of national science policy in achieving societal goals. Science policy is sometimes a result of a larger public policy, and as society becomes more complex, so too, do those policies governing science.

The aim of this lecture course is to introduce students to the manner in which science and technology issues both shape and are shaped by public policy. Issues such as global climate change, energy sustainability, human genomics, and exponentially evolving technologies (e.g, info-, bio-, and nano-) are among the most challenging and complex facing contemporary society. The course will review the historical role of national science policy in addressing the health, welfare, and security needs of the nation, and will provide an organizational map to help the reader better understand how the federal government develops and executes its science policy and why it funds science. It will explore how universities, national laboratories, and industry partner with the federal government to carry out scientific research, and why states are developing their own scientific and technological support structures. The course will examine the interactions between the scientific community and policymakers, and the grand challenges that face science and society, including environmental preservation, advances in new technologies, transportation, power generation, and prevention and cure of diseases. The urgency of strengthening these interactions in order to meet such significant scientific and technical challenges will be explored.

The list of broad topics to be covered includes:

- Organization of Governmental Entities Supporting Scientific Research
- How National Science Policy is Made
- Funding Trends
- The Role of Universities, Industry, the National Labs, and States in Science Policy
- Defense Research
- Big Science
- The Science and Engineering Workforce and Science Education in the US
- Ethics and Integrity in Science
- Globalization and Science Policy
- Homeland Security

Lectures will also include the background and structure of the US science policy system as well as dissection of current science policy issues.

The course is targeted to a broad audience and no prior science background is necessary. It is expected that the course would be of particular interest to students in political science, public policy, engineering, any of the science disciplines, higher education, and other similar disciplines.

Assignments will include readings, papers, and two exams as described below.

GRADING AND COURSEWORK:
The course grade will be based on homework assignments, a midterm, and a final exam. Students will be expected to read all reading assignments prior to class.

Texts: chapters from Neal, Smith, McCormick "Beyond Sputnik: US Science Policy in the 21st Century", the National Science Foundation's "Science & Engineering Indicators 2008 (http://www.nsf.gov/statistics/seind08/)", the American Association for the Advancement of Science Report (http://www.aaas.org/spp/rd/rd09main.htm), and additional reading as assigned.

Assignments: there will be two short written assignments (a science editorial and a policy memo), one semester report, 2 exams, and class readings (see details below).

All writing assignments should be 1.5 to double-spaced. Use 11pt or 12pt font.

More details about the science editorial, policy memo and semester report are given below.

Science Editorial
On occasion there are instances in which perspectives on a particular issue or set of issues need to be expressed. We are all familiar with the general media editorial columns. The authors of these pieces, while citing facts, are taking a position on an issue or making a point. Likewise, in science media (e.g. Science Magazine, Nature) there is a place for commentary on topics and issues in science and science policy. These editorials are written not only by prominent scientists but also policymakers and industry leaders. This first assignment is intended to provide students with the opportunity to reflect on a specific topic or issue in science policy. An example of an editorial from Science Magazine is available on Ctools. Students may wish to express a viewpoint, to present a specific argument for or against a policy change, or to present the perspective of a particular subpopulation (e.g. women in physics, etc). As noted above, good editorials are not merely venues for expressing one's opinion but should also be grounded in fact. Editorials should be between 750 and 850 words and have a well-conceived title.

Policy Memo
This assignment is intended to give students practice in writing a policy memo. The paper should be set-up like an actual memo. Students can create the person to whom they are writing the memo or can use an actual existing policymaker (e.g. Speaker of the House Nancy Pelosi (D-CA), Representative Vern Ehlers (R-MI), OSTP Director John Holdren, OMB Director Peter Orszag). Again, a topic in science policy should be chosen. The memo can be either an argumentative memo (arguing for or against a policy or change in policy) or a strategy memo (presenting a proposed mechanism for implementing a policy). A little background reading may be necessary in order to provide the factual basis for what you present. Memos should start with an "executive summary" (e.g. an abstract) and should end with a reminder of why the topic/issue at hand is so important. Example topics might be increased funding for a specific big science project or one of the agencies or expansion of undergraduate research opportunity program support or a plan for revamping K-12 math and science curriculum in a specific state. Memos should be between 1,200 and 1,500 words.

Semester Report
Students should select a topic in science policy and take the opportunity to explore it further. The report should be 10-12 pages in length. A general approach might be to review materials that are available and present a discussion that covers the history of the topic and related issues as well as what keeps the topic prominent in the realm of US science policy and where things seem to be headed, if relevant. Examples might be university technology transfer, human embryonic stem cell research, or the Superconducting Super Collider. Another possibility is to select a prominent player in US science policy, for example Vannevar Bush, or a particular position (the President's Science Advisor). In the case of the former, one might choose to discuss who the person is/was, his/her importance to US science policy, what important contribution the person made, etc. For the latter, one might choose to review and discuss how the position was formed and how it has changed over the years.

Grading Weights:

Science Editorial –	10%
Policy Memo –	15%
Semester Report –	20%
Exam #1 –	25%
Exam #2 –	30%

LECTURE AND READING SCHEDULE

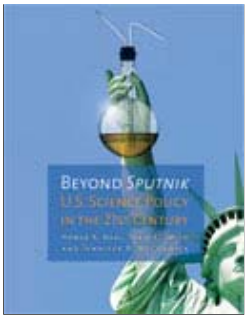
The table below provides the planned schedule of lectures. Most lectures are provided by the course professors. For particular topics expert guest speakers will address the class. Please consult the CTOOL course site for the latest update on the schedule.

(The shorthand "NSM" refers to the required text by Homer Neal, Tobin Smith, and Jennifer McCormick, *Beyond Sputnik: US Science Policy in the 21st Century* (University of Michigan Press, 2008)

DATE		**TITLE**	**READINGS**	**LECTURER**
Thursday, January 08		**Introduction and Overview: What is Science Policy**	NSM-chapter 1; "Science: The Endless Frontier" (Summary of Report, chapters 1, 6);	Homer Neal
Tuesday, January 13		**Historical Perspectives**	NSM- chapter 2	Homer Neal
Thursday, January 15		**The players in science policy**	NSM- chapter 3	Homer Neal
Tuesday, January 20		**Federal funding for research: rationale, impact, trends**	NSM-chapter 5 ;"The Allocation of Scientific Resources" http://www.nsf.gov/nsb/documents/2001/nsb0139/nsb0139.pdf	Homer Neal
Thursday, January 22		**Case Examples**		Jenifer McCormick

Tuesday, January 27		**The process of making science policy**	NSM-chapter 4	Tobin Smith
Thursday, January 29		**Industry and the States**	NSM, chapters 8, 9	Guest
Tuesday, February 03		**STEM Education/Universities**	NSM- chapter 6, 15	Jim Duderstadt
Thursday, February 05		**Science and Engineering Workforce**	NSM- chapter 16	Jim Duderstadt
Tuesday, February 10		**Scientific Infrastructure**	NSM- chapter 13	Jim Duderstadt
Thursday, February 12		MIDTERM		
Tuesday, February 17		**Federal Laboratories**	NSM- chapter 7	Homer Neal
Thursday, February 19		**Science for National Defense**	NSM- chapter 11	Homer Neal
Tuesday, February 24		Spring Break		
Thursday, February 26		Spring Break		
Tuesday, March 03		**Computing and Science Policy**		Jim Duderstadt
Thursday, March 05		**Globalization and Science Policy**	NSM- chapter 17	Jim Duderstadt
Tuesday, March 10		**Big Science**	NSM- Chapter 12; Daniel Kevles, "Big Science and Big Politics in the United States: Reflections on the death of the SCC and the Life of the Human Genome	Homer Neal

			Project", *Historical Studies in the Physical Sciences* 27 (1997), 269-98	
Thursday, March 12		**Homeland Security, Innovation, and Science Policy**	NSM- Chapter 18	Tobin Smith
Tuesday, March 17		**Space Policy**		Guest Speaker
Thursday, March 19		**Ethics in Scientific Research, the Public**	NSM- Chapter 10, 14	Jen McCormick
Tuesday, March 24		**Grand Challenges (Physical Sciences)**	NSM- Chapter 19	Homer Neal
Thursday, March 26		**Grand Challenges (Life Sciences)**	NSM- Chapter 19	Guest
Tuesday, March 31		**Grand Challenges (Environmental Policy)**	NSM- Chapter 19	Guest
Thursday, April 02,		**Grand Challenges (Energy)**	NSM- Chapter 19	Jim Duderstadt
Tuesday, April 07		**Science Policy and the Nation's Future**	NSM-Chapter 20	Homer Neal
Thursday, April 09		**Science Policy in the New Administration**		Jim Duderstadt
Tuesday, April 14		**Course Review**		Homer Neal
Thursday, April 16		**Course Review**		Homer Neal
Tuesday, April 21		**Final Exam**		Homer Neal



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Beyond *Sputnik*

U.S. Science Policy in the Twenty-First Century

Homer A. Neal, Tobin L. Smith, and Jennifer B. McCormick

A timely introduction to all facets of U.S. national science policy

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About the Book

Science and technology are responsible for almost every advance in our modern quality of life. Yet science isn't just about laboratories, telescopes and particle accelerators. Public policy exerts a huge impact on how the scientific community conducts its work. *Beyond Sputnik* is a comprehensive survey of the field for use as an introductory textbook in courses and a reference guide for legislators, scientists, journalists, and advocates seeking to understand the science policy-making process. Detailed case studies—on topics from cloning and stem cell research to homeland security and science education—offer readers the opportunity to study real instances of policymaking at work. Authors and experts Homer A. Neal, Tobin L. Smith, and Jennifer B. McCormick propose practical ways to implement sound public policy in science and technology and highlight how these policies will guide the results of scientific discovery for years to come.

Homer A. Neal is the Samuel A. Goudsmit Distinguished University Professor of Physics, Interim President Emeritus, and Vice President for Research Emeritus at the University of Michigan, and is a former member of the U.S. National Science Board.

Tobin L. Smith is Associate Vice President for Federal Relations at the Association of American Universities. He was formerly Assistant Director of the University of Michigan and MIT Washington, DC, offices.

Jennifer B. McCormick is an Assistant Professor of Biomedical Ethics in the Division of General Internal Medicine at the Mayo College of Medicine in Rochester, Minnesota, and is the Associate Director of the Research Ethics Resource, part of the Mayo Clinic's NIH Clinical Translational Science Award research programs.

GO BEYOND SPUTNIK ONLINE--Visit **www.science-policy.net** for the latest news, teaching resources, learning guides, and internship opportunities in the 21st-Century field of science policy.

On the Web

"Science and Science Policy in the New Obama Administration," commentary by author Tobin Smith 11/25/2008 | PDF

Also of Interest

The American Voter Revisited

Democratic Laboratories: Policy Diffusion among the American States

The Political Economy of Expertise: Information and Efficiency in American National Politics

Social Science Knowledge and Economic Development: An Institutional Design Perspective

"*Beyond Sputnik* is a readable, concise, yet remarkably comprehensive introduction to contemporary science policy. It is devoid of 'wonkishness' yet serves the needs of policymakers and students alike. Because science and technology policy is of central importance in the twenty-first century this accessible volume is a godsend."
—Charles M. Vest, President of the National Academy of Engineering and Vice Chair of the National Research Council of the National Academies of Sciences and Engineering

"This highly researched book is a treasure trove for anyone concerned with science policy relating to such challenges as providing energy, preserving the environment, assuring healthcare, creating jobs, and more."
—Norman Augustine, retired Chairman and CEO of Lockheed Martin Corporation and recipient of the 2008 Vannevar Bush Award from the National Science Board

"Science policy is a subject of growing importance in the United States, yet there has long been a vacuum among textbooks in the field. *Beyond Sputnik* fills it splendidly and will be greeted with enthusiasm by students and faculty alike. Even those who have practiced the art for years will learn from it."
—Albert Teich, Director of Science and Policy Programs at the American Association for the Advancement of Science

"Homer A. Neal, Tobin L. Smith, and Jennifer B. McCormick have written a landmark work calling for a national effort to restore our nation's power in the fields of science, energy, and education, as we did in the remarkable year following Sputnik. The next preident should read *Beyond Sputnik* and accept this call to action as did President Eisenhower."
—Ambassador David M. Abshire, President of the Center for the Study of the Presidency, Cofounder and Vice Chairman of the Center for Strategic and International Studies, and President of the Richard Lounsbery Foundation

"At last we have a text that tells the story from where A. Hunter Dupree left off; an excellent core text for courses in science and technology policy, DC policymakers, and anyone who needs to get up to speed in the field . . . The book that we have all been waiting for."
—Christopher T. Hill, Professor of Public Policy and Technology, George Mason University

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sitemap

Physics Department Directory

Homer Neal

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Director, UM-ATLAS Collaboratory Project at University of Michigan

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Education: Indiana University B.S. 1961; University of Michigan M.S. 1963; University of Michigan Ph.D. 1966.

Research Field: Elementary Particle Experiment

Research Focus: ATLAS Experiment at CERN'S Large Hadron Collider

Professor Homer A. Neal is Director of the UM-ATLAS Collaboratory Project, the Samuel A. Goudsmit Professor of Physics, Interim President Emeritus, and Vice President Emeritus for Research at the University of Michigan. From 1987 to 1993 he was Chair of the University of Michigan Department of Physics. Before returning to Michigan (he received his Ph.D. from U-M in 1966), he served as Vice President for Academic Affairs and Provost at the State University of New York at Stony Brook (1981-86) and Dean for Research and Graduate Development at Indiana University (1976-81).

Professor Neal's research area is experimental high energy physics and he is currently conducting his research at CERN, the European Laboratory for Particle Physics in Geneva, where his research group is part of the ATLAS Experiment. The University of Michigan has the largest scientific contingent in this 2000 person collaboration, and Professor Neal is the Michigan Institutional Representative in this world-wide effort. Professor Neal also participates in, and founded the Michigan component of, the DZERO collaboration that in 1995 announced the discovery of the top quark and that in 2007/2008, as a result of specific work in the Michigan DZERO group, announced the discovery of the Xi_b and Omega_b hyperons. Within the DZERO collaboration, he and his group had particular responsibility for designing, implementing, and analyzing data from the Intercryostat Detector which was built by his team at the University of Michigan. His technical research expertise includes the design of particle detectors, the development of image pattern recognition algorithms, particle event reconstruction and analysis, large scale database management and particle physics phenomenology. He has led many experiments that have elucidated the nature of spin effects in high energy particle interactions, including proton-proton elastic scattering, electron-positron scattering and in various inclusive hadronic reactions.

Professor Neal is a member of the Board of Directors of the Ford Motor Company and currently chairs its Committee on Sustainability. He is a recipient of the Sloan Foundation Fellowship, the John Simon Guggenheim Fellowship, the Stony Brook Medal, and the Indiana University Distinguished Alumni Service Award. He is a Fellow of the American Physical Society, the American Association for the Advancement of Science, and the American Academy of Arts and Sciences. He holds honorary degrees from Indiana University, Michigan State University, and Notre Dame University.

Professor Neal has had extended scientist-in-residence appointments at the Niels Bohr Institute in Copenhagen and at the European Organization for Nuclear Research in Geneva. He has been a visiting scientist at Stanford University, Argonne National Laboratory, and Brookhaven National Laboratory. His professional travels have also taken him to the Institute for High Energy Physics at the Chinese Academy of Sciences in Beijing and to laboratories in the former Soviet Union, Israel, Japan and several other countries.

Professor Neal has served as a Regent of the Smithsonian Institution and is currently a member of the Smithsonian Council of the National Museum for African American History and Culture. He has also served as a member of the Oak Ridge National Laboratory Advisory Board, as a member of the MIT Visiting Committee on Sponsored Research, and on the Board of Trustees of the Center for Strategic and International Studies. In addition, he has served on the Board of Trustees of the Argonne National Laboratory, the Fermi National Accelerator Laboratory, and the Lawrence Berkeley National Laboratory. As a member of the National Science Board, the oversight body of the National Science Foundation, he chaired the committee that produced in 1986 the Board's first comprehensive report on undergraduate science, mathematics and engineering education. He has also served as Chairman of the Physics Advisory Committee of the National Science Foundation. He has delivered testimony on numerous occasions to Congress, on matters ranging from the funding of National Laboratories to the state of undergraduate science education. He delivered testimony to the House Science Committee on International Science, as part of its preparations for its recent report, “Unlocking our Future: Toward a New National Science Policy”. He is a member of the National Research Council Board on Physics and Astronomy. He is co-author of a recently released book “Beyond Sputnik: U.S. Science Policy in the Twenty-First Century”.

Selected Publications

Explanation of the Structure of the Spin Correlation Parameter Ann in p-p Elastic Scattering at Multi-GeV Energies, (Homer A. Neal, Holger B. Nielsen), *Phys. Letters B* **508,** 251-258 (2001).

Studies of Elastic p-p Polarization and Differential Cross Section in a Simple Parton Scattering Model, (Homer A. Neal, Joseph Boon Kuah, and Holger B. Nielsen), *Phys. Letters B* **439,** 407-414 (1998).

Measurement of the W Boson Mass, (D0 Collaboration), *Phys. Rev. Letters* **77,** 3309 (1996).

Observation of the Top Quark, (D0 Collaboration), *Phys. Rev. Letters* **74,** 2632 (1995).

The Study of Inclusive Ë Production in e^+ e^- Annihilations at 29 GeV, (HRS Collaboration), *Phys. Rev. D* **45,** 3949 (1992).

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Biographical Profile
James Johnson Duderstadt

Dr. James J. Duderstadt is President *Emeritus* and University Professor of Science and Engineering at the University of Michigan.

Dr. Duderstadt received his baccalaureate degree in electrical engineering with highest honors from Yale University in 1964 and his doctorate in engineering science and physics from the California Institute of Technology in 1967. After a year as an Atomic Energy Commission Postdoctoral Fellow at Caltech, he joined the faculty of the University of Michigan in 1968 in the Department of Nuclear Engineering. Dr. Duderstadt became Dean of the College of Engineering in 1981 and Provost and Vice President for Academic Affairs in 1986. He was appointed as President of the University of Michigan in 1988, and served in this role until July, 1996. He currently holds a university-wide faculty appointment as University Professor of Science and Engineering, directing the University's program in Science, Technology, and Public Policy, and chairing the Michigan Energy Research Council coordinating energy research on the campus.

Dr. Duderstadt's teaching and research interests have spanned a wide range of subjects in science, mathematics, and engineering, including work in areas such as nuclear fission reactors, thermonuclear fusion, high powered lasers, computer simulation, information technology, and policy development in areas such as energy, education, and science.

During his career, Dr. Duderstadt has received numerous national awards for his research, teaching, and service activities, including the E. O. Lawrence Award for excellence in nuclear research, the Arthur Holly Compton Prize for outstanding teaching, the Reginald Wilson Award for national leadership in achieving diversity, and the National Medal of Technology for exemplary service to the nation. He has been elected to numerous honorific societies including the National Academy of Engineering, the American Academy of Arts and Science, Phi Beta Kappa, and Tau Beta Pi.

Dr. Duderstadt has served on and/or chaired numerous public and private boards. These include the National Science Board; the Executive Council of the National Academy of Engineering, the Committee on Science, Engineering, and Public Policy of the National Academy of Sciences; the Nuclear Energy Research Advisory Committee of the Department of Energy, the Big Ten Athletic Conference; the University of Michigan Hospitals, Unisys, and CMS Energy.

He currently serves on or chairs several major national study commissions in areas including federal science policy, higher education, information technology, and energy sciences, including NSF's Advisory Committee on Cyberinfrastructure, the National Commission on the Future of Higher Education, the AGB Task Force on the State of the University Presidency, the Intelligence Science Board, and the Executive Board of the AAAS.

Home
The Book
About the Authors
Additional Resources
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Contact Us

BEYOND *SPUTNIK* – U.S. Science Policy in the 21st Century

A book and webpage for people interested in learning about science policy

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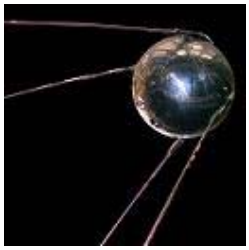
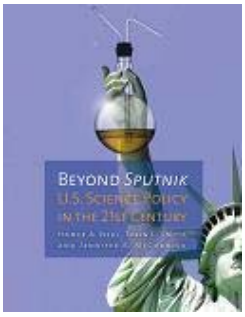


Over the course of the last century, numerous societal advances have been driven by progress in science. Devastating diseases have been conquered, our quality of life and national security have been enhanced, and new economic and intellectual frontiers have been opened. Yet, the public has generally treated this progress as something that just happened, without recognizing that it is, in fact, largely the result of a sustained federal commitment to support science through science policies enacted immediately after World War II and in response to the Soviet launch of Sputnik. Likewise, scientists and engineers often understand little about the policy processes that determine how they conduct their research and, in fact, have tended to avoid becoming involved the policy making process for science. ***Beyond Sputnik*** explains for scientists, policymakers and the public why science policy is important and how science policy is made.

HOW CAN THIS BOOK CAN HELP?



BEYOND* SPUTNIK – *U.S. Science Policy in the 21st Century is written for scientists, policymakers, students, and the general public who want to learn more about science policy in the United States. It is the perfect introductory text for courses in science policy and is a must-read guide for lawmakers, scientists, journalists, and advocates interested in better understanding federal policies for science. Authors and experts Homer Neal, Tobin Smith, and Jennifer McCormick address a range of topics from science education, stem cell research and cloning, to big science projects such as the Super Conducting Super Collider and the Human Genome Project, to homeland and national security research. ***BEYOND* SPUTNIK** offer readers the opportunity to study real instances of science policymaking at work and discusses major policy challenges facing policymakers and the scientific community.

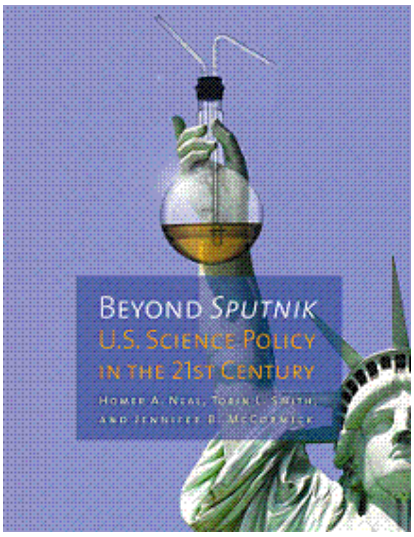
HOW CAN THIS WEBSITE HELP?

Along with information about ***BEYOND* SPUTNIK**, this website links to to other science policy resources including books, magazines, newsletters and budget information as well as

resources on how to work effectively with Congress. Information also is provided to help individuals interested in teaching a science policy course, pursuing a degree in science policy, or in seeking an internship, fellowship or other experience in science policy.

BEYOND *SPUTNIK* – U.S. Science Policy in the 21st Century

-- Table of Contents
-- Brief Description and Chapter Summaries
-- Praise for the Book



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